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## Mobile Phone Text Messaging to Promote Healthy Behaviors and Weight Loss Maintenance: A Feasibility Study

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### Abstract

There is a need to investigate newer strategies pertaining to the maintenance of healthy behaviors and weight. We investigated the feasibility of mobile phone text messaging to enable ongoing communication with African-American women participating in a weight management program. Ninety-five African-American women participated in this pilot study and received regularly scheduled text messages. Forty-two of these women chose to create 165 personal text messages that included tips on healthy eating and physical activity, as well as reminders to drink water and expressions of encouragement. A commercially available client-based application transmitted these personal messages and general health messages at least three times per week. The software transmitted over 4,500 text messages during the first four months with 114 returned as undeliverable. Participants expressed generally positive attitudes toward incoming text messages, with only one participant declining to continue after enrollment. This study demonstrated early feasibility and acceptability of text messaging as a method for promoting healthy behaviors for weight maintenance.

### Keywords

African-Americans; cellular phone; health behavior; health promotion; obesity

### Introduction

Obesity places individuals at greater risk of a wide variety of health problems, including hypertension, diabetes, cardiovascular disease, and stroke <sup>1</sup>. Although many studies demonstrate that weight loss is achievable through lifestyle modifications, the maintenance of weight reduction beyond six months is a challenge <sup>2</sup>. A number of contributing factors may lead to regaining weight, including expectation of a short-term behavioral change, inadequate length of treatment for obesity, lack of continuous motivation, and others <sup>2–6</sup>. Studies often require maintaining continuous contact with intervention participants <sup>7</sup>. The challenges to extended treatment include cost, adherence, and difficulty maintaining group cohesion and attendance over long periods of time <sup>3</sup>. Alternative methods that require less face-to-face contact have been recommended <sup>7</sup>. Still, little research is available on the maintenance of healthy lifestyle behaviors among African-American women. This study investigates the feasibility of text messaging (Short Message Service (SMS)) to provide an alternative to face-to-face continuous contact with obese African-American women trying to maintain their weight, prevent relapse, and to sustain motivational efforts in following healthy behaviors.

The use of text messaging in health-related research is increasing. Previous studies have demonstrated early feasibility of using text messaging to improve compliance with medications and appointments<sup>8, 9</sup>, to enhance smoking cessation efforts<sup>10</sup>, and to support asthma<sup>11</sup> and diabetes self-management<sup>12, 13</sup>. Based on these experiences, there are several advantages to using text messaging services in this study to promote healthy behaviors: (1) there is a high penetration of mobile telephones among people, across income and ethnic groups; (2) mobile phones are popular, portable and convenient, and (3) information may be individualized and delivered quickly. Text messaging also exploits the use of ‘push’ technology, where information is transmitted to a user without a user initiated request. This contrasts with other technology-based interventions that may require calling a telephone number or accessing an Internet web site. This may be of particular relevance to individuals trying to maintain their weight, as lifestyle decisions made continuously throughout each day determine the overall level of success.

## Methods

### Participants

This feasibility study included subjects enrolled in an ongoing randomized clinical trial on weight loss and weight loss maintenance of African-American women (Obesity Reduction Black Intervention Trial (ORBIT))<sup>14, 15</sup>. The participants completed a culturally competent 6-month weight loss program. The program highlighted dietary changes including foods that are typical in the African-American diet that offer lower fat/calorie options while maintaining a high level of flavor. Goals for increased physical activity accounted for potential barriers such as childcare, hair styling, and family and work responsibilities<sup>16–18</sup>. Considerations were also made for body image, the meaning of weight, and reasons for weight loss<sup>19–21</sup>.

Following the weight loss program, in-person meetings gradually decreased in frequency from twice weekly for six months, to once weekly for three months, to phone communication without any face-to-face sessions. There was greater emphasis on structuring one’s life to support the continuous maintenance of weight loss behaviors with a transition to fewer group meetings. Telephone and in-person counseling sessions of 20–30 minutes in length addressed diet and physical activity utilizing motivational interviewing techniques<sup>22, 23</sup>. During this time, participants suggested that text messaging could potentially provide valuable reminders to exercise, eat more healthful foods and help them engage in other associated behaviors important in weight control.

All participants actively participating in ORBIT were eligible for inclusion in the study. These individuals were women between the ages of 30 and 65, with body-mass index (BMI) between 30 and 50, self identified as African-American, and living in the Chicago area. All women needed a form signed by their primary care physicians to be eligible to participate. Individuals who already had mobile phones provided the research staff with their mobile phone number. We provided pre-paid mobile phone service with text messaging to 17 individuals who did not have mobile phones. An additional 26 participants required assistance as needed to have text messaging services added to their phones currently in use. The research staff held a training session to ensure that all participants were capable of receiving and reading the text messages on mobile phones. The staff provided additional individual training as necessary, particularly for older participants.

The research staff asked participants to identify at minimum three weight control behaviors that could benefit from remote assistance. Based on their selections, they completed a list of personal messages that encouraged continued efforts in maintaining weight loss behaviors (e.g., “remember to eat fruit at breakfast” or “take a walk after lunch”). They were encouraged to compose brief, clear, motivational messages up to 160 characters in length. Individuals could

also indicate specific times and/or days when their personal messages would be delivered (e.g., at 8:00 AM on Monday morning). There was no limit to the number of messages participants could request for themselves.

In addition, the research staff created over 230 general health messages based on common themes that emerged during prior in-person weight loss meetings. These included messages on healthy eating (e.g., “Drop the donut! Try a low-calorie breakfast bar instead.” or “Try a new vegetable this week! Ever tried kale? Jicama?”) and physical activity (e.g., “Taking a dance class is a great way to learn some new moves and burn off some calories.” or “Get your 30 minutes of daily exercise by doing it the easy way: in three 10 minute segments spread out over the day.”).

## Intervention

We utilized a client-based software application for text messaging services (Hiplink XS, Semotus Solutions, Inc.). A web browser graphical user interface allows specifications of text message content, delivery options, and carrier/receiver information. This includes the capability of sending text messages to individuals or groups of users at any time of day on a regular basis. The Hiplink server sends all message information through an IP connection for multiple wireless service protocols (e.g., SMTP for this study, though SNPP, WCTP, HTTP are also available through an IP connection). Messages are dispatched through the appropriate carrier for the mobile phone device, and undelivered messages are recorded in a log. We only utilized an outbound messaging service in this study.

Those participants who created personalized messages received two general and one or more personal health messages each week selected by the research staff. Others who did not create their own personalized messages received three general health messages weekly. The software tracked messages not successfully delivered to mobile phones. In these instances, research staff contacted participants to identify potential problems with message transmission or retrieval. Throughout the study, subjects could indicate whether they wished to continue receiving messages, and could opt out at any time.

## Assessment

Seventy-three women completed anonymous study satisfaction questionnaires and seventy women completed telephone interviews at the end of the study. We asked participants: “*Did you read the text messages?*” and “*Did they help you towards your weight loss goal?*” We also asked participants about alternative modes of information delivery: “*If you were not achieving your weight loss goals...*”: (a) “*Would you be willing to receive text messaging during the week?*”, (b) “*Would you be interested in a mail-based weight-loss program that did not require you to attend regular sessions?*”, and (c) “*Would you be interested in a weight loss program delivered through the Internet?*” In addition, several women provided written comments on text messaging on the study satisfaction questionnaire.

## Results

Ninety-five African-American women agreed to participate and receive mobile phone text messages. These women ranged in age from 30 to 65 years (mean 47 years, SD 8.5), with an average 14 years of education, and BMI mean of 38.8 kg/m<sup>2</sup> (SD 5.4). The text messaging software transmitted an average of three text messages to each woman per week (with over 4,500 messages sent during the first four months, including both general and personal messages). A total of 114 text messages were returned as undeliverable due to problems experienced by six subjects. The two most common reasons for unsuccessful transmission were full message inbox and disconnected phone service (some had also changed phone numbers

during the study period). These problems were easily corrected, and subjects were routinely reminded to delete old inbox messages. However, one subject declined to continue receiving text messages after six weeks. She stated that she did not find the text messages useful.

We invited the women to identify personal text messages they would like to receive on an ongoing basis. Forty-two women (44%) chose to create a total of 165 personal text messages in the following categories: healthy eating, physical activity and exercise, phrases to provide encouragement or reassurance, phrases to encourage water intake, and reminders related to personal lifestyle (Table 1). Of the 165 personal text messages, 142 (86%) were to be received at a specific time of day. For example, a reminder to eat breakfast may occur at 8:00 AM, while another reminder to discourage overeating at night may come at 8:00 PM. One individual requested that she receive her personal messages on a daily basis during the week. Another subject only wanted personal messages on her phone, (a reminder to eat breakfast) without general messages.

### Mobile Phone Use

Some older individuals needed assistance and training on the use of retrieving text messages. Most were able to demonstrate competence in accessing messages afterwards. A few subjects responded to incoming messages to acknowledge receipt. Based on acknowledgements and data from undelivered messages, we identified and assisted those women that had problems with their phones.

### Attitudes Toward Text Messaging

Seventy of seventy-three women (96%) indicated on study satisfaction questionnaires that they had read the text messages. Of those reporting that they read the text messages, 54 of 68 (79%) indicated that the text messages helped them toward their weight loss goals. In addition, all 70 women completing telephone surveys indicated that they would be willing to receive more help if they had not achieved their weight-loss goals. Of these 70 women, 56 (80%) responded that they would be interested in a mail-based weight-loss program that did not require them to attend regular sessions, 48 (69%) responded that they would be willing to receive text messaging during the week, and 43 (61%) responded that they would be interested in a weight loss program delivered through the Internet.

Based on written comments on the study satisfaction questionnaires, most of the subjects welcomed the text messages on their mobile phones. For example, one subject commented, *"I have read the text messages...it's help[ed] me make better choices, of deciding what I'll have to eat for the day."* Two subjects recommended a more intense experience with text messaging: *"...the text messages were very effective. I just wish they would have started at the beginning of the program..."* and *"You should text more because that is like a little person on your shoulder helping you make the right choice."* Some subjects noticed a lack of messages during one week when the HipLink software was unavailable. During this time period, there was an expectation of message prompts described by subjects. Overall, the feedback from participants was generally very positive. Many looked forward to receiving messages and said it affected their behavior.

### Discussion

This study demonstrates early feasibility and acceptability of text messaging to promote healthy behaviors for weight maintenance. Initial experience in message development and transmission suggests that this may offer a cost-effective means of continuing interactions following a weight loss intervention. This may be particularly useful following weight loss interventions when contact and involvement frequently declines over time, and relies less upon face-to-face

encounters. Also, we found that the use of commonly available mobile phones to deliver reminders and motivate individuals may more easily be integrated into lifestyle. Individuals were able to receive text messages at various times of the day from different locations. This allowed for individuals to receive reminders and encouragement throughout the day to help positively impact routine decisions affecting behavior.

Our study offered opportunities for the participants to control the time, frequency, and type of messages that they received. Physical activity reminders and messages to avoid unhealthy eating were frequently requested. In addition, individuals varied in the frequency with which they wished to receive text messages. One future strategy may be to increase the frequency of messages around more stressful time periods (e.g., holidays that are associated with binge eating). A study on smoking cessation incorporated a similar approach prior to scheduled quit days<sup>10</sup>. Also, decreasing the frequency of message delivery may be appropriate over a longer duration of time to prevent fatigue of messaging.

There are several advantages to text messaging over other methods of electronic transmission of educational information. Text messaging utilizes 'push' technology and does not require users to prompt information retrieval. Many web-based products involve persons logging in to online services and are associated with non-usage attrition over time<sup>24</sup>. The availability of massive amounts of background information for review may exceed individual needs. Succinct advice on a frequent basis (e.g., daily) may be preferable or complimentary to weekly accessing health related information<sup>25</sup>. Finally, text messages may be superior to automated methods of audio recorded voice messages. Voice messages must be received immediately and become disruptive, and may be affected by poor reception. The popularity of text messaging arises from the speed of sending/receiving messages and the ability to read messages discretely.

The use of mobile phones is rapidly growing in the United States. Many individuals who own mobile phones do not have convenient access to the Internet, and this may represent an alternative means of establishing reach in low-income populations. In the present study, participants indicated comparable interest in text messaging and Internet-delivered modes of weight loss support. In addition, there is a high prevalence of mobile phones among younger and middle-aged persons, including minority populations. Among older adults, the use of text may be less desirable to multimedia elements available on computer or television video. However, the newer mobile phone features including images and video may have greater appeal.

## Challenges

We identified several challenges in the implementation of text messaging for our study. A significant number of messages were not delivered, due to a number of potential factors such as mobile phones being disconnected or inboxes being full. When messages were delivered, the response by individual participant varied. Some persons read them immediately, while others delayed in reading messages. Possibly, the notification of a new incoming text message (audio sound or vibration prompt) at a particular time of day may effectively serve as a reminder without the text being actually read. Still, we have no evidence to date to support that healthy behaviors are followed subsequent to receiving text messages. Furthermore, the long-term effect on weight maintenance remains unclear, beyond changes made in health related behaviors.

## Future Development

We plan to continue data collection on health behaviors and weight through 2008. As individuals gain experience in the technology, we will consider using two-way text messaging to collect data on responses to basic questions sent to participants via text messaging. To date,

we have only provided training on reading and deleting text messages, and not composing or sending new messages. In the future, text messages may complement other automated counseling and feedback efforts in weight management (e.g., e-mail or Interactive Voice Response technology). Further research in this area will help determine the optimal frequency and intensity of text messaging services to engage participants over a long period of time. Additional study with a larger sample will help determine if it can serve as an effective component within a comprehensive weight loss program. Ensuring that the technology is not overly complex and burdensome to individuals remains an important concern.

## Conclusions

Text messaging via mobile phones offers a unique method of providing brief, intermittent, and timely information to individuals involved in a weight maintenance program. This study demonstrated early feasibility and acceptability of automated text messaging to promote healthy behaviors on a frequent basis. Further research is necessary to evaluate the impact of text messaging on lifestyle decisions related to eating and physical activity.

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## Abbreviation List

ORBIT, Obesity Reduction Black Intervention Trial; SMS, Short Message Service.

**Table 1**  
Example Personal Text Messages Created by Subjects

Category	Example Messages
Healthy Eating	<p>Don't 4-get to eat breakfast!</p> <p>STOP! Are you really hungry?</p> <p>Pack your lunch.</p> <p>Don't eat junk food...cook dinner!</p>
Physical Activity	<p>Make sure you get your walk in today.</p> <p>Do your total gym workout.</p> <p>Walk up those stairs.</p> <p>Did you walk today?</p>
Encouragement	<p>One step = to one less pound.</p> <p>Don't give up!</p> <p>Remember your goal!</p> <p>The more pounds you lose, the less you carry.</p>
Drinking Water	<p>Water water water.</p> <p>Drink some water girl!</p> <p>How much water have you had today?</p>
Personal	<p>Get out of bed!</p>
Reminders	<p>Don't forget your calcium.</p>