An Exploratory Randomized Controlled Study of a Healthy Living Intervention in Early Intervention Services for Psychosis: the INTERvention to Encourage ACTivity, Improve Diet, and Reduce Weight Gain (INTERACT) Study

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ABSTRACT

Background: People with psychosis often experience weight gain, which places them at risk of cardiovascular disease, diabetes, and early death.

Objective: To determine the uptake, adherence, and clinical effectiveness of a healthy living intervention designed to reduce weight gain.

Method: An exploratory randomized controlled trial, comparing the intervention with treatment as usual (TAU) in 2 early intervention services for psychosis in England. *DSM-IV* classification was the diagnostic criteria used to assign the psychiatric diagnoses. The primary outcome was change in body mass index (BMI) from baseline to 12-month follow-up. The study was conducted between February 2009 and October 2012.

Results: 105 service users, with a BMI of ≥ 25 (≥ 24 in South Asians), were randomized to intervention (n = 54) or TAU (n = 51) after stratification by recent commencement of antipsychotic medication. Ninety-three service users (89%) were followed up at 12 months. Between-group difference in change in BMI was not significant (effect size = 0.11). The effect of the intervention was larger (effect size = 0.54, not significant) in 15 intervention (28%) and 10 TAU (20%) participants who were taking olanzapine or clozapine at randomization.

Conclusions: The healthy living intervention did not show a significant difference in BMI reduction compared to the TAU group.

Trial Registration: www.isrctn.org identifier: ISRCTN22581937

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People with psychosis are at increased risk of ill health and early death.[1] One major contributory factor for poor physical health is rapid weight gain associated with second-generation antipsychotics.[2,3] After 6–8 weeks of medication, average weight gain was 5–6 kg, with unhealthy cardiometabolic changes emerging.[4] A recent editorial[5] argued that, in any other scenario, the responsible physician would seek an alternative treatment. However, few realistic alternatives are available, and, hence, the development of interventions to protect against rapid weight gain is urgently needed.

A systematic review and meta-analysis[6] of behavioral lifestyle interventions reported significant benefits when compared to control for those experiencing medication-induced weight gain. A Cochrane review[7] of interventions for weight management in schizophrenia identified 5 cognitive-behavioral therapy trials, of which 2 were in favor of the intervention. The authors stressed the need for a rigorous trial with a sufficiently large sample, blinded evaluation, and long-term follow-up (at least 12 months). They recommend that lifestyle interventions include dietary and exercise components.

Studies suggest that the risk of weight gain is greatest shortly after diagnosis and commencement of antipsychotic medication.[4] We designed a healthy living intervention for users of early intervention services for psychosis.[8] We evaluated the feasibility, acceptability, and effectiveness of this intervention using an exploratory randomized controlled trial (RCT).[9]

Our study had 4 aims: (1) estimate the effect size by comparing outcomes in participants receiving the intervention plus treatment as usual (TAU) with TAU alone; (2) estimate the effect size of the intervention in the subgroup of participants taking olanzapine or clozapine; (3) determine feasibility of recruitment, uptake, and adherence to the intervention; and (4) estimate the direct costs associated with the intervention.

METHOD

We conducted an exploratory RCT of a 12-month healthy living intervention plus TAU compared to TAU alone. The trial was overseen by independent data monitoring and trial steering committees and is reported in accordance with the CONSORT guidelines for nonpharmacologic trials.[10] Ethical approval was obtained from the Cumbria and Lancashire B Research Ethics Committee (approval number: 09/H1016/20), Manchester, United Kingdom. The trial was registered on www.isrctn.org (identifier: ISRCTN22581937).

Participants

Participants were recruited from 2 early intervention services in the northwest of England between 2009 and 2011. Inclusion criteria were the following: 16 to 35 years old; diagnosis of schizophrenia, schizophreniform

disorder, schizoaffective disorder, delusional disorder, brief reactive psychosis, or psychosis not otherwise specified; first episode of psychosis occurring within the 3 years preceding the trial; current user of an early intervention service; stable accommodation; ability to give informed consent; and BMI of ≥ 25 or of ≥ 24 for service users from the South Asian community.[11] Exclusion criteria were the following: diagnosis of substance dependence or abuse at a level that would interfere with participation, a significant history of organic factors implicated in the etiology of psychotic symptoms, and pregnancy.

Clinical Points

- People with psychosis often experience weight gain, which puts them at risk of cardiovascular disease, diabetes, and early death.
- A healthy living intervention targeting users of early intervention services for psychosis caused no reduction in body mass index.
- Because of the health risks of weight gain, continued development of interventions that overcome barriers to successful weight reduction remains an urgent need.

Procedure, Randomization, and Allocation Concealment

All early intervention services case managers screened their caseloads for potentially eligible participants. Participants who consented to be contacted were contacted by the researcher and given an appointment for baseline assessment for eligibility. Randomization was conducted electronically independently from the study using an online clinical data management system (openCDMS).[12] Individuals were randomly allocated using computer-generated, randomized, permuted blocks, with randomly varying block sizes of 2, 4, 6, and 8 after stratification according to whether the participant had started to take olanzapine or clozapine in the previous 6 months. Notification of the randomization was transmitted to the trial manager, who alerted the service user's case manager and support, time, and recovery worker if the participant was in the intervention arm.

Measures

Assessments were conducted by researchers masked to treatment allocation. Researchers recorded when they were inadvertently unmasked.

Outcomes were taken at baseline and at 6- and 12-month follow-up. At baseline, demographic details were collected. *DSM-IV* primary diagnosis was obtained from case notes, and numbers of previous mental health admissions were recorded. The primary outcome was change in body mass index (BMI) at 12 months. Height was measured at baseline assessment. Participants were weighed using the same set of SECA model 864 scales (GmbH and Company KG, Hamburg, Germany) at each assessment. The formula kg/m^2 was then applied to calculate BMI. Secondary outcomes included waist circumference and BMI at 6-month follow-up.

International Physical Activity Questionnaire. The International Physical Activity Questionnaire,[13,14] a self-report measure, rates the number of minutes spent exercising per day in the previous week, and the intensity level of the exercise. Metabolic equivalents (METS) are calculated by weighting minutes by 8, 4, and 3.3 for vigorous, moderate, and walking intensities, respectively, and summing to produce a total METS score.

Food Frequency Questionnaire. Participants used the Food Frequency Questionnaire[15] to self-report the frequency of 10 types of food associated with better diet (peppers, tomatoes, vegetable dishes, courgettes, green salad, whole meal bread, onions, vegetarian foods, pasta, and spinach) and 10 foods associated with poorer diet (full-fat milk, beef, crisps and snacks, Yorkshire puddings/pancakes, white bread, sugar, gravy, sausages, meat pies, and chips/roast potatoes), hereafter termed "good" and "bad" foods. Frequencies were scored over the previous month as 1 = never, 2 = once a month, 3 = once every 2 weeks, 4 = 1–2 times a week, 5 = 3–6 times a week, 6 = once a day, and 7 = more than once a day. The total "good" food score and the total "bad" food score were calculated (range, 10–70), and the "good" food score was subtracted from the "bad" food score (range, −60–60).

Calgary Depression Scale. The Calgary Depression Scale[16,17] is an assessor-rated measure of 9 symptoms of depression. Each item is scored 0 = absent, 1 = mild, 2 = moderate, and 3 = severe. Total scores range from 0 to 27, with higher scores indicating more depression.

Medical Outcomes Study 36-Item Short Form Health Survey. The Medical Outcomes Study 36-Item Short Form Health Survey (SF-36)[18] is a self-rated measure of health status that generates 8 subscales and 2 principal component measures, the physical and mental health component summary scores. Scores on the 8 subscales are converted to a percentage. The component summary measures are designed to have a mean of 50 and SD of 10 in the general population. Higher scores represent better health.

European Quality of Life-5 Dimension. The European Quality of Life-5 Dimension (EQ-5D)[19] is a self-rated measure of health outcome that asks respondents to rate, on a 3-point scale ranging from none to severe, the problems they experience in mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. These 5 items can be summed to give a total score ranging from 5 to 15, with higher scores indicating more problems. Respondents were also asked to rate, on a vertical visual analog (termed the "health state thermometer"), their own health today on a scale from 0 (worst imaginable health state) to 100 (best imaginable).

The Brief Adherence Rating Scale. The Brief Adherence Rating Scale[20] is a self-rated measure assessing adherence to antipsychotics. Participants were asked 3 questions (how many doses of medication were they prescribed each day, how many days over the past month did they not take medication, how many days did they take less than prescribed) and were also asked what percentage of medication they had taken over the past month. This percentage was used as the score.

Costs. The costs of health and social care services used were estimated from an economic patient questionnaire.[21] This questionnaire asked participants about their use of hospital services, community mental health services, primary care services, and social care services in the previous 6 months. The service use data were collected at baseline and at 6 and 12 months. The service use was costed using published national cost data for the financial year 2010–2011.[22,23]

Intervention

Healthy living intervention. The healthy living intervention drew on Leventhal's Common Sense Model,[24,25] which suggests that a person's behavioral responses to a threat to their health (in this case, the threat posed by weight gain and associated cardiometabolic consequences) are generated by and congruent with that person's perceptions of the health threat. The intervention contained both motivational and behavioral components, starting with exploration of existing beliefs and psychoeducation to provide the motivation for embarking on a weight control program, followed by the facilitation of participatory exercise and dietary change through the development of patient-centered goals and implementation and review of patient-led action plans. Participants received 7 individual face-to-face sessions over 6 months, with a "booster" session at 9–10 months. The intervention was delivered by support, time, and recovery workers, who attended a 3-day training program prior to delivering the intervention. The support, time, and recovery workers received supervision from the study team. In addition to the face-to-face sessions, access to a range of optional group activities (eg, football, walking, cycling, cooking groups) was offered by the support, time, and recovery workers. A booklet[26] and a Web site[27] were developed to provide educational advice, action plans, goals, and healthy-eating recipes.

Treatment as usual. The early intervention services works individually with service users and their families to address problems/needs that are identified through detailed assessments; all service users have enhanced-care coordination and all have a specific care plan. When appropriate as part of the care plan, service users in the TAU group received some level of support from their case managers to undertake physical health activities, although there was no systematic approach to weight control.

Sample Size

Our systematic review[8] of weight loss interventions found a mean change in BMI of approximately 1 point, with slightly larger effects in individualized interventions and those with exercise components. We based our sample size on the assumption that a reduction in BMI of 1.5 points would be clinically significant. We assumed no mean reduction in TAU and took the common SD of 2 BMI points from our systematic review, giving an effect size of 0.75. Using a *t* test to compare intervention and TAU, we required complete follow-up data for 39 service users in each group in order to achieve 90% power, with a $P < .05$ significance level.

Statistical Methods

An intention-to-treat analysis, using all available data, compared the 2 groups on primary and secondary outcomes. Analysis of covariance was used in the comparison of changes from baseline to follow-up assessments, adjusting for baseline value, age, sex, early intervention services, and initiation of treatment with olanzapine or clozapine in the 6 months before the study. The analysis was repeated, adjusting for missing data caused by noncompletion of follow-up assessments using inverse probability sampling weights. The weights were calculated by using logistic regression, with assessment as the dependent variable and including the covariates listed above in order to generate a probability of completing assessment at 6 or 12 months. The follow-up results were then weighted using the reciprocals of these probabilities.

In a planned subgroup analysis, *t* tests were used to compare participants in the intervention and TAU arms who were taking olanzapine or clozapine at the time of randomization.

To identify variables that predicted reduction in BMI at 12-month follow-up in each group, univariate analyses were carried out examining differences in change scores by all categorical baseline variables using *t* tests or analysis of variance, as appropriate, and by continuous baseline variables using correlation coefficients. Variables that were significant at $P < .2$ on univariate analyses were entered into a multiple regression analysis, with reduction in BMI as the dependent (outcome) variable.

RESULTS

Participant Flow

Case notes of 971 service users were screened, and 695 were excluded (Figure 1). Of the 276 potentially eligible participants, 148 were contacted by the researcher, and 105 consented and were randomized (54 to intervention and 51 to TAU). Five participants (9.3%) withdrew from the intervention. Follow-up at 12 months was completed by 88.6% of participants (intervention, 90.7%; TAU, 86.3%).

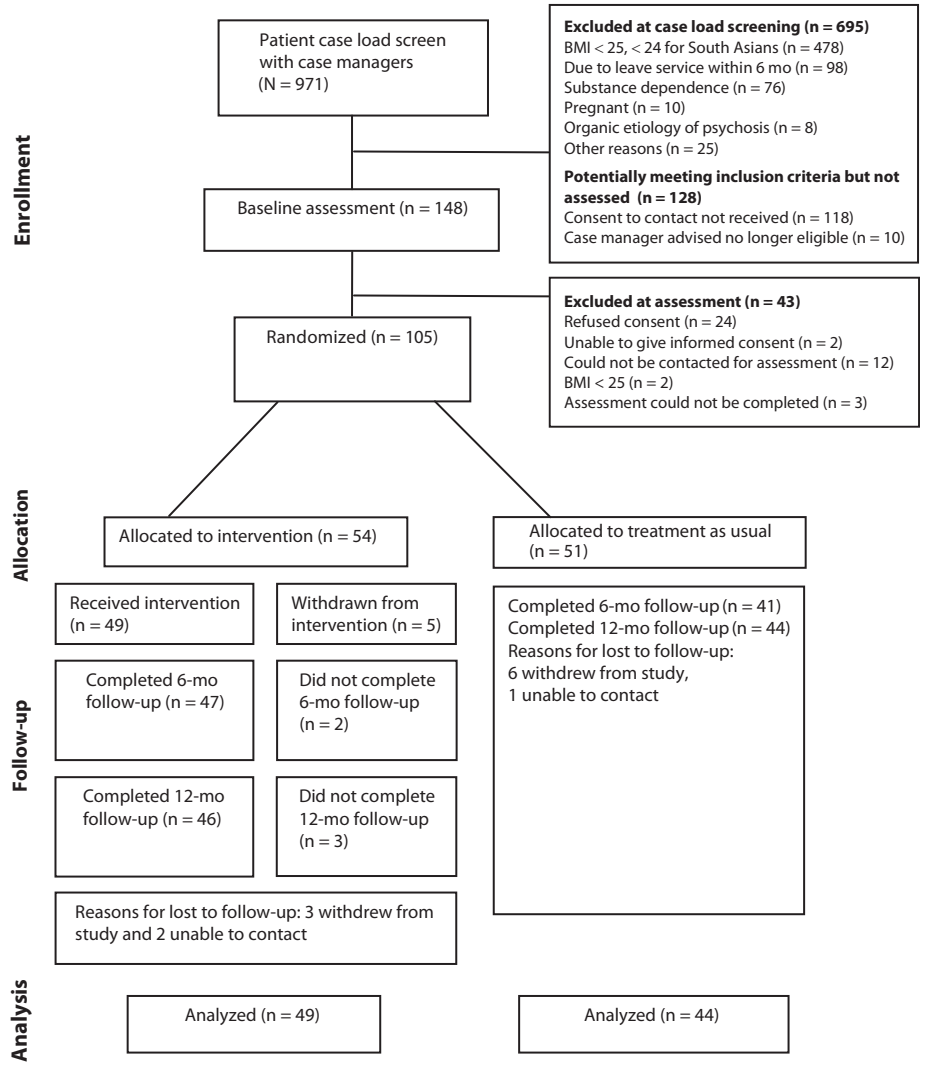
Researchers were unmasked to the randomization in 29 participants (28%) during the trial. Reallocation of assessments to another researcher resulted in 24 (23%) assessment points conducted unmasked.

Sample Description

Of the 105 randomized participants, 63 (60%) were male, 78 (74%) were living with a family member, 72 (69%) were unemployed, and 86 (82%) were of white ethnic origin (Table 1).

Only 12 participants (11%) had commenced on olanzapine or clozapine therapy in the 6 months prior to study entry. Of the 92 participants (49 intervention and 43 TAU) who consented to examination of their case notes, 36 (39%) had been prescribed olanzapine and/or clozapine at any time in

Figure 1. Flow of Participants in the Study



Abbreviation: BMI = body mass index.

the 6 months prior to randomization, including the 12 who started during this time and 8 who had stopped at the point of randomization. Twenty-eight participants were therefore taking olanzapine or clozapine at randomization: 16 in the intervention group and 12 in the TAU group (Fisher exact test, $P = .66$).

There were no significant differences between intervention and TAU on demographic variables, weight, BMI, or waist circumference at baseline (Table 2). Mean Calgary Depression Scale scores were significantly higher in the intervention group than in the TAU group, and the SF-36 mental health score was significantly lower in the intervention group (Table 2). There were no significant differences between groups at baseline on the remaining questionnaires, health status, EQ-5D, or costs.

Compliance With Intervention

Of the 54 intervention participants, 52 (96.3%) had at least 1 session and 42 (77.7%) completed 6–8 sessions.

Outcomes

There was a mean decrease in BMI in the intervention group of 0.31 at 12 months compared with no change in the TAU group. The effect size for this comparison was 0.11 in favor of the intervention, which was not statistically significant ($P = .44$). Similarly, there was no significant difference between intervention and TAU groups for changes in weight or waist circumference at both 6 and 12 months, whether covariates and missing data were accounted for or not (Table 2).

Follow-up data were available for 25 of the 28 service users taking olanzapine or clozapine at the time of randomization. For the 15 intervention participants, mean weight reduced by 1.1 kg (SD = 8.1) compared with a mean increase of 3.7 kg (SD = 9.3) in the 10 TAU participants (t test $P = .19$, effect size = 0.55). Similarly, the BMI of the 15 intervention participants reduced by a mean of 0.23 (SD = 2.6) compared with a mean increase of 1.22 (SD = 2.8) in the 10 TAU participants (t test $P = .20$, effect size = 0.54).

Table 1. Demographic and Baseline Variables by Group

	Intervention (n = 54)		Control (n = 51)		Total (n = 105)	
Variable	Mean	SD	Mean	SD	Mean	SD
Age, y	25.6	5.5	25.9	6.0	25.7	5.7
Age left formal education	17.1	2.9	16.7	1.9	16.9	2.5
	n	%	n	%	n	%
Early intervention services						
Site 1	29	54	27	53	56	53
Site 2	25	46	24	47	49	47
Female	21	39	21	41	42	40
Living alone or in hostel or temporary accommodation	15	28	12	24	27	26
White	44	82	42	82	86	82
Black Caribbean	1	1.9	0	0	1	1.0
Black African	2	3.7	0	0	2	1.9
Indian	1	1.9	2	3.9	3	2.9
Pakistani	2	3.7	5	9.8	7	6.7
Bangladeshi	1	1.9	0	0	1	1.0
Other Asian	2	3.7	2	3.9	4	3.8
Other	1	1.9	0	0	1	1.0
Employment status						
Employed/self-employed	9	17	9	18	18	17
Unemployed	36	67	36	71	72	69
Student	9	17	6	12	15	14
DSM-IV primary diagnosis						
Schizophrenia	1	2	5	10	6	6
Schizoaffective disorder	2	4	0	0	2	2
Schizophrenia spectrum disorder	43	80	38	74	81	77
Not known	8	15	8	16	16	15
No. of previous mental health admissions[a]						
None	31	60	17	36	48	48
1	15	29	21	45	36	36
2 or more	6	11	9	19	15	15
Body mass index, baseline category						
25.0–30.0	21	39	22	43	43	41
30.1–35.0	16	30	15	29	31	30
35.1–40.0	12	22	13	25	25	24
40.1–50.0	4	7	1	2	5	5
> 50	1	2	0	0	1	1
International Physical Activity Questionnaire, baseline category[b]						
No exercise	7	13	4	8	11	11
Low	18	34	15	29	33	32
Moderate	12	23	19	37	31	30
High	16	30	13	25	29	28
Olanzapine or clozapine commenced during 6 mo prior to study entry	6	11	6	12	12	11

[a]Data missing for 2 intervention group patients and 4 control group patients.
[b]Missing data for 1 intervention patient.

Forty service users in the intervention group who attended 6 or more sessions and completed the 12-month follow-up had a mean decrease in BMI from baseline to 12 months of 0.46 (SD = 2.2), whereas 9 who completed 5 or fewer sessions (or none at all) had a mean increase of BMI of 0.33 (SD = 2.7) (*t* test $P = .36$, effect size = 0.28).

Costs reduced in both groups at 6 and 12 months; there were no significant differences between the groups in the change in costs. The mean cost of health and social care services used (excluding medications and the cost of the intervention) for the intervention group was £5,103 ($8,340.70) (SD = £13,816 [$22,581.80]; n = 45), which was lower than that for the TAU group (£6,152 [$10,055.30]; SD = £13,470 [$22,016.30]; n = 35). The estimated difference in mean costs, adjusting for baseline covariates, was £1,276 ($2,085.58) (95% CI, –£4,906 [–$8,018.71] to £7,406 [$12,104.90]; $P = .686$).

Factors Relating to Improvement in BMI at 12 Months

No variables listed in Table 1 were significantly related to the change in BMI from baseline to 12 months. Reduction in BMI from baseline to 12 months was associated with baseline Calgary Depression Scale score ($r = 0.23$, $P = .026$) (higher initial depression scores being associated with greater reduction in BMI), reduction in Calgary Depression Scale score from baseline to 12 months ($r = 0.22$, $P = .037$), and decrease in bad food score from baseline to 12 months ($r = 0.27$, $P = .011$).

Table 2. Comparison of Intervention and Control Groups on Weight, Body Mass Index, Waist Circumference, and Scored Variables at Baseline and Change From Baseline to 6 and 12 Months

	Intervention (n = 54)			Control (n = 51)			Comparison[a]			ANCOVA,[b]	ANCOVA,[c]	Effect
Variable	Mean	SD	n	Mean	SD	n	*t*	*df*	*P*	*P*	*P*	Size
Weight, kg												
Baseline	97.5	22.5	54	93.0	14.9	51	1.2	103	.23			
Baseline to 6 mo[d]	−0.1	5.4	48	−1.5	8.3	41	1.0	87	.32	.29	.33	−0.22
Baseline to 12 mo	−0.9	7.0	49	−0.0	10.1	44	0.5	91	.65	.55	.56	0.09
Body mass index												
Baseline	32.7	5.9	54	32.1	4.3	51	0.6	103	.56			
Baseline to 6 mo	0	1.9	48	−0.5	2.6	41	0.9	87	.35	.34	.38	−0.20
Baseline to 12 mo	−0.3	2.3	49	0	3.4	44	0.5	91	.60	.42	.44	0.11
Waist circumference, cm												
Baseline	108.1	16.3	52	107.9	11.1	48	0.1	90[e]	.95			
Baseline to 6 mo	−0.5	6.4	43	−0.8	9.2	37	0.2	63[e]	.85	.82	.87	−0.04
Baseline to 12 mo	−1.4	8.6	45	−0.7	8.7	40	0.4	83	.72	.69	.74	0.08
IPAQ, total METS in previous wk												
Baseline	2,415	3,851	53	2,178	2,252	51	0.4	102	.70			
Baseline to 6 mo	58	2,238	48	839	3,189	40	1.3	86	.18	.23	.23	−0.29
Baseline to 12 mo	661	2,896	49	1,339	4,976	44	0.8	68[e]	.43	.30	.40	−0.17
EQ-5D total score												
Baseline	6.7	1.7	54	6.8	1.7	50	0.1	102	.95			
Baseline to 6 mo	0.3	1.6	47	−0.2	1.5	39	1.6	84	.12	.050	.032	−0.34
Baseline to 12 mo	0.3	1.4	49	−0.0	1.9	43	0.8	90	.40	.23	.27	−0.18
EQ-5D health state thermometer												
Baseline	53.2	19.2	53	55.4	18.8	49	0.6	100	.56			
Baseline to 6 mo	3.1	18.8	46	13.1	17.1	38	2.5	82	.013	.003	.003	−0.56
Baseline to 12 mo	9.2	17.2	48	11.8	21.2	42	0.6	88	.53	.29	.35	−0.14
10 good foods score												
Baseline	29.3	9.8	54	27.8	9.5	51	0.8	103	.43			
Baseline to 6 mo	2.7	6.1	47	−0.1	6.5	39	2.0	84	.047	.025	.024	0.44
Baseline to 12 mo	2.8	8.1	48	−0.1	8.1	44	1.7	90	.087	.064	.045	0.36
10 bad foods score												
Baseline	31.2	7.4	54	28.7	7.3	51	1.7	103	.090			
Baseline to 6 mo	−1.6	8.6	47	−0.3	7.2	39	0.8	84	.43	.86	.86	0.18
Baseline to 12 mo	−2.3	6.9	48	−0.3	8.2	44	1.2	90	.22	.44	.49	0.26
Food score (good-bad)												
Baseline	−1.9	11.3	54	−1.0	11.3	51	0.4	103	.67			
Baseline to 6 mo	4.3	11.7	47	0.2	9.1	39	1.8	84	.075	.078	.066	0.40
Baseline to 12 mo	5.0	11.1	48	0.2	8.0	44	2.4	90	.018	.027	.025	0.51
Calgary Depression Scale score												
Baseline	5.2	4.6	53	3.0	3.5	49	2.7	97[e]	.008			
Baseline to 6 mo	−0.1	4.9	46	−0.2	4.1	39	0.02	83	.98	.084	.058	−0.004
Baseline to 12 mo	−0.2	3.7	48	0.1	3.2	42	0.5	88	.65	.31	.38	0.10
Brief Adherence Rating Scale score	92.5	10.8	49	88.9	19.6	43	1.1	63[e]	.26			
Baseline	0.6	10.0	42	−0.3	14.5	30	0.3	70	.76	1.0	.90	0.07
Baseline to 6 mo	0.2	15.1	40	0.2	15.3	33	0.001	71	1.0	.61	.65	0
Baseline to 12 mo												
SF-36 physical score												
Baseline	46.4	7.2	53	46.5	11.4	49	0.1	80[e]	.96			
Baseline to 6 mo	1.1	7.5	47	2.8	9.2	39	0.9	84	.35	.36	.34	−0.21
Baseline to 12 mo	3.0	7.5	47	1.3	10.2	43	0.9	88	.35	.32	.26	0.20
SF-36 mental score												
Baseline	35.0	11.0	53	39.7	10.0	49	2.2	100	.028			
Baseline to 6 mo	3.4	7.2	47	1.3	7.6	39	1.3	84	.19	.51	.60	0.29
Baseline to 12 mo	3.8	9.4	47	1.2	8.4	43	1.4	88	.18	.61	.65	0.29
Total cost (United Kingdom), £												
Baseline	3,663	9,250	53	4,110	9,513	49	−0.240	100	.811	.285	.145	1,202
Baseline to 6 mo	−2,531	11,201	46	−2,534	11,196	39	0.001	83	.999	.759	.739	500
Baseline to 12 mo	−2,429	12,876	48	−1,988	4,486	43	−0.213	89	.832	.957	.949	−72

[a]Comparison using *t* test.
[b]Adjusted for age, sex, baseline score, early intervention services, and whether patient started olanzapine or clozapine in the 6 months before entering trial.
[c]Adjusted for age, sex, baseline score, early intervention services, and whether patient started olanzapine or clozapine in the 6 months before entering trial and missing data caused by noncompletion of follow-up assessments.
[d]Negative changes are reductions, and positive changes are increases.
[e]Comparison using unequal variance version of the *t* test.
Abbreviations: ANCOVA = analysis of covariance, EQ-5D = European Quality of Life-5 Dimension, IPAQ = International Physical Activity Questionnaire, METS = metabolic equivalents, SF-36 = Medical Outcomes Study 36-Item Short Form Health Survey.

DISCUSSION

To summarize our findings in relation to our key aims, first, we found that our healthy living intervention was associated with a small reduction in BMI but that this did not differ significantly from the TAU group. Second, we found that, in those participants taking olanzapine or clozapine at the time of randomization, there was a larger effect of the intervention; again, this did not reach statistical significance. Third, we found that we were able to recruit and engage our planned sample. Our fourth aim was to estimate the overall cost of health and social care services used, which was lower in the intervention than in the TAU group, but the difference was not statistically significant.

Our exploratory RCT was designed in consultation with service users and successfully executed but was not effective in reducing BMI. This finding contrasts with the mean effect seen in some previous interventions.[6] There are some possible reasons for this finding. First, ours was a phase-specific intervention; given that weight gain is more marked early in the course of psychosis,[4] we may have overestimated the potential effect of the intervention. Indeed, follow-up of a previous intervention to reduce weight in first-episode psychosis showed that the effects of the intervention attenuated at 12 months.[28] It is possible that a more intensive intervention is required. Second, most weight-management studies in psychosis have focused on the prevention of weight gain in either drug-naive service users[29] or those being switched to olanzapine[29–32] rather than weight loss. The focus of our study was weight loss in participants, many of whom were already obese. Similar small effects have been reported elsewhere when service users with established weight gain have been recruited.[33–36] Third, participants were able to choose from a range of physical activities performed in groups or individually. Given that the amount of physical activity required to produce weight loss is considerable,[37] we might have produced a larger effect if all participants had undertaken the same structured exercise program. Fourth, it is possible that our study did not pay sufficient attention to the impact of psychosis-associated cognitive deficits on motivation and the ability to regulate behavior.[38]

Only 27% of participants were taking olanzapine or clozapine at randomization. Participants taking olanzapine or clozapine in the TAU group had a mean increase in BMI, while those in the intervention group showed a mean decrease. This provides some evidence to suggest that the intervention may be more effective in participants taking these medications.

Health and social care costs in the intervention group were lower than in the TAU group, but the difference was not statistically significant. The association between high levels of depression and a greater reduction in BMI could be explained by the fact that greater reductions are usually associated with greater starting values, or it could be a chance finding.

The study was well conducted, with independent randomization, 12-month follow-up, and low attrition. Limitations of the study include the potential bias in the sample due to case managers excluding participants who may have been eligible and the variability in exercise regimens followed in the intervention group. While our trial, like most others, is not perfectly generalizable, in the real world it is probably as close to generalizability as can be obtained when informed consent is required. While we screened 971 patients of early intervention services, only 276 were eligible for the study (478 were not overweight). Of these 276, we recruited 118, or 42.8% of all eligible patients. A further limitation was that we excluded participants with substance abuse (7.8%).

We have also considered whether BMI was the most appropriate outcome measure. Future research might consider additional measures of cardiovascular vulnerability such as high-density lipoprotein–low-density lipoprotein cholesterol ratio and levels of triglycerides.

Drug names: clozapine (Clozaril, FazaClo, and others), olanzapine (Zyprexa).
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