Using Technology to Promote Postpartum Weight Loss in Urban, Low-Income Mothers: A Pilot Randomized Controlled Trial

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ABSTRACT

Objective: To examine the feasibility, acceptability, and initial efficacy of a technology-based weight loss intervention for urban, low-income mothers.

Methods: Eighteen obese, ethnic minority, socioeconomically disadvantaged mothers in the first year after childbirth were randomly assigned to either: 1) technology-based intervention, which included empirically supported behavior-change strategies, daily skills, and self-monitoring text messages with personalized feedback, biweekly counseling calls from a health coach, and access to a Facebook support group, or 2) usual-care control.

Results: After 14 weeks of treatment, the technology-based intervention participants had significantly greater weight loss (-2.9 ± 3.6 kg) than usual care (0.5 ± 2.3 kg; adjusted mean difference: -3.2 kg, 95% confidence interval -6.2 to -0.1 kg, $P = .04$). One-third of intervention participants (3 of 9) and no control participants lost $> 5\%$ of their initial body weight at follow up.

Conclusions and Implications: Results suggest the potential for using technology to deliver a postpartum weight loss intervention among low-income racial/ethnic minorities.

Key Words: postpartum, obesity, weight loss, technology, disparities, social media, health coach (*J Nutr Educ Behav*. 2014;46:610-615.)

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INTRODUCTION

Obesity prevalence among women in the US has reached epidemic proportions,[1] with disproportionate rates among low-income and minority women. The childbearing period represents a critical life stage of heightened vulnerability for excess weight gain and new or persistent obesity,[2] especially among racial/ethnic minorities, who retain 2 to 3 times more weight after pregnancy than non-Hispanic white women.[2-8] These women may be especially disadvantaged, as they are the most likely to enter pregnancy overweight,[1] which is a strong risk factor for retaining a substantial amount of weight by the end of the first postpartum year.[2]

Efforts to reduce postpartum weight retention among low-income, racial/ethnic minorities in clinical trials have proven challenging. Four recent weight loss studies targeting these high-risk women suffered from poor intervention adherence, high attrition, and nonsignificant weight differences between intervention and control groups.[9-12] The challenge of keeping participants actively engaged in a postpartum weight loss intervention may be due to competing demands for mothers' time and energy (eg, child care, work, school responsibilities), making traditional, in-person weight control interventions targeting racial/ethnic minorities largely unsuccessful.

Text messaging and social media are innovative formats that may overcome many of these barriers.[13,14] Users can interact frequently and at their convenience, a pattern that facilitates engagement, retention, and delivers a high intervention dose—all at a low cost. These technologies have become ubiquitous, especially among young racial/ethnic minorities who are increasingly connected through their mobile devices,[15] yet no published studies have leveraged technology to support postpartum weight loss. The purpose of this pilot study was to evaluate the feasibility, acceptability, and initial short-term

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efficacy of a novel, technology-based behavioral weight control program (using text messaging, Facebook, and telephonic counseling sessions with a health coach) to promote postpartum weight loss among predominately obese, socioeconomically disadvantaged, ethnic minority women.

METHODS

Participants, Recruitment, and Randomization

In early 2013, women were recruited from the waiting rooms of 2 large outpatient practices (obstetrics, pediatrics), which served primarily Medicaid-insured patients in Philadelphia, PA. Eligibility criteria included: 1) age ≥ 18 years; 2) singleton infant delivered within the last 2 weeks to 12 months; 3) early pregnancy (first trimester) body mass index ≥ 25 kg/m^2 via prenatal records; 4) weight at enrollment that exceeded early pregnancy weight by at least 5 kg; 5) cell phone ownership with unlimited text messaging; and 6) member of Facebook. Exclusion criteria included current tobacco use and any history of cardiac, gastrointestinal, cognitive, or psychiatric disorders.

The Figure outlines study enrollment and retention flow. A total of 18 women completed a baseline visit, at which a trained research assistant measured body weight and height and administered a number of questionnaires assessing demographics, diet quality (using questions from the Dietary History Questionnaire II, focusing exclusively on weight-related behaviors such as soda, fruit drinks, chips, and fast- or fried-food consumption),[16] physical activity (via the International Physical Activity Questionnaire, which has fair agreement [r = 0.36] with accelerometer-determined physical activity in black subjects),[17,18] health literacy (using the short form of the Rapid Estimate of Adult Literacy in Medicine, which has moderate evidence for validity using the Wide Range Achievement Test-Revised as the standard [r = 0.64] and demonstrated reliability [Cronbach α = .91]),[19] and mood (via the Edinburgh Postnatal Depression Scale, which has high sensitivity [86%] and specificity [78%] for all forms of depression when compared to diagnostic clinical interviews).[20] Similar self-report instruments have been used previously in other studies of pregnant and postpartum mothers with relationships found between these variables and weight-related outcomes.[21-23] Following completion of baseline assessments, participants were randomized 1:1 by computer-generated numbers in sealed envelopes to technology-based intervention (n = 9) or usual care (n = 9). The intervention was delivered for 14 weeks, after which participants in both treatment groups again completed in-person anthropometric measures and questionnaires assessing diet quality and physical activity, along with program satisfaction. Twenty dollars was provided to participants for attending each assessment. All participants gave written informed consent to take part in the study, which was approved by the Institutional Review Board at Temple University.

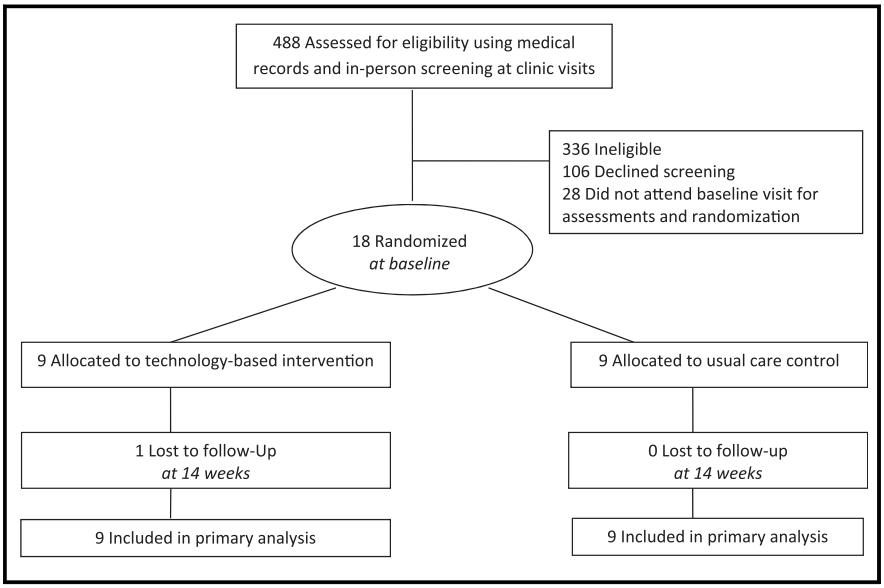

Figure. Flowchart for enrollment, randomization, and follow-up of study participants.

Treatment Groups

Technology-based intervention. Using the interactive obesity treatment approach as our guide,[24-27] the intervention (Healthy4Baby) was designed to create an energy deficit sufficient to produce weight loss by focusing on the modification of evidence-based, weight-related lifestyle behaviors. During our formative work, a set of 6 empirically supported weight-related behavior change strategies were identified and prioritized that were relevant to the patient population, could be communicated simply, and were easily self-monitored through text messaging.[28] The resulting set of weight-related behavior change strategies included (as provided to all participants): "Limit sugary drinks like juice and soda to no more than 1 per day," "Limit junk and high fat foods to no more than 1 per day," "Aim for 1,200–1,500 calories per day," "Walk 30 minutes or 5,000 steps every day," "Sleep at least 7 hours per day," "Weigh yourself weekly." Strategies were implemented one at a time, for 2 to 4 weeks, after a problem-solving session with a bachelor's-level health coach by phone. Participants were encouraged to set personal goals around each of the 6 behavioral strategies; for example, if a participant was drinking 4 cups of sugary drinks a day at the start of the program, she would be asked by her coach to set a realistic goal around changing her sugary drink consumption, which might have been to cut her drink consumption in half. Mothers who were breastfeeding were encouraged to set caloric goals at or above 1,800 calories per day. The health coach was trained in methods of behavioral weight control and prioritized the order by which each of the strategies was executed (based on participant weight loss progress and preference). Calls were 15 minutes in length and conducted

biweekly over the 14-week intervention period.

Skills training and self-monitoring of all strategies were done through text messaging and Facebook. Participants received daily text messages tailored to each weight-related strategy that were based on effective behavior change techniques (eg, recognizing cues, role modeling, reward)[29] to build skills and self-efficacy (eg, "Do u eat at the sight or smell of junk or greasy foods? Keep tempting foods where they're harder to reach or don't keep them in the house at all!"). Participants also received self-monitoring texts 3 to 4 times weekly to probe about adherence to behavioral strategies. Participants received a text message prompt in the morning (eg, "Healthy4Baby Check-in: Please text us # cups of sugary drinks u had yesterday. Remember, 1 cup = 8 ounces") and received immediate personalized automatic feedback that reinforced successes and/or offered motivational support (eg, "U had 0 sugary drinks. Great job! Ur really working toward getting healthy! Keep drinking water, it's the healthiest!"). Raffles for $25 gift certificates, to incentivize participants to text their self-monitoring data, were held on a monthly basis. Each time a participant responded to a self-monitoring prompt, she received a raffle entry; an automated computer program randomly chose a monthly winner, announced on our private Facebook group created exclusively for Healthy4Baby participants. This Facebook group provided a forum for support and additional behavioral skills training via links to Web sites and videos. Participants were encouraged to post questions, photos, and status updates about their study progress on Facebook in order to create a virtual support network and promote participant engagement.

To aid in behavioral goal attainment, intervention participants received a digital scale for self-weighing, pedometer to track daily steps, calorie guide, and water bottle at their baseline visit. A binder with print versions of program content was also provided and served to offer tailored skills training if participants' access to text messaging or Facebook was lost during the study period.

Usual care. Participants randomized to usual care received the current standard of care offered to postpartum mothers from their primary care providers or through the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Often, usual care meant one visit over the entire first postpartum year with their physicians (typically at 6 to 8 weeks postpartum), at which time providers screened for depression and counseled new mothers about breastfeeding and birth control. All mothers in the study received nutrition counseling and food/beverage vouchers from WIC, although WIC visit frequency varied among participants from monthly to every 3 months over the first year postpartum. At baseline, usual-care participants additionally received information about postpartum weight loss published by the American College of Obstetricians and Gynecologists.[30,31]

Outcome Measures

The primary outcome was change in body weight (kg) at 14 weeks from baseline. Each participant's weight was measured without shoes, in lightweight street clothing using a calibrated electronic scale (Detecto digital scale with 758C weight indicator; Detecto Scale Co, Webb City, MO) at baseline and 14 weeks after baseline in both groups. Each participant's height was measured at baseline using a wall-mounted stadiometer (Holtain Limited Harpenden Stadiometer, Crymych, Dyfed, UK). Secondary outcomes included changes in weight-related dietary and physical activity targets self-reported via questionnaires. Also examined was the relationship between adherence to the intervention (assessed by the number of self-monitoring texts sent and number of coach calls completed) with weight loss among intervention participants. Program satisfaction was assessed via a 10-item questionnaire at follow up.

Statistical Methods

Univariate analyses of variables of interest were examined to test for baseline group differences, outliers, and distributional assumptions. Analysis of covariance, controlling for baseline weight, was used to test for group differences in the primary study outcome. All but one participant (17/18) completed baseline and 14-week follow-up measures; for this participant, a weight measured at 8 weeks post scheduled follow up was used in intent-to-treat analyses. Continuous secondary outcomes were analyzed in the same manner as body weight. Categorical secondary outcomes (eg, changes in dietary or activity behaviors) were analyzed using Fisher's exact tests. All analyses were performed using SAS version 9.3 (SAS Institute, Cary, NC, 2012).

RESULTS

Participants' Baseline Characteristics

All participants self-identified as non-Hispanic black (78%) or Hispanic (22%) and received Medicaid (100%). Mean age was 24.2 ± 5.1 years, and baseline body mass index was 36.9 ± 6.1 kg/m^2. The majority of study participants were multiparous (67%) and unmarried (78%). More than two thirds graduated high school (72%), yet most participants had inadequate health literacy (61%). Few participants breastfed their infants (22%) or had depressive symptoms (11%). Daily sugary beverage (juice and soda, 83%), fried-/fast-food (33%), and chip (44%) consumption were relatively common. Most reported they walked at least 10 minutes at a time (83%), several days per week (mean number of days walked was 4.1 ± 2.6). Participants were, on average, 4.3 ± 3.9 months postpartum at study entry. There were no differences between treatment groups on demographic characteristics, weight, weight-related behaviors, mood, or timing of baseline measures.

Change in Body Weight

As shown in the Table, mean weight losses varied slightly between intent-to-treat and completer analyses; however, both analyses revealed significantly greater mean weight losses among technology-based intervention participants compared to usual care. Participants randomized

Table. Primary Outcome of Weight Loss (kg) by Urban, Low-Income Mothers

	Completers (n = 17)			Intent to Treat (n = 18)		
Treatment Group	**Mean (SD)**	**Difference Between Conditions[a] Mean (95% CI)**	***P***	**Mean (SD)**	**Difference Between Conditions[a] Mean (95% CI)**	***P***
Technology-based intervention	−3.3 (3.6)	−3.6 (−6.8 to −0.3)	.03	−2.9 (3.6)	−3.2 (−6.2 to −0.1)	.04
Control	0.5 (2.3)			0.5 (2.3)		

CI indicates confidence interval.
[a]Analysis of covariance, controlling for baseline weight, was used to test for group differences.

to the technology-based intervention group also lost a greater percentage of baseline body weight (−2.8 ± 3.7%), compared to 0.7 ± 2.7% gained among those in usual care (adjusted difference: −3.4%, 95% confidence interval −6.8 to −0.03, $P = .05$). One-third of intervention participants (3 of 9) and no control participants lost > 5% of their initial body weight by 14-week follow up.

Secondary Outcomes

Greater reductions were observed in intervention participants' daily consumption of sugary drinks (78% at baseline vs 38% at follow up), fried/fast foods (44% at baseline vs 0% at follow up), and chips (44% at baseline vs 0% at follow up) compared to control participants (although none reached statistical significance). More intervention than control participants endorsed eating "less food" at follow-up (100% vs 44%, $P = 0.03$). Group differences in number of days spent walking or time spent walking were not found.

Adherence to the Intervention

Over the 14-week intervention period, the mean frequency of self-monitoring texts per intervention participant was 32.4 ± 17.5 (expected texts = 57). All 9 participants in the intervention treatment arm text-messaged their self-monitoring data at least once during the 14-week study period, and the majority (n = 7, 78%) responded to at least 50% of the self-monitoring text prompts. Similarly, completing a greater proportion of coach calls led to greater weight losses; however, adherence with coach calls waned over time (78% completed the first 3 calls vs 33% completed the final 4 calls).

Acceptability

Among intervention participants who completed the program satisfaction questionnaire (n = 5), 80% reported that the skills they learned in the program were extremely helpful (at least 8 on a 10-point scale); 80% found the text messages, Facebook posts, and coach calls extremely useful; and 100% reported that the program was extremely successful in promoting weight control.

DISCUSSION

Findings from this pilot study revealed that participation in a 14-week moderate-intensity technology-based behavioral weight loss intervention was associated with a 3.2-kg greater weight loss than usual care among predominately obese, socioeconomically disadvantaged, ethnic minority mothers. This study is believed to be the first to demonstrate the feasibility, acceptability, and initial efficacy of text messaging and Facebook as platforms for the delivery of a weight loss program in the postpartum period. These platforms provide a mechanism for mothers to instantaneously receive new information, obtain immediate personalized automated feedback, and interact within a virtual group network, while at the same time allow for flexibility around work/school schedules and child care responsibilities.

While the magnitude of weight loss produced in this study was modest and somewhat lower than reported in other technology-based interventions,[32,33] the population under study has previously been recalcitrant to weight loss treatment. In the largest postpartum weight loss trial to date, Ostbye et al[12] randomized 450 overweight and obese mothers (45% African-American, 60% low-income) to receive either: 1) nutrition and physical activity group sessions over the first postpartum year, or 2) newsletters with general tips for postpartum mothers. The nutrition and physical activity intervention did not produce differences in 1-year postpartum weight compared to the control (newsletter) arm; however, intervention mothers were not encouraged to self-monitor, nor did they receive strategies around setting calorie goals. These 2 methods have proved successful in promoting weight loss in previous trials and were included in the pilot intervention.[34] Further, the investigators used a group format, leading to poor attendance and high attrition (> 30%). In contrast to Ostbye et al,[12] much higher rates of participant adherence (nearly all participants texted self-monitoring data over 50% of the time) and lower rates of participant attrition (6%) were observed in this study. These findings provide support for an intervention approach that advocates for the modification of several simple and easily understood behaviors through platforms already integrated into the lives of mothers with young children. In-person visits and/or group sessions required in Ostbye et al[12] and 3 other recent studies among low-income postpartum mothers may not be feasible for disadvantaged women with low levels of social support.[9-12] Even connecting with a human counselor by phone proved challenging by the end of the 14-week study period, and raised questions as to whether conducting the intervention entirely via texting and Facebook

would be equally (or even more) efficacious.

Findings suggest that the intervention effects were mediated primarily by changes in dietary behaviors, not activity. It is important to note, however, that this pilot study focused exclusively on walking, and most mothers in the sample already walked several days weekly at baseline. It is unclear if greater weight losses could have been observed if more moderate and/or vigorous activities were recommended.[35]

Limitations to this study include its small sample size and relatively short follow-up period (14 weeks). The study design did not allow for the stratification of analyses by racial/ethnic group or isolation of the independent contribution of discrete intervention components (eg, text messaging, Facebook). Considering the use of a usual-care control arm with minimal provider contact, it is unclear whether the observed weight differences are attributable to the increased contact with intervention participants or the actual components of the intervention. Additionally, participation in "text4baby" was not collected and may be a confounder. Objective measures of activity and diet were not used in this study, which limits the results, as social desirability bias may have influenced intervention participants' responses. Staff involved with end-of-study measures were not blinded to treatment arm, and thus, measurement bias may have been introduced. However, strict protocols on completion of anthropometric measures and delivery of questionnaires were used in this study, which should have minimized error. Further, the acceptability findings are limited regarding mothers' satisfaction with the program, as not all intervention participants were surveyed at the program's conclusion.

IMPLICATIONS FOR RESEARCH AND PRACTICE

These findings suggest that technology-based platforms hold promise for the delivery of weight loss interventions in the postpartum period among socioeconomically disadvantaged, ethnic minority women. Achieving clinically meaningful weight loss after childbirth among these women has been challenging. It is clear that new treatment approaches, such as using mobile technology platforms for intervention delivery, may be necessary to overcome the considerable challenge of preventing postpartum weight retention among urban, low-income women and requires further study in larger samples for longer durations to confirm efficacy. Future study designs allowing for analyses by racial/ethnic group are also important for understanding how some ethnic minority participants may respond differently than those from other racial/ethnic groups.

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