Process Evaluation of an Internet-based Resource for Weight Control: Use and Views of an Obese Sample
Áine McConnon, PhD¹; Sara F. L. Kirk, RD, PhD²; Joan K. Ransley, PhD²

ABSTRACT
Objective: To investigate use and views of a Web site designed for weight control.
Design: Questionnaire-based evaluation with data collected at baseline, 6 months, and 12 months.
Setting: Data were collected as part of a community-based, randomized controlled trial.
Participants: Subjects (n = 111) were participants of the intervention arm of a randomized controlled trial evaluating effectiveness of a Web site designed for weight control in an obese sample.
Intervention: Participants were asked to use the intervention Web site for weight control over a 12-month period.
Main Outcome Measure(s): Participants were asked to report their use and views of the Web site. In addition, use of the Web site was automatically recorded on logging onto the Web site.
Analysis: Descriptive statistics, factor analysis.
Results: Fifty-nine participants (53%) reported using the Web site at 6 months, with 32 participants (29%) still using it at 12 months. The average time spent on the Web site per visit was 21.1 minutes (SD = 16.6) at 6 months and 13.6 minutes (SD = 9.3) at 12 months, with an average number of logons of 15.8 (SD = 15.2) over the trial period. In general, satisfaction scores for the Web site were positive. Scores for ability of the resource to encourage positive behavior change for weight control were marginally negative. Social support sections of the Web site were used least and received the lowest satisfaction ratings.
Conclusions and Implications: Despite positive satisfaction scores, use of the resource was limited. It is expected that participants’ limited ability to use the Internet may have limited the use of the resource and consequently reduced the social support available to participants. Future investigation of the views and use patterns of current users of Internet-based weight loss resources would help inform future development of such tools.

Key Words: process evaluation, obesity, weight loss, Internet (J Nutr Educ Behav. 2009;41:261-267.)

INTRODUCTION
With the continuing rise in obesity prevalence worldwide, obesity is now recognized as the second most avoidable cause of ill health.¹ In the United Kingdom, it has been estimated that over two thirds of the population is overweight or obese.² Current recommendations for treatment of obesity include a combined approach involving dietary, behavioral, and physical activity aspects. However, traditional approaches to weight loss based on current recommendations have failed to demonstrate long-term, sustained weight loss, suggesting the need to investigate novel approaches. The Internet offers a novel delivery tool for weight loss interventions in obesity management, with the potential to offer long-term intervention at a low cost, in comparison to traditional face-to-face intervention. The rapid increase in access to the Internet and use of the Internet as a health resource has made it a viable and logical tool for health care interventions.³ However, the use of the Internet as a treatment tool in obesity has only recently received any coverage and to date has demonstrated mixed results.³,⁴

Internet interventions in health care present complex interventions with many influencing factors. For this reason, comprehensive evaluation is required to investigate more than simply the efficacy of the tool. Process evaluation is required to help identify the key components of Internet interventions, whether positive, negative, or insignificant. However, research to date has focused primarily on investigating the ability of Internet-based weight control interventions to promote weight loss, with very little investigation of acceptance, satisfaction, patterns of use, and views of Web-based weight loss resources in these interventions. The lack of such data limits the evidence base for online weight loss tools, and a more comprehensive approach to evaluating the

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role of computer-based tools, more than simply demonstrating improved outcomes to confer success in the health care domain, is needed. Womble et al investigated the efficacy of a commercial Web-based weight loss resource (ediets.com) compared with the LEARN manual for weight management and reported a much lower frequency of use of the Web site than expected, with an average logon of only 17.7 times over the first 16 weeks. Heathfield et al also point out that failure of a randomized controlled trial (RCT) to demonstrate improvement in health outcome can lead to premature abandonment of new approaches. Given the inconsistency of the evidence supporting use of Web-based weight control resources, more comprehensive evaluation that goes beyond the basic change in health outcomes is needed to fully evaluate such novel approaches to weight control. Investigations of this nature are important to allow development of an optimum resource.

As part of a RCT evaluating the effectiveness of a Web-based tool for weight control, a Web site was created aimed at promoting weight loss in overweight and obese individuals. The Web site was designed to reflect those currently available to consumers, based on the features of the recommended combined approach of behavioral, nutritional, and physical activity components. The main RCT was conducted to investigate the effectiveness of this Web site in a free-living sample of obese individuals who were randomized into a control or Internet arm, and anthropometric data and data on use and views of the Web site were collected. Results of the main RCT are published elsewhere. The aim of this paper is to report on the use and views of obese individuals attempting weight loss with access to a freely available (no fee for use) Internet-based weight loss resource, therefore this paper reports on the process evaluation component of the RCT and presents data only on those participants recruited to the Internet arm of the trial.

METHODS

Ethical approval from a local research ethics committee was obtained prior to recruitment. Two hundred twenty-one individuals with a body mass index (BMI) ≥ 30 (objectively measured by a researcher), aged 18–65 years, able to access the Internet at least once per week, and able to read and write in English (for the purposes of accessing the Web site and completing questionnaires) were recruited through advertisements in general practitioners’ (GP) practices across Leeds, UK. The advertisement asked for people who were more than 2 stone (or 6.4 kg) overweight, wanted to do something positive about their weight, and had access to the Internet at least once a week. Participants were randomly allocated into either the Internet group (n = 111) or the usual care group (n = 110). The data presented in this paper are from the Internet group only. A more detailed description of the methods used has been published elsewhere. The sample was predominantly white (96%) and female (77%), with a mean age of 45.7 (SD = 10) years and a median BMI of 34.5 (31.8 to 38.5). Seventy-four percent of the sample were in employment, and 75% were married or living as married.

The Intervention Web Site

Current research evidence supports a lifestyle approach to treating obesity, offering a combination of dietary advice, physical activity advice, and behavioral therapy. The Scottish Intercollegiate Guidelines Network (SIGN) guidelines were the first attempt, and they were the only obesity-specific guidelines at that time that combined prevention and management strategies in relation to overweight and obesity in the United Kingdom. Based on these guidelines and clinical evidence, the intervention Web site was developed by a team of nutrition professionals with professional qualifications in dietetics and human nutrition with experience in the area of weight management in obesity, with the assistance of a Web designer, to incorporate these elements. The content of the UK Weight Control Trial Web site follows the recommendations of the SIGN guidelines. This Web site encouraged healthful lifestyle changes and included advice, information, tools, and support on nutrition and physical activity as well as behavioral compo-

ments to promote sustained weight control. It was designed to enable patients to manage their own care and to vary the frequency of use according to their own needs. The Web site also offered personalized advice to participants, which, in the context of this trial, involved targeting the information provided to an individual, based on that individual’s responses to a series of on-line questions. This process enabled tailored motivational statements to be generated to participants whenever they visited the Web site. In addition, details of progress in terms of self-reported weight loss were stored on the Web site, accessible only to the individual concerned. The Web site was piloted for ease of use and clarity in a sample of daily Internet users, and findings from this pilot were included in the final design of the Web site. On randomization into the Internet group in the trial, an active e-mail address was obtained from each participant. Automatic e-mails were sent on a biweekly basis to participants who had not visited the Web site in the previous 2 weeks, to encourage them to visit more often. In addition, the content of the Web site was updated every 2 weeks with topical articles and recipes. The Web site was designed to engage and maintain user interest, using colors and graphics, with a consistent navigational scheme used throughout the pages of the Web site to make it user friendly. The features offered by the Web site are explained in Table 1. Participants were seen individually by the researcher at baseline, 6 months, and 12 months. At the baseline appointment, participants were given a demonstration of the Web site and its services, along with a username and password to access the Web site and written instructions. They were encouraged to log on frequently over the first few days to get accustomed to the Web site. After that, participants were asked to visit the Web site at least once a week, but they were encouraged to visit it as often as they wished. Participants were not offered any financial or other incentive for participating. All nonresponders were followed up according to a strict protocol by mail and telephone. Three attempts were made to contact each participant not responding to the initial mailing at follow-up by telephone; then a 6-month
A follow-up questionnaire was mailed to participants asking them to complete the questionnaire, even if they did not wish to attend a follow-up visit.

**Measurements**

For the main RCT, objective measures of weight and height were taken at baseline, 6 months, and 12 months, as well as subjective postal questionnaire-based measurements of physical activity, quality of life, self-efficacy, and dietary habits. From the main RCT, no difference in weight loss between the groups was established at 12 months (difference = 0.6 kg; 95% CI: -1.4 to 2.5, P = .56). A questionnaire was developed by the study team to measure use and views of the Web site, and these data were collected at 6 and 12 months. Participants were mailed a questionnaire prior to the follow-up appointment, and they were asked to bring their completed questionnaire with them. The questionnaire asked participants to rate clarity of layout, ease of use, motivation, and support provided by the Web site. In addition, the questionnaire asked participants to rate how useful, interesting, informative, relevant, and original each section of the Web site was using 5-point Likert scales of -2 to +2, referring respectively to “not at all” and “very.” Participants also rated how strongly they agreed with a number of statements in terms of the Web site’s ability to help them change their behavior and if using the Web site gave them more confidence to make positive lifestyle changes. These statements were “lose weight,” “follow a healthy eating plan,” “increase physical activity,” “improve quality of life,” and “change to a healthier lifestyle.”

Using a 7-point Likert scale, participants were asked to rate their ability to use the Internet. Use of the Web site was also measured in the questionnaire, where participants were asked to report how often they logged onto the Web site and, on average, for how long they logged on at each visit. In addition, use of the Web site was also measured objectively; each time a participant logged onto the Web site was recorded and used as an objective measure of interest in the resource.

**Data Analysis**

Data were analyzed using Statistical Package for the Social Sciences (SPSS for Windows, version 11.5; SPSS, Chicago, IL; 2002). Descriptive statistics included means and standard deviations for normally distributed data, with medians and interquartile range (IQR) reported for non-normally distributed data. Mean satisfaction ratings for each section of the Web site were produced using factor analysis, which reduced the dimensions tested (useful, interesting, informative, relevant, and original) for each section to produce a mean score. Frequency analyses were used to confirm that a sufficient number of cases existed for this analysis. The correlation matrix was inspected for coefficients greater than 0.3 to confirm the suitability of factor analysis. Reliability analyses were conducted, where a Cronbach’s alpha of >0.8 was considered to indicate a reliable scale.

**RESULTS**

**Use of the Web Site**

Self-reported data revealed that 53% of participants were using the Web site at 6 months, with 32 participants (29%) still using it at 12 months. When asked if they had used the Web site in the previous 6 months, 38% of users (n = 22) reported using the Web site 1 to 3 times per month at 6 months and 27% (n = 16) less than once a month. Of the 32 participants reporting use of the Web site at 12 months, 31% (n = 10) accessed it 1 to 3 times a month, and 47% (n = 15) used it less than once per month at 12 months. From self-reported data, the average length of time spent on the Web site per visit at 6 months was 21.1 (SD = 16.6) minutes, ranging from 1 to 75 minutes, and 13.6 (SD = 9.3) minutes, ranging from 1 to 30 minutes at 12 months. The mean (SD) number of logons, recorded automatically over the trial, was 15.8 (15.2), this ranged from a minimum of 1 logon to a maximum of 77 logons. Participants were advised to use the Web site at least once a week, however, only 3 people logged onto the Web site more than 52 times over the 12-month intervention period. The most frequently used sections of the Web site at 6 months were the information and monitoring sections of the Web site, and the least accessed sections of the Web site were the social support sections. Patterns of use at 12 months were similar. Of those who had reported use of the Web site at 6 months, 39 (63%) rated it easy or very easy to use at 6 months, and 49 (78%) rated it as clear or very clear. With 28 (85%) and 25 (77%) of those respondents reporting use of the Web site in the second 6 months of the trial rating it as easy or very easy and clear or very clear at 12 months.
Rating the Intervention Web Site

Table 2 presents the percentage variance explained by each factor and the scale α or significance of each of the factors produced from the ratings of each section of the Web site. For each section, greater than 63% of the variance was explained by 1 factor, with only 1 factor produced in each analysis. The dimensions of each question (useful, interesting, informative, relevant, and original) were subsequently collapsed to a single factor; Table 2 presents the mean satisfaction score generated for each section of the Web site at 6 and 12 months.

Web site satisfaction scores. Scores for each section of the Web site were positive at 6 and 12 months, except for the chat room. Limited use of the chat room by participants limited the role of this feature, as it depended on a number of users accessing it at the same time. As shown in Table 2, the highest scores were evident for the information and monitoring sections of the Web site, with mean scores close to 1 (“satisfied”). The sections of the Web site generating the lowest scores were the support sections, with the chat room receiving a negative score at 6 and 12 months. This trend is similar to the trend on frequency of use of these sections. Mean scores decreased from 6 to 12 months, however this decrease was statistically significant only for the assessment (P = .04) and monitoring areas (P = .01). In addition, participants rated how useful the Ask the Expert function had been on a similar 5-point scale from -2 to +2 (“not at all” to “very”). Mean scores of 0.55 at 6 months and 0.39 at 12 months were computed. Participants’ scores for each of the Web site sections were then combined to produce an overall satisfaction score for the Web site. The mean overall satisfaction score at 6 months was 0.56 and 0.43 at 12 months; no significant change in this score from 6 to 12 months was detected (CI = -0.07 to 0.24, P = .26).

Motivation and support score. Participants rated how useful they had found the motivation and support provided by the Web site. Mean scores produced for this question were 0.57 at 6 months and 0.42 at 12 months. Although these scores decreased over time, this decrease was nonsignificant (CI = -0.05 to 0.64, P = .09).

Ability of the resource to induce positive lifestyle changes. Participants also rated how strongly they agreed with a number of statements in terms of the Web site’s ability to help them change their behavior and if using the Web site gave them more confidence to make positive lifestyle changes. These statements were “lose weight,” “follow a healthy eating plan,” “increase physical activity,” “improve quality of life,” and “change to a healthier lifestyle.” Responses for each question were close to zero (neither disagree nor agree) and were generally negative, indicating that participants were more likely to disagree than agree with the statements (Table 3). Perceived helpfulness and confidence ratings reduced over time, with perceived helpfulness of the Web site for weight loss showing a significant reduction between 6 months and 12 months (P = .02).

General Internet use and ability. Only one quarter of respondents at 6 months were daily Internet users. The mean Internet ability score of the group was 3.1 at 6 months and 2.7 at 12 months, where 1 represents unable to use the Internet and 7 represents very Internet able. There was no significant difference in Internet ability score over time; however these figures suggest this group were not very able Internet users, only reporting a score of approximately 3 out of 7 overall.

DISCUSSION

A novel feature of the Internet as a method of treatment delivery is that it makes the intervention available 24 hours a day, 7 days a week. Despite this availability, use of the intervention Web site was very limited. Although over half the Internet group was using the Web site at 6 months, this figure had dropped to only a third by 12 months. In addition, although participants were asked to log on at least once a week, the

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<tr>
<th>Web site section</th>
<th>6 Monthsa</th>
<th>12 Monthsb</th>
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<tr>
<td>Managing Your Weight</td>
<td>64.5</td>
<td>.87</td>
</tr>
<tr>
<td>Assessment area</td>
<td>63.3</td>
<td>.89</td>
</tr>
<tr>
<td>Goal setting</td>
<td>64.9</td>
<td>.9</td>
</tr>
<tr>
<td>Monitoring area</td>
<td>65.3</td>
<td>.9</td>
</tr>
<tr>
<td>Meal planning</td>
<td>75.9</td>
<td>.93</td>
</tr>
<tr>
<td>Recipe database</td>
<td>86.6</td>
<td>.97</td>
</tr>
<tr>
<td>Chat room</td>
<td>90.4</td>
<td>.96</td>
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<tr>
<td>Top Tips</td>
<td>83.1</td>
<td>.96</td>
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<tr>
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<td>68.5</td>
<td>.9</td>
</tr>
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a n = 57. b n = 34. *p < 0.05.

Factor analysis produced 1 factor for each section of the Web site, with variance explained and α values for each factor presented in the table.

Mean scores were generated from a 5-point Likert scale from -2 (not at all) to 2 (very).
mean number of logons in this group over the 12 months was only 15.8. In weight loss research, continued adherence to the intervention is considered important for the success of weight loss programs.\textsuperscript{16,17} In a study comparing a commercial Internet weight loss program with a weight loss manual, participants made little use of the resource, logging on only 17.7 times on average over 16 weeks.\textsuperscript{8} Lack of compliance in interventions of drugs, behavioral change, and diet in randomized controlled trials has been recognized.\textsuperscript{18} Compliance, or lack thereof, in weight loss trials has always been a major obstacle in evaluating interventions.\textsuperscript{19} A study evaluating the effectiveness of an Internet-based program for eating disorders showed a weekly reduction in compliance with the intervention over the trial period.\textsuperscript{20} A review by Tate and Zabinski in 2004 suggested that adherence to Internet programs may be a particular problem, as it may be easier to disengage with the intervention, to not continue with treatment, or to fail to keep an appointment on-line.\textsuperscript{21} An average attrition rate of 21% is typical in lifestyle interventions for weight loss\textsuperscript{22}; in a recent review of long-term weight loss studies in obese adults, losses to follow-up typically between 30–60% were reported.\textsuperscript{23} An overall attrition rate of 40% in the main trial was higher than anticipated, although attrition rates as high as 34% have been reported in weight loss trials using the Internet.\textsuperscript{8} In the current study, failure to demonstrate significant advantage in terms of weight loss, examined by the main RCT, is likely to have led to reduced use of the resource.

The sections used least often and rated most negatively were the support sections of the Web site. Social support in weight loss attempts has been demonstrated to be an essential element of successful weight control.\textsuperscript{24–27} It was expected that the support sections of the Web site would be the most popular, as one of the major problems with currently available weight-loss treatments is restrictions on availability of support (ie, available only at specified times and in specified locations), with increased social support resulting in better compliance and weight loss.\textsuperscript{28} This resource offered synchronous and asynchronous forms of support in terms of live chat, e-mail, and messages both professional and peer. However, use of the Web site was limited by the traffic to the Web site, which in turn may have been limited by staggered recruitment into the trial and because the site was a closed portal (ie, only people recruited to the trial had access, limiting the numbers using the site). Peer support available from this resource relied on participants using the Web site to support each other. However, a study by Harvey-Berino et al found that participants were more likely to attend group sessions than use Internet chat rooms in a weight-loss trial. So the fact that the Internet does offer convenient, readily available support does not mean that people will use it for weight-loss support.\textsuperscript{5} It is expected that a larger sample size would have increased the “traffic” on the Web site and consequently increased the social support element of the intervention. Automated feedback for participants on diet and goal setting, motivational statements, and encouragement to use the Web site were features of this Web site, however, personalized feedback was not routinely offered. An association between personalized feedback and success in weight loss has been established,\textsuperscript{29} and an increase in personalized feedback would possibly be one of the keys to increasing success of the intervention Web site. Future research investigating the intensity of on-line personalized feedback and professional support needed to produce optimum weight loss, while keeping health professional costs to a minimum, could be very worthwhile.

The main premise of this resource was to support individuals in their weight-loss efforts. Lifestyle change is recommended for long-term weight loss and maintenance and is what this Web site endorses.\textsuperscript{12} However, mean scores for helpfulness of the Web site and for change in confidence enabled by the Web site in making positive lifestyle changes were generally negative. A significant reduction in mean score for helpfulness of the Web site for weight loss may reinforce the suggestion that unmet expectations had a role to play in the lack of use of this resource. Lack of weight loss in previous lifestyle intervention trials has resulted in low compliance and increased attrition.\textsuperscript{16}

For effectiveness of Internet-based weight control tools to be determined, measures of ability, confidence, and willingness to use the Internet should be obtained. Assessment of previous Internet use prior to the study would have allowed investigation of the effect of previous Internet experience on use of the intervention Web site.

### Table 3. Perceived Role of the Intervention Web Site in Enabling Positive Lifestyle Changes During the Intervention Period, Mean Scores (Standard Error)

<table>
<thead>
<tr>
<th>The intervention Web site helped me to…</th>
<th>6 Months\textsuperscript{a} (SE)</th>
<th>12 Months\textsuperscript{b} (SE)</th>
<th>P Value</th>
<th>The intervention Web site gave me more confidence in my ability to…</th>
<th>6 Months\textsuperscript{a} (SE)</th>
<th>12 Months\textsuperscript{b} (SE)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lose weight</td>
<td>−0.18 (0.14)</td>
<td>−0.47 (0.13)</td>
<td>0.02\textsuperscript{*}</td>
<td>Lose weight</td>
<td>−0.07 (0.17)</td>
<td>−0.25 (0.17)</td>
<td>0.46</td>
</tr>
<tr>
<td>Healthful eating</td>
<td>0.14 (0.12)</td>
<td>−0.09 (0.13)</td>
<td>0.50</td>
<td>Healthful eating</td>
<td>0.21 (0.20)</td>
<td>−0.14 (0.17)</td>
<td>0.06</td>
</tr>
<tr>
<td>Physical activity</td>
<td>−0.02 (0.13)</td>
<td>−0.26 (0.13)</td>
<td>0.26</td>
<td>Physical activity</td>
<td>−0.05 (0.19)</td>
<td>−0.28 (0.16)</td>
<td>0.07</td>
</tr>
<tr>
<td>Quality of life</td>
<td>−0.11 (0.12)</td>
<td>−0.23 (0.11)</td>
<td>0.42</td>
<td>Quality of life</td>
<td>−0.05 (0.17)</td>
<td>−0.22 (0.17)</td>
<td>0.28</td>
</tr>
<tr>
<td>More healthful lifestyle</td>
<td>0.11 (0.13)</td>
<td>−0.14 (0.12)</td>
<td>0.13</td>
<td>More healthful lifestyle</td>
<td>0.09 (0.18)</td>
<td>−0.11 (0.18)</td>
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\textsuperscript{a}n = 57. \textsuperscript{b}n = 34. \textsuperscript{*}p < 0.05. Mean scores were generated from a 5-point Likert scale from -2 (not at all) to 2 (very).
Also, inconvenience of using the Internet (ie, restricted Internet access) may have been a barrier to use of the Web site. In this study, limited Internet ability and experience, as rated by the participant, are believed to have limited the use of the intervention Web site. In obesity management, it is recognized that a key element to successful weight control is that participants have the skills required to make the behavior change.\(^\text{30}\) It could be the case that if this resource was offered to able Internet users who use the Internet on a daily basis, the resource may have a greater uptake and effect.

Owing to the nature of the current trial, numbers recruited had to be restricted to a relatively small sample compared with the potential number who could have access to such a resource at the population level. Evaluating the use and views of the intervention Web site on a population level would be preferable to judge the usefulness of the Internet as a treatment delivery tool for obesity interventions. A comparable study by Womble et al also concluded that increased sample sizes and evaluation of Internet-based resources in the manner in which they would be used by the public is needed to determine the efficacy of such resources.\(^\text{8}\) Although this trial represented a real-life evaluation, restrictions on the number of participants recruited restricts the generalizability of the results to population level. Collaboration with the major commercial slimming clubs currently offering online weight control to the general public should be considered for large-scale evaluation of such resources.

**IMPLICATIONS FOR RESEARCH AND PRACTICE**

The results of this study reveal a limited uptake of the intervention Web site, with positive but low satisfaction scores. The role of Internet-based resources in weight loss needs further examination. Previous research has established that the Internet offers a viable tool for weight management.\(^\text{5,6}\) However, more evidence is required in this emerging topic area of research to fully establish the role of such tools. Future investigation of the views and use patterns of current users of Internet-based weight-loss resources would help provide an evidence base for development of an optimum resource.

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