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Contribution ID: 231

Type: 1 - Scientific Poster

Short-term metabolic and physical adaptations to low-carbohydrate time-restricted feeding with and without exercise

Thursday 23 July 2026 12:40 (20 minutes)

Background: Carbohydrate restriction and time-restricted feeding (TRF) have independently shown beneficial effects on metabolic health, including improvements in insulin sensitivity, body composition, and lipid metabolism. However, the combined effects of these dietary interventions with structured exercise on metabolic parameters and lipid profiles remain uncertain. This study investigated whether exercise participation enhances metabolic adaptations during a combined low-carbohydrate TRF intervention in healthy adults. **Methods:** Twenty-seven healthy adults were randomly assigned to an exercise group (n=13) or control group (n=14). All participants followed a 2-week 16:8 TRF protocol with a low-carbohydrate diet. The exercise group performed six supervised sessions consisting of 30-minute bodyweight resistance exercises followed by 30-minute Zone 2 running, three times weekly. Comprehensive assessments included body composition, muscular strength, cardiorespiratory fitness, glucose metabolism markers, and lipid profiles at baseline, day 7, and day 14.

Results: Twenty-five participants completed the protocol. Both groups showed significant improvements in body weight (-1.47 ± 1.06 kg), fat mass (-0.99 ± 0.86 kg), blood pressure, fasting glucose, and insulin sensitivity (all $p < 0.001$). Notably, the exercise group demonstrated preserved muscle mass and greater fat mass reduction compared to the diet-only group. Furthermore, leg press strength significantly improved only in the exercise group ($p = 0.016$), with a trend toward improved VO_{2max} ($p = 0.053$). The proportion of larger LDL particles increased significantly in both groups. No significant group \times time interactions were observed for metabolic parameters.

Discussion: The combined low-carbohydrate TRF intervention rapidly improved metabolic parameters and favorably shifted LDL particle distribution toward larger, less atherogenic subfractions. Exercise provided additional benefits in preserving lean mass and improving muscular strength and cardiorespiratory fitness. These findings suggest that timing and composition of food intake may offer targeted strategies to improve cardiometabolic health beyond conventional approaches.

Keywords

time-restricted feeding, low-carbohydrate diet, combined exercise, metabolic health

Conflict of Interest & Ethical Approval

yes

Abstract submitters declaration

yes

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Session Classification: Poster Session