Food, Fun and Fitness Internet program for girls: influencing log-on rate

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Abstract

Internet-based interventions hold promise as an effective channel for reaching large numbers of youth. However, log-on rates, a measure of program dose, have been highly variable. Methods to enhance log-on rate are needed. Incentives may be an effective method. This paper reports the effect of reinforcement schedule and recruitment method on log-on rates to an 8-week Internet-based obesity prevention program. It also explores trends in log-on rate. Girls were randomized to receive immediate (weekly) or delayed (program end) incentives ($5). The study was powered to detect a moderate-to-large effect (0.65). Overall log-on rate was 74.5%. A higher but not statistically different log-on rate was observed in the immediate incentive group (79%) than in the delayed incentive group (70%) ($P = 0.118), and among girls recruited via media (80%) as opposed to non-media methods (69%) ($P = 0.058). Trend analysis indicated a significant drop in log-on rate between weeks 4 and 5 among all participants ($P = 0.009). Although an acceptable log-on rate was achieved in this program, there was a substantial drop between weeks 4 and 5. Identifying the reason that this occurred may provide insight into how to further enhance log-on rate. Recruitment method may influence log-on rate.

Introduction

Youth obesity has increased dramatically [1–3], especially among African-American girls [1, 3]. Among 6-11-year-old girls, African-Americans were more likely to be overweight (22.8%) than Whites (13.1%) or Mexican-Americans (17.1%) [3]. Obese youth, particularly older youth were more likely to become obese adults [4]. Obese adults have increased risk for Type 2 diabetes [5], certain cancers [6, 7] and cardiovascular disease [8]. Chronic disease risk factors have been observed among obese youth [9]. Preventing youth obesity, particularly among high-risk youth, could have significant public health effects.

Youth obesity prevention interventions have had limited success [10, 11], suggesting that alternative approaches are needed to address this escalating problem. The Internet is a particularly promising channel, with broad availability and accessibility among youth, thereby offering potential for wide distribution. In a recent survey of online use among youth, ~11 million of whom go online daily [12], with home being the most frequent point of access [12]. Slightly more than half (51%) had high-speed Internet connections at home [12]. Further, 77% of African-American youth and 88% of girls reported being online users [12]. Although income differences were observed, nearly three-quarters (73%) of teens from homes with family incomes <$30 000 reported being online [12].

Interventions are most likely to be effective when targeting factors that influence the desired behavior [13]. Mediators are intermediate variables through which the intervention affects behavior [13–15]. In
behavioral interventions, mediators most often come from theory [13, 16]. Social Cognitive Theory [17] provides a rich source of mediating variables to guide youth behavior change (e.g. skills, behavior-specific knowledge). Observational learning is thought to be the most common method by which people learn new behaviors [17]. The Elaboration Likelihood Model [18] proposes that people are more likely to pay attention to personally relevant messages. Internet programs can seamlessly incorporate these theoretically based procedures (e.g. observational learning, tailoring) [19–21]. Though still in its infancy, the Internet is an increasingly popular channel for behavior change interventions [19–28].

Program dose [29] (i.e. exposure [30]) is a measure of the amount of intervention received. Dose is associated with behavior change [10, 31–36]. In a review of school-based diet and physical activity interventions, programs achieving change in body composition had a duration (a component of dose) of at least 6 months [10]. This supports a 1997 Institute of Medicine report [31] which reported a relationship between school health education dose and child physiological, behavioral and/or psychosocial effects. The TEENS study reported a dose–response relationship, with peer leaders having greater change in fruit–vegetable and fat consumption than others [33]. A dose–response relationship was reported in Go Girls, a church-based obesity prevention program for African-American adolescent females [34]. Among girls who participated in the high-intensity group, greater changes in body mass index (BMI) and body fat were observed in the girls who attended ≥75% of the sessions versus those with lower attendance. These differences persisted at the 1-year follow-up. A dose–response relationship was also reported for the VERB campaign, such that as awareness of the program increased, so did free-time physical activity [35]. Dose–response relationships have also been observed in adult interventions [32, 36]. The Treatwell 5-a-day worksite study reported a dose–response relationship between participation in intervention activities and change in fruit–vegetable consumption [36]. Block et al. [32] reported a dose–response relationship between percent participation and program effectiveness in a worksite e-mail program to enhance dietary intake. Thus, ample evidence supports a relationship between intervention exposure (i.e. program dose) and behavior change among both youth and adults.

In Internet-based interventions, log-on rate is a measure of program dose [19]. Available data suggest there are wide variations in log-on rates [19, 20, 25, 37–39]. In one study, treatment girls and parents had a log-on rate of slightly <50%, while control girls and parents had <30% [19]. In a 2-year troop-plus-Internet study with Girl Scouts, Year 1 log-on rates were 82% (logged on once) and 48% (logged on more than once). Year 2, however, they dropped to 56% (one log on) and 23% (more than one log on) [38]. Programs with adults have reported similar results [25, 37, 39], including declines in log on rates over time [25, 37]. Alternatively, in a 9-week troop-plus-Internet diet or physical activity intervention with Boy Scouts [20], 78 and 75%, respectively, of Scouts logged on at least once a week during the program. Although these log-on rates were impressive, they required a large investment of weekly staff time. To maximize outcome effectiveness, Internet programs must achieve and maintain adequate log-on rates with minimal staff contact.

Economic incentives appear to be effective at encouraging consumers to engage in preventive health behaviors [40]. A review of 47 randomized control trials revealed that economic incentives had an overall effectiveness of 73%, with a slightly higher effectiveness for simple, one-time behaviors (74%) (e.g. getting immunized) as opposed to more complex behaviors (72%) (e.g. smoking cessation), particularly when the goals were specific and clearly defined. Conclusions regarding size of economic incentive needed to motivate behavior or the mechanisms through which economic incentives exerted their effectiveness were not possible [40].

Incentives also appear somewhat effective at encouraging youth behavior, especially when contingent on performing a particular action [41–44]. Greater participation in a health behavior change program was observed when an incentive was
awarded according to a saturated, versus partial, reinforcement schedule [42]. Incentives were effective at encouraging youth to keep health care appointments [41, 43, 44]. This was especially true with African-American adolescent females [43]. Immediate incentives may be more reinforcing than delayed incentives [45], particularly with a younger population although this issue is complex.

Although incentives may prove to be effective at encouraging youth to log on to web-based behavior change programs, it would be economically unfeasible for these programs to provide large log-on incentives. While no research could be located on a systematic examination of the effect of financial incentives on log-on rate, it appears that financial incentives have been effective at enhancing survey response rate [46], recruitment for an Internet-based smoking cessation program [47] and at encouraging prevention-oriented behaviors [40]. Therefore, incentives may be effective at enhancing specific, short-term behaviors, such as logging onto a time-limited behavior change Web site.

Recruitment for health behavior change programs can be challenging, particularly among ethnic minorities [48–50]. Enrolling representative participants is critical to generalizability [51, 52]. In a recent review, participation bias (i.e. differences between participants and non-participants [51, 52]) was found in 10 of 14 sexual practice/attitudes studies examined [52]. Effective recruitment techniques for Internet programs have not been well explored [53]. Both traditional [19, 22, 37, 54, 55] and electronic [19, 22, 55, 56] recruitment methods have been reported, with varying degrees of success. No research is currently available regarding the potential effect of using multiple strategies on participation bias.

The purpose of this paper is to report the effect of reinforcement schedule (immediate, delayed) and recruitment method (media, non-media) on log-on rate to an Internet-based obesity prevention program for African-American females. It was hypothesized that girls receiving immediate incentives and those recruited via media would have higher log-on rates than girls receiving delayed incentives or those recruited via non-media methods.

### Methods

#### Participants

Eighty African-American 8- to 10-year-old girls at risk of obesity (BMI ≥ 50th percentile) were enrolled in the study. Further inclusionary requirements included having a home computer with Internet access, an e-mail address and written parental consent and child assent. Two of the girls enrolled in the study and randomized neither completed baseline assessment nor participated in the program. Therefore, they were deleted from analyses, leaving a sample of 78 girls (39 per group). Of the remaining 78 girls, all but five participated in post-assessment, yielding an attrition rate of 6%. The Baylor College of Medicine Institutional Review Board approved this study. The Internet-based study covered a period spanning January–December, 2004 (recruitment through post-data collection), with program content delivered September–November, 2004.

#### Recruitment procedures

Initial emphasis was placed on recruiting through churches, because of evidence that churches were an effective recruitment channel in the African-American community [57]. The goal was to enroll eight churches as recruitment sites, and then recruit 10 girls from each church. After several months, recruitment was expanded to the broader community. In addition to non-media recruitment techniques (e.g. flyers, mailings, face-to-face presentations), broadcast media methods were used (brief televised segment on the local afternoon news, paid radio advertisements). Recruitment procedures have been described elsewhere [53].

#### Participants differentiated via recruitment

Of the 80 girls enrolled in the study, 41 were recruited via broadcast media, while 39 were recruited by non-media methods (e.g. churches, flyers, pediatricians, schools, mailings). The two girls who never logged on were both recruited via non-media methods, thus revising the sample as follows: 41 broadcast media and 37 non-media.
Study design

A two-group design, with random assignment, and baseline- and post-assessment, was followed. Study staff randomized girls using a plan developed by the investigators (40 index cards were numbered ‘1’ and 40 were numbered ‘2’, then shuffled, placed face-down in an envelope, and a card randomly selected). Two pairs of sisters participated in the study, with each assigned as a pair. Randomization resulted in one pair assigned to each group. Data from all four girls were included in the analysis due to the small sample size.

Following random assignment, neither study staff nor participants were blinded to condition. Data collection occurred online, using pre-programmed procedures. Girls logged on to the study Web site and self-completed questionnaires. Baseline-assessment was completed prior to viewing Week 1 program content; post-assessment data could be completed immediately upon completing Week 8 activities.

Incentives

Groups varied on when they received an incentive. In the ‘immediate incentive’ group, incentives were mailed to girls within two business days of their meeting the criteria for obtaining an incentive (i.e. logging on to the program Web site and completing the required activities). In the ‘delayed incentive’ group, incentives were accumulated and mailed at the conclusion of the 8-week program. Regardless of incentive group, when the criteria were met for receiving an incentive each week, a dialogue box appeared on the computer screen, notifying the girl that an incentive had been earned and when it would be mailed. Incentives were valued at $5 each. Girls had the option of receiving money orders or gift cards to a large national discount store. Only one girl asked to receive a money order. Girls also received incentives for completing baseline assessment ($10) and post-assessment ($15). These incentives were mailed upon completion of the assessments.

Intervention

The study was a stand-alone 8-week Internet-based obesity prevention program promoting healthy nutrition and physical activity. All intervention and data collection activities occurred on the password-protected program Web site. When enrolled in the program, girls received a unique username and password, which they used to log on to the program Web site. Girls were asked to log on from home. Program content and procedures were identical, with the exception of the incentive reinforcement schedule (immediate, delayed).

Although the program structure has been described in detail elsewhere, it will be briefly summarized here [19, 21]. The Web site was designed, using a theoretical framework informed by Social Cognitive Theory [17] (program content) and the Elaboration Likelihood Model [18] (program structure). Weekly program components included a culturally sensitive comic in which characters modeled using asking and self-regulatory skills to meet their goals; a problem-solving module which modeled using problem-solving skills to overcome barriers to goal attainment; personal goal setting and personal goal reporting. These modules were designed to be completed in ~20 min each week and constituted the ‘required activities’. In addition, there was a ‘fun activities’ module, which included comic character profiles, healthy events in Houston, etc.

Each week, girls attempted the following three daily goals: five glasses of water (to displace sweetened beverages), five servings of fruit–vegetables and 30 min of lifestyle activity. To simplify goal setting, self-schemas were developed, which demonstrated different ways goals could be achieved (e.g. a ‘Dynamite Diner’ consumed two servings of fruit–vegetables at dinner, and one each at other meals and snack; a ‘Lunch Leader’ consumed two fruit–vegetables at lunch, and one at other times). Similar self-schemas were developed for water and physical activity. As part of goal setting, each week, girls selected a self-schema for each behavior. They were encouraged to try different self-schemas each week to reinforce there are many different ways to meet goals. To help the girls achieve their weekly goals, the program taught self-regulatory skills (e.g. goal setting/review, problem solving, decision making) as well as asking/negotiation skills to

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increase home availability and accessibility of water, fruit, vegetables and physical activity opportunities.

Although the structure of the Web site remained constant, the content changed weekly. When this occurred, an automatic e-mail was sent to the girls that included a ‘teaser’ of what was happening on the Web site that week [i.e. tune in to see how (comic character) solved her (XYZ) problem], as well as a hot link to the Web site. By clicking on the hot link, they were automatically routed to the program home page, where they entered their username and password to enter the Web site.

Since girls tend to prefer affiliative activities [58], the Internet program was presented as a ‘club’ (Food, Fun and Fitness Club), of which girls became a member when they enrolled in the program. As a club member, they received club member gifts, such as a T-shirt; a special pen with which to track daily goal achievement; a manual containing a club member pledge to participate in program activities; biographies of the comic character club members and a mouse pad containing the web address and study telephone number. The weekly theoretically based comic and problem-solving module storylines revolved around comic character ‘club members’ and their struggles to meet their weekly goals. Each weekly comic ended with a cliffhanger to encourage the girl to come back next week to see how the problem was solved. In addition, the comic character having the problem each week ‘invited’ the girl to help them find a solution. By clicking on a ringing telephone at the end of the comic, the girl entered the problem-solving module where characters modeled how to use problem-solving skills to generate and evaluate possible solutions.

Measures

Log-on rate

The intervention consisted of baseline assessment, eight web programs (delivered at the rate of one per week) and post-assessment (starting immediately after the conclusion of the Week 8 program to maximize cases collected). Log-ons and activity completion were automatically collected by the computer program. Separate log-ons to complete baseline- and post-assessment were not included when calculating weekly log-on rate. Since an additional incentive was received for completing post-assessment, Week 8 was also excluded from the calculation of log-on rate. Thus, log-on rate was calculated by summing the number of weeks girls logged on and completed the required activities during the first 7 weeks, divided by 7.

Log-on trends

To calculate log-on trends over the first 7 weeks, log-ons were measured a second way: one (logged on and completed the required activities) or zero (did not log on or complete the required activities).

Recruitment source

Recruitment source was obtained by a staff member at time of recruitment by asking an adult family member how they learned of the program.

Statistical analyses

Groups were defined as ‘immediate’ and ‘delayed’, based on incentive schedules. Analyses to address the research aims included independent t-tests and a Mantel-Haenszel-based procedure for the analyses of categorical repeated measures. Using data (mean log on ~50%, SD = 16.3) from a previous study [19], alpha of 0.05, and a two-tailed test, the study was sufficiently powered (power ≈ 80%) to detect a 15% increase in log-on rate [59]. The 15% increase translates into a large standardized difference of 0.92 (standardized in terms of the variance or variability in measures) [60]. Analyses were repeated replacing ‘incentive group’ with ‘recruitment source’.

Results

Overall log-on rate by incentive group

Overall log-on rate was 74.5% (SE = 0.03). Girls who received an immediate incentive had an overall log-on rate of 79% (SE = 0.04), whereas girls who received a delayed incentive had an overall log-on rate of 70% (SE = 0.04). An independent t-test
revealed this small-to-moderate effect size (0.36) was not significant \[t(76) = 1.58, P = 0.118\]. The study did not have sufficient power for the 9% difference in log-on rate to achieve statistical significance [59].

**Trends in log-on rate by incentive group**
The Mantel–Haenszel procedure for time trends in log-on rate yield neither a significant group-by-week interaction \[\chi^2(6) = 9.48, P = 0.148\] nor a significant group main effect \[\chi^2(1) = 2.57, P = 0.109\]. There was a trend toward a significant \[\chi^2(6) = 12.30, P = 0.056\] main effect for week, indicating at least 1 week trended toward a statistically significant difference from the others. *A priori* contrasts for repeated measures comparing each week to its subsequent week (i.e. Week 1 versus Week 2, Week 2 versus Week 3), yielded a significant \(P = 0.009\) decline in log-on rate from weeks 4 to 5 that did not recover over the next 3 weeks (Fig. 1). The average log-on rate for weeks 1–4 was 78%, while the average log-on rate for weeks 5–7 was 70%.

**Log-on rate by recruitment method**
Analyses were repeated, substituting ‘recruitment method’ (media versus non-media) for incentive group (immediate versus delayed). Girls recruited via the media \((n = 41)\) had an overall log-on rate of 80% \((SE = 0.04)\), whereas girls recruited through non-media methods \((n = 37)\) had an overall log-on rate of 69% \((SE = 0.04)\). An independent \(t\)-test revealed this small-to-moderate effect size (0.44) trended toward significance \([t(76) = 1.93, P = 0.058]\). The study did not have sufficient power for this 11% difference in log-on rate to achieve statistical significance [59].

**Trends in log-on-rate-by-recruitment method**
The results of the analysis for overall log-on-rate-by-recruitment method were supported with the examination of the trend in the number of participants logging on each week by recruitment method (Fig. 2). Results from the Mantel–Haenszel procedure to examine trends yielded a nearly significant \([\chi^2(1) = 3.80, P = 0.051]\) difference by recruitment method as well as the nearly significant main effect of week as demonstrated in the trend analysis for incentive group. No significant recruitment-method-by-week-interaction \([\chi^2(6) = 2.09, P = 0.911]\) was observed.

**Discussion**

In contrast to several other youth web-based studies [19, 38], an acceptable overall log-on rate was
achieved in this stand-alone Internet-based obesity prevention program for 8- to 10-year-old African-American girls (74.5%). Interestingly, this was achieved with no face-to-face participant contact. Although it is not clear why log-on rates were higher in this study than other youth-based programs [19, 38], several possibilities exist. The weekly e-mails served as reminders to log on. They also contained a ‘teaser’ to entice girls to log on and a hot link to the Web site, thereby minimizing the need to remember the web address. Additionally, girls became members of a club when they were enrolled in the program and received club member gifts. This may have met their affiliative needs [58]. The club member mouse pad included the web address and phone number, thereby providing easy access to the web address and study staff. Additionally, a staff member with computer experience was appointed web master and was available to help girls with technical difficulties. The authors are aware of no studies that have reported using all these techniques, which may partially explain the high log-on rates observed in this study, as well as the high retention rate (6% attrition).

Providing a small financial incentive, regardless of reinforcement schedule, for logging on to the program Web site and completing the required activities each week may also explain the higher log-on rates, although this cannot be known for sure since there was not a ‘no-incentive’ condition. Because incentives have been somewhat effective at encouraging youth to engage in desired behaviors [41–44], it appears to be a plausible explanation, but needs further investigation. Although external rewards (i.e. incentives) have been discouraged because of a concern they may actually discourage behavior when the incentive is removed [61], the current study incentivized logging on to the program Web site and completing the required activities, a time-limited behavior, rather than incentivizing goal attainment and/or behavior change. In other words, the incentive was tied to program dose (i.e. increase program exposure), rather than to goal attainment or behavior change. This should have minimized any potential decrement in intrinsic motivation for making healthy diet and physical activity choices.

Difference in reinforcement schedule marginally influenced log-on rate. There was a 9% difference in log-on rate between girls who received an immediate incentive versus those who received a delayed incentive. It was expected the difference would be greater. Thus, this is consistent with the literature suggesting the effect of incentives on behavior is complex [45, 62].

Trend analysis indicated a substantial drop in log-on rate between weeks 4 and 5, which was
independent of reinforcement schedule. Similar decreases over time have been observed in other web-based programs [25, 37, 38]. Although we retrospectively attempted to determine if family, community or school events distracted the girls’ attention or limited their free time (e.g. preparing for standardized tests) at this juncture, no such distractions were identified. This decrease may be partially explained by boredom or lack of continued interest (although we have no data to support that proposition) and suggests that some dramatic programmatic changes may need to occur at this point to maintain attention and interest.

Finally, log-on rate marginally varied by recruitment method. Girls recruited via the broadcast media had an 11% higher log-on rate than those recruited via more traditional methods. Social desirability, peer pressure or the desire to fit in may have influenced the decision to sign up by non-media recruitment methods. This may be particularly true of church-based recruitment. In the African-American community, churches traditionally hold a particularly important place in the community [57], and ministers are highly respected community members [63]. Therefore, their recommendation and/or endorsement of the program could have influenced parental decisions regarding whether or not to enroll their child in the study. Girls were also recruited through schools and physician offices, where the same phenomenon may have occurred. More work is needed to explore the effect of recruitment method on participation as participation bias influences generalizability [51, 52].

Broadcast media may be an effective method for recruiting youth for Internet programs. This finding is of interest because effective recruitment techniques for Internet programs are still being explored. Existing techniques are often adoptions of those used in traditional programs, which may or may not be effective in reaching participants for Internet programs [19, 22, 37, 54, 55]. Little information regarding the success of these approaches, individually or collectively, has been published. No literature could be located that discussed the potential participants representative of the target population or of potential participation biases that may be inherent in these techniques. Because this study revealed that there was a marginal difference in log-on rate based on recruitment source, more work is needed to examine the potential impact of populating studies with participants obtained from a variety of sources.

Strengths and limitations
This is one of the first studies to report systematically varying methods to increase log-on rates of a completely Internet-based obesity prevention intervention. The objectively recorded nature of the log-on data was a strength of this study. Limitations included a relatively small sample size and a short duration intervention (8 weeks).

Conclusion
Although overall log-on rate was higher than typically reported in the literature, more work is needed to identify methods to further enhance log-on rate. Broadcast media may be an effective method for recruiting young girls to Internet behavior change programs. Use of multiple recruitment methods may influence generalizability.

Acknowledgements
This research was largely funded by a grant from the Robert Wood Johnson eHealth Technologies Initiative (grant number 49128). This work is also a publication of the US Department of Agriculture/Agricultural Research Service (USDA/ARS) Children’s Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, Texas, and had been funded in part with federal funds from the USDA/ARS under Cooperative Agreement No. 58-6250-6001. The contents of this publication do not necessarily reflect the views or policies of the USDA, nor does mention of trade names, commercial products or organizations imply endorsement from the US government.
Conflict of interest statement

None declared.

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Received on May 15, 2006; accepted on March 08, 2007