ORIGINAL ARTICLE

Self-monitoring has no adverse effect on disordered eating in adults seeking treatment for obesity

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Summary

Objectives

Although monitoring is considered a key component of effective behaviour change, the development of apps has allowed consumers to constantly evaluate their own diet, with little examination of what this might mean for eating behaviour. The aim of this study was to investigate whether self-monitoring of diet using the app MyFitnessPal or daily self-weighing increases the reported occurrence of eating disorders in adults with overweight/obesity following a weight loss programme.

Methods

Two hundred fifty adults with body mass index ≥ 27 kg/m^2 received diet and exercise advice and were randomized to one of four monitoring strategies (daily self-weighing, MyFitnessPal, brief monthly consults or self-monitoring hunger) or control for 12 months. The Eating Disorder Examination Questionnaire 6.0 was used to assess eating disorder symptoms and behaviours for the previous 28 d at 0 and 12 months.

Results

There were no significant differences in the global Eating Disorder Examination Questionnaire score or the subscales between those in the four monitoring groups and the control at 12 months (all $p \geq 0.164$), nor were there differences in binge eating, self-induced vomiting, laxative misuse or excessive exercise at 12 months ($p \geq 0.202$). The overall prevalence of one or more episodes of binge eating was 53.6% at baseline and 50.6% at 12 months, with no change over time ($p = 0.662$).

Conclusions

There was no evidence that self-monitoring, including using diet apps like MyFitnessPal or daily self-weighing, increases the reported occurrence of eating disorder behaviours in adults with overweight/obesity who are trying to lose weight.

Keywords: Disordered eating, monitoring, obesity, weight loss.

Introduction

An increasing number of people are monitoring their health, as diet apps like MyFitnessPal and exercise trackers like Fitbit become popular, socially accepted and recommended by clinicians (1). Monitoring is key to goal attainment, specifically for goals associated with healthy eating and physical activity (2). However, with the proliferation of self-monitoring comes concern of disordered eating symptoms and behaviours, including binge eating, purging with laxatives, vomiting and excessive exercise (3–5).

Given that adults with overweight/obesity who seek treatment for weight loss exhibit symptoms of disordered eating, with 21–55% reporting binge eating (eating an unusually large amount of food with a loss of control) (6), it seems important to assess the effect of introducing self-monitoring on disordered eating behaviour. To date, only one cross-sectional study appears to have examined the use of diet apps in relation to disordered eating, indicating

that eating concern and dietary restraint scores are significantly higher in users, whereas no difference is apparent in global Eating Disorder Examination Questionnaire (EDE-Q) scores (7). A larger body of research has examined the impact of regular (e.g. daily) self-weighing on disordered eating (8–11). While a recent review found conflicting results when it included observational studies, all the randomized controlled trials (RCTs) examined showed a neutral or beneficial effect of self-weighing on disordered eating, and the authors suggested that treatment-seeking overweight adults might benefit from being asked to self-weigh (12). Smart scales are thought to encourage a nuanced analysis of weight change as granular weight data are transmitted to users' mobile phones (13,14), which may exacerbate disordered eating. Therefore, further examination of the effect of regular self-weighing on disordered eating is warranted because of the increasing availability of smart scales.

The recent SWIFT (Support strategies for Whole-food diets, Intermittent Fasting and Training) RCT (15) investigated the effect of adding a monitoring strategy to diet and exercise advice on weight, markers of health and psychosocial indices in adults with overweight/obesity who wanted to lose weight. At 12 months, no significant differences in weight, body composition, blood markers, exercise or eating behaviour were apparent between those in the four monitoring groups and the control condition, although some monitoring groups reported favourable effects on

depression and anxiety. In terms of disordered eating, there was no significant difference in global EDE-Q score compared with the control group at 1 year (16). However, given that previous research has linked self-monitoring with a change in certain subscales (7,9), a detailed analysis of the EDE-Q subscales is warranted. Furthermore, the prevalence of binge eating is not considered in the global EDE-Q score and thus warrants investigation.

The aim of this paper is to investigate whether self-monitoring, particularly the use of diet apps like MyFitnessPal and daily self-weighing, increases the reported occurrence of disordered eating behaviours in adults with overweight/obesity who undertake a weight loss programme.

Methods

This was a secondary outcome analysis of the SWIFT study, a five-arm parallel RCT that examined the effect of different monitoring strategies on weight and health over 12 months (16). As a protocol paper and results for the wider study have been published (15,16), only necessary details will be provided here. The SWIFT study was approved by the University of Otago Human Ethics Committee (H14/024) and is registered with the Australian New Zealand Clinical Trials Registry ACTRN12615000010594. All participants provided written informed consent.

Table 1 Baseline characteristics of the sample

Variable		Control	Daily weighing	MyFitnessPal	Brief support	Hunger training
n		48	51	50	51	50
Female, *n* (%)		30 (62.5)	32 (62.8)	31 (62.0)	31 (60.8)	31 (62.0)
Age (years)		46.7 (11.4)	46.1 (11.4)	44.4 (10.2)	40.6 (9.9)	40.7 (10.8)
Education, *n* (%)	School only	9 (18.8)	10 (19.6)	11 (22.0)	9 (17.7)	10 (20.0)
	Post-secondary	16 (33.3)	12 (25.3)	11 (22.0)	11 (21.6)	13 (26.0)
	University	23 (47.9)	29 (56.9)	28 (56.0)	31 (60.8)	27 (54.0)
Ethnicity, *n* (%)	NZEO	41 (85.4)	45 (88.2)	46 (92.0)	43 (84.3)	45 (90.0)
	Maori	5 (10.4)	4 (7.8)	3 (6.0)	5 (9.8)	1 (2.0)
	Pacific	1 (2.1)	1 (2.0)	1 (2.0)	0	4 (8.0)
	Asian	1 (2.1)	1 (2.0)	0	3 (5.9)	0
Weight (kg)		91.0 (14.9)	96.8 (16.6)	99.1 (17.3)	96.4 (14.4)	95.9 (17.0)
Height (cm)		167.7 (8.2)	170.6 (9.3)	171.9 (10.2)	170.8 (9.9)	170.3 (9.5)
BMI (kg/m^2)		32.3 (4.3)	33.2 (4.8)	33.5 (4.5)	33.0 (4.1)	33.0 (4.3)
Waist (cm)		99.8 (11.0)	102.7 (12.8)	103.2 (14.4)	101.3 (10.9)	100.4 (13.0)
Previously dieted, *n* (%)		35 (72.9)	41 (80.4)	43 (86.0)	29.2 (7.3)	29.9 (7.2)
Anxiety		4.46 (4.03)	3.11 (4.71)	3.89 (3.79)	2.63 (3.42)	3.79 (3.71)
Depression		5.09 (5.12)	4.53 (5.69)	5.83 (5.11)	6.06 (6.11)	5.14 (5.75)
Stress		9.3 (5.7)	9.6 (6.9)	11.3 (7.8)	9.4 (6.9)	9.2 (6.2)

Values are means (standard deviations) unless otherwise indicated.
BMI, body mass index; NZEO, New Zealand European and Others.

Participants (250 adults, ≥18 years, body mass index ≥ 27 kg/m^2, living locally) were recruited between November 2014 and April 2015. Participants in all groups received comprehensive diet and exercise advice in one face-to-face session (30–45 min) at baseline. Participants were subsequently randomized to a control group (no additional monitoring support) or one of four different monitoring strategies: self-monitoring of daily weight (advised to weigh themselves daily with brief monthly email feedback); self-monitoring of dietary intake using MyFitnessPal (advised to enter food intake into app and/or website); face-to-face monitoring (brief monthly appointments to be weighed and chat about progress); or self-monitoring of hunger (advised to record hunger and blood glucose levels in a booklet [17]).

All outcome measures were assessed by researchers blinded to group allocation. At baseline, participants completed questionnaires on demographics (age, sex and education) using relevant New Zealand census questions (stats.govt.nz/Census), the Depression Anxiety Stress scale [18] and the Dieting and Weight History Questionnaire [19]. At baseline and 12 months, eating disorder symptoms and behaviours were assessed using the EDE-Q 6.0, a widely-used, 28-item self-administered questionnaire that measures disordered eating over the previous 28 d [20]. Twenty-two questions are scored on a 7-point Likert scale and asked about the frequency of thoughts or behaviours ('On how many days have you had a definite fear of losing control over eating?') or the intensity of feelings ('Has your weight influenced how you think about yourself as a person?'). A global score is based on the average of these 22 items, with higher scores indicating greater severity of eating disorder pathology. These 22 items are divided into four subscales: restraint, weight concern, shape concern and

Table 2 Effect of the intervention on EDE-Q scales

Variable	Group	N	Month 0 Mean (SD)	Month 12 Mean (SD)	Difference[†] Mean (95% CI)
Global score					
	Control	35	1.97 (0.92)	1.88 (1.07)	
	Daily weighing	38	2.19 (0.90)	2.17 (0.92)	0.13 (−0.23, 0.48)
	MyFitnessPal	36	2.15 (0.90)	2.04 (1.03)	−0.03 (−0.40, 0.34)
	Brief support	32	1.70 (0.83)	1.62 (0.86)	−0.09 (−0.45, 0.26)
	Hunger training	28	1.89 (0.99)	1.84 (1.03)	−0.04 (−0.39, 0.31)
Restraint					
	Control	35	0.88 (0.91)	1.49 (1.33)	
	Daily weighing	38	1.27 (0.96)	2.00 (1.15)	0.40 (−0.18, 0.98)
	MyFitnessPal	36	1.21 (1.18)	1.47 (1.25)	−0.24 (−0.85, 0.37)
	Brief support	32	0.62 (0.78)	1.16 (1.12)	−0.20 (−0.79, 0.40)
	Hunger training	28	1.15 (1.09)	1.84 (1.19)	0.24 (−0.36, 0.84)
Eating concern					
	Control	35	0.74 (0.76)	0.71 (0.80)	
	Daily weighing	38	0.81 (0.94)	0.80 (0.91)	0.02 (−0.32, 0.36)
	MyFitnessPal	36	1.05 (1.13)	1.12 (1.12)	0.23 (−0.13, 0.59)
	Brief support	32	0.72 (0.81)	0.56 (0.67)	−0.21 (−0.53, 0.12)
	Hunger training	28	0.84 (0.85)	0.89 (1.07)	0.08 (−0.30, 0.48)
Shape concern					
	Control	35	2.91 (1.50)	2.55 (1.50)	
	Daily weighing	38	3.19 (1.41)	2.76 (1.46)	0.00 (−0.50, 0.50)
	MyFitnessPal	36	3.06 (1.31)	2.73 (1.44)	0.01 (−0.49, 0.50)
	Brief support	32	2.57 (1.20)	2.23 (1.32)	−0.09 (−0.60, 0.43)
	Hunger training	28	2.66 (1.46)	2.22 (1.54)	−0.22 (−0.72, 0.29)
Weight concern					
	Control	35	2.46 (1.19)	2.02 (1.17)	
	Daily weighing	38	2.61 (1.01)	2.41 (1.04)	0.29 (−0.12, 0.70)
	MyFitnessPal	36	2.42 (1.06)	2.09 (1.11)	0.01 (−0.39, 0.42)
	Brief support	32	2.11 (0.98)	1.88 (1.02)	0.03 (−0.36, 0.41)
	Hunger training	28	2.21 (1.22)	1.82 (1.22)	−0.13 (−0.54, 0.28)

Values are means (standard deviations) unless otherwise indicated.
[†]Difference refers to intervention relative to control group adjusting for baseline EDE-Q scores, sex, age, exercise and diet group.
CI, confidence interval; EDE-Q, Eating Disorder Examination Questionnaire; SD, standard deviation.

eating concern. The remaining six questions ask about the frequency of key eating and compensatory behaviours, including binge eating and purging with laxatives, vomiting and excessive exercise. *Any* occurrence of these behaviours is defined as used over the 28-d period, whereas *regular* occurrence is defined as 4 d or more, in accordance with the DSM-5 definitions for binge eating disorder and bulimia nervosa (21). The EDE-Q showed good internal consistency (Cronbach's α 0.89 for global score and 0.67–0.85 for subscale scores) in our sample.

Statistical analysis

Regression analysis, adjusting for EDE-Q scores at baseline, sex, age, exercise and diet group were used to estimate differences in the EDE-Q scores at 12 months between each support and the control group. An overall test for differences among the groups was also carried out. A chi-squared test or Fisher's exact test was used to compare the frequency of the behaviours, where possible, at 12 months.

Results

Table 1 demonstrates that participant characteristics were broadly comparable across groups, with the majority of participants being well-educated, middle-aged and European, with an average body mass index of 33 kg/m^2. At baseline, only 21 participants (8.4%) regularly monitored their weight or physical activity (at least daily), with six (2.4%) monitoring their dietary intake; data that were evenly spread across the five intervention groups.

At 12 months, 171 participants (68.4%) remained in the study, and 169 (67.6%) participants completed the EDE-Q. There was no significant difference in the global EDE-Q scores, or in the four individual subscales between any of the monitoring groups and the control group at 12 months (Table 2).

There were no differences at 12 months between any of the groups in terms of key disordered eating behaviours ($p \geq 0.202$) (Table 3). The overall prevalence of any occurrence of binge eating was 53.6% at baseline and

Table 3 Frequency (%) of any or regular occurrence of key eating and compensatory behaviours

Behaviour	Group	N	Any occurrence (≥1/28 d)			Regular occurrence (≥8/28 d)		
			Month 0 *n* (%)	Month 12 *n* (%)	Difference at 12-months between groups *p*-value	Month 0 *n* (%)	Month 12 *n* (%)	Difference at 12-months between groups *p*-value
Binge eating[†]					0.458			0.202
	Control	35	17 (48.6)	18 (51.4)		11 (31.4)	7 (20.0)	
	Daily weighing	38	21 (55.3)	15 (39.5)		10 (26.3)	4 (10.5)	
	MyFitnessPal	36	24 (66.7)	22 (61.1)		10 (27.8)	9 (25.0)	
	Brief support	32	14 (43.8)	17 (53.1)		9 (28.1)	5 (15.6)	
	Hunger training	27	14 (51.9)	13 (48.2)		8 (29.6)	9 (33.3)	
Self-induced vomiting[‡]								
	Control	35	2 (5.7)	1 (2.9)		0 (0.0)	1 (2.9)	
	Daily weighing	38	2 (5.3)	0 (0.0)		0 (0.0)	0 (0.0)	
	MyFitnessPal	36	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
	Brief support	32	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
	Hunger training	27	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
Laxative misuse[‡]								
	Control	35	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
	Daily weighing	38	1 (2.6)	0 (0.0)		1 (2.6)	0 (0.0)	
	MyFitnessPal	36	0 (0.0)	1 (2.8)		0 (0.0)	0 (0.0)	
	Brief support	32	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
	Hunger training	27	0 (0.0)	0 (0.0)		0 (0.0)	0 (0.0)	
Excessive exercising					0.570			0.561
	Control	35	8 (22.9)	5 (14.3)		4 (11.4)	1 (2.9)	
	Daily weighing	38	7 (18.4)	5 (13.2)		4 (10.5)	3 (7.9)	
	MyFitnessPal	36	7 (19.4)	2 (5.6)		6 (16.7)	1 (2.8)	
	Brief support	32	3 (9.4)	2 (6.3)		2 (6.3)	1 (3.1)	
	Hunger training	27	7 (25.9)	4 (14.8)		4 (14.8)	3 (11.1)	

[†]Binge eating: days with both loss of control and eating an 'unusually large amount of food'.
[‡]*p*-value not calculated due to insufficient numbers.

50.6% at 12 months, with no difference among the groups at 12 months (p = 0.458). Regular binge eating also did not differ among the groups at 12 months (p = 0.202), with 28.6% of all participants regularly binge eating at baseline and 20.2% at 12 months. Self-induced vomiting and laxative use were rare in this group.

Discussion

These results indicate that asking individuals to self-monitor their diet, weight or hunger did not adversely affect disordered eating behaviours. This finding should provide reassurance to clinicians that recommending common tools like MyFitnessPal or daily self-weighing appears safe for adults who are trying to lose weight but are otherwise healthy.

This study did not find an increase in restraint or eating concern with the use of diet apps, which is in contrast to the single existing study (7). Similarly, no adverse effects were observed for self-weighing, which agrees with some (8,11) but not all previous work (9,10). It is feasible that this variation in study outcomes is a result of study design and population group: younger adults that choose to self-monitor their diet or weight (as measured by a survey or cohort analysis) (8–11) may be more susceptible to disordered eating than adults with overweight/obesity who are asked to self-monitor in an RCT (11), such as in the present study. The prevalence of binge eating in the current sample was comparable with that from a similar population group (6). The stability of our rate over 12 months suggests that binge eating is a complicated behaviour, and the lack of differences between the groups suggests that it may be immune to the effect of self-monitoring.

The main strength of the current study is the RCT design, which allowed the direct examination of whether self-monitoring of diet and/or weight influences disordered eating. This was particularly important for the use of MyFitnessPal, which does not appear to have been examined previously despite widespread use of diet apps. However, this was a secondary outcome data analysis, which was not designed specifically to address the effects of self-monitoring on disordered eating. Providing the estimated differences with confidence intervals allows the reader to determine the potential strength of any relationship. While the use of the original four-factor structure of the EDE-Q has been challenged, there is currently no consensus on an improved factor model (22,23).

In conclusion, in contrast to observational studies (3,5,7,9), we found no evidence that self-monitoring, including using diet apps like MyFitnessPal or daily self-weighing, increases the reported occurrence of disordered eating symptoms or behaviours in adults with overweight/obesity who undertake a weight loss programme. However, these findings should be interpreted with caution, given the small sample sizes involved.

Conflict of Interest Statement

The authors declare no conflict of interest.

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