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Comparing two exercise training doses on metabolic control in adults with overweight/obesity and type 2 diabetes: a randomised controlled trial

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Background: Moderate intensity continuous aerobic training with moderate intensity resistance training (C-MICT) has been shown to improve insulin sensitivity and beta-cell function in people with type 2 diabetes mellitus (T2D). The combination of high-intensity interval aerobic training with high-intensity resistance training (C-HIIT) has not been previously investigated in people with T2D. We aimed to compare the efficacy of 8 weeks of low volume C-HIIT and C-MICT on beta-cell function, insulin sensitivity (IS) and resistance (IR), fasting plasma blood glucose (FPG) and insulin (FPI) in adults with T2D.

Methods: Forty-three adults (60 ± 7y) with overweight/obesity (BMI = 33.4 ± 6.6 kg/m²) and T2D (glycated haemoglobin [HbA_{1c}] 61 ± 13 mmol/mol [7.7 ± 1.2%]) were randomised into 8 wks of either: low volume C-HIIT (n = 15), C-MICT (n = 16), or control (n = 12). C-HIIT involved aerobic exercise for 4 min at 85–95% peak heart rate (HR_{peak}) followed by high-intensity resistance training (Rate of Perceived Exertion [RPE] ≥ 17) involving 8 exercises for 1-min each, on three days/week. Session time was 26 mins = 78 mins/week. C-MICT comprised aerobic exercise for 150 mins/wk over four days at 55–69% HR_{peak} and moderate intensity resistance training 60 mins/wk (RPE 11–13). Total exercise time = 210 mins/week. Blood samples were taken after an overnight fast with the homeostatic model assessment 2 (HOMA2) used as an indicator of beta-cell function, IS and IR. ANCOVA was used to determine differences in change scores between groups using the baseline value as the covariate. Values are reported as means ± SD.

Results: There were no significant between-group difference for change in beta-cell function (5.43 ± 25.81%, 0.93 ± 31.51%, and 15.23 ± 77.06% for C-HIIT, C-MICT and control, respectively), IS (−1.36 ± 23.34%, −1.49 ± 32.86%, 2.17 ± 9.90%), IR (0.45 ± 0.82, −0.36 ± 1.74, 0.04 ± 0.90), FPG (0.24 ± 2.66 mmol/l, −0.89 ± 2.96 mmol/l, 0.42 ± 3.09 mmol/l) and FPI (3.23 ± 5.95 μU/ml, −1.68 ± 9.87 μU/ml, 0.87 ± 7.87 μU/ml).

Conclusion: The novel findings from this study are that 8 weeks of low volume C-HIIT and C-MICT did not significantly improve metabolic control in adults with T2D.

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Effect of high intensity interval training on visceral adiposity and body composition in patients with coronary artery disease

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Introduction: Obesity, and particularly visceral adiposity, is a significant contributor to lifetime risk of cardiovascular disease. Exercise training reduces visceral adipose tissue (VAT), however it remains unclear if exercise intensity influences the degree of fat reduction. The aim of this study was to compare isocaloric high intensity interval training (HIIT) and moderate intensity continuous training (MICT) on VAT and body composition.

Methods: 29 participants (26 male) with coronary artery disease (CAD) commencing a cardiac rehabilitation program (mean age 64 ± 8 years and body mass index of 27.8 ± 3.5 kg/m²) were randomised to 12-weeks of HIIT or MICT, 3 times per week. Estimated energy expenditure for the training was ~1 MJ per session (3 MJ per week). Both groups received standard cardiac rehabilitation nutrition education. VAT and abdominal subcutaneous fat (SAT) were measured by a 3 Telsa magnetic resonance imaging system. Transverse slice images from diaphragm to pelvis (L5/S1) were used to quantify total volumes by semi-automated specialised software. Total fat mass (FM) and fat free mass (FFM) were measured by dual energy x-ray absorptiometry. Data was analysed by ANOVA with baseline data used as a covariate.

Results: There was a significant ($p < 0.05$) effect of time over 12 weeks on total VAT volume (HIIT: −348 ± 287 cm³ [−13% ± 13%], MICT: −501 ± 495 cm³ [−16% ± 14%]), total SAT volume (HIIT: −211 ± 186 cm³ [−6% ± 5%], MICT: −315 ± 360 cm³ [−9% ± 10%]), FM (HIIT: −1.0 ± 1.3 kg, MICT: −2.6 ± 2.4 kg), and FFM (HIIT: +0.3 ± 0.9 kg, MICT: +0.9 ± 1.5 kg), but only a significant group difference for FM favouring MICT ($p = 0.05$). No significant differences for time ($p = 0.82$) or group ($p = 0.69$) were found for energy intake. MICT participants reported significantly greater average exercise minutes per week (HIIT: 144 ± 51 min, MICT: 259 ± 131 min, $p = 0.006$).

Conclusion: Both HIIT and MICT provide a clinically significant reduction in VAT (13–16%) over 12 weeks in patients with CAD. HIIT may offer similar reduction in visceral adiposity with less time commitment.

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Predicting variations in individual response to different weight loss regimens

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Background: A number of studies have shown that the mean response to a weight loss intervention hides significant individual variation with some individuals responding well and losing large amounts of weight and others failing to respond or even gaining weight. The reason for this wide individual variation is

