Efficacy of Nursing Interventions Using Motivational Interviewing Aimed at Weight Loss in Overweight/Obese Breast Cancer Patients Undergoing Endocrine Therapy

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Objective: Obesity adversely impacts breast cancer treatment and outcomes. This study assessed the efficacy of nurses' motivational interviews (MI) in promoting weight loss among breast cancer patients.
Methods: Motivational Interviewing was performed at 4, 8, and 12 weeks from baseline in 27 overweight/obese breast cancer patients receiving adjuvant endocrine therapy. An average weight loss rate of 5% at week 12 was the threshold for determining whether MI intervention was clinically meaningful. Clinical and sociodemographic variables were gathered from medical records and self-administered questionnaires. Body weight, body mass index (BMI), physical activity time, sedentary time, self-efficacy for weight loss, and mood scores were evaluated at baseline, 4, 8, 12, and 24 weeks.
Results: Significant reductions in body weight were observed throughout compared with baseline; 51.9% of participants attained the 5% weight loss target, but the average weight loss rate was 3.9% at week 12. BMI notably decreased at 8, 12, and 24 weeks compared with baseline. Physical activity increased significantly at 12 weeks, while sedentary time decreased at 8 and 24 weeks.
Conclusions: Nursing-administered MI did not achieve the goal of 5% weight loss at week 12. However, it increased physical activity and reduced sedentary time, showing potential for promoting healthier habits.

Key words: motivational interviewing, weight loss, breast cancer, endocrine therapy, obesity

INTRODUCTION

Breast cancer is the most common cancer among women worldwide, accounting for 15% of all cancer deaths among women [1]. Based on the molecular subtype of the cancer, it is treated with multidisciplinary therapies, including surgery, endocrine therapy, chemotherapy, and radiation therapy. Recurrence with distant metastasis is considered incurable with currently available treatments; hence, adjuvant systemic therapy is often performed to reduce the risk of recurrence [2].

For patients with early-stage hormone receptor-positive breast cancer, adjuvant endocrine therapy for 5–10 years is recommended in addition to surgery to reduce the risk of recurrence and death [3, 4]. However, previous studies have shown that the efficacy of standard adjuvant endocrine therapy is reduced in obese patients with breast cancer, regardless of tumor size or the presence of lymph node metastases [5]. Additionally, obese women have a 35% higher rate of breast cancer recurrence and a 41% increase in breast cancer-related mortality and overall mortality [5–7]. Furthermore, disease-free survival was found to be poorer in severely obese patients than in underweight/standard-weight patients [8]. Weight loss in overweight/obese patients with breast cancer is supposed to improve survival, and prospective studies of multidisciplinary interventions for 7–10% weight loss are underway [9–11]. Although multidisciplinary interventions are suggested to be effective for successful lifestyle improvement and weight loss in overweight/obese breast cancer survivors [11], implementation of these interventions is impractical due to barriers such as time limitations and human and financial resources in the clinical setting.

Nurses have utilized various behavioral change perspectives and techniques, such as cognitive behavioral therapy, the transtheoretical model, and motivational interviewing (MI), to support medication adherence in treating chronic conditions like type 2 diabetes, promote weight loss, provide treatment support for alcohol use disorders, and address chronic pain and insomnia [12]. MI, an interpersonal assistance theory [13], has been applied in clinical settings to manage cancer pain, maintain and improve adherence to oral chemotherapy, and improve cancer screening rates [14–16]. MI for lifestyle modification interventions and supportive self-management for weight loss in overweight/obese breast cancer patients may be more

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effective and straightforward than multidisciplinary lifestyle interventions; however, its efficacy has not been determined. In this study, we aimed to evaluate the efficacy of nursing interventions that utilize MI to support weight loss in overweight/obese patients with breast cancer undergoing postoperative adjuvant endocrine therapy.

MATERIALS AND METHODS

Participants

This single-arm study was conducted from September 2020 to December 2021 at Tokai University Hospital in Kanagawa, Japan. Eligible participants were patients with hormone receptor-positive breast cancer undergoing postoperative adjuvant endocrine therapy who were either overweight (body mass index (BMI) ≥ 25–29 kg/m^2) or obese (BMI ≥ 30 kg/m^2) according to guidelines of the World Health Organization [17]. Obesity was further classified according to severity: obese I (BMI = 30–34.9 kg/m^2), obese II (BMI = 35–39.9 kg/m^2), and obese III (BMI < 40 kg/m^2) [17]. Patients undergoing chemotherapy or radiation therapy, and those with psychiatric disorders or exercise limitations were excluded from the study. Written informed consent was obtained from all patients before implementing the nursing intervention and conducting the survey.

Nursing Intervention

We used MI as a nursing intervention. MI was performed at the beginning of the study intervention and 4, 8, and 12 weeks after study initiation, with a follow-up period of 24 weeks (Fig. 1). Face-to-face interactions were minimized as nursing interventions were introduced during the COVID-19 pandemic. Therefore, the interviews were conducted by telephone, online, or in person (e.g., during medical visits).

A psychologist trained the nurses conducting the interviews (note: Lecture content included “Principles of Motivational Interviewing” and practical training comprised “Interviewing for Behavior Change to Healthy Lifestyle”) to ensure intervention quality and participant safety. Considering the psychological burden on the patients and nurses, each intervention was limited to approximately 45 minutes.

MI is a communication technique used in medicine to tap into a patient’s inner motivation and willingness to change. Nurses interact with patients to explore their level of motivation for behavioral change by taking a non-directive approach and avoiding the provision of direct instructions. Nurses help patients explore their thoughts and feelings through open-ended questions and reflective responses. For example, nurses encourage patients to express their desire to wear clothing that is one size smaller when they lose weight, which motivates behavioral modification. MI can promote long-term behavioral change by clarifying the patient’s motivations and intentions. This allows patients to take ownership of their change process and helps them find their intrinsic motivations [18, 19].

Target Weight Loss Rate

Although there are no established guidelines for the target weight loss rate, previous studies showed that multidisciplinary lifestyle interventions led to a weight loss of 1.6–5.9% within a timeframe of 3 to 6 months in patients with breast cancer [9, 20–22]. There is no consensus on weight loss goals during adjuvant endocrine therapy in patients with breast cancer. However, it has been suggested that a 5% weight loss is beneficial to the health of obese individuals [23–26]. Based on these data, an average weight loss rate of 5% at 12 weeks from baseline was set as the threshold for determining whether MI intervention was clinically meaningful.

Intervention for Physical Activity

Nurses encouraged the participants to enhance their physical activity time and strength by engaging in at least 150 minutes of moderate-intensity exercise or 75 minutes of high-intensity exercise per week, based on the American Society of Clinical Oncology (ASCO) guidelines [27]. Furthermore, nurses supported the participants in identifying and verbalizing strategic processes that led to behavioral change (e.g., starting with 30 minutes of walking three times per week).

Intervention for Diet

During the MI sessions, participants were asked to record their daily weight and discuss their caloric intake based on their basal metabolic rate, with recommendations to include vegetables, fruits, and whole grains in their diet while reducing saturated fatty acids.

They were assisted in learning and adopting healthy eating habits based on the recommendations outlined in the ASCO guidelines [27]. By understanding participants’ usual eating habits, nurses summarized and highlighted areas for improvement to create awareness of their weight loss goals. Participants were also encouraged to express their motivations, such as increasing vegetable consumption, reducing or eliminating snacks, and substituting sweetened beverages with sugar-free drinks. They also identified the amount of calories they wanted to lose per day.

Outcome Measures

Baseline data on age, clinical stage, menopausal status, type of endocrine therapy, presence of metabolic syndrome-related diseases (e.g., type 2 diabetes, hypertension, hypercholesterolemia [28]), marital status, employment, household income, and final academic history were collected through medical records and self-administered questionnaires. Outcome measurements were recorded at baseline and 4, 8, 12, and 24 weeks (Fig. 1). The study’s primary endpoint was the change in body weight compared to baseline measurements after the intervention. Secondary endpoints were BMI, physical activity time, sedentary time, self-efficacy for weight loss, and mood.

Physical activity and sedentary time were evaluated using the International Physical Activity Questionnaire (IPAQ) [29]. The mean duration of at least 10 minutes of continuous physical activity over the previous week and the mean daily sedentary time were calculated. Self-efficacy was measured using the Japanese version of the Generalized Self-Efficacy Scale (SE) [30], considering that weight changes may affect successful experiences, agency experiences, social persuasion, and physiological status, contributing to self-efficacy.

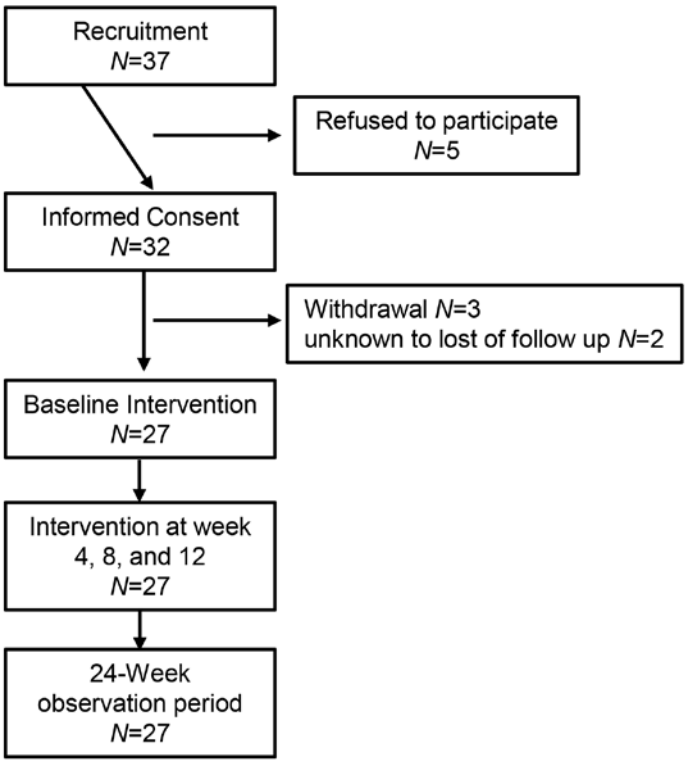

Fig. 1 CONSORT diagram of patient flow

Mood changes were assessed using the Profile of Mood States Second Edition (POMS 2™), which evaluates six individual mood domains (Tension-Anxiety, Depression-Rejection, Anger-Hostility, Vitality-Activity, Fatigue-Inertia, Confusion-Embarrassment), as well as overall mood score [31]. The T-score presented the overall mood score, a value converted to approximate a normal distribution with an average of 50 and a standard deviation of 10. Higher scores indicate a higher prevalence of mood problems or more pronounced symptoms, while lower scores indicate fewer or more harmful problems.

Statistical Analysis

An appropriate sample size to detect a 5% weight change was calculated with an effect size of 3.5 kg, corresponding to 5% of a person weighing 70 kg. The standard deviation (SD) of the weight of Japanese women was set to 6 kg based on the data from the portal site of the Official Statistics of Japan (https://www.e-stat.go.jp/; accessed on 8/1/2023). Using EZR version 4.2.2 [32], a sample size of 26 cases was calculated with an effect size of 3.5 kg, an SD of 6, an alpha error of 0.05, and a power of 0.80.

GraphPad Prism ver. 9.1.0 software was used for statistical analyses and graph preparation. All data were assessed using the D'Agostino–Pearson normality test; parametric or non-parametric tests were used depending on the data distribution. Dunnet's multiple comparisons test or Dunn's multiple comparisons test was performed for multiple comparisons of repeated measure samples depending on data distribution. Only the comparison of body weight at each time point was tested using a paired t-test because the sample size was calculated assuming a paired t-test. Dunn's multiple comparison test was conducted for multiple comparisons of no pairing sample. Univariate analysis using multiple logistic regression models was used to evaluate the strength of the association between patient characteristics and achievement of target weight loss rate in 12 weeks. A p-value < 0.05 was defined as statistically significant.

RESULTS

Baseline Patient Characteristics

A total of 37 patients were recruited, but only 27 completed the study and were analyzed (Figure 1). The mean age was 59.1 years (SD 9.7). The clinical stage of breast cancer was stage I in 12 patients (44.4%), II in 14 (51.9%), and III in one (3.7%). Twenty-four patients (88.8%) were postmenopausal, and three (11.1%) were premenopausal. Postoperative adjuvant endocrine therapy included tamoxifen (55.6%) and aromatase inhibitors (44.4%). Comorbidities included type 2 diabetes mellitus (33.3%), hypertension (33.3%), and hyperlipidemia (25.9%); twelve (44.4%) participants had no comorbidities. Of all the participants, 23 (85.1%) were married and 16 (59.2%) were employed. Eleven (40.8%) had annual household incomes of less than 5 million yen, nine (33.3%) less than 10 million yen, three (11.1%) more than 10 million yen, and four (14.8%) had no record. Fourteen (51.8%) had completed high school, and 13 (48.1%) had completed high school or higher as their final education (Table).

Nursing Interventions Provided

A total of 108 motivational interviews were performed. Of these, 66 were conducted in person, 36 by telephone, and six online (Fig. 2a). The interview duration at the beginning of the study intervention was

Table Participants' characteristics (n = 27)

	n = 27
Age, mean (range)	59.1 (41–74)
Clinical stage (%)	
Ⅰ	12 (44.4)
Ⅱ	14 (51.9)
Ⅲ	1 (3.7)
Menopausal state (%)	
Post-menopause	24 (88.8)
Pre-menopause	3 (11.1)
Types of endocrine therapy (%)	
Tamoxifen	15 (55.6)
Aromatase Inhibitors	12 (44.4)
Metabolic syndrome-related diseases, No. (%)*	
Type 2 diabetes	9 (33.3)
Hypertension	9 (33.3)
Hypercholesterolemia	7 (25.9)
None	12 (44.4)
Marital status (%)	
Married	23 (85.1)
Unmarried	4 (14.8)
State of employment (%)	
Employed	16 (59.2)
Unemployed	11 (40.7)
Household income (%)	
~ 5 million yen/year	12 (44.4)
5.01 ~ 10 million/year	6 (22.2)
10.01 ~ million yen/year	5 (18.5)
Not reported	4 (14.8)
Academic history (%)	
High school graduation	14 (51.8)
Above (professional training college, junior college, university, graduate school)	13 (48.1)

*; Also counted in case of co-occurrence

longer because consent had to be obtained. Still, it became shorter (< less than 40 minutes) at weeks 4 and 8, with a trend toward more extended interviews in the final 12 weeks (Fig. 2b). Except for the first interview, the interview times for the second and subsequent interviews were compared, considering different interview methods (i.e., in-person, online, and telephone). A significant difference was found between in-person and telephone interviews and in-person and online interviews. However, there was no significant difference between telephone and online interviews (Fig. 2c).

Change in Body Weight and Body Mass Index

Body weight was 73.2 kg (SD10.3) at baseline, 71.9 kg (SD 9.9) at 4 weeks, 70.6 kg (SD 9.6) at 8 weeks, and 69.5 kg (SD 9.6) at the end of 12 weeks, showing a significant decrease compared to baseline (Fig. 3a), with an average weight loss of 2.0%, 3.0%, and 3.9% at 4, 8, and 12 weeks, respectively. BMI showed significant decreases at 8, 12, and 24 weeks compared to baseline. Fig. 3b shows the proportion of BMI categories at each time point. Waterfall plots for the percentage of body weight loss from baseline at each time point are shown in Fig. 3c–f. At 4, 8, 12, and 24 weeks after the intervention, 3.7%, 29.6%, 51.9%, and 37.0% of the participants, respectively, achieved the target weight loss rate of 5% (Fig. 3c–f). Univariate analysis for achieving the target weight loss rate in 12 weeks showed that only employment was associated with achieving the target weight loss rate, while other factors were not (Fig. 3g). When comparing employment status, more employed patients achieved target weight loss goals compared with unemployed patients (Fig. 3h).

Change in Physical Activity Time and Sedentary Time

A significant increase was observed in physical activity time at 12 weeks compared to baseline, but no significant differences were found at 4, 8, and 24 weeks (Fig. 4a). Sedentary time significantly decreased at 8 and 24 weeks compared with baseline, but not at 4 and 12 weeks (Fig. 4b).

Change in Self-Efficacy and Mood

Self-efficacy scores were consistently stable at 4, 8, 12, and 24 weeks compared to baseline (Fig. 5a). Mood score was significantly lower at 24 weeks. However, no significant differences were found at 4, 8, and 12 weeks.

DISCUSSION

This study aimed to assess the effectiveness of MI as a nursing intervention for weight loss in overweight/obese breast cancer patients. The pre-set threshold for determining the clinical significance of an MI inter-

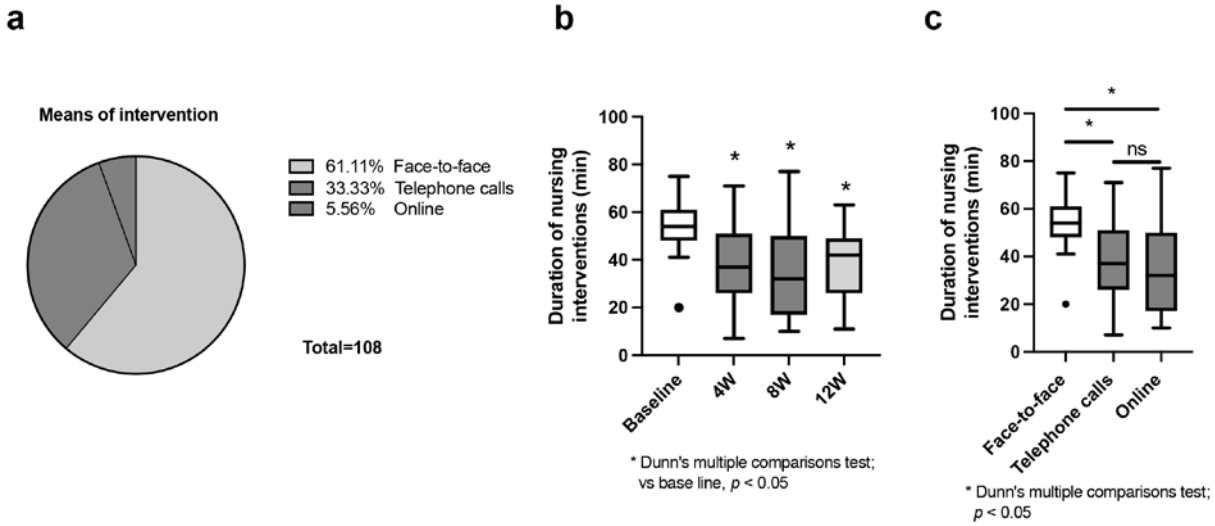

Fig. 2 Methods and duration of MI-based nursing interventions
(a) Graph shows the breakdown of the intervention method (e.g., face-to-face, telephone, and online).
(b) The duration of MI (min) at each time point is shown using Tukey box plots.
(c) Except for the first interview, the interview times (min) for the second and subsequent interviews were shown using a Tukey box plot and compared by interview methods (e.g., face-to-face, telephone, and online).

vention (i.e., an average weight loss rate of 5% at 12 weeks from the baseline) was not achieved. However, the results showed that the MI-based nursing intervention alone reduced body weight and BMI in breast cancer patients undergoing adjuvant endocrine therapy during all observation periods. Moreover, the MI-based nursing intervention transformed physical activity and sedentary time into favorable conditions for weight loss without increasing the patients' psychological burden.

A systematic review of interdisciplinary interventions [24] demonstrated significant weight loss outcomes in women with breast cancer. In the weight loss intervention group, the weight loss rate over an intervention period of 8 weeks to 1 year, compared to baseline, ranged from 3.3% to 13.9%, whereas weight changes in the control group ranged from -1.8% to + 1.2% [24].

In considering studies with intervention periods similar to our research (i.e., 3 to 6 months) [9, 20–22], weight loss rates varied from 1.6% to 5.9%. Our study's average weight loss rate over the entire study period was 3.7% (data not shown), which is consistent with previous research. One previous report has suggested that MI alone does not significantly improve behavioral management programs for weight control in overweight/obese individuals [33]. The other reports, though, have used MI to improve physical activity levels and weight loss in cancer survivors, with favorable results [34]. In the present study, more than half of the study participants achieved a weight loss of 5% or more (Fig. 3a), and MI-based interventions resulted in behavioral changes such as increased physical activity (Fig. 4a) and decreased sedentary behavior (Fig. 4b). This suggests that nurse-led MI may influence lifestyle behavior change in overweight/obese patients. To our knowledge, this study provides new evidence that MI-based nursing interventions can contribute to weight loss. It demonstrates the potential effectiveness of MI in weight management for overweight/obese breast cancer patients undergoing adjuvant endocrine therapy. It also reveals a correlation between employment and weight management, suggesting that employment contributes positively to weight management. However, it is important to note that the findings of this study apply to a limited subset of breast cancer patients who are overweight/obese and undergoing adjuvant endocrine therapy.

This study has several limitations. First, we could not achieve a mean weight loss rate of 5% at 12 weeks from baseline with a single MI intervention conducted by nurses. Although a 5% weight loss was achieved in some instances, we cannot conclude that a nursing intervention using MI is clinically meaningful. The duration of the nursing intervention could be extended to achieve a 5% weight loss. Second, the impact of weight loss on progression-free survival and overall survival in breast cancer survivors who are overweight or obese remains unknown. The effects of weight loss in overweight/obese breast cancer patients are pending the results of ongoing studies [35]. Third, our outcome assessments did not include nutrition or body composition measurements. Finally, in light of the nursing shortage, the timing of MI interventions in clinical applications needs to be reevaluated [36].

CONCLUSIONS

Although the MI-based nursing intervention did not achieve the pre-set threshold of a 5% average weight loss rate and its clinical effectiveness could not be verified, it contributed to weight loss at a specific rate. Moreover, the intervention did yield increased physical activity and reduced sedentary time, demonstrating its potential to encourage healthier behaviors in these patients.

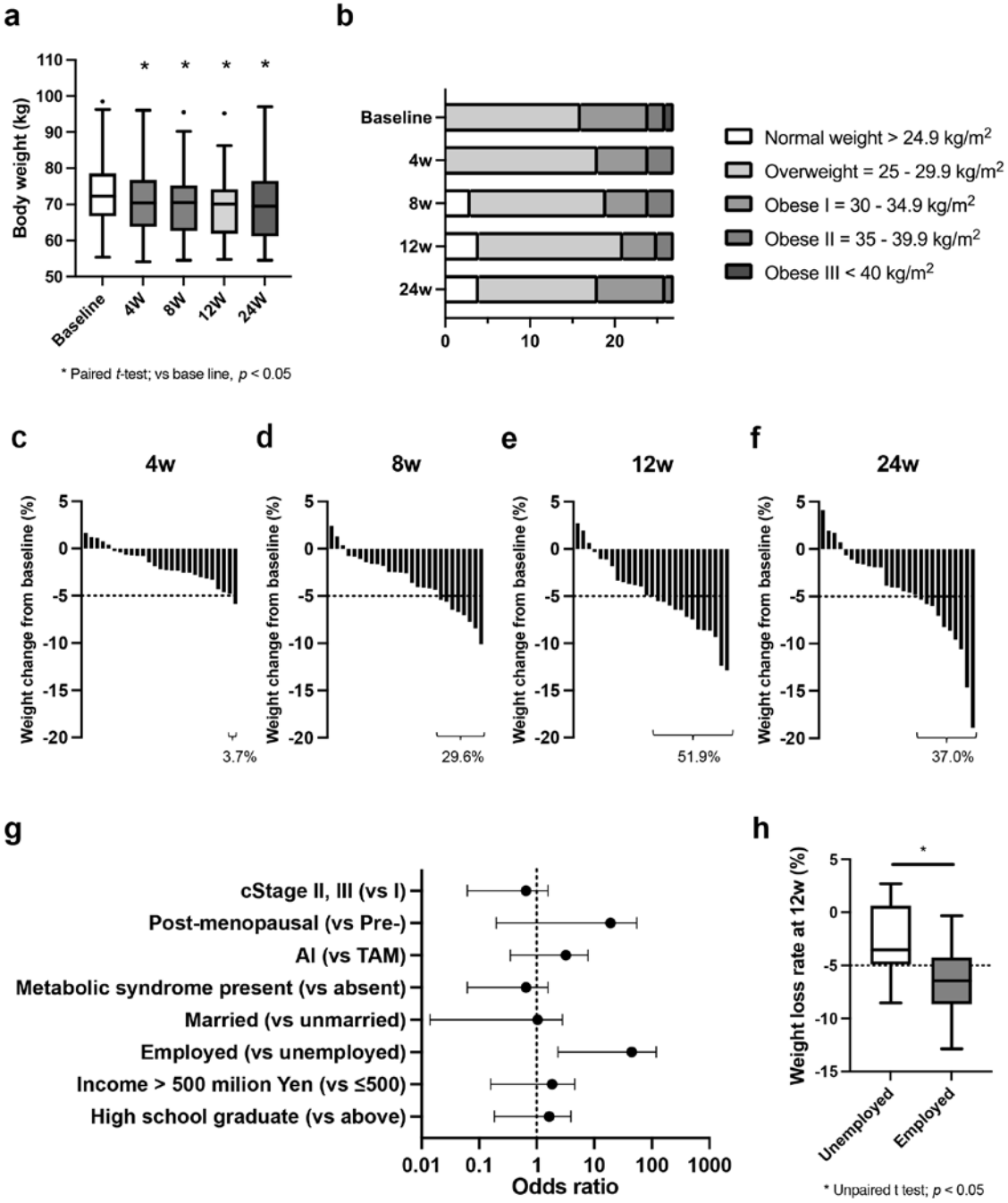

Fig. 3 Change in body weight and body mass index (BMI)
(a) Body weight (kg) at each time point is shown in Tukey box plots.
(b) The distribution (number) of BMI categories at each time point is shown.
(c–f) Waterfall plots show the percentages of body weight loss from baseline at each time point. The percentages of participants who achieved a weight loss goal of 5% from baseline are also shown below the graph.
(g) Univariate analysis was performed to achieve the target weight loss rate (i.e., 5%) in 12 weeks by patient background. The graph shows the odds ratio (plot) and 95% CI (bar).
(h) Employment status in Tukey box plots shows body weight loss rate at 12 weeks compared with baseline.

DECLARATIONS

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Conflict of Interest

Naoki Niikura received honoraria from AstraZeneca K.K., Daiichi Sankyo Co. Ltd., Pfizer Japan Inc., Eisai Co. Ltd., and Nippon Kayaku Co. Ltd.

Ethical Approval

All procedures performed in studies involving human participants followed ethical standards of the institutional and/or national research committee and the

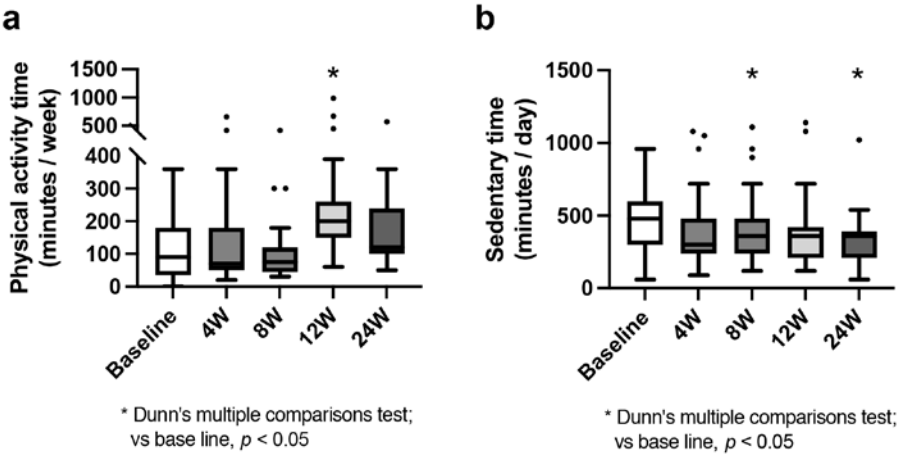

Fig. 4 Time spent in physical activity and daily sedentary time
(a)Physical activity time (minutes/week) and (b) sedentary time (minutes/day) at each time point are shown in Tukey box plots.

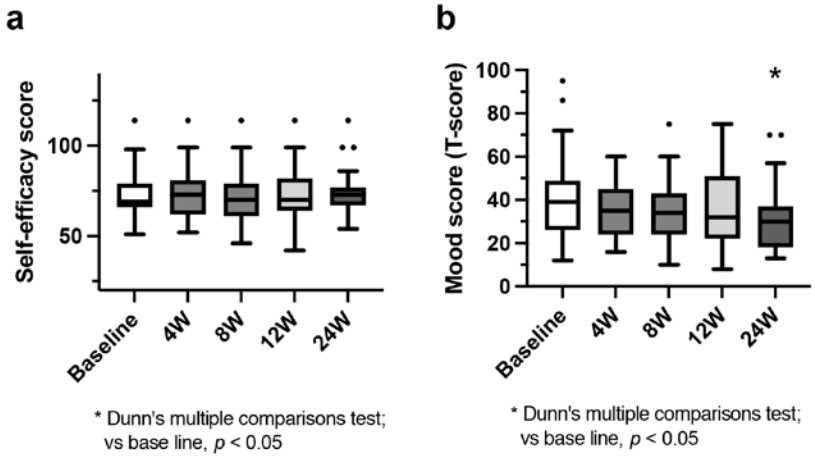

Fig. 5 Self-efficacy and Mood
(a) Self-efficacy score and (b) mood score at each time point are shown in Tukey box plots.

1964 Helsinki Declaration and its later amendments or comparable ethical standards [37]. The research protocol was approved by the Institutional Review Board for Clinical Research at Tokai University School of Medicine (approval number 20R08).

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Author Contributions

Emi Sato and Niikura Naoki developed the concept and designed the study. Emi Sato performed the nursing intervention data analysis and wrote the manuscript. Toru Hanamura and Kouta Fukai performed data analysis. Emi Sato, Mari Mizuno, Kozue Yokoyama, Mayako Terada, Banri Tsuda, Toru Hanamura, Takuho Okamura, and Niikura Naoki recruited participants. Masako Shomura, Mari Mizuno, Kozue Yokoyama, Mayako Terada, Banri Tsuda, Toru Hanamura, Takuho Okamura, and Niikura Naoki supervised the writing of the manuscript. All authors have read and approved the final version of this manuscript for publication.

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