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Fit for Life Boy Scout badge: Outcome evaluation of a troop and Internet intervention

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Abstract

Background. This study reports the results of a 9-week intervention on the physical activity levels of adolescent males.

Methods. Participants were 473 10- to 14-year-old Houston Boy Scouts (42 troops) with troops randomly assigned to intervention or control conditions. Data were collected in spring (16 troops) and fall (26 troop) waves during 2003. Intervention participants received a 9-week troop and Internet program to increase physical activity skills, self-efficacy and goal-setting. Physical activity was assessed at baseline, end of the intervention (Post#1) and post-6 months (Post#2) by accelerometer. Minutes of sedentary, light and moderate to vigorous physical activity were calculated. Repeated measure analyses were performed to test differences in physical activity over time between groups with participants nested in troops.

Results. A three-way interaction (group * time * wave) that approached significance ($P = 0.051$) indicated a 12-min reduction in sedentary behavior among spring intervention participants. A significant three-way interaction ($P = 0.011$) (group * time * wave) indicated a 12-min increase in light intensity activity among the spring intervention group.

Conclusion. Participation in the Fit for Life badge program resulted in a trend towards a small decrease in sedentary behavior and increased light intensity physical activity among spring participants only. There was no effect on moderate to vigorous physical activity.

Keywords: Physical activity; Accelerometer; Multi-media; Season

Introduction

Physical activity has been associated with a decreased risk of developing cardiovascular disease (Sesso et al., 2000), type 2 diabetes (Kriska et al., 2003), obesity (Patrick et al., 2004) and some cancers (Lagerros et al., 2004; Slattery et al., 2003). The low physical activity levels of US adolescents (Jago et al., 2005a) suggest that interventions are needed. Community organizations such as the Boy Scouts of America have been identified as locations for increasing adolescent physical activity (Jago and Baranowski, 2004). A previous intervention focused on increasing fruit and vegetable consumption with Boy Scouts (Baranowski et al., 2002). Although the study resulted in increased fruit and vegetable consumption, the intervention sessions lasted an hour each week for 9 weeks, which limited troop leader enthusiasm (Baranowski et al., 2002). The aim of this study was to assess both the immediate and longer-term (6 month) effect of a Boy-Scout-based physical activity intervention using limited troop time and an Internet program targeting physical activity self-efficacy and preference change.

Methods

Participants and study design

Participants were 473 10- to 14-year-old Boy Scouts recruited from 42 troops within the greater Houston area. The study was conducted in two waves that started in spring (16 troops) or fall (26 troops) of 2003. The study was a randomized trial with troops assigned to intervention or control conditions after baseline data collection. Results are reported in accordance with the CONSORT statement (Moher et al., 2001). The intervention group

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participated in a physical activity intervention, while the control group received a "mirror image" fruit and vegetable intervention. Both interventions lasted 9 weeks. Data were collected at baseline, immediately after the intervention (Post#1) and 6 months after the intervention (Post#2). The Baylor College of Medicine IRB approved this study, and written informed consent was obtained for all participants.

Intervention

The "Fit for Life" physical activity badge included skill building activities at troop meetings and Internet-based role modeling, goal setting, goal review and problem-solving. A week-by-week description of all activities is presented in Table 1. Trained study staff led 20-min physical activity sessions during troop meetings. Participants were encouraged to engage in these activities outside of the troop meetings and were provided with a Boy Scout "drills booklet" to help them do so.

Participants were asked to log onto the study website at least twice a week. The first log-on was to experience the behavior change program and set change goals. The second log-on was to report goal attainment before the next troop meeting. There was a weekly animated role-modeling comic in which characters faced and overcame a physical activity barrier. The comics ended with a "cliffhanger" designed to entice the Scout to return to the website. Participants set progressively difficult physical activity goals each week. Scouts who did not meet their goal were directed to a computerized problem-solving component. To increase log-on rates, there was a different physical activity knowledge game on the website each week. Points were awarded for attending troop sessions and setting and achieving activity goals. Badges were awarded at program end to participants who obtained 70% of the available points.

Measures

Ethnicity and the highest household educational attainment were obtained by parental self-report. Stature was measured according to a standard protocol (Gordon et al., 1988) to the nearest 0.1 cm using a stadiometer (Shorr Height Measuring Board; Olney, MD). Body weight was measured according to a standard protocol (Gordon et al., 1988) to the nearest 0.1 kg using a calibrated scale (Seca 770 Model Scale; Vogel and Halke, Hamburg, Germany). Body mass index (BMI = kg/m^2) and BMI percentile were computed using CDC age and gender-specific percentiles (National Center for Health Statistics, 2000). Triceps skinfold, the site most closely associated with DEXA (Goran, 1998), was measured three times using Lange calipers and the mean used in all analyses.

Physical activity was monitored for 3 consecutive days at each assessment using the MTI accelerometer (Manufacturing Technologies Inc. Fort Walton Beach, FL). The MTI® has been shown to be a valid measure of physical activity in adolescents (Puyau et al., 2002). Each monitor was programmed to begin recording at midnight after the measurement meeting. Monitors were removed on the fourth morning after data collection. Two hypothesized mediators, self-efficacy and preferences, were measured at each time period using validated questionnaires (Sherwood et al., 2004).

Data reduction

Accelerometry data for a day were included if the Scout met a previously developed MTI inclusion criterion of at least 800 min between 6 am and midnight (Treuth et al., 2004). In accordance with previous studies (Jago et al., 2005a; Treuth et al., 2004), an SPSS program identified minutes in which the monitor was not worn using a criterion of 20 or more continuous minutes of zeros. Days with less than 800 min of recorded data were considered invalid (Treuth et al., 2004). To maximize the sample size, participants were included in the analysis if they possessed at least one complete day during each measurement period. There were 240 (82.4%) of the participants at baseline who possessed 3 valid days of data with 240 (68.2%) and 197 (70.6%) at Post#1 and Post#2. Forty-four (15.2%), 75 (21.2%) and 43 (15.4%) of participants possessed 2 valid days at baseline, Post#1 and Post#2. Seven (2.4%), 37 (10.5%) and 39 (14.0%) participants possessed 1 valid day at baseline, Post#1 and Post#2.

Adolescent-specific cutpoints (Puyau et al., 2002) were used to categorize the physical activity in each minute as sedentary (<800 counts), light (800–3199 counts) or moderate to vigorous intensity (≥3200 counts). To account for differences in the time the monitor were worn, mean minutes of activity at each level were weighted by the inverse of the proportion of time the monitor was worn. Mean minutes in each category per day were then calculated. The mean number of counts per minute, an indicator of the total volume of activity in which the participant engaged, was also calculated. There were no significant ($P < 0.05$) differences in minutes of sedentary, light or moderate to vigorous physical activity or counts per minute when one, two or three valid days were used as inclusion criteria for accelerometer data.

Statistics

The number of participants for whom any data and accelerometer data was calculated for each phase and wave of the study was presented using flow charts. Chi-square tests of independence for three-way tables and analyses of variance were used to test for difference in baseline demographics characteristics between subjects with and without missing data. Follow-up tests to identify where significant differences occurred included Chi-square tests of independence and independent *t* tests. Repeated measure analyses were completed using the Proc Mixed (Littlell et al., 1996) procedure in SAS 9.1 to detect differences in physical activity over time between the intervention (Fit for Life) and control groups. Main effects for treatment groups (intervention, control), visit time (baseline, Post#1 and Post#2), wave (spring, fall) and the interactions within groups, visit time and wave main effects were treated as fixed effects. Scouts were nested within troops and troop treated as a random effect. Four separate analyses in which either minutes of sedentary, light or moderate to vigorous physical activity per day and counts per minute were the dependent variables, were run. Models were then re-run controlling for BMI, ethnicity and parental education. Similar models in which either BMI, BMI percentile, triceps skinfold, self-efficacy or physical activity preferences were the dependent variables were then run. Alpha was set at 0.05.

Results

Participant characteristics are shown in Table 2. Participants were 13 years of age and predominantly Anglo-American. Parental education was significantly ($P = 0.007$) associated with intervention group and wave, with more participants living in households in which there was either a college or postgraduate educated adult in the fall than the spring and more in the control group than the intervention group.

Fig. 1 shows the flow of participants throughout the study and how the enrollment represented 64% of the eligible sample. Education was shown to be significantly associated with missing data, regardless of intervention group. Further investigation showed that participants for which any Post#2 were obtained resided in homes with a higher level of education than those who did not ($\chi^2 = 16.29$, $df = 3$, $P < 0.001$) with approximately 44% of participants living in households in which someone possessed a college degree as opposed to only 27%. Further tests showed that participants for whom any Post#2 data were obtained also possessed significantly lower BMI ($t = 2.11$, $P = 0.004$) than those for whom no data were collected with a mean BMI of 21.0 vs. 22.4. There was a significant difference ($t = 1.99$, $P = 0.048$) in the baseline triceps skinfold of participants for whom Post#2 accelerometer data were obtained (Fig. 2) with a lower skinfold (16 vs. 17 mm) among those for whom data were obtained. About 75% of the intervention participants and 78% of the control participants logged onto the study website at least once a week.