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Research Brief

# Dietary Self-Monitoring, But Not Dietary Quality, Improves With Use of Smartphone App Technology in an 8-Week Weight Loss Trial

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## ABSTRACT

**Objective:** Dietary self-monitoring is linked to improved weight loss success. Mobile technologies, such as smartphone applications (apps), might allow for improved dietary tracking adherence. The authors assessed the use of a popular smartphone app for dietary self-monitoring and weight loss by comparing it with traditional diet counseling and entry methods.

**Methods:** Diet tracking and weight loss were compared across participants during an 8-week weight loss trial. Participants tracked intake using 1 of 3 methods: the mobile app "Lose It!", the memo feature on a smartphone, or a traditional paper-and-pencil method.

**Results:** App users (n = 19) recorded dietary data more consistently compared with the paper-and-pencil group (n = 15; $P = .042$) but not the memo group (n = 13). All groups lost weight over the course of the study ($P = .001$), and no difference in weight loss was noted between groups.

**Conclusions and Implications:** Smartphone apps could represent a novel and feasible dietary self-monitoring method for individuals.

**Key Words:** smartphones, apps, weight loss, dietary self-monitoring (*J Nutr Educ Behav*. 2014;46:440-444.)

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## INTRODUCTION

Assessment tools such as food frequency questionnaires, 24-hour dietary recalls, and food records are means for establishing trends in caloric intake and dietary patterns that may influence weight regulation over time. Although these assessment tools are used extensively by researchers and nutrition professionals to track food intake, diet monitoring faces obstacles that reduce the accuracy of data collection. In particular, diet monitoring is compromised by reliance on accurate recall, lack of consistency of reporting, and the overall burden of data logging.[1] Yet, at the individual level, dietary self-monitoring has been identified as one of the most successful tools for managing body weight among individuals.[2-4]

Innovations in dietary monitoring technology are emerging with the intent of improving accuracy of data collection and analysis as well as reducing the burden of self-monitoring on individuals.[1,2] Many of these new technologies incorporate Internet-based dietary self-monitoring for behavior change interventions.[5-7] These modalities have been shown to be effective, but computer-based monitoring still requires individuals not only to rely on memory, but also to take time at a computer to log data.[8]

More recently, with the advent of mobile technologies, including smartphones, tablets, and other handheld devices, the possibilities for rapid dietary data logging and real-time dietary analysis are growing. Roughly 83% of Americans now own a mobile phone.[9] Of these, 45% own smartphones with Internet access, up dramatically from 18% in 2009.[10] These newer technologies offer unprecedented opportunities for individual-level data collection. Furthermore, they can be tailored to implement educational and other health behavior change interventions. In particular, health-related applications, or apps, commonly used on smartphones permit individuals to record personal and dietary data with relative ease.[11,12] They can also provide immediate feedback to aid users in achieving particular health-related goals. In addition, smartphones are often consistently used for multiple daily functions. As such, the technology might offer a more accessible platform for self-monitoring and dietary data entry compared with Web sites or other diet-tracking methods. Recent research suggested that individuals, especially those of younger generations, preferred the use of mobile phones for dietary and weight loss interventions compared with other Web-based tools.[13]

The literature base has grown related to mobile device use for

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dietary data collection and behavior change interventions, much of which has focused on personal digital assistants (PDAs). However, this technology is quickly being replaced with smartphones running mobile app technology that allows for real-time health-related and other data collection.[14] To date, little research has documented the extent to which health-focused apps on smartphones are useful from the user's perspective or feasible in terms of self-monitoring of dietary intake. Further, little is known about whether the most recent mobile app technologies offer a superior platform for data collection compared with more traditional methods of diet tracking. The purpose of this pilot weight-loss study was to compare the feasibility of diet recording using the commercially available smartphone app "Lose It!" with standard diet recording and counseling methods, using either traditional paper-and-pencil methods or the use of text-based smartphone memo functionality. Researchers hypothesized that use of a smartphone app would lead to increased compliance in tracking caloric consumption, as measured by full days of diet recording, compared with either the smartphone memo method or a paper-and-pencil diet-tracking method. It was further hypothesized that smartphone app users would demonstrate lower rates of attrition from the study, as well as a greater degree of weight loss, compared with the paper-and-pencil group.

## METHODS

### Participants

Healthy, weight-stable adults (18–65 years of age; body mass index [BMI], 25–40 kg/m$^2$) who owned smartphones were recruited from a campus community to participate in an 8-week weight loss trial (Table). Participants (n = 57) were free of unresolved medical conditions and did not take medications or supplements known to affect body weight. All participants reported no dieting or weight changes of greater than ± 5 lb in the past 3 months and agreed to record all food intake during the trial using their smartphone or a paper-based diet log. All participants provided written informed consent, and the Arizona State University Institutional Review Board approved the study.

**Table.** Selected Baseline Characteristics of Study Participants, by Diet Assessment Technique Group

| | iPhone App | Smartphone Memo | Paper/Pencil | *P* |
|---|---|---|---|---|
| Gender, male/female | 6/13 | 2/11 | 4/11 | .58 |
| Age, y | 43.7 ± 3.5 | 41.5 ± 4.0 | 40.8 ± 3.8 | .83 |
| Weight, lb | 185.7 ± 6.8 | 189.9 ± 11.6 | 181.3 ± 10.0 | .82 |
| Body mass index, kg/m$^2$ | 29.9 ± 0.9 | 31.0 ± 1.7 | 28.9 ± 1.0 | .52 |
| PA score (METs × frequency/wk)[a] | 35.8 ± 6.3 | 38.4 ± 7.1 | 31.4 ± 4.4 | .73 |
| Daily energy, kcal[b] | 1,791 ± 181 | 1,997 ± 266 | 2,163 ± 129 | .42 |
| Total HEI score | 63.9 ± 3.8 | 59.8 ± 3.5 | 61.1 ± 2.5 | .68 |
| Whole-grain HEI score | 2.4 ± 0.6 | 1.7 ± 0.5 | 1.8 ± 0.4 | .69 |
| Vegetable HEI score | 3.0 ± 0.4 | 2.5 ± 0.4 | 3.0 ± 0.3 | .57 |
| Fruit HEI score | 3.6 ± 0.4 | 3.3 ± 1.4 | 3.1 ± 0.5 | .89 |
| Saturated fat HEI score | 6.2 ± 1.0 | 5.9 ± 0.5 | 7.0 ± 1.0 | .68 |
| Sodium HEI score | 4.1 ± 0.8 | 3.7 ± 0.7 | 6.0 ± 0.7 | .08 |

HEI indicates Healthy Eating Index; MET, metabolic equivalent; PA, paper group.
[a]1 MET corresponds to an energy expenditure of 1 kcal • kg$^{-1}$ • h$^{-1}$; [b]Dietary data for subset of sample with complete pre and post 3-day diet records (n = 10, 10, and 11 for iPhone app, smartphone memo, and paper-and-pencil groups, respectively).
Note: Data represent means ± standard error. *P* was derived from 1-way analysis, except for gender, where chi-square analysis was used. There were no significant differences between groups.

### Design

Participants were stratified by age, BMI, and gender and semi-randomized into 3 groups: the app group (AP) (n = 19), trained to use the diet-tracking "Lose It!" app daily; the memo group (ME) (n = 18), trained to track dietary intake daily through use of the memo function on their smartphones; and the paper group (PA) (n = 20), trained to record dietary intake daily using a traditional paper-and-pencil method. Because the app was available only on iPhones at the time of the study, only participants with iPhones could be placed in the "Lose It!" app group. Before the start of the study, all participants completed a written food record for 3 consecutive days, including 1 weekend day. At the start of the study, participants met with investigators for anthropometric measurements and to complete a short health history, which included questions on health, recent dieting and weight loss, and use of medications and/or supplements. Customary physical activity data were gathered using a standard physical activity questionnaire,[15] and activity was calculated by multiplying the number of weekly exercise and walking episodes by the intensity index expressed in metabolic equivalent (MET) values (9, 5, and 3 METS for vigorous, moderate, and mild exercise, respectively).

The AP group recorded dietary intake using the "Lose It!" app interface, which provided a large database of commonly consumed foods for users to search and add to a diary at each eating occasion. It also provided immediate feedback in the form of a daily calorie gauge graphic that increased in real-time as foods were entered. The "Lose It!" app calculated the daily energy allotment for the user based on a pre-identified weight loss goal (1 lb/wk) and individual anthropometric data. No dietary advice was provided to the AP group; however, these participants received immediate feedback regarding calorie intake when dietary data were entered into the "Lose It!" app.