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ORIGINAL ARTICLE

How are body mass and body attitude impacted by a behaviour change intervention in primary care? A pragmatic randomised controlled trial

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Abstract

Aims: This study evaluated the effect of behaviour change interventions at Norwegian Healthy Life Centres on change in body mass index (BMI) and body attitude, and explored the predictors for change after 6 months. *Methods:* We randomised 118 participants to either an intervention or a control group. Eligible participants: ⩾18 years and able to take part in group-based interventions. Body attitude, weight, and height were assessed at inclusion and after 6 months. We analysed the data using simple and multiple regression. *Results:* Eighty-six participants completed 6-month follow-up. The study found no intervention effect on BMI or body attitude across the two groups. However, an interaction effect indicated that the leaner participants in the intervention group reduced their weight significantly (b 0.94, $p < 0.001$). BMI reduction was predicted by self-efficacy for physical activity and autonomous motivation for change. Weight loss was associated with impaired body attitude, body shape concern, impaired weight-related self-esteem, weight cycling, and controlled motivation for change. Improvement in body attitude was positively impacted by self-rated health, the experience of childhood respect, life satisfaction, and self-efficacy for physical activity. Impaired body attitude was predicted by body shape concern, impaired weight-related self-esteem, and controlled motivation. ***Conclusions:*** **The interventions did not affect body mass on average, but promoted weight loss among the leaner participants. Because weight reduction was associated body shape concern and impaired body attitude, the study supports the claim that interventions should be weight neutral and aim to improve body image and psychological well-being rather than weight reduction.**

Keywords: *Randomised controlled trial, exercise referral, body mass index, weight-neutral intervention*

Introduction

Non-communicable diseases (NCDs) are the leading cause of morbidity and mortality in Europe. The Norwegian Directorate of Health has recommended Healthy Life Centres (HLCs) in primary care to prevent and treat NCDs [1]. HLCs mainly focus on healthy eating, tobacco cessation and physical activity (PA).

The Norwegian Healthy Life Centre Study was a 6-month pragmatic randomised controlled trial (RCT) with a longitudinal cohort study 24 months from baseline. The study aimed to evaluate the effect of interventions on PA, self-rated health (SRH) and well-being, diet and eating behaviour, tobacco use, sleep, and body attitude. The protocol and the participants' baseline characteristics were presented earlier [2, 3]. The RCT found no effect on PA 6 months after baseline compared with a control group. However, those least physically active in the intervention group benefitted significantly from the interventions [4].

Body mass index (BMI) and low levels of psychological well-being may function as a motivator to initiate behaviour change, and being 'overweight' was the most frequently given reason for attending the

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HLC. The HLC interventions are not primarily aimed at weight loss, but weight and waist circumference are measured at inclusion and at follow-up [3]. Dieting and weight-loss interventions are popular in the population, and recommended in many public health policies, including the Norwegian Directorate of Health's guideline for treating overweight and obesity, in order to improve health [5].

Being overweight or obese are strongly associated with NCDs, but causation is not well established [6]. Many short-term studies of weight-loss interventions indicate improved health, but because the interventions also include behaviour change, it is not known whether the health benefits can be attributed to the weight loss [6]. The fact that health benefits from weight loss rarely show a dose response may indicate that it is behaviour change and not weight loss that provides the effects. Long-term studies show complete weight regain in most participants, resulting in loss of the health effects of the weight reduction, as well as compromised physical and psychological health associated with weight cycling [6, 7].

A weight-normative approach (emphasis on weight and weight loss) has the potential for undermining the benefits of improved health behaviour. Thus, behaviour change interventions that improve psychological well-being (e.g. self-esteem (SE), body satisfaction, SRH, and quality of life) are called for [8].

The aims for the present study were, therefore, first, to examine whether the HLC interventions impacted on BMI and body attitude compared with the control group; and second, to examine whether sociodemographic and other characteristics impacted on change in these outcomes 6 months after baseline.

Material and methods

Setting and recruitment

This was a pragmatic RCT of a complex intervention in routine practice in primary healthcare in Norway [2]. After 6 months, the control group, which had been held on a waiting list, also received the intervention. Eight rural and urban municipalities encompassing six HLCs, with a total of 630,000 inhabitants (varying from 6000 to 270,000), agreed to take part. The participants were >18 years old and able to participate in a group-based PA intervention held in Norwegian. Exclusion criteria were having disabling mental illness or a severe learning disability.

Participants were referred by their general practitioner, other health professionals or were self-referred. (See Figure 1 flow chart.) The HLCs invited 351 eligible people to participate in the study between June 2014 and September 2015, and 118 (35%) agreed to take part. The main reason for declining participation was the possibility of having to wait 6 months for the intervention if randomised to the control group.

Randomisation

Randomisation was performed ensuring a 50% allocation probability to each group at each HLC. A research coordinator, not part of the intervention, drew cards from numbered, sealed, opaque envelopes allocating treatment assignment, ensuring concealment of sequence to those enrolling the participants. Randomisation was performed after the inclusion visit.

Data collection

Data were collected using a questionnaire administered by an online survey management system (SurveyXact™; Rambøll Management Consulting, Oslo, Norway). Participants completed the questionnaire 6- (the RCT) and 24 months after baseline (the cohort study). The results from the cohort study are not included here.

Interventions

The HLC model consists of referral to a group-based behaviour change intervention for 12 weeks, with an individual counselling session based on motivational interviewing at entry and exit [1]. In the first session (30–60 min), the counsellor offers information tailored to the needs and abilities of the individual and supports change in behaviour in a mutually agreed plan. At 12 weeks, a second individual counselling session reviews goals and the results, and if the participants are motivated, the prescription period may be extended for up to a year. PA interventions, such as Nordic walking, light strength training, stretching or games, are recommended twice a week [1]. The HLCs' interventions vary depending on local resources and competence. The professionals involved may be physiotherapists, nutritionists, trained lifestyle counsellors, or nurses trained in public health or psychiatry. Some HLCs organise their own PA groups, while others refer to public or private services [2]. Attending healthy diet and/or tobacco cessation interventions is optional, based on personal motivation.

Body mass index (BMI) and body attitude

At inclusion and at 6-month follow-up, HLC counsellors measured participants' weight, height and waist circumference at the level of the umbilicus. For

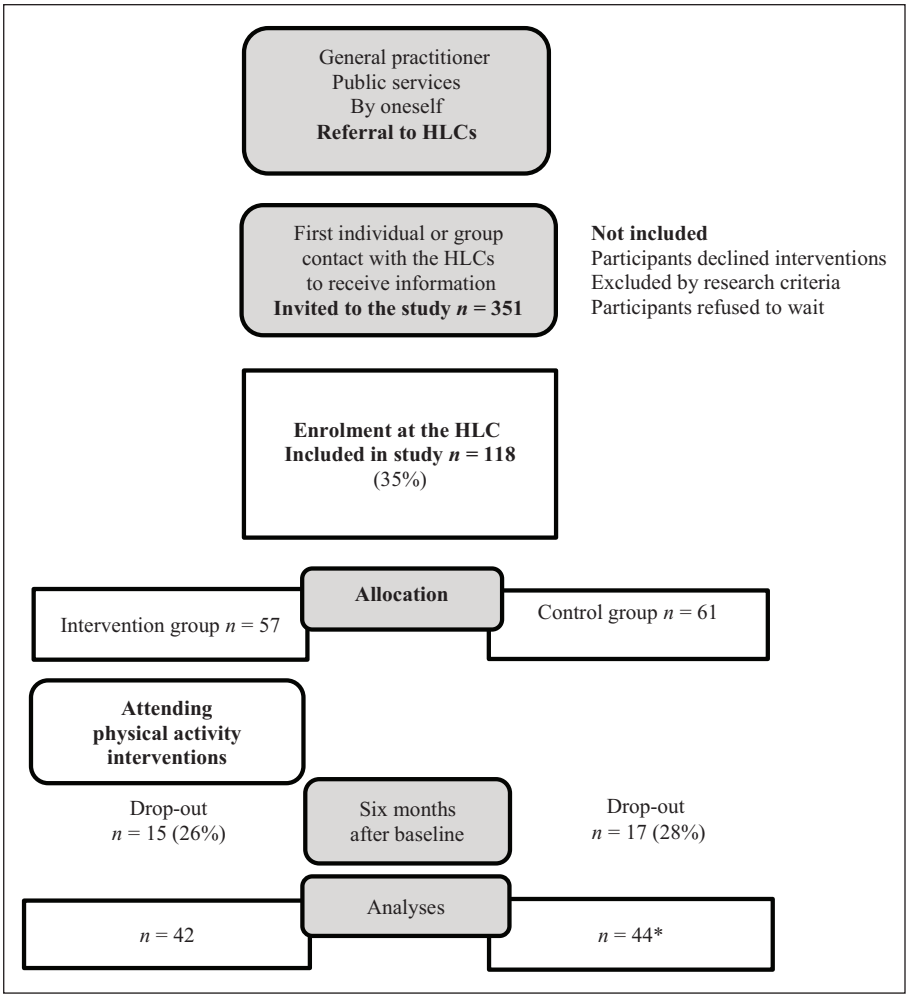

Figure 1. Participants in the Norwegian Healthy Life Centre Study recruited from June 2014 to September 2015. Flow chart of referral, uptake and attendance. This figure was originally published in a previous study on the same population [2].
HLC = Healthy Living Centre.
*One participant did not answer survey question about body attitude (n = 43).

assessing subjective body experience and attitude toward one's own body, we used the Body Attitude Test (BAT), applicable for both clinical and non-clinical use, and with good internal consistency and test-retest reliability [9]. BAT measures four constructs over 20 items (Negative appreciation of body size, Lack of familiarity with one's own body, General dissatisfaction, and a Rest factor; Likert scale 0–5), where higher scores indicate impaired body attitude (negative experience and attitudes). The second construct, 'Lack of familiarity with one's own body' (seven items), was judged the most relevant for this study.

Predicting variables

For socio-economic status, we used a five-item scale on education in line with the Norwegian education system [10]. SRH is suggested to be an accurate self-perception of the individual's overall health status, measured by a single-item question validated in a Norwegian study [11]. Participants' life satisfaction was measured using Cantril's 11-step ladder [12]. Worst possible life equals the first step, and the top step represents best possible life. The Impact of Weight on Quality of Life–Lite (IWQOL-Lite) is an obesity-specific quality of life measure [13]. A version with 31 items covering five domains (Physical functioning, SE, Sexual life, Public distress, and Work) has been tested in Norway [14]. We decided that the questions pertaining to weight-related impact on SE were the most relevant for this study (Likert scale 1–5). Higher scores indicate a negative impact of weight on SE. The experience of parental acceptance and rejection in childhood has been linked to adults' behavioural and emotional adjustment. To assess childhood respect and appreciation, we applied a single item ('I experienced

respect and appreciation in my childhood') with increasing respect (Likert scale 1–7) [15].

The Treatment Self-Regulation Questionnaire (TSRQ), developed by Levesque et al., assessed the participant's motivation for behaviour change (Likert scale 1–7) [16]. The scale identifies three types of motivational regulation for change: autonomous motivation (six items), controlled motivation (six items) and amotivation (not motivated for change) (three items). Autonomous motivation manifests the volition of the person, whereas controlled motivation originates either from external pressure or bad conscience. The TSRQ has been validated in several studies, including one Norwegian study [17]. Self-efficacy for PA was measured with a scale previously used in a population study (eight items; Likert scale 1–7) [18].

We used BAT plus body shape concern as two dimensions of body dissatisfaction. Body shape concern was measured with a single six-point item validated by World Health Organization in a cross-national survey ('What do you think about your body?') [19]. Body shape concern was later dichotomised, and the option 'Way too fat' (value 1) was compared with the other five response options ('I do not think about it', 'A little bit fat', 'About right', 'Too thin', 'Way too thin') (value 0). Weight cycling was measured by numbers of episodes with weight gain or loss (>5 kg) over the last 2 years. Impaired body attitude was used both as a primary outcome and as a predictor of BMI change in the analyses. The constructs had high internal consistency and the randomisation was effective (Table I).

Statistical analysis

All the statistical analyses were conducted using IBM SPSS, version 25 (IBM Corp, Armonk, NY, USA). Sample size calculation was based on an estimated 50% improvement in PA (moderate to vigorous intensity) in the intervention group, with a power of 80%. We reported the means and standard deviations (SDs). Although it is of contested value, a post hoc power calculation in the present study revealed that we were able to rule out a 10% between-group post-intervention difference in BMI across the intervention and control group (34.0 and 30.5 with SD 6.0, respectively with a power of 80%) [20].

The instruments single missing values varied from 1.7% to 6.8%. We used linear regression analyses with adjustment for baseline values to examine whether the intervention had an impact on BMI or body attitude change 6 months after baseline. We used linear regression to relate change in BMI and body attitude to potential predictors, comparing the predictors using standardised betas (*b*). Performing the predictor analyses, we merged responses from 86 participants answering the SurveyXact questionnaire at both time points (intervention and control group). In these analyses, we used residual change as the method for change in both BMI and body attitude.

The predictors were body attitude at baseline (predictor for BMI change) and BMI at baseline (predictor for change in body attitude), body shape concern, SRH, weight-related SE, childhood experience of respect, autonomous and controlled motivation, self-efficacy for PA, episodes of weight cycling, and education level. The predictors were adjusted for gender, age, group (intervention/control), and the baseline values of the outcome measures. The results for each predictor were reported as standardised regression coefficients (*b*) with *p*-values from the *F*-test. A *p*-value of <0.05 was accepted as significant.

Ethics

All participants gave written informed consent prior to participation in the study. The Regional Committee for Medical and Health Research Ethics (REK Vest) approved the study (no. 2013/1291).

Results

The study recruited 118 participants (77% women). Randomisation resulted in 57 participants allocated to the intervention group, and 61 to the 6-month waiting list (control group). Table I shows that participants were predominantly middle-aged (mean 49 years old), obese (75%), women (77%), and many had body shape concern (65%). Approximately half had upper-secondary school or less as their highest education. Over 50% rated their health as bad or fairly bad. The participants scored high on autonomous reasons for behaviour change.

The main effects of the intervention are presented in Table II. There was no statistically significant change in body attitude or BMI within either group 6 months after baseline, and the regression analysis showed no significant difference in change between the groups. Interaction analysis revealed that the intervention promoted weight loss, dependent on baseline BMI, and leaner participants benefitted most (*b* for the interaction term 0.94, $p < 0.001$; data not shown in the table.)

Older age, more self-efficacy for PA, and being autonomously motivated for change of behaviour predicted a reduction in BMI 6 months after baseline (Table III). However, reduced BMI was at the same time associated with body shape concern, impaired

Table I. Descriptive baseline characteristics of 118 participants in the Norwegian Healthy Life Centre Study, recruited from June 2014 to September 2015, for the total group and according to intervention and waiting list (control) group.

Group: Variable (Scale) Category	Total *N* = 118 (100%)	Intervention *n* = 57 (48.3%)	Control *n* = 61 (51.7%)	CrA
Female, *n* (%)	91 (77.1)	45 (78.9)	46 (75.4)	
Age in years, mean (SD) (%)	48.6 (13.4)	47.7 (13.3)	49.4 (13.5)	
BMI (kg/m^2), mean (SD)	34.0 (5.8)	33.8 (6.2)	34.1 (5.4)	
⩾30 kg/m^2, *n* (%)	88 (74.6)	40 (70.2)	48 (78.7)	
Impaired body attitude (1–5)[a], mean (SD)	2.6 (0.8)	2.5 (0.8)	2.7 (0.9)	0.82
Education (1–3), *n* (%)				
Low: Upper-secondary school or below,	44 (37.6)	17 (29.8)	27 (45.0)	
Middle: Upper-secondary school general	21 (17.9)	15 (26.3)	6 (10.0)	
High: University college and/or university	52 (44.4)	25 (43.9)	27 (45.0)	
Autonomous motivation (1–7), mean (SD)	6.1 (0.9)	6.1 (1.0)	6.1 (0.8)	0.81
Controlled motivation (1–7), mean (SD)	4.1 (1.2)	4.0 (1.3)	4.0 (1.1)	0.73
Self-rated health (1–5)				
Bad or fairly bad health (<3), *n* (%)	65 (56.0)	34 (52.3)	31 (47.7)	
Body shape concern (1–0)[b], *n* (%)	77 (65.3)	39 (63.9)	38 (66.7)	
Childhood experience of respect (1–7), mean (SD)	4.5 (1.8)	4.7 (1.9)	4.4 (1.7)	
Low childhood experience of respect (<3), *n* (%)	39 (33.1)	20 (35.1)	19 (31.2)	
Impaired weight-related self-esteem (1–5)[c], mean (SD)	3.0 (1.2)	3.0 (1.3)	3.0 (1.2)	0.93
Life satisfaction (1–10)[d], mean (SD)	5.7 (2.1)	5.4 (2.2)	6.0 (2.0)	
Episodes of weight cycling (1–5)[e], mean (SD)	2.9 (1.4)	3.0 (1.3)	2.9 (1.5)	
Self-efficacy for PA (1–7), mean (SD)	4.6 (1.6)	4.4 (1.8)	4.7 (1.4)	0.93

Note: RCT: randomised controlled trial; CrA: Cronbach's alpha; SD: standard deviation; BMI: body mass index; PA: physical activity.
[a]Measured by 'Lack of familiarity with one's own body' (seven items), one construct in the Body Attitude Test (BAT). Higher scores indicate a worsened body attitude.
[b]A single question 'What do you think about your body?' (1–6) dichotomised into 'Way too fat' (= 1) versus five alternatives ('I do not think about it', 'A little bit fat', 'About right', 'Too thin', 'Way too thin'; = 0).
[c]Four of seven items of impact of weight on self-esteem, one domain of Impact of Weight on Quality of Life–Lite (IWQOL-Lite). Higher scores indicate lower self-esteem.
[d]Life satisfaction according to Cantril's ladder.
[e]Weight cycling >5 kg in last 2 years: (1 = 0, 2 = 1, 3 = 2, 4 = 3, 5 = at least four episodes).

Table II. Results from linear regression analyses of change in BMI and body attitude 6 months after baseline for participants in the Norwegian Healthy Life Centre RCT, recruited from June 2014 to September 2015.

Baseline				Post intervention			Regression		
Response variable Outcome group	*N* = 118	Mean	SD	*N*	Mean	SD	*b*[a]	95% CI	*p*-value
BMI				86					0.185
Intervention	57	33.8	6.2	42	34.3	7.0	0.04	(–0.02, 0.09)	
Control	61	34.1	5.4	44	34.0	4.8		Reference	
Impaired body attitude (1–5)[b]				85					0.747
Intervention	57	2.5	0.8	42	2.5	0.7	–0.04	(–0.26, 0.19)	
Control	61	2.7	0.9	43	2.5	0.9		Reference	

Note: BMI: body mass index; RCT: randomised controlled trial; SD: standard deviation; *b*: standardised regression coefficient; CI: confidence interval.
[a]Between-group difference adjusted for baseline values.
[b]Measured with 'Lack of familiarity with one's own body' (seven items), one construct in the Body Attitude Test (BAT). Higher scores indicate greater impairment of body attitude.

body attitude, impaired weight-related SE, episodes of weight cycling, and reporting external pressure or bad conscience as reasons for change.

High levels of SRH, self-efficacy for PA, experience of childhood respect, or being satisfied with life, predicted an improvement of body attitude 6 months after baseline (Table IV). Less beneficial characteristics, such as body shape concern, impaired weight-related SE, or controlled motivation for change of behaviour, predicted an impairment of body attitude.

Table III. Results from linear regression analyses of change in BMI (residual change) 6 months after baseline for 86 participants (both groups) in the Norwegian Healthy Life Centre Study, recruited from June 2014 to September 2015 on predictors at baseline.

Predictors	*b*	95% CI	*p*-value
Female gender[a]	–0.12	(–0.34, 0.10)	0.270
Age[a]	–0.34	(–0.55, –0.14)	**0.001**
Intervention group[a]	0.02	(–0.20, 0.24)	0.862
BMI at baseline[a]	0.97	(0.94, 1.05)	**<0.001**
Impaired body attitude (1–5)[b,c]	–0.13	(–0.17, –0.08)	**<0.001**
Education[b,d]			
High	0.00	Reference	–
Middle	–0.05	(–0.11, 0.01)	0.091
Low	–0.03	(–0.25, 0.03)	0.307
Self-rated health (1–5)[b,e]	–0.00	(–0.08, 0.08)	0.978
Body shape concern (0–1)[b,d,f]	–0.13	(–0.19, –0.06)	**<0.001**
Childhood experience of respect (1–7)[b,e]	0.06	(0.00, 0.11)	**0.050**
Impaired weight-related self-esteem (1–5)[b,g]	–0.13	(–0.20, –0.07)	**<0.001**
Life satisfaction[b,e,h]	–0.03	(–0.08, 0.03)	0.305
Episodes of weight cycling[b,d,i]	–0.07	(–0.13, –0.02)	**0.013**
Self-efficacy for PA (1–7)[b]	–0.06	(–0.11, 0.00)	**0.047**
Autonomous motivation (1–7)[b]	–0.17	(–0.22, –0.13)	**<0.001**
Controlled motivation (1–7)[b]	–0.14	(–0.19, –0.09)	**<0.001**

Note: BMI: body mass index; *b*: standardised regression coefficient; CI: Confidence interval; PA: physical activity. Bold indicates the result is statistically significant. '–' indicate name of item and alternatives in answer.
[a]Unadjusted models.
[b]Models adjusted for gender, age, BMI at baseline and group allocation.
[c]Measured with 'Lack of familiarity with one's own body' (seven items), one construct in the Body Attitude Test (BAT). Higher scores indicate greater impairment of body attitude.
[d]Low: upper-secondary school and below; Middle: upper-secondary school with general studies; High: university college and/or university.
[e]Single-item scale.
[f]Single item 'What do you think about your body?' (1–6) dichotomised into 'Way too fat' versus five alternatives ('I don't not think about it', 'A little bit fat', 'About right', 'Too thin', 'Way too thin').
[g]Four items of weight's impact on self-esteem, one domain of Impact of Weight on Quality of Life–Lite (IWQOL-Lite). Higher scores indicate lower self-esteem.
[h]Life satisfaction according to Cantril's ladder.
[i]Weight cycling >5 kg in last 2 years: (1 = 0, 2 = 1, 3 = 2, 4 = 3, 5 = at least four episodes).

Self-efficacy for PA was the only factor that explained both a reduction in BMI and improved body attitude simultaneously. At the same time, both reduced BMI and impaired body attitude, were predicted by body shape concern, impaired weight-related SE, and controlled motivation. Educational level had no impact on the outcomes 6 months after baseline.

Discussion

This RCT did not reveal any intervention effect on BMI or body attitude after 6 months. The results showed a significant interaction effect between intervention and BMI. The leaner participants in the intervention group reduced their BMI significantly as compared with the leaner participants in the control group. Motivational resources for change, such as self-efficacy for PA and autonomous motivation for change, predicted a reduction in BMI. However, reduced BMI was also caused by several self-conceptual problems, such as impaired body attitude, body shape concern, impaired weight-related SE, episodes of weight cycling, and controlled motivation. Higher levels of SRH, respect and appreciation in childhood, satisfaction with life, and self-efficacy for PA predicted improvement in body attitude. Body shape concern, impaired weight-related SE, and controlled motivation predicted deterioration of body attitude.

Predictors for change in body attitude

Reports on the relation between body dissatisfaction and BMI have been inconsistent [21]. A one-way causal link between impaired body attitude at baseline and a reduction in BMI at follow-up was evident in the present study, although other studies document a bi-directional relation [21, 22]. Our findings that high levels of SRH at inclusion significantly predicted improvements in body attitude are in line with previous research. Previous studies were cross-sectional [23, 24], and our findings add support for a causal link between SRH and body attitude. Impaired weight-related SE and high levels of body shape concern predicted impaired body attitude after 6 months, confirming the results from cross-sectional

Table IV. Results from linear regression analyses of change in body attitude (residual change) 6 months after baseline for 85 participants (both groups) in the Norwegian Healthy Life Centre Study, recruited from June 2014 to September 2015 on predictors at baseline.

Predictors	*b*	95% CI	*p*-value
Female gender[a]	0.16	(–0.06, 0.37)	0.149
Age[a]	–0.32	(–0.51, –0.12)	**0.003**
Intervention group[a]	–0.03	(–0.25, 0.19)	0.769
Impaired body attitude at baseline[a,b]	–0.03	(–0.24, 0.18)	0.768
BMI[c]	0.18	(–0.04, 0.40)	0.108
Education[c,d]			
High	0.00	(Reference)	–
Middle	0.22	(–0.00, 1.13)	0.052
Low	0.12	(–0.11, 0.35)	0.292
Self-rated health (1–5)[c,e]	–0.33	(–0.52, –0.13)	**0.001**
Body shape concern (0–1)[c,f]	0.21	(0.00, 0.45)	**0.050**
Childhood experience of respect (1–7)[e,h]	–0.44	(–0.63, –0.26)	**<0.001**
Impaired weight-related self-esteem (1–5)[c,g]	0.49	(0.28, 0.69)	**<0.001**
Life satisfaction[c,h]	–0.52	(–0.69, –0.34)	**<0.001**
Weight cycling[c,e,i]	0.06	(–0.15, 0.27)	0.556
Self-efficacy for PA (1–7)[c]	–0.27	(–0.48, –0.06)	**0.012**
Autonomous motivation (1-7)[c]	0.13	(–0.09, 0.35)	0.235
Controlled motivation (1–7)[c]	0.27	(0.06, 0.48)	**0.011**

Note: b: standardised regression coefficient; CI: Confidence interval; BMI: body mass index; PA: physical activity. Bold indicates the result is statistically significant. '–' indicate name of item and alternatives in answer.
[a]Unadjusted models.
[b]Measured with 'Lack of familiarity with one's own body' (seven items), one construct in the Body Attitude Test (BAT). Higher scores indicate a worsened body attitude.
[c]Models adjusted for gender, age, group allocation and body attitude at baseline.
[d]Low: upper-secondary school and below; Middle: upper-secondary school with general studies; High: university college and/or university.
[e]Single-item scale.
[f]Single item 'What do you think about your body?' (1–6) dichotomised into 'Way too fat' versus five alternatives ('I don't not think about it', 'A little bit fat', 'About right', 'Too thin', 'Way too thin').
[g]Four of seven items of impact of weight on self-esteem, one domain of Impact of Weight on Quality of Life–Lite (IWQOL-Lite). Higher scores indicate lower self-esteem.
[h]Life satisfaction according to Cantril's ladder.
[i]Weight cycling >5 kg up or down in last 2 years: (1 = 0, 2 = 1, 3 = 2, 4 = 3, 5 = at least four episodes).

studies [25]. Body dissatisfaction is related to poor SE, and being vulnerable to negative thoughts about one's own body. High SE seems to have a mitigating effect, protecting against body dissatisfaction during weight-normative interventions [25]. Our study found evidence that preserving one's SE protected against impaired body attitude. This finding supports the importance of reinforcing SE for maintaining a healthy body attitude during a behaviour change intervention.

Experience of respect and appreciation in childhood seems an important utility for a healthy body attitude later in life. Distress in childhood, such as emotional, cognitive and social impairment can negatively influence the ability to develop a positive body attitude [26]. Among the many possible long-term implications reported are low SE, low SRH, inactivity, and severe obesity in adult life. Experience of life satisfaction is a similar measure, and our findings enable a causal inference between contentment with life and body attitude, where we previously only had cross-sectional evidence [27].

Predictors for BMI change

Previous studies have shown mixed results in significant predictors for change in BMI [28]. Collectively, it appears that elevated levels of body distress may hinder attempts to lose weight in some cases, but multiple factors might confound this association [29]. Self-conceptual problems, like impaired SE, may serve as a significant predictor for short-term, but not for long-term weight loss [30]. Low levels of psychological well-being may function as a motivational resource to initiate behaviour change, but will not provide enough psychological energy to support long-term self-regulation and maintenance of change [31].

Further, we discovered that weight cycling predicted significant reduction in BMI in the short term.

However, earlier episodes of weight cycling appear to be a persistent antecedent of larger weight regain after successful weight treatment [6, 7]. The results from the 2-year cohort study will evidence to what degree changes are maintained in the long term. In the present study, both autonomous and controlled motivation significantly predicted weight loss 6 months after baseline. In line with our findings, controlled motivation is sometimes expected to motivate short-term behaviour, whereas autonomous motivation is needed in order to sustain change over time [32].

Although previous research shows mixed results [28], both autonomous motivation and self-efficacy for PA have been associated with both short- and long-term effects on BMI [32]. Three of the authors of the present study (GBS, EM and GEE) found evidence in a meta-analytic study that interventions promoting autonomous motivation were associated with long-term behaviour change [33]. In line with the present study, similar intervention studies in primary healthcare revealed either no significant change in BMI [34] or mixed findings [35].

Weight-based interventions may lead to weight cycling and compromised psychological well-being [6]. We could not trace such negative effects, at least concerning impaired body attitude, in the present study. However, we ascertained that several measures of self-conceptual problems and controlled motivation predicted BMI reduction and impaired body attitude simultaneously. Some researchers have called for a weight-neutral or weight-inclusive strategy for improving health and well-being in behaviour change interventions. This implies that the intervention includes 'health at every size' efforts to improve health behaviours and reduce weight stigma [6].

Strengths

The strength of this study was the pragmatic, real-world, RCT design with exploration of predictors for change in a primary healthcare setting. The randomisation procedures assured random sequence generation and allocation concealment. We used measures with well-documented validity and reliability [2].

Limitations

We acknowledge several limitations. Low uptake (35%) and selection bias represent a threat to external validity. However, the participants were socio-economically diverse and represented low educational levels as compared with the national average [10]. Approximately half had upper-secondary school or less as their highest education, which is low compared with 66% in the general population. Women were more likely to enter the study, and the age distribution may not reflect the general population. Another weakness was the dropout rate of 30%; participants who reported mental, musculoskeletal and chronic somatic diseases as their reasons for attending HLCs were more likely to leave before follow-up [4].

Conclusion

The interventions did not affect body mass on average, but promoted weight loss among the leaner participants. Because weight reduction was associated with self-conceptual problems, body shape concern and impaired body attitude, the study supports the claim that interventions should be weight neutral and aim at improving body image and psychological well-being rather than focusing on weight reduction.

Conflict of interest

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