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Individual variation in response to high intensity interval training among participants with newly diagnosed type 2 diabetes

A. McCann[1,2], K. Backx[2], D. Wasley[2], G. Dunseath[3], S. Luzio[3] and D. Owens[3]
[1]*Northern Ireland Centre for Food and Health, University of Ulster, Coleraine, BT52 1SA,* [2]*Cardiff School of Sport, Cardiff Metropolitan University, Cardiff, CF23 6XD, Wales and* [3]*Diabetes Research Unit, Cardiff University, Cardiff, CF64 2XX, UK*

Most studies evaluating the efficacy of exercise tend to overlook inter-individual variability[(1)]. The aim of the present study was to investigate the effect of 12 weeks of high intensity interval training on metabolic control, beta-cell secretion and insulin resistance among ten individuals with newly diagnosed type 2 diabetes. Baseline measures included body composition, glycosylated haemoglobin (HbA_{1c}), lipid profile and tests performed were meal tolerance test (MTT) and frequently sampled intravenous glucose tolerance test (FSIVGTT). Measures of fasting (M_0) and postprandial (M_1) beta-cell responsiveness, and acute insulin response to glucose (AIR_g) were determined and HOMA-IR calculated as a measure of insulin resistance. Interval training was scheduled 3 times·week^{-1} and used individualized exercise intensities determined using the heart rate reserve (HRR) method. Following an introductory phase during weeks 1 and 2, training progressed to 20–40 min periods of interval training consisting of low-intensity periods of 1–2 min at 40–50% HRR and high-intensity periods of 1, 2 or 3 min at 80–90% HRR (weeks 3–12). All baseline measurements and tests were repeated post intervention.

Average [range] compliance was observed as 63.0[38.9–80.5]% at an intensity of 77.3[65.8–86.5]% HRR. Group analysis indicated there were significant changes following intervention in BMI (30.0 *vs.* 28.7 kg.m^{-2}; $p = 0.006$), waist circumference (101.4 *vs.* 97.2 cm; $p = 0.021$), HbA_{1c} (6.4 *vs.* 6.0%; $p = 0.007$), total cholesterol (5.3 *vs.* 4.6 mmol.L^{-1}; $p = 0.046$), low-density lipoprotein (LDL) cholesterol (3.2 *vs.* 2.6 mmol.L^{-1}; $p = 0.028$), M_0 (11.5×10^{-9} *vs.* 7.0×10^{-9} pmol.kg^{-1}.min^{-1}; $p = 0.009$), AIR_g (20.4 *vs.* 27.2; $p = 0.05$) and HOMA-IR (3.0 *vs.* 2.1; $p = 0.049$). However, the Table below illustrates that within the group there were also considerable variations in response to interval training both among individuals and among the measured parameters.

	Participant									
	1	2	3	4	5	6	7	8	9	10
BMI	−5.0	0.8	−3.6	−3.6	−1.8	−8.6	−0.9	−1.7	−8.7	−10.8
Waist circumference	−10.8	−3.9	0.0	−4.8	1.1	−7.2	2.4	−3.3	−6.0	−9.1
HbA_{1c}	−7.8	−3.4	−3.4	−1.7	−3.5	−3.5	0.0	−4.1	−10.3	−20.0
Total cholesterol	−26.0	−2.1	−11.8	−28.2	5.6	−34.0	−3.8	−4.1	15.8	−24.5
LDL cholesterol	−25.0	−10.0	−6.5	−37.0	18.2	−37.5	−17.1	−7.7	0.0	−17.6
M_0	−74.5	−42.2	−53.3	−61.8	33.3	−59.0	−29.9	−27.1	−9.3	−34.9
AIRg	24.2	86.2	20.9	91.7	−6.6	−16.6	0.0	23.7	0.0	46.4
$HOMA_{IR}$	−27.8	−40.7	−57.5	−50.0	58.3	−63.9	−23.1	−2.7	28.6	−63.4

Values presented are percentage (%) change in relation to baseline.

Although in some instances inter-individual variation may be explained by compliance[(2)] it is plausible that response to exercise stimuli can vary from one individual to another[(3)]. Individuals and measured parameters may be described as showing 'high' or 'low' sensitivity to exercise stimuli[(4)]. Exercise programmes modelled on personalised interventions which provide greater consideration of variation in response among individuals and parameters of interest should be promoted and further researched.

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