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Changes in Metabolic and Inflammatory Markers after a Combined Exercise Program in Workers: A Randomized Controlled Trial

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Abstract

Purpose: We investigated the effects of a 16-week combined exercise training on body composition, metabolic and inflammatory markers in sedentary middle-aged workers. We also assessed whether significant alterations in metabolic markers were associated with changes in health-related outcomes.

Methods: This randomized controlled trial involved 46 participants randomly allocated into control and exercise groups. The exercise group performed 16-week combined aerobic and resistance training for 75 min/session, 3 times/week. Fasting blood samples were collected at baseline and after 16-week intervention to determine lipid profile, metabolic and inflammatory markers as primary outcomes.

Results: A total of 36 participants completed the intervention (53.70 ± 6.92 years old) (n = 18 in each group). Waist circumference (interaction effect: F = 7.423, p = 0.002), fat mass (interaction effect: F = 5.070, p = 0.011), and muscle mass (interaction effect: F = 5.420, p = 0.007) were improved in the exercise group compared to the control group. Fasting glucose increased after the 16-week follow-up (time effect: F = 73.253, p < 0.001), without an intergroup difference. Insulin levels were greater in the control compared to exercise group (group effect: F = 6.509, p = 0.015). The control group tended to increase the HOMA-IR index (interaction effect: F = 3.493, p = 0.070) and to decrease the QUICKI index (interaction effect: F = 3.364, p = 0.075) to a greater extent compared to the exercise group. Exercise group reduced leptin (interaction effect: F = 11.175, p = 0.002) and adiponectin (interaction effect: F = 4.437, p = 0.043) concentrations in a greater magnitude than control group. IL-6 (time effect: F = 17.767, p < 0.001) and TNF-α (time effect: F = 9.781, p = 0.004) concentrations decreased after the intervention, without an intergroup difference. IL-17A levels increased in the control compared to exercise group (interaction effect: F = 5.010, p = 0.033). Effects on adiponectin, IL-6 and IL-17A levels seem to depend on baseline BMI, age, and sex. Percentage changes in leptin correlated positively with changes in HOMA-IR index in the exercise (r = 0.565, p = 0.015) and control (r = 0.670, p = 0.002) groups.

Conclusions: A combined training program can be an effective strategy to improve body composition and inflammatory markers and prevent marked reductions in insulin sensitivity among middle-aged workers.

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