Abstract

Purpose: The objective of this study was to evaluate the impact of a school-based intervention (*Program X*) incorporating pedometers and email support on physical activity, sedentary behavior and healthy eating in adolescents.

Methods: A randomized control trial (RCT) was used to evaluate the impact of the *Program X* intervention. Six schools (N = 124 participants, mean age = 14.1 ± .8) were randomized to intervention or control conditions for the six month study period. Objectively recorded physical activity (mean steps/day), self-reported sedentary behavior and dietary habits were measured at baseline and at six month follow-up and intervention effects were assessed using repeated measures analysis of variance (ANOVA) and chi square tests (χ^2).

Results: Participants in the intervention group increased their step counts by 956 ± 4107 steps/day (boys) and 999 ± 1999 (girls). Repeated measures ANOVA revealed significant group-by-time interactions for boys ($F = 7.4$, $p = .01$, $d = .80$) and girls ($F = 29.6$, $p < .001$, $d = 1.27$) for mean steps/day. The intervention significantly decreased the number of energy dense/low nutrient snacks consumed by boys ($\chi^2 = 4.0$, $p = .043$) and increased the number of fruit serves among girls ($\chi^2 = 4.8$, $p = .028$). The intervention did not have a statistically significant effect on sedentary behavior.

Conclusions: A school-based intervention incorporating physical activity monitoring using pedometers and email support was successful in promoting physical activity and selected healthy eating behaviors in adolescent boys and girls.

Introduction

Physical activity declines steeply during adolescence [1] and dietary behaviors deteriorate as adolescents consume more food away from the influence of the family [2]. Data from recent studies suggest that many Australian adolescents are not adequately active, consume too much soft drink and junk food and not enough fruit and vegetables [3, 4]. While the relative contribution of physical activity and nutrition to obesity is controversial [5], it is irrefutable that the pandemic of excess weight is a product of widespread energy imbalance [6]. The prevalence of overweight and obesity among Australian youth has accelerated since the early 1970s [7] and recent studies suggest that approximately a quarter of Australian youth are overweight or obese [4, 8]. These rates are consistent with pediatric obesity prevalence in the United States [9] and Europe [10].

The school has been identified as an ideal setting for the promotion of physical activity and healthy eating [11] and school-based interventions that combine a variety of strategies appear to hold considerable promise for sustainable behavior change in adolescents [12, 13]. Due to a crowded school curriculum, interventions that encourage adolescents to increase their activity levels outside of the school setting are warranted. Physical activity self-monitoring with pedometers has emerged as an effective strategy for increasing activity with adults [14]. More recently, the *Girls Stepping Out Program* (GSOP) and the *Learning to Enjoy Activity with Friends* (LEAF) interventions have demonstrated that pedometers can be used to increase physical activity among low-active adolescents [15, 16]. While there has been a shift in health promotion focus from targeting fitness, to the promotion of moderate intensity lifestyle activity [17], few interventions targeting youth reflect this change.

Over the past ten years, computer-tailored feedback has emerged as a health education strategy to improve diet and physical activity behaviors [18]. Frenn and

colleagues [19] evaluated an innovative intervention based on the Transtheoretical Model of behavior change in adolescents. The intervention was delivered using the Internet and computer-generated tailored feedback based on stage of change and was provided to individuals for both physical activity and dietary fat. Participants in the intervention group increased their physical activity (self report) and decreased their percentage of dietary fat intake from baseline to posttest. In contrast, the Internet intervention evaluated by Patrick and colleagues [20] did not have a significant impact on physical activity (self-report and objective measure).

The aim of this study was to evaluate the impact of *Program X*, a multi-component, extra-curricular school sport intervention that included pedometers for self-monitoring and social support from parents and emails. The intervention was developed in reference Bandura's SCT Social Cognitive Theory [SCT: 21] and specifically targeted social support and self-efficacy for physical activity. To the authors' knowledge, no previous intervention has combined these strategies into one multi-component intervention for adolescents.

Methods

Study design

Schools were randomized to one of two treatments. One treatment (control) consisted of a 10-week school sport program. The second treatment (*Program X* intervention) consisted of the same school sport program with information sessions and included pedometers for self-monitoring and social support from parents and emails. The study design, intervention components and participant flow are outlined in Figure 1.

Participants

Following a power calculation, it was determined that a sample of 120 students (60 in each treatment arm) was necessary to detect an increase in 0.5 standard deviations (1500 steps/day) with 80% power assuming 5% significance. The intervention was offered as an extra-curricular school sport program aimed at, but not restricted to low-active adolescents. Eight secondary schools were invited to participate in the study. Two schools (one government school and one independent school) declined to participate and six schools were randomized. A randomization envelope was prepared by a member of the research team and schools were assigned to one of two treatment conditions. Schools included in this study were from urban areas with low to moderate socioeconomic status. The mean age of participants was 14.1 (± .8) years and the majority of participants were born in Australia (94.4%) and spoke English at home (89.5%). There were 124 participants in the study, of these, 58 participants (boys = 30, girls = 28) were in the intervention group and 66 (boys = 23, girls = 43) in the control group. One hundred and six participants were assessed at follow-up. Participants were blinded to treatment allocation at baseline. Baseline data were collected in May/June 2007 and follow-up data were collected in November/December 2007. Ethics approval for the study was obtained from the University of Newcastle, New South Wales (NSW), Australia and the NSW Department of Education and Training ethics committees.

Treatments

Bandura's SCT provided the theoretical framework for the development of the *Program X* intervention. The SCT purports that behavior change is influenced by environmental factors, personal factors, and attributes of the behavior itself. This interaction is referred to as 'reciprocal determinism', as each factor may affect or be

affected by the others [21]. The primary personal components of the SCT addressed in *Program X* were skills (students were provided with exercise-skill development including weight training techniques and cardio-respiratory fitness exercises), self-efficacy (students were instructed on goal setting techniques and self-management strategies), and outcome expectancy (the program involved the identification of physical activity benefits and strategies to make exercise more enjoyable). Social support was identified as a key environmental component and the intervention included strategies to elicit social support for physical activity from family and friends through newsletters and email-based support for healthy eating and physical activity.

The *Program X* intervention was based on the LEAF pilot study [15] and included five major components: i) enhanced school sport program focusing on lifetime physical activities, ii) information sessions and summary interactive lecture focusing on physical activity and healthy eating, iii) pedometers for physical activity monitoring, iv) physical activity and nutrition handbooks and monthly information newsletters for parents, and v) social support for healthy behaviors using email.

The enhanced school sport component was delivered once a week for ten weeks and focused on lifetime activities (e.g. aerobics, weight training) that can be carried into adulthood [26]. At the start of each school sport session, teachers introduced one of ten physical activity and nutrition messages and delivered an activity reinforcing the message. The ten physical activity and nutrition messages were selected because they represent the behaviors that are commonly associated with lower levels of disease risk and with being in the healthy weight range and included: i) Keep track of your physical activity (using goals/diary), ii) Every step counts, iii) Reduce your time spent watching television, using the computer & playing electronic games immediately after school, iv) Be active with friends and family, v) Identify excuses for not being active, vi) Keep track

of fruit and vegetable intake (using goals/diary), vii) Aim for 2 pieces of fruit and 5 servings of vegetables each day, viii) Drink more water and swap sugary drinks for diet drinks, ix) Reduce your portion sizes and eat at the dinner table, and x) Reduce your junk food snacks.

To encourage physical activity self-management strategies, participants were provided with pedometers to monitor their physical activity over the 6-month study period. Pedometers were not sealed during this period and participants were able to receive feedback regarding their step counts. Parents were provided with monthly newsletters and participants were given physical activity and nutrition handbooks to be signed by parents each week (for the 10-week face-to-face component). Both handbooks and newsletters were designed to educate parents on strategies to support the health behaviors taught to their children in *Program X*. Emails were used to provide additional social support for physical activity and dietary behavior change. Following the completion of the 10-week school sport component of the study, a member of the research team delivered an interactive lecture summarizing the ten messages.

To assist in the recruitment of schools and students and to prevent resentful demoralisation, the control group received a very minimal intervention. Students in the control schools participated in school sport sessions and were provided with exercise handbooks to improve the quality of their school sport experience. However, they were not given any of the 'Program X messages' or additional materials or strategies to support behavior change. They were not given any information regarding nutrition behaviors and the only information students in the control group received about physical activity were the exercise instructions in the school sport sessions.

Measurements

Physical activity was assessed using pedometers, demographics, sedentary and dietary behaviors were assessed using a questionnaire.

Physical activity. Yamax SW700 pedometers (Yamax Corporation, Kumamoto City, Japan) were used to measure physical activity [22-24]. Participants were asked to wear sealed pedometers for five days (including four consecutive school days and one weekend day). On the morning of the first day of monitoring, students were instructed by a research assistant on how to attach the pedometers (at the waist on the right hand side) and asked to remove the pedometers only when sleeping or when the pedometer might get wet. During the first session pedometers were sealed with stickers and students were asked not to tamper with the devices. At school each morning research assistants removed the stickers, recorded the scores, reset the devices and returned the pedometers to the students.

Sedentary behavior. The sedentary behavior measure focused on three components: hours per day spent watching television, using the computer (for non-school purposes) and playing electronic games. These items were adapted from the Adolescent Sedentary Activity Questionnaire used in the NSW Schools Physical Activity and Nutrition Study (SPANS) [25].

Dietary behaviors. Dietary behaviors were assessed using items from SPANS [25]. Items were used to assess students' consumption of fruit and vegetables, daily soft drink and water consumption and energy dense and/or low nutrient snack consumption. The final nutrition question asked students to report how often they ate energy dense and/or low nutrient snacks between meals.

Process evaluation. A process evaluation including a posttest questionnaire was completed to determine: (i) how many intervention school sport sessions were attended by students, (ii) participant use of pedometers for self-monitoring at follow-up, (iii)

participant perceptions of the email support (rated on a Likert scale from 1 to 5), and (iv) participant perception of the intervention's impact on specific physical activity behaviors.

Statistical analyses

Data were analyzed using the SPSS statistics package version 14.0 (SPSS Inc, Chicago, Ill.). Alpha levels were set at $p < .05$ for all analyses. Students who had completed at least three days of pedometer monitoring (with one weekend day) were included in the analysis. Intraclass correlation coefficient (ICCs) was calculated for 3 days (1,2,3) to determine the variability of the physical activity data. Independent samples t-tests were used to compare the groups at baseline for physical activity and sedentary behavior outcomes. Changes in physical activity and sedentary behavior from baseline to follow-up were assessed using a repeated measure analysis of variance (ANOVA) to determine differences between groups. Intervention effect sizes were calculated using mean change scores with Cohen's *d* ($d = M_1 - M_2 / \sigma_{pooled}$). While there is some debate as to what the daily step targets for children and adolescents should be [27, 28], the recommendations from Tudor-Locke et al [29] were used to classify the students as low-active (boys < 15,000 steps/day and girls < 12,000) or active (boys ≥ 15,000 and girls≥ 13,000). Independent samples t-tests were then used to compare treatment conditions for change in physical activity over time between low-active and active participants. Nutrition variables were recoded as dichotomous variables (e.g. less than 2 servings of fruit/day or more 2 servings/day) and treatment groups were compared using Chi square tests. Baseline and follow-up results were also compared using Chi square tests.

Results

Physical activity and sedentary behavior

Three days of pedometer step counts resulted in a stable index of physical activity, ICC = .71 (.60-.79). At baseline, there were no significant differences between intervention and control groups for boys' (Table 1) or girls' mean steps/day (Table 2). At follow-up, boys in the intervention group increased their step counts by 956 ± 4107 steps/day, while those in the control group decreased their step counts by 2409 ± 3489 (Figure 2). A repeated measures ANOVA indicated a significant group-by-time interaction effect, $F(1,40) = 7.4$, $p < .05$, $d = .80$. Similarly, girls in the intervention group increased their physical activity by an average of 999 ± 1999 steps/day over the six month study period, while girls in the control group decreased their activity by 2781 ± 2537 steps/day (Figure 2). This was also a significant group-by-time interaction effect, $F(1, 46) = 29.6$, $p < .001$, $d = 1.2$. In the control group 15 boys were classified as low active (mean steps/day 9104 ± 3091) and 20 girls (8773 ± 1852) at baseline. In the intervention group 19 boys (10132 ± 2717) and 18 girls (9383 ± 2135) were classified as low-active at baseline. The change in step scores (posttest – baseline) for low-active participants was significantly different between treatment conditions ($p < .001$, control group = -1918 ± 2508 versus intervention group = 2342 ± 2626). There were no significant differences between treatment conditions for those participants classified as active at baseline. The intervention did not have a significant effect on any of the sedentary behavior outcomes.

Dietary behavior

The findings from the nutrition behavior questions are reported in Table 3. There were no statistically significant differences between the intervention and control groups for any of the dietary outcomes at baseline or at follow-up. However, two significant

within-group changes (i.e. baseline to posttest) were identified. The number of boys in the intervention group who reported eating three or more snacks each day decreased from 47% to 21% over the study period, $\chi^2 = 4.0$, $p = .043$. Girls in the intervention group increased their intake of fruit over the study period with approximately three quarters of participants reported eating two or more serves of fruit each day at follow-up, $\chi^2 = 4.8$, $p = .028$.

Process evaluation

Attendance at school sport sessions was high in both treatment and control groups (approximately 80% of sessions attended). Following the completion of the intervention, only a small percentage of participants (11%) in the intervention group reported wearing their pedometer everyday. Almost two thirds of participants indicated that their parents had never read or signed their physical activity and nutrition handbooks. External motivation provided by email support was relatively ineffective and the mean of participants' responses to this item was 3.06 (± .94). Approximately half of the participants reported that their involvement in *Program X* had encouraged them to join a gym or fitness club and two-thirds suggested that their involvement had resulted in them being more active with their family members.

Discussion

The primary objective of this study was to evaluate the impact of a school-based intervention incorporating pedometers and email support on physical activity, sedentary behavior and healthy eating in adolescents. The *Program X* intervention had a significant impact on the physical activity behaviors of those classified as low-active at baseline but not on those classified as active. This finding confirms the evidence from previous

interventions with adolescents, that self-monitoring with pedometers is an effective strategy for promoting physical activity among low-active individuals, but not for adolescents who are already meeting physical activity guidelines [15, 16]. The intervention also had a positive impact on reducing energy dense/nutrient poor snack consumption among boys and increasing fruit intake among girls.

Previous interventions have demonstrated that goal setting with pedometers is an effective strategy for increasing physical activity with adolescents [15, 16]. The GSOP was one of the first physical activity interventions with adolescents to use pedometers for self-monitoring and resulted in significant increases in physical activity [16]. In the LEAF intervention, pedometer goal setting was combined with an enhanced school sport intervention and found a significant impact on low-active adolescents, but not in adolescents classified as active at baseline [16]. Both interventions were quasi-experiments and involved relatively short assessment periods. In their review of physical activity interventions among youth, Van Sluijs and colleagues [15] noted that the methodological quality of studies was limited and that future studies should include longer-term follow-ups. While a one year follow-up would provide stronger support for the efficacy of the *Program X* intervention, the 6-month results provide evidence for the feasibility of this intervention.

Because the timing and assessment protocols were consistent between control and intervention schools, alternative interpretations for the decline in physical activity found in the control schools need to be explored. The control group program was not designed to be a physical activity promoting program and did not target any mediators of behavior change to increase exercise adherence outside of the school sport sessions. It is important to note that the study period represented the period of time (age 13 to 18yr) associated with the greatest decline in physical activity over the lifetime [1, 30]. Therefore, students

may already have been on a downward trajectory. Alternatively, it is possible that the baseline assessments did not provide an accurate measurement of physical activity. Although studies suggest that reactivity to wearing pedometers does not exist in children [31], we cannot discount the possibility that the baseline step counts were slightly inflated and the novelty of wearing the devices at post-test had decreased, thereby introducing a response bias.

It is interesting to note that post-intervention, the majority of participants no longer wore their pedometers regularly. We suggest that in the early stages of the intervention, pedometers are used to provide participants with a reminder of their step targets and the need for physical activity. As the intervention progresses, participants may become aware of the amount of activity necessary to achieve their step targets, and therefore, no longer wear their pedometers or the novelty wears off. It is possible that the reintroduction of the forced use of pedometers at post-test acted as a "booster" for the intervention group, which contributed to the significant group-by-time interaction effect. However, the authors cannot discount the possibility that there were some systematic differences between the treatment groups that contributed to the differences, as participants were randomly allocated to conditions at the school level.

Boys in the intervention group significantly decreased their consumption of energy dense/nutrient poor snacks from baseline to follow-up. Reducing the consumption of energy dense/nutrient poor foods was one of the ten health messages of *Program X*. Prevalence of snacking is associated with Body Mass Index (BMI) in adolescents [32, 33] and may be a contributing factor to the development of pediatric obesity [33]. Girls in the intervention group increased their fruit intake from baseline to follow-up. A bigger impact on dietary intake may not have been observed for many reasons including the low intervention intensity of the nutrition component relative to the physical activity

component and low sensitivity of the dietary intake tool. The intervention components and outcome measures designed to promote healthy dietary behavior may need to be further refined to promote sustainable changes.

Recent reviews of physical activity [12] and nutrition interventions [13] indicate that strategies to include parents in the intervention process are warranted. For example, Haerens and colleagues [13] found that their school-based physical activity intervention involving parent support resulted in larger effects than their intervention without parental involvement. Previous studies have noted that getting parents to attend meetings regarding school-based interventions is difficult [34] and to overcome this, we included strategies that did not place unnecessary time demands on parents. In the current study, parents were provided with monthly newsletters outlining the benefits of physical activity and healthy eating. According to the participants, only a small percentage of parents signed the handbooks weekly. However, because we did not survey parents, we cannot determine the true extent of parental involvement. For example, many parents did not sign the handbooks regularly, but we cannot be sure that they were not involved in the home-based tasks. It may have been beneficial to include an information session for parents to outline the program rationale and objectives in an attempt to engage parents more formally. Furthermore, two-thirds of intervention participants indicated that their involvement in the program had resulted in them being more active with their family members. Considering these findings and the results from previous interventions, identifying ways to engage parents in interventions to promote physical activity and healthy eating is clearly a research priority.

Participant perception of the efficacy of the email-based support was modest, suggesting that the email component was not an integral component of the *Program X* intervention. A recent review of Internet-based interventions concluded that interventions

that included interactive technologies need to be refined and more rigorously evaluated to determine their potential for health behavior change [35]. In our study, the majority of email addresses provided by the students were school-based addresses and they may not have been accessed as regularly as students' social email addresses. This potentially indicates that students were not interested in being contacted in this way or that they did not perceive this method of contact to be engaging or of value. Future studies could examine whether other web-based methods could be of greater appeal in the context of a physical activity interventions or could incorporate on-line social support strategies using websites such as Face Book and My Space, which are popular with teenagers, to facilitate behavior change.

There are a number of limitations in this study that should be noted. First, the efficacy of *Program X* alone is not known and so we cannot be sure how it or the add-on components contributed to changes observed in the control and experimental groups. This could be addressed in further studies by the addition of a non-intervention control group. Second, the randomization of students to intervention and control conditions occurred at the school level. Third, ideally this study would have evaluated the impact of the intervention on physical activity using accelerometers. Fourth, this study did not report the effect on the intervention on social cognitive variables to identify potential mechanisms of behavior change. Another important limitation is that the adolescents were volunteers and a selection bias may have been introduced because those most enthusiastic will have been more likely to volunteer first.

In conclusion, a school-based intervention incorporating physical activity monitoring using pedometers was successful in promoting physical activity and selected healthy eating behaviors in adolescent boys and girls.

References

1. Sallis JF. Age-related decline in physical activity: A synthesis of human and animal studies. Med Sci Sport Exerc 2000;32(9):1598-1600.
2. Story M, Neumark-Sztainer D, French S. Individual and environmental influences on adolescent eating behaviors. J Am Diet Assoc 2002;102(Suppl 3):S40-S51.
3. Australian Institute of Health & Welfare. Young Australians: Their health and wellbeing 2007. Canberra: AIHW, 2007.
4. Booth ML, Okely AD, Denney-Wilson E, et al. NSW Schools Physical Activity and Nutrition Survey (SPANS) 2004: Full Report. Sydney: NSW Department of Health; 2006.
5. Jeffery RW, Utter J. The changing environment and population of obesity. Obes Res 2003;11(Suppl):12S-22S.
6. Bouchard C. The biological predisposition to obesity: beyond the thrifty genotype scenario. Int J Obes 2007;31(9):1337-1339.
7. Norton K, Dollman J, Martin M, et al. Descriptive epidemiology of childhood overweight and obesity in Australia: 1901-2003. Int J Pediatr Obes 2006;1(4):232-238.
8. Dollman J, Pilgrim A. Changes in body composition between 1997 and 2002 among South Australian children: Influences of socio-economic status and location of residence. Aust N Z J Public Health 2005;29(2):166-170.
9. Hedley AA, Ogden CL, Johnson CL, et al. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. JAMA 2004;291(23):2847-2850.

10. Lobstein TJ, James WPT, Cole TJ. Increasing levels of excess weight among children in England. Int J Obes 2003;27:1136-1138.
11. Wechsler H, Devereaux RS, Davis M, et al. Using the school environment to promote physical activity and healthy eating. Prev Med 2000;31(2):S121-S137.
12. Van Sluijs EMF, McMinn AM, Griffin SJ. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. BMJ 2007:doi:10.1136/bmj.39320.843947.BE.
13. Knai C, Pomerleau J, Lock K, et al. Getting children to eat more fruit and vegetables: A systematic review. Prev Med 2006;42(2):85-95.
14. Bravata DM, Smith-Spangler C, Sundaram V, et al. Using pedometers to increase physical activity and improve health: A systematic review. JAMA 2007;298(19):2296-2304.
15. Lubans DR, Morgan PJ. Evaluation of an extra-curricular school sport program promoting lifestyle and lifetime activity. J Sport Sci 2008;26(5):519-529.
16. Schofield L, Mummery WK, Schofield G. Effects of a controlled pedometer-intervention trial for low-active adolescent girls. Med Sci Sports Exerc 2005;37(8):1414-1420.
17. Dunn AL, Andersen RE, Jakicic JM. Lifestyle physical activity interventions: history, short- and long-term effects, and recommendations. Am J Prev Med 1998;15(4):398-412.
18. Haerens L, De Bourdeaudhuij I, Maes L, et al. School-based randomized controlled trial of a physical activity intervention among adolescents. J Adolesc Health 2007;40:258-265.

19. Frenn M, Malin S, Brown RL, et al. Changing the tide: An Internet/video exercise and low-fat diet intervention with middle-school students. App Nurs Res 2005;18(1):13-21.
20. Patrick K, Calfas KJ, Norman GJ, et al. Randomized controlled trial of a primary care and home-based intervention for physical activity and nutrition behaviors: PACE+ for adolescents. Arch Pediatr Adolesc Med 2006;160(2):128-136.
21. Bandura A. Social Foundations of Thought and Action: A Social Cognitive Theory. Englewood Cliffs, N.J: Prentice-Hall, 1986.
22. Le Masurier GC, Lee SM, Tudor-Locke C. Motion sensor accuracy under controlled and free-living conditions. Med Sci Sports Exerc 2004;36(5):905-910.
23. Schneider PL, Crouter SE, Lukajic O, et al. Accuracy and reliability of 10 pedometers for measuring steps over a 400-m walk. Med Sci Sports Exerc 2003;35(10):1779-1784.
24. Crouter SE, Schneider PL, Karabulut M, et al. Validity of 10 electronic pedometers for measuring steps, distance, and energy cost. Med Sci Sports Exerc 2003;35(8):1455-1460.
25. NSW Centre for Obesity & Overweight. NSW Schools Physical Activity and Nutrition Survey (SPANS) 2004: Short Report. Sydney: NSW Department of Health; 2006.
26. Sallis JF, Patrick K. Physical activity guidelines for adolescents: Consensus statement. Pediatr Exerc Sci 1994;6(4):302-314.
27. Duncan SJ, Schofield G, Duncan EK. Step count recommendations for children based on body fat. Prev Med 2006;44(1):42-44.

28. President's Council on Physical Fitness & Sports. The Presidential Active Lifestyle Award (PALA). Washington; 2002.
29. Tudor-Locke C, Pangrazi RP, Corbin CB, et al. BMI-referenced standards for recommended pedometer-determined steps/day in children. Prev Med 2004;38(6):857-864.
30. Kimm SY, Glynn NW, Kriska AM, et al. Decline in physical activity in black girls and white girls during adolescence. N Engl J Med 2002;347(10):709-715.
31. Ozdoba RS, Corbin CB, LeMasurier GC. Does reactivity exist in children when measuring activity levels with unsealed pedometers? Pediatr Exerc Sci 2004 2004;16(2):158-166.
32. Kubik MY, Lytle LA, Story M. Schoolwide food practices are associated with body mass index in middle school students. Arch Pediatr Adolesc Med 2005;159(12):1111-1114.
33. Savige G, Mac Farlane A, Ball K, et al. Snacking behaviours of adolescents and their association with skipping meals. Int J Beh Nutr Phys Act 2007;4(36):doi:10.1186/1479-5868-1184-1136.
34. Nader PR, Sallis JF, Abramson IS, et al. Family-based cardiovascular risk reduction education among Mexican- and Anglo-Americans. Fam Commun Health 1992;15:57-74.
35. Norman GJ, Zabinski MF, Adams MA, et al. A review of eHealth interventions for physical activity and dietary behavior change. Am J Prev Med 2007;33(4):336-345.