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Maintaining a clinical weight loss after intensive lifestyle intervention is the key to cardiometabolic health

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Summary

Objective: Intensive lifestyle interventions (ILI) are criticised for ineffective obesity treatment because weight loss over time is modest and thus of limited clinical relevance. However, a subgroup (5–30%) maintains a clinical weight loss >10%, but it is not clear if cardiometabolic health follows this pattern. The aim was to study the effect of different magnitudes of weight loss maintenance after ILI on cardiometabolic health.

Methods: Eighty out of 2420 former participants (age: 36 ± 1 , BMI: 38 ± 1 , (means \pm SE)) in an 11–12-week ILI were recruited into 3 groups; clinical weight loss maintenance (>10% weight loss), moderate maintenance (1–10%), and weight regain based on weight loss at follow-up (5.3 ± 0.4 years). Weight loss during the ILI was achieved by increased physical activity and hypo-caloric diet. Dual X-ray Absorptiometry, blood sample, skeletal muscle biopsy and VO_{2max} test were used to determine cardiometabolic health at follow-up.

Results: At follow-up, the clinical weight loss maintenance group scored better in the following variables compared to the other groups: BMI (31 ± 1 , 33 ± 2 , 43 ± 2 kg/m²),

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composition (34 ± 2 , 40 ± 1 , $49 \pm 1\%$ fat), visceral adipose tissue (0.8 ± 0.2 , 1.7 ± 0.5 , 2.4 ± 0.4 kg), plasma triglycerides (0.8 ± 0.2 , 1.3 ± 0.4 , 1.6 ± 0.3 mmol/L), plasma glucose (4.9 ± 0.1 , 5.9 ± 0.4 , 5.9 ± 0.1 mmol/L), Hb1Ac (5.1 ± 0.0 , 5.6 ± 0.2 , $5.8 \pm 0.2\%$), protein content in skeletal muscle of GLUT4 (1.5 ± 0.2 , 0.9 ± 0.1 , 1.0 ± 0.1 AU) and hexokinase II (1.6 ± 0.2 , 1.0 ± 0.2 , 0.7 ± 0.1 AU), citrate synthase activity (155 ± 6 , 130 ± 5 , 113 ± 5 μ mol/g/min) and VO_{2max} (49 ± 1 , 43 ± 1 , 41 ± 1 mL/min/FFM) ($p < 0.05$).

Conclusion: Cardiometabolic health is better in participants who have maintained $>10\%$ weight loss compared to moderate weight loss and weight regain.

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Introduction

Currently it is debated whether individuals suffering from overweight and obesity should engage in intensive lifestyle interventions (ILIs) to lose weight [1–4]. It is argued that ILIs are ineffective as obesity treatment inducing only small weight losses without clinical relevance and that over time mortality may even increase when compared to weight stable individuals with obesity [5–7].

Nevertheless, behavioural modifications such as ILIs including increased physical activity and reduced energy intake are still first line treatment of overweight and obesity [8–10]. Various types of ILIs have over the years been tested to achieve long-term weight loss maintenance [11,12]. Randomised controlled clinical trials reveal that despite a 5–10% weight loss 3–12 months after the intervention a subsequent gradual weight regain results in almost no weight loss at follow-up after 2–8 years [13,14]. Two of the most comprehensive lifestyle intervention-studies conducted to date, the Diabetes Prevention Program study [14] and the LOOK AHEAD study [5], found that the initial weight loss was associated with improvements in almost all cardiovascular risk factors including aerobic capacity, and levels of glycated hemoglobin (Hb1Ac), but over time gradual weight-regain attenuated these improvements. Thus, overall it seems that ILIs are somewhat ineffective in the treatment of obesity and in obtaining lasting improvements of cardiovascular risk factors and metabolic health.

However, ILI does seem to work for a subgroup of participants (5–30%), where weight loss is maintained or even further increased over time [15–18]. Whether this subgroup that achieves a successful or clinical relevant weight loss of $>10\%$ (defined by Wing and Hill in 2001 and US National Institute for Health) [19,20] and maintains it for years without weight regain is rewarded with improvements in indices of good health compared to individuals with an average and modest response to ILI (3–5% weight loss after 2–8 years) [5,15,17] has not been fully explored. One study by Neiberg et al. found that an ILI-induced clinical weight loss of $>10\%$ sustained for 4 years was associated with lasting improvements in Hb1Ac and HDL cholesterol in overweight and patients with type 2 diabetes [16]. However, whether cardiovascular risk fac-

tors and metabolic health over a wide range are improved with maintenance of $>10\%$ weight loss over more than four years is not clear.

Thus, we performed a follow-up study investigating the effects of weight loss maintenance after ILI on cardiometabolic health. Our aim was to recruit individuals who had previously participated in a controlled ILI and afterwards experienced major differences in terms of weight loss maintenance. Our hypothesis was that participants who achieved clinical weight loss maintenance ($>10\%$), but not those who achieved moderate weight loss maintenance would experience better cardiometabolic health compared to weight regain.

Subjects, materials and methods

Ethical approval

The study was approved by the Local Research Ethics Committee, Copenhagen, Denmark (H-3-2013-146), (Clinical trial number: NCT02040753) and performed according to the Helsinki declaration. Subjects were informed orally and in writing about the experiments and potential risks before written consent were obtained.

Participants

80 former participants (48 women, 32 men) were recruited from a population of 2420 individuals who had participated in and completed an ILI for overweight and people with obesity at a private health school in Denmark (www.ubberup.dk). In order to recruit subjects, all former participants were contacted by letter and by an advertisement on www.facebook.com. The enrollment process is illustrated in Fig. 1. Inclusion criteria were age between 18–60 years, BMI > 28 prior to starting the ILI and a minimum follow-up period of one year. Some lifestyle related diseases were expected and medication for these accepted. However, cardiovascular disease, cancer, low or elevated metabolism, severe psychological disease and gastric bypass operation were exclusion criteria. Of the 80 included volunteers five were diag-

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