Nursing: Research and Reviews

Dovepress
open access to scientific and medical research

Open Access Full Text Article

REVIEW

Evaluating the feasibility and impact of interactive telephone technology and incentives when combined with a behavioral intervention for weight loss: a pilot study

This article was published in the following Dove Press journal:
Nursing: Research and Reviews
21 August 2012
Number of times this article has been viewed

Mary Annette Hess[1]
David E Vance[1,2]
Peggy R McKie[1]
Laura S Burton[3]
Jamy D Ard[4]
Josh Klapow[5,6]

[1]School of Nursing, [2]Edward R Roybal Center for Translational Research in Aging and Mobility, [3]Department of Nutrition Sciences, [4]UAB EatRight Weight Management Services, Department of Nutrition Sciences, [5]School of Public Health, University of Alabama at Birmingham, AL, USA; [6]ChipRewards, Inc, Birmingham, AL, USA

Abstract: The purpose of this study was to determine the effectiveness of delivering the 'EatRight Lifestyle' program as an educational weight loss program when combined with a system for behavior-based incentives (ie, ChipRewards). Participants (N = 70) were randomly assigned to one of two interventions over a 12-week period: (1) 'EatRight Lifestyle' only (control), and (2) 'EatRight Lifestyle plus ChipRewards'. From baseline to the 12-week visit, the overall attrition rate was 27.14% (n = 19). A completers only and an intent-to-treat repeated measures analysis of covariance was conducted on the outcome measures (ie, weight loss, change in blood glucose) for the baseline and 12-week visit. It was found that waist circumference decreased slightly for those in the 'EatRight Lifestyle plus ChipRewards' program; however, BMI and weight was slightly more reduced for those who were more compliant to the study protocol in general, regardless of group assignment. No other time or group differences were detected. This study showed that these two weight loss programs did not produce drastically differential effects on these outcome measures.

Keywords: behavior, obesity, diet, physical activity, education, token economy, online intervention, phone counseling

Introduction

Obesity is the most prevalent, fatal, chronic, and relapsing disorder in the 21st century. The prevalence of overweight and obesity in the US has steadily increased annually over the past 50 years.[1] As the second leading cause of preventable death in the US, obesity is a major contributor to the public health burden.[2] The US Surgeon General's recent call to action has highlighted the epidemic rise in obesity, which affects about 65% (ie, 200 million) of people.[1,3,4]

Obesity contributes to a number of health conditions and diseases. Obesity increases cardiovascular disease risk factors[5–8] and overall mortality.[9–11] The prevalence of these risk factors – hypertension, dyslipidemia, and type 2 diabetes mellitus (T2DM) is generally 1.5–2.9 times higher among overweight adults than normal weight adults.[12] T2DM is a major health problem that will continue to increase in occurrence and cost if preventive steps are not taken. According to the Centers for Disease Control and Prevention (CDC) data from 2007, T2DM is currently one of the most common and costly chronic diseases in the US, with approximately 24 million diagnosed and 57 million who are at risk for T2DM.[13,14]

Correspondence: Mary Annette Hess
School of Nursing, Room 436, 1701 University Boulevard, University of Alabama at Birmingham (UAB), Birmingham, AL 35294-1210, USA
Tel +1 205 934 0479
Fax +1 205 996 7183
Email wrighta@uab.edu

Regionally, obesity and T2DM are more prevalent in the southern US. Eight of the 10 states with the highest number of obese adults are in the South.[15] Furthermore, the incidence of obesity in Alabama continues to increase, currently at 35%, with little evidence of a slowing trend in sight.[16,17] Alabama has greater than 70% of counties with obesity prevalence in the top quintile (≥30.9%).[15] Obesity incidence is highly associated with T2DM occurrence and this is especially true in Alabama. According to 2009 data released from the CDC, over 12% of people in Alabama have been diagnosed with T2DM, and thousands are unaware that they have the disease. Alabama ranks among the top five states in the nation for the prevalence of T2DM.[18]

Interventions

Interventions to reduce obesity have shown positive health improvements. Modest weight loss not only reduces risk for T2DM,[9,19–22] it significantly improves cardiovascular disease risk factors including: lowering blood pressure[9,19–21,23] and hypertension risk; [9,19–21,24] reducing total cholesterol, low density lipoprotein cholesterol, and total triglycerides; and raising high density lipoprotein cholesterol,[9,19–21,25,26] as well as lowering blood glucose levels.[19,25,27,28] In response to this overwhelming evidence, clinical treatment guidelines for hypertension, dyslipidemia, and T2DM include weight control as a core component.[9,19–22,25,27,29–32]

Based upon principles of the Health Promotion Model,[33] the Diabetes Prevention Program (DPP) demonstrated that lifestyle modifications such as weight loss can help improve health outcomes.[34] For example, in a sample of 1079 participants who were overweight and at risk for developing T2DM, the DPP included intensive lifestyle modifications with both diet and increased physical activity. The DPP randomized 3234 men and women with impaired glucose tolerance or impaired fasting glucose into one of three conditions: (1) a no-contact control condition, (2) a medication (metformin – T2DM pharmaceutical treatment) condition, or (3) a lifestyle modification condition, composed of dietary and weight loss goals and 150 minutes of aerobic activity per week.[35] After 24 weeks, it was observed that those in the lifestyle modification group had a reduced incident T2DM by 58% which was a greater effect than those in the metformin condition (31%).[35] Some of the prescribed interventions included individual support and counseling, dietary intake, weight reduction, and physical activity.[36] The DPP used a model of intervention delivery that focused on individual- and group-based counseling using trained professionals and frequent provision of incentives to encourage participation. The primary challenges with this model are that the use of individual- and group-based counseling with trained professionals is resource intensive, has limited scalability, and is dependent on a non-sustainable, inefficient incentive model.

The 'EatRight Lifestyle' program, an effective DPP-style weight management intervention, could be delivered in conjunction with interactive telephone technology and a targeted incentive program in a way that is cost efficient, scalable, and effective. The 'EatRight Lifestyle' program promotes effective lifestyle change and weight reduction within a 24-week program by lowering dietary energy density and increasing moderate physical activity (http://www.uab.edu/eatright/programs/lifestyle). Weinsier and colleagues documented that this dietary pattern prolongs eating time, displaces intake of more energy-dense foods, and produces equal satiety at half the energy intake as compared to a high-energy-density diet.[37–39] Follow-up studies of 'EatRight Lifestyle' participants showed that they lost an average of 6.3–8.2 kg by the end of the program; this was 10.8 kg (24 lb) for participants who completed all recommended visits with 77% remaining below their baseline weight an average of 25 months later.[39,40] Recent evidence from 'EatRight Lifestyle' shows that long-term weight maintenance by former participants is associated with consuming a low energy dense dietary pattern.[41] While able to produce effective weight loss as in the original DPP, the 'EatRight Lifestyle' program is limited in reach because all participants receive extensive nutrition, behavioral, and fitness education from a team of certified professionals, including registered dietitians, behaviorists, and fitness trainers, in weekly 60-minute group sessions. There are also no active incentive plans for 'EatRight Lifestyle' participants despite demonstration that participation-based incentives can result in improved attendance, weight loss, and retention.[42,43]

A key technology may provide the solution to overcoming these barriers to widespread dissemination while maintaining effectiveness – the 'ChipRewards' incentive program. 'ChipRewards' is a software technology similar to many national customer loyalty programs that reward people for purchases of products and services at specific vendors; however, 'ChipRewards' uses this technology to incentivize healthy behaviors such as obtaining prescription refills on time, getting preventive screening tests, or completing medical visits.[44,45] Large audiences can be reached with programs such as this because: (1) health professionals are not required to intervene in a face-to-face format; (2) telephones are virtually ubiquitous; (3) the incentive program provided by 'ChipRewards' can be highly tailored and specific; and

(4) there is tremendous capacity within each system to accommodate large numbers of individuals.

Purpose

Evidence from the DPP reveals that T2DM can be delayed or prevented by changes in certain lifestyle factors; however, there is a lack of evidence for effective dissemination models. Therefore, the purpose of this pilot study was to evaluate the feasibility and impact of interactive online technology and incentives when combined with a behavioral intervention for weight loss; more specifically, it was to determine the effectiveness of delivering the 'EatRight Lifestyle' program as an individual study program when combined with an online system for behavior-based incentives (ie, 'ChipRewards'). The effectiveness of two intervention conditions was compared over a 12-week period by randomizing participants into one of two groups: (1) 'EatRight Lifestyle' only (control); and, (2) 'EatRight Lifestyle plus ChipRewards'.

Method

Participants

Participants were recruited from Jefferson County in Alabama. During the enrollment period, through flyers placed in clinics and newspaper advertisements, interested participants called and left their name and number (see Figure 1). Numerous interested individuals (N = 429) called and emailed to enroll in the study. Following the telephone interview to ensure participants met study criteria, the first eligible 70 individuals were invited to participate in the study. Participants were eligible for the study if they: were aged ≥ 19 years, had a body mass index (BMI) >25 kg/m^2 with or without T2DM, had access to a telephone, had a computer with an email address, and were able to read the materials provided as a part of the study. Participants were ineligible to participate if they did not have a computer with an email address, reported a medical condition where weight loss is contraindicated (ie, as measured by self-reported pregnancy or current cancer treatment), had experienced significant weight loss in the past 6 months, or it was deemed that the volunteer was psychologically unstable (ie, self-reported hospitalization for depression or psychosis in the past 6 months).

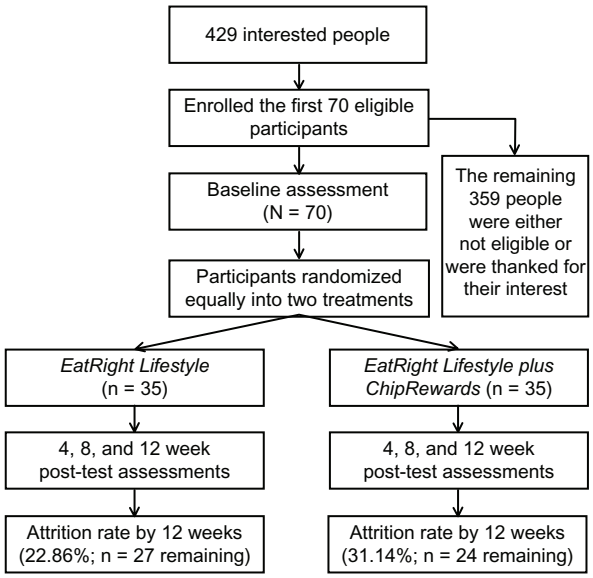

Figure 1 Recruitment and retention flowchart.
Note: *Attrition rate by treatment group was not statistically different.

Eligible participants were to schedule their study enrollment appointment. A confirmation letter and the consent form was also sent to all participants. Participants were instructed where to go and to not eat or drink anything for 8 hours prior to their enrollment clinic visit. At the enrollment visit, participants received a study information sheet and a verbal explanation of the study procedures as well as their rights as research participants, followed by a request to consent to participate. All participants provided written informed consent; this study and the consent form were approved by the University of Alabama at Birmingham's Institutional Review Board.

Procedure and interventions

During the enrollment visit, biometric measures (weight, BMI, waist circumference, blood pressure, fasting lab measures of blood glucose, insulin, high density lipoprotein (HDL) cholesterol, and triglycerides) on each participant were obtained by a trained research assistant in conjunction with the family nurse practitioner (principal investigator). Following the baseline data measurements, participants were randomly assigned to one of two intervention groups: (1) 'EatRight Lifestyle' only (control); and, (2) 'EatRight Lifestyle plus ChipRewards'. During the baseline visit, participants selected one blank envelope from a stack of blank envelopes that contained what intervention they were assigned; this ensured that half were assigned to each arm of the study. Following the initial clinic meeting on enrollment visit, the participants were scheduled an appointment for their follow-up at 4-, 8-, and 12-week visits. At the 4- and 8-week visits, each participant's blood pressure and weight were measured by the principal investigator and/or research assistant; then they met with the registered dietitian for dietary evaluation, guidance, clarification, and continuing education. At the 12-week visit, each participant

returned to the clinic for follow-up fasting (ie, 8 hours) laboratory tests (blood glucose, insulin, HDL cholesterol, and triglycerides), weight, BMI, waist circumference, blood pressure, and dietary guidance and evaluation by the principal investigator and research assistant. Following the completion of the 12-week visit, each participant was asked to complete a brief exit survey provided by the research assistant.

The EatRight Lifestyle only intervention

Participants assigned to this intervention group received an 'EatRight Lifestyle' manual that included 12 behavioral educational modules. This program normally lasts 24 weeks; however, in this study, the focus was on the 12 behavioral educational modules that were administered over a 12-week period. The 'EatRight Lifestyle' program (details are available online, www.eatright.uab.edu) was first developed by Weinsier and colleagues[37–39] and is based on the concept of time-calorie displacement, which states that large quantities of low energy-dense complex carbohydrates will prolong eating time and induce satiation, and thus, displace the intake of higher energy-dense foods. At the baseline visit, a study interventionist met with the participants in a 30-minute visit to prescribe the appropriate dietary plan and orient the participants to the program. Participants were instructed to self-monitor food intake daily using a food and fitness daily diary. The interventionist recommended 150 minutes/week of leisure time physical activity. The manual also included a list of foods categorized as 'Eat More Often' and 'Eat Less Often' foods. The participants' assessments occurred while meeting with the interventionist for 15–30 minutes at the 4-, 8-, and 12-week visits. During these meetings, participants provided an update on their progress and the interventionist was able to review the participants' self-monitoring activities as well as reinforce key behavioral goals. Weekly task accomplishment incentives were not provided in this group.

The EatRight Lifestyle plus ChipRewards intervention

In this group, participants received everything in the control intervention along with an orientation to the behaviors that would result in incentives being awarded. The 'ChipRewards' online software platform provided detailed electronic tracking on records of a wide variety of health-related behaviors including the outcomes described in the present study. 'ChipRewards' further managed all incentive offerings electronically including point issuances, participants' feedback, and redemption. The 'ChipRewards' platform was customized to fit the specific parameter of the present study. 'ChipRewards' provided the participants with 'chips' (ie, cyber tokens) for accomplishing key behaviors associated with weight loss, including self-monitoring of dietary intake and physical activity. Essentially, chips are a token economy which participants' redeem for a range of items available in an online catalog.

Participants were able to earn a maximum of 7500 chips (approximate $75 value) during the course of the program.[44] Specifically, if participants completed four food records per week, they were issued 100 chips; however, if participants completed three or less food records per week, no chips were issued. If participants completed four physical activity records per week whereby they exercised at least 90 minutes that week, they were issued 100 chips; however, if participants completed three or less physical activity records per week, no chips were issued. Likewise, if participants completed one 'EatRight Lifestyle' educational module per week, they were issued 100 chips. Participants were also awarded 700 chips for coming to each of the follow-up clinic visits. If participants were completely compliant to all of these intervention components during each 4-week period, they received an additional 600 chips as a bonus.

Instruments

Demographic information was collected at baseline. An experimenter-generated questionnaire was used to assess gender (1 = women; 2 = men), age (date of birth minus date of initial visit), race/ethnicity, marital status (1 = married/living as married; 2 = single, divorced, or widowed), educational level completed (years of education; 1 = 1st grade; 12 = 12th grade/graduate equivalency diploma (GED); 16 = bachelor's degree; 18 = master's degree; 20 = doctoral degree), income (0 = no income; 1 = $1–$9999; 2 = $10,000–$19,999; 9 = $80,000 or more), and self-rated health (1 = excellent; 5 = poor).

At each visit (initial/baseline, 4, 8, and 12 weeks), researchers weighed each participant. Participants were weighed in their clothing without shoes, using a Tanita digital scale (Model #BWB500A; Tanita Corporation, Arlington Heights, IL). The Tanita scale was calibrated to subtract 1.5 lbs from each participant's weight for clothing allowance. Height was measured using a wall-mounted stadiometer. BMI was calculated using the formula kg/m^2.

Waist circumference (cm) was measured at baseline and 12-weeks with constant-tension, non-stretch, retractable-style tape measures (Gulick II; Country Technology, Inc, Gays Mills, WI). The measure was made in a horizontal

plane at the narrowest part of the torso at the end of a normal expiration.

Blood pressure was measured according to Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) guidelines (ie, seated quietly with back supported and feet on the floor for 5 minutes prior, appropriate size cuff, arm bared and supported, no ingestion or smoking for 30 minutes prior) by an oscillometric blood pressure machine.[46] At each study visit, the average blood pressure was defined as the averaging of two measurements taken approximately 5 minutes apart.

Standard laboratory values of blood glucose, insulin level, HDL cholesterol, and triglycerides were measured by a blood sample obtained after an overnight fast and were measured at an UAB research laboratory; this occurred at the baseline and 12-week visit.

An exit survey was administered at the end of the last study visit. Questions included: (1) How much did you enjoy the study? (1 = not at all; 5 = extremely); (2) Would you recommend the 'EatRight' study to your friends and family? (1 = not at all; 5 = extremely); (3) Do you feel the study benefited you in achieving your weight loss goals? (1 = not at all; 5 = extremely); and, (4) How much would you pay for the services you received in this study (in dollars and cents)? This experimenter-generated measure also included general open-ended questions to assess what participants' liked and disliked about the study protocol and opinions about how the intervention could be improved.

Compliance to the protocol was captured by simply tallying if participants met the goals of each of the components of the protocol. As already mentioned, for food records, participants had to complete at least four per week in order to count this as a success; thus, compliance scores for food records ranged from 0 to 12. For physical activity records, participants had to complete at least four per week (with 90 minutes of exercise) in order to count this as a success; thus, compliance scores for physical activity records also ranged from 0 to 12. For 'EatRight Lifestyle' educational modules, participants had to complete one module per week in order to count this as a success; thus, compliance scores for 'EatRight Lifestyle' modules ranged from 0 to 12. For clinic visits, counting the baseline appointment, this score ranged from 0 to 4. A total compliance score was created by transforming the above compliance scores into *z*-scores in order to equally weight them and then adding them together; higher values indicate greater compliance to the protocol.

Data analysis

Data were examined using SPSS (v 19; SPSS, Inc, Chicago, IL). To examine baseline differences between the groups and between the completers and those who discontinued, *t*-tests and chi-squares were used. Repeated measures analysis of covariance (ANCOVA) was used to examine differences between the two groups over time (baseline, 12-week visit); gender was found to vary significantly between groups (see Table 1), so this was statistically controlled. Assumptions of normality, homogeneity of variance, and linearity were satisfied for using repeated measures analysis to test for treatment effects between the two intervention groups. Alpha was set at $P < 0.05$. Incidents of missing data were rare: one for education, one for self-rated health; therefore, mean imputation based upon the entire sample was used. One person was missing their baseline weight; since their other weights varied by only 2 kg, their average was used. At the 12-week visit, three cases were missing their waist circumference and one was missing their glucose measure; since these were going to be imputed in the intent-to-treat; they were not imputed for the completers only analysis (below). Two types of main analyses were conducted to determine the efficacy of the intervention. First, a completers only analysis was conducted between the two groups on the major outcomes variables (eg, weight, BMI, waist circumference, blood pressure, blood glucose, insulin level, HDL cholesterol, and triglycerides). Only cases that had the data for the 12-week visit were included in this listwise deletion analysis. Second, an intent-to-treat analysis was conducted; for those who dropped out of the study, their last known value was imputed for the final 12-week visit (eg, if BMI was present at the 8-week visit but not the 12-week visit, the value at the 8-week visit was imputed for the 12-week visit). In addition, attrition and compliance data were examined between the two groups and compared to the outcome measures. Finally, satisfaction of the study intervention was examined with the exit survey.

Results

Demographics and differences between groups

Table 1 shows demographics of the two intervention groups. There were no statistically significant group differences in the demographics of the sample (not shown), except for gender (X^2[N = 70] = 3.97, $P = 0.05$); there were more women in the 'EatRight Lifestyle' only group. The mean age of the sample was 43.67 years (SD = 10.24; range = 23.98–63.87). Most of the sample was female

Table 1 Demographic and baseline comparison of the intervention groups (N = 70)

Demographic variables	EatRight Lifestyle (n = 35)	EatRight Lifestyle plus ChipRewards (n = 35)	*P*-values for group effects
	Mean (SD)	Mean (SD)	
Age	43.02 (11.69)	44.32 (8.66)	0.07
No of women (%)	34 (97.14%)	29 (82.86%)	0.05†
No of men (%)	1 (2.86%)	6 (17.14%)	
No of African Americans (%)	15 (42.86%)	14 (40.00%)	0.60
No of Caucasians (%)	20 (57.14%)	21 (60.00%)	
No married/living as married (%)	18 (51.43%)	25 (71.34%)	0.09
No not married/living as married (%)	17 (48.57%)	10 (28.57%)	
Education (years)	15.77 (2.26)	14.97 (2.37)	0.31
No with full-time employment (%)	33 (94.29%)	31 (88.57%)	0.39
Income (0 = no income; 1 = $1–$9990; 9 = $80,000+)	6.63 (2.68)	6.71 (2.26)	0.27
Self-rated health (1 = excellent; 5 = poor)	2.77 (0.91)	2.37 (0.73)	0.55
Height (cm)	167.02 (6.09)	165.44 (7.44)	0.34
Weight (kg)	233.26 (59.69)	225.56 (42.97)	0.54
BMI (kg/m^2)	37.81 (9.03)	37.30 (6.20)	0.78
Waist circumference (cm)	107.85 (20.38)	109.17 (14.46)	0.76
Systolic blood pressure (mmHg)	115.46 (14.55)	114.03 (11.47)	0.65
Diastolic blood pressure (mmHg)	76.67 (11.62)	76.56 (9.75)	0.97
Blood glucose (mg/dL)	111.03 (15.22)	108.60 (13.66)	0.49
Insulin level (uU/mL)	17.46 (14.96)	15.50 (7.89)	0.50
HDL cholesterol (mg/mL)	54.97 (13.87)	52.74 (12.88)	0.49
Triglycerides (mg/mL)	101.51 (44.27)	102.31 (46.06)	0.94

Note: †$P < 0.05$.
Abbreviations: BMI, body mass index; HDL, high density lipoprotein; SD, standard deviation; uU, pictogram units.

(n = 63; 90.00%). Most of the sample was married/living as married (n = 43; 61.40%). The sample was comprised of 29 (41.43%) African Americans, 40 (57.14%) Caucasians, and one (1.43%) other. The mean number of years of education was 15.37 (SD = 2.34; range = high school graduate/GED to doctoral degree); this figure translates to a junior in college. Most of the sample (n = 64, 91.43%) were employed full-time. The mean income was 6.67 (SD = 2.46; range = 0–$80,000+ per year); this translates into a mean income of $55,500 per year. The mean self-rated health was between 'very good' and 'good' (M = 2.57; SD = 0.84; range = 1–5).

Table 2 displays the baseline and 12-week visit measures for the outcome variables by using change scores (ie, baseline – post-test values). Values for the 12-week visit reflect imputed values from baseline, 4-, and 8-week visits when values for the 12-week visit were missing due to attrition or measurement error; values closest in time to the 12-week visit were used for such imputation. No statistically significant baseline differences were

Table 2 Unadjusted change scores (baseline minus post-test) comparison of the health outcomes for the intervention groups (N = 70)

Health outcome variables	EatRight Lifestyle (n = 35)	EatRight Lifestyle plus ChipRewards (n = 35)	*P*-values for group effects
	Mean (SD)	Mean (SD)	
Change score in weight (kg)	1.57 (2.60)	0.90 (2.06)	0.24
Change score in BMI (kg/m^2)	0.56 (0.91)	0.34 (0.77)	0.28
Change score in WC (cm)	1.72 (5.49)	1.65 (3.66)	0.95
Change score in systolic BP (mmHg)	–2.11 (14.19)	–4.33 (12.71)	0.49
Change score in diastolic BP (mmHg)	1.26 (8.22)	–1.71 (7.65)	0.12
Change score in blood glucose (mg/dL)	3.49 (9.12)	–0.20 (13.60)	0.19
Change score in insulin level (uU/mL)	0.15 (7.60)	–1.66 (6.35)	0.29
Change score in HDL cholesterol (mg/mL)	–2.14 (10.20)	–0.17 (6.24)	0.33
Change score in triglycerides (mg/mL)	–0.83 (32.00)	–4.77 (24.18)	0.56

Abbreviations: BMI, body mass index; BP, blood pressure; HDL, high density lipoproteins; SD, standard deviation; uU, pictogram units; WC, waist circumference.

observed on the outcome variables between the groups (not shown). Since there were no baseline differences between the groups on these variables, these variables did not need to be controlled statistically in the repeated measures analysis.

Repeated measures ANCOVA

In the listwise analysis (n = 51), only completers of the interventions were analyzed using repeated measures ANCOVAs for the outcomes measures for the baseline and 12-week visit controlling for gender. No time or group differences were detected (not shown). In an intent-to-treat analysis, everyone was included (N = 70). Using repeated measures ANCOVAs for the outcome measures for the baseline and 12-week visit controlling for gender, similar results were found as before. No other time or group differences were detected (not shown).

Attrition and compliance to the interventions

From baseline to the 12-week visit, the overall attrition rate was 27.14% (n = 19). Table 3 and Figure 1 show the attrition rate for both groups: 'EatRight Lifestyle' (n = 8; 22.86%) and 'EatRight Lifestyle plus ChipRewards' (n = 11; 31.14%). Attrition rates were not significantly different between groups (X^2[N = 70] = 0.65, P = 0.42). Those who discontinued from the study did not differ from those who completed the study on age (t = –0.06, P = 0.97), gender (X^2[N = 70] = 0.01, P = 0.93), married/living as married (X^2[N = 70] = 0.54, P = 0.46), working full-time (X^2[N = 70] = 1.73, P = 0.19), income (t = 1.18, P = 0.24), height (t = 0.96, P = 0.65), weight (t = 0.98, P = 0.07), BMI (t = –1.86, P = 0.07), systolic blood pressure (t = 0.96, P = 0.34), diastolic blood pressure (t = –0.20, P = 0.85), blood glucose (t = –1.04, P = 0.30), insulin level (t = –1.25, P = 0.22), HDL (t = 0.57, P = 0.57), and triglycerides (t = 1.12, P = 0.27). Also, those who discontinued from the study differed from those who completed the study on minority status (X^2[N = 70] = 4.34, P = 0.04), education (t = 3.19, P < 0.01), self-rated health (t = –2.35, P = 0.02), and waist circumference (t = –2.39, P = 0.02); those who discontinued from the study were more likely to be African American, less educated, self-rated their health as poorer, and had a larger waist circumference.

Both groups shared some common activities (including the number of times they were to complete the activities) that were required as part of the intervention; such activities included submitting food records, submitting physical activity records, completing educational modules, and coming to clinic visits. Participants had to complete a preset number of food records (four per week) to count for one successful completion; thus, although participants may have completed several food or physical activity records, if they did not meet the minimum requirement of four per week, they received no credit. As a measure of treatment fidelity, the number of times these activities were completed successfully were tallied for each participant and compared between the intervention groups (Table 3). No significant group differences were observed in compliance to these activities except for submitting food records (t = 3.04, P < 0.01); the 'EatRight Lifestyle' only group successfully completed more food records (3.49 vs 1.17).

To determine whether these treatment fidelity measures were reflective of compliance, correlations between them were calculated. Correlations (not shown) ranged from 0.34 to 0.88; all of them were significantly related to each

Table 3 Comparison of the attrition and compliance for the intervention groups (N = 70)

Compliance variables	EatRight Lifestyle (n = 35)	EatRight Lifestyle plus ChipRewards (n = 35)	*P*-value for group effects
	Mean (SD)	Mean (SD)	
Attrition rate (%)	22.86%	31.43%	0.42
Food records (4/week)‡ (Range: 0–12)	3.49 (3.94)†	1.17 (2.16)†	<0.01
Physical activity records (4/week)‡ (Range: 0–12)	1.37 (2.73)	2.26 (2.97)	0.20
Educational modules (1/week)‡ (Range: 0–12)	4.11 (4.77)	3.11 (3.98)	0.34
Number of clinic visits/assessments‡ (Range: 0–4)	3.40 (1.17)	3.29 (1.13)	0.68
ChipRewards points (Range: 0–7500)	NA	4,084.31 (1755.13)	NA
Composite compliance score (z-score)	0.41 (3.10)	–0.27 (2.60)	0.33

Notes: †P < 0.01; ‡included in composite compliance score.
Abbreviations: NA, not applicable; SD, standard deviation.

other ($P < 0.001$). Based on common activities between the interventions (ie, submitting food records, submitting physical activity records, completing modules, coming to the clinic visits), a composite compliance score was created by generating *z*-scores for each of the compliance scores so they would be equally weighted and then summed. From this composite compliance score, group differences were examined. No intervention group differences emerged ($t = 0.99$, $P = 0.33$); this suggests that in general participants were for the most part equally compliant to each of the intervention protocols.

Since compliance may affect improvement in the outcome scores, the correlations between these compliance scores with the change scores between baseline and the 12-week visit imputed outcome scores (ie, baseline value minus 12-week visit value) were examined (correlation matrix not provided). The composite compliance score was only significantly related to changes in weight ($r = 0.31$, $P < 0.01$) and BMI ($r = 0.32$, $P < 0.01$); those who were more compliant to the study protocol in general experienced more weight loss and lower BMI. No other correlations were significant.

Since groups differed on shared compliance scores and because compliance was related to changes in weight and height, controlling for compliance (ie, food records completed) may show that the different interventions have a distinct effect on the outcome measures. Using the compliance composite score as a control variable (along with gender), the repeated measures ANCOVAs for the completers only was performed as before. In the listwise analysis (n = 51), only completers of the interventions were analyzed. Using repeated measures ANCOVAs for the outcome measures for the baseline and 12-week visit, a group effect was observed on waist circumference ($F(1,47) = 5.85$, $P = 0.02$); the 'EatRight Lifestyle plus ChipRewards' group had a slightly lower waist circumference. All of the other outcome measures were not significant.

Likewise, in the intent-to-treat analysis (N = 70), using repeated measures ANCOVAs for the outcome measures for the baseline and 12-week visit controlling for the compliance composite score (along with gender), similar results were found as before. An effect was observed on BMI × compliance ($F(1,66) = 7.14$, $P = 0.009$); those who were more compliant to the intervention, regardless of the intervention, experienced more of a decrease in BMI. No other time or group differences were detected (not shown).

Exit survey

Finally, participants were asked to rate the study at the last (12-week) visit (Table 4). Regarding how much they enjoyed the study, participants indicated that they enjoyed the study moderately (M = 3.31; SD = 0.95; N = 51), would recommend it to friends and family moderately to very much (M = 3.90; SD = 0.99; N = 51), felt it benefited their weight loss goals moderately (M = 3.08; SD = 1.00; N = 51), and would pay around $99.89 (SD = 93.28; N = 44) for the services they received in the study. However, there were no significant differences between the two groups on these responses.

Discussion

Overall, the intervention groups were relatively the same in that they produced very little change in the outcome measures. It was expected that the intervention with more components (ie, 'ChipRewards') would be more effective in reducing weight and improving the outcome measures. Instead, it appears that there was minimal change observed over the 12-week period. These findings are somewhat reflective of other weight loss programs that also show a slight benefit regardless of the type of intervention conducted. For example, Walker and colleagues[47,48] used two newsletter interventions designed to help

Table 4 Exit survey of satisfaction with the study of the intervention groups (N = 51)

Satisfaction suggestions	EatRight Lifestyle (n = 27)	EatRight Lifestyle plus ChipRewards (n = 24)	*P*-values for group effects
	Mean (SD)	Mean (SD)	
How much did you enjoy participating in the study? (1 = not at all; 5 = extremely)	3.37 (1.01)	3.25 (0.90)	0.66
Would you recommend the EatRight study to your friends and family? (1 = not at all; 5 = extremely)	4.15 (0.95)	3.62 (0.97)	0.06
Do you feel the study benefited you in achieving your weight loss goals? (1 = not at all; 5 = extremely)	3.19 (1.01)	2.96 (1.00)	0.42
How much would you pay for the services you received in this study (in dollars and cents)?	$115.22 (94.96)	$83.10 (90.67)	0.26

Notes: 1 = not at all; 2 = a little; 3 = moderately; 4 = very much; 5 = extremely. †$P < 0.05$.
Abbreviation: SD, standard deviation.

older rural women maintain physical activity and facilitate a change in eating. In the control condition, researchers mailed generic monthly newsletters to participants that contained information on physical activity and healthy eating. In the experimental condition, researchers mailed tailored monthly newsletters to participants; the information was specifically tailored for each participant based upon data they collected from the participants. It was found that in both conditions, there was a reduction in the amount of fat calories consumed, an increase in exercise and the amount of fruits and vegetables consumed, and improvement in blood pressure. Although the experimental condition was more efficacious, participants from both groups benefited. This finding, along with the findings of the present study, may attest to the motivation of the participants that were recruited. Participants who join a weight loss study may be intrinsically motivated to lose weight anyway. In fact, it was found in the present study that those who were more compliant to the study protocol, regardless of the intervention, experienced more reduction in BMI and weight (despite condition) and waist circumference (only for 'EatRight Lifestyle plus ChipRewards').

Limitations and strengths

All studies have limitations; this study is not without exception. First, attrition was moderately high in this study, at nearly 27%. There may be several reasons for this. As mentioned in the open-ended questions of the exit surveys (not reported), many participants expressed dissatisfaction with not being able to talk to a 'real person'; human contact may be an important motivator in adhering to such weight loss interventions. Also, many participants indicated that they would have liked to receive study materials to help them lose weight such as DVDs and nutrition pocket guides. As seen in Walker's studies,[47,48] their attrition rate was incredibly low (9.6%) over a 24-month period; however, these researchers provided such materials and exercise equipment to participants which may have assisted with their high retention rate; also, their participants only had to receive newsletters and attend scheduled clinic appointments. Meanwhile, over a period of 6 months, the Weight Loss Maintenance study[49] which had a similar intervention design, had an attrition rate (27%) that was very similar to the current study (27%) over 12 weeks.

Although participants seemed to enjoy the study as exhibited by the response to the exit survey (Table 4), in the open-ended questions of the exit survey, participants expressed frustration with the taxing process of recording their food intake on the 'ChipRewards' website. This may explain why those participants in the 'EatRight Lifestyle plus ChipRewards' group completed significantly fewer food records. Furthermore, because food journaling is one of the most beneficial behaviors in the weight management process, a non-user-friendly site that makes journaling an arduous task is a significant barrier to the success of the participants.[49] Specific feedback from this pilot study allowed ChipRewards to the journaling user interface to create a more user friendly experience.

Another limitation of this study is that it was relatively brief (ie, 12 weeks). Likewise, substantive changes in blood pressure, blood glucose, insulin, HDL cholesterol, and trigylcerides may take much longer to occur than the other changes in BMI, weight, and waist circumference. Albeit, trends in the data suggest modest improvements in the health outcomes variables.

Strengths were also observed in this study. First, the sample size was adequate and represents a wide range of individuals from the community which makes the study more ecologically valid. And second, there were sufficient numbers of participants randomly assigned to both interventions to satisfy central limit theorem.[50]

Conclusion and future directions

It was found that these interventions were slightly effective over a 12-week period; however, it has been suggested that lasting lifestyle changes in eating and physical activity behaviors cannot be expected to occur with brief interventions as this present study has shown.[51] Based upon the feedback from the exit survey (not reported), participants expressed a desire to have more one-on-one personal contact to help motivate them to exercise and lose weight. Such personal contact suggests that individualized or tailored approaches may be more effective in the long term. Perhaps this reflects the need for external accountability and social support to facilitate such weight loss goals. Walker and colleagues used tailored newsletters with older rural women to successfully change and maintain physical activity and eating patterns. Using a similar strategy of tailoring the intervention to the participants, specifically by setting individualized goals and modifying the 'EatRight Lifestyle' and 'ChipRewards' interventions to more accurately reflect such individual goals of the participants, may enhance the efficacy of these approaches as has been observed in other such studies.[48,52]

Acknowledgment

The 'EatRight Lifestyle' and 'ChipRewards' pilot study was a 12-week clinical trial sponsored by the Diabetes Research

and Training Center (DRTC) at the University of Alabama at Birmingham, Alabama. The UAB DRTC is a NIH research center (P60 DK079626).

Disclosure

Josh Klapow is affiliated with ChipRewards Inc. Otherwise, the authors report no conflicts of interest in this work.

References

1. Obesity Society. *What is obesity*: Obesity Society; 2010.
2. Rappange DR, Brouwer WBF, Hoogenveen RT, Van Baal PHM. Healthcare costs and obesity prevention: Drug costs and other sector-specific consequences. *Pharmacoeconomics*. 2009;27(12): 1031–1044.
3. National Institutes of Health. *Nhlbi Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults, Executive Summary*. United States Department of Health and Human Services; 1998.
4. United States Department of Health and Human Services. *The Surgeon General's Call to Action to Prevent and Decrease Overweight and Obesity*. Rockville, MD: United States Department of Health and Human Services; 2001.
5. Appel LJ, Sacks FM, Carey VJ, et al; OmniHeart Collaborative Research Group. Effects of protein, monounsaturated fat, and carbohydrate intake on blood pressure and serum lipids: Results of OmniHeart randomized trial. *JAMA*. 2005;294(19):2455–2464.
6. Colditz GA, Willett WC, Rotnitzky A, Manson JE. Weight gain as a risk factor for clinical diabetes mellitus in women. *Ann Intern Med*. 1995;122:481–486.
7. Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. *JAMA*. 1999;282(16):1523–1529.
8. Pi-Sunyer FX. Medical hazards of obesity. *Ann Intern Med*. 1993; 119(7 Part 2):655–660.
9. Flegal KM, Graubard BI, Williamson DF, Gail MH. Excess deaths associated with underweight, overweight, and obesity. *JAMA*. 2005; 293(15):1861–1867.
10. Haslam DW, James WP. Obesity. *Lancet*. 2005;366(9492):197–1209.
11. Muennig P, Lubetkin E, Jia H, Franks P. Gender and the burden of disease attributable to obesity. *Am J Public Health*. 2006;96(9): 1662–1668.
12. Mokdad AH, Serdula MK, Dietz WH, Bowman BA, Marks JS, Koplan JP. The spread of the obesity epidemic in the United States, 1991–1998. *JAMA*. 1999;282(16):1519–1522.
13. Huang ES, Basu A, O'Grady M, Capretta JC. Projecting the future diabetes population size and related costs for the US. *Diabetes Care*. 2009;32(12):2225–2229.
14. Mokdad AH, Bowman BA, Ford ES, Vinicor F, Marks JS, Koplan JP. The continuing epidemics of obesity and diabetes in the United States. *JAMA*. 2001;286(10):1195–1200.
15. Centers for Disease Control and Prevention. *Obesity Among US Adults Continues to Rise*. Atlanta, GA: Centers for Disease Control Media Relations; 2009.
16. Center for Disease Control and Prevention. State-specific incidence of diabetes among adults-participating states, 1995–1997 and 2005–2007. *MMWR Morb Mortal Wkly Rep*. 2008;57(43):1169–1173.
17. Center for Disease Control and Prevention. Estimated county-level prevalence of diabetes and obesity-United States, 2007. *MMWR Morb Mortal Wkly Rep*. 2009;58(45):1259–1263.
18. HJ Kaiser Family Foundation. *Alabama: Diabetes:* HJ Kaiser Family Foundation; 2009.
19. American Dietetic Association. *Type 1 and Type 2 Diabetes Evidence-Based Nutrition Practice Guidelines for Adults*. American Dietetic Association; 2008.
20. Buse JB, Ginsberg HN, Bakris GL, et al. Primary prevention of cardiovascular diseases in people with diabetes mellitus: A scientific statement from the American Heart Association and the American Diabetes Association. *Circulation*. 2007;115:114–126.
21. Watkins PJ. ABC of diabetes: Cardiovascular disease, hypertension, and lipids. *Br Med J*. 2003;326:874–876.
22. Almdal T, Scharling H, Jensen JS, Vestergaard H. The independent effect of type 2 diabetes mellitus on ischemic heart disease, stroke, and death: A population-based study of 13,000 men and women with 20 years of follow-up. *Arch Intern Med*. 2004;164(13): 1422–1426.
23. Elmer PJ, Grimm R, Laing B, et al. Lifestyle intervention: Results of the Treatment of Mild Hypertension Study (TOMHS). *Prev Med*. 1995;24(4):378–388.
24. Stevens VJ, Obarzanek E, Cook NR, et al. Long-term weight loss and changes in blood pressure: Results of the Trials of Hypertension Prevention, phase II. *Ann Intern Med*. 2001;134(1):1–11.
25. American Diabetes Association. Nutrition recommendations and interventions for diabetes. *Diabetes Care*. 2008;31(1):S61–S78.
26. Wood PD, Stefanick ML, Dreon DM, et al. Changes in plasma lipids and lipoproteins in overweight men during weight loss through dieting as compared with exercise. *N Engl J Med*. 1988;319(18): 1173–1179.
27. Bianchi C, Penno G, Miccoli R, Del Prato S. Primary prevention of cardiovascular disease in people with dysglycemia. *Diabetes Care*. 2008;31(2):S2008–S2014.
28. Tuomilehto J, Lindström J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *N Engl J Med*. 2001;344(18): 1343–1350.
29. National Institutes of Health. *NHLBI Task Force Report on Research in Prevention of Cardiovascular Disease*. United States Department of Health and Human Services; 2001.
30. National Institues of Health. The sixth report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *Arch Intern Med*. 1997;157(21):2413–2446.
31. National Institues of Health. *NHLBI Report of the Conference on Socioeconomic Status and Cardiovascular Health and Disease*. United States Department of Health and Human Services; 1995.
32. National Institues of Health. The fifth report of the joint national committee on detection, evaluation, and treatment of high blood pressure (JNCV). *Arch Intern Med*. 1993;153(2):154–183.
33. Pender N, Murdaugh C, Parsons M. *Health Promotion in Nursing Practice*. Upper Saddle River, NJ: Haworth Press; 2002.
34. Diabetes Prevention Program Research Group. The Diabetes Prevention Program (DPP): Description of lifestyle intervention. *Diabetes Care*. 2002;25(12):2165–2171.
35. Knowler WC, Barrett-Conner E, Fowler SE, et al. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393–403.
36. The Diabetes Prevention Program Research Group. The Diabetes Prevention Program (DPP): Description of lifestyle intervention. *Diabetes Care*. 2002;25(12):2165–2171.
37. Duncan KH, Bacon JA, Weinsier RL. The effects of high and low energy density diets on satiety, energy intake, and eating time of obese and nonobese subjects. *Am J Clin Nutr*. 1983;37(5):763–767.
38. Weinsier RL, Bacon JA, Birch R. Time-calorie displacement diet for weight control: a prospective evaluation of its adequacy for maintaining normal nutritional status. *Int J Obes*. 1983;7(6):539–548.
39. Weinsier RL, Johnston MH, Doleys DM, Bacon JA. Dietary management of obesity: evaluation of the time-energy displacement diet in terms of its efficacy and nutritional adequacy for long-term weight control. *Br J Nutr*. 1982;47(3):367–379.
40. Fitzwater SL, Weinsier RL, Wooldridge NH, Birch R, Liu C, Bartolucci AA. Evaluation of long-term weight changes after a multidisciplinary weight control program. *J Am Diet Assoc*. 1991;91(4): 421–426, 429.

41. Greene LF, Malpede CZ, Henson CS, Hubbert KA, Heimburger DC, Ard JD. Weight Maintenance 2 Years after Participation in a Weight Loss Program Promoting Low-Energy Density Foods. *Obesity*. 2006;14(10):1795–1801.
42. Hubbert KA, Bussey BF, Allison DB, Beasley TM, Henson CS, Heimburger DC. Effects of outcome-driven insurance reimbursement on short-term weight control. *Int J Obes Relat Metab Disord*. 2003; 27(11):1423–1429.
43. Butsch WS, Ard JD, Allison DB, et al. Effects of a reimbursement incentive on enrollment in a weight control program. *Obesity (Silver Spring)*. 2007;15(11):2733–2738.
44. ChipRewards Inc. *ChipRewards: Consumer Health Incentive Program*. Birmingham, AL: ChipRewards Inc; 2008.
45. TruSage International Inc. *TruSage: Wired for Wellness*. Del Mar, CA: TruSage International Inc; 2010.
46. Dolor RJ, Yancy WS, Owen WF, et al. Hypertension Improvement Project (HIP): Study protocol and implementation challenges. *BioMed Central Ltd*. 2009;10(1):1–14.
47. Walker SN, Pullen CH, Boeckner L, et al. Clinical trial of tailored activity and eating newsletters with older rural women. *Nurs Res*. 2009;58(2):74–85.
48. Walker SN, Pullen CH, Hageman PA, et al. Maintenance of activity and eating change following a clinical trial of tailored newsletters with older rural women. *Nurs Res*. 2010;59(5):311–321.
49. Hollis JF, Gullion CM, Stevens VJ, et al. Weight loss during the intensive intervention phase of the weight-loss maintence trail. *Am J Prev Med*. 2008;35(2):118–126.
50. Kranzler JH. *Statistics for the Terrified*. Prentice Hall: Upper Saddle River, NJ; 2007.
51. Richards KC, Enderlin CA, Beck C, McSweeney JC, Jones TC, Roberson PK. Tailored biobehavioral interventions: A literature review and synthesis. *Res Theory Nurs Pract*. 2007;21(4):271–285.
52. Prochaska JO, DiClemente CC, Velicer WF, Rossi JS. Standardized, individualized, interactive, and personalized self-help programs for smoking cessation. *Health Psychol*. 1993;12(5):399–405.