

Technical Note

A Diabetic Adolescent Case Study: Use of a Website in Combination with an Exercise Program to Increase Physical Activity

DANIELLE H. BUCKLEY*, MICHAELA M. AINSWORTH*, NICOLE DEMILIA†, STEPHANIE TANZI†, FURONG XU‡, and LINDA S. LAMONT‡

Department of Kinesiology, University of Rhode Island, Kingston, RI, USA

‡Denotes professional author, †Denotes graduate student author, *Denotes undergraduate student author

ABSTRACT

International Journal of Exercise Science 5(3) : 296-300, 2012. The purpose of this study was to report on the efficacy of a web-based technology support to encourage physical activity in children. This program was designed to promote physical activity and proper nutrition in the diabetic adolescent with a weekly meeting that consisted of a 30-minute educational session followed by 60-minutes of exercise. A specifically designed website was used as a support to this weekly supervised exercise program. Outcomes assessment included body mass index (BMI), muscle strength (grip strength, back and leg strength), flexibility, exercise self-efficacy, and physical activity participation (pedometer, LEAP II Survey). Improvements occurred in steps walked per day and exercise self-efficacy indicating that a once a week formal exercise, when combined with a technology support, is useful in increasing physical activity behavior.

KEY WORDS: Website for activity promotion, technology support for adolescents, physical activity

INTRODUCTION

School based exercise interventions have been shown to increase physical activity and fitness (3, 4). Fitness-oriented physical education when compared to a standard physical education format can increase cardiovascular function, improve fasting insulin, and reduce body fat in overweight children (1). There is limited research on the best way to promote physical activity in the diabetic child outside of a school setting.

Face-to-face counseling is an effective delivery method but it is very time consuming (9, 10). An alternative strategy is to have participants interact with a website (9, 10). Internet interventions can mimic face-to-face counseling by offering advice and social support and allowing the child to communicate with other participants and professionals (6, 10). The internet allows for 24 hr access and convenience (6, 8).

Table 1. Education topics for the 12 week program

Weeks	Education topic	Weeks	Education topic
1	Introduction	7	Nutritionist
2	Demographics/RPE	8	Exercise, intensity & calories
3	Certified diabetes educator	9	Nutrition labels
4	Website	10	Exercise, safety & myths
5	Body Image	11	At home exercise program
6	Nutritionist	12	Feedback on program

Internet support for goal setting as well as personalized feedback and coaching has previously been reported to overcome exercise obstacles in a group of sedentary adults with type 2 diabetes. These adults received and posted messages to an online coach and were invited to participate in peer group support and derived a significantly greater benefit to their 8 week exercise participation (8). Internet based self-management for physical activity has the potential to enhance diabetes care but studies on children are limited. The purpose of this study was to design a website and pilot its use for encouraging physical activity in children. We hypothesized that a weekly education-exercise program, when combined with a website support would increase physical activity behavior.

METHODS

Technology support

The website was designed to provide information for parents and children about general diabetes care as well as the benefits of and recommendations for regular physical activity.

The website is available to the general public at the internet Uniform Resource Identifier (URL) of:

www.uri.edu/hss/physical_education/livin_fit/aboutus.html. The web site has a side-bar section for: exercise, diabetes, exercise benefits, and an exercise guide section. In addition there is a side-bar for a calendar and resources in the community. Lastly the site allows for a “forum section” to foster dialogue among participants and a “my account section” to record and tabulate each individual participant’s exercise data such as pedometer output and exercise frequency and hours of engagement. The software program that was used to design this site is: Adobe Dreamweaver® CS4, the web design software. Interaction among participants and exercise staff was made available through a Sakai interface (Sakai 2.7 CLE). The website can be used as a template for future researchers who wish to design an online component that meets their own specific needs in promoting physical activity in adolescents.

Exercise Protocol

A 12 week exercise-education program met once a week for 90 minutes with 30 minutes devoted to education (Table 1) and 60 minutes to physical activity (Table 2). The website that was designed as a technology support for this program was used to motivate physical activity during the remainder of the week.

A DIABETIC ADOLESCENT CASE STUDY

Table 2. Physical Activity for the 12 week program

Weeks	Physical Activity	Weeks	Physical Activity
1	Yoga	7	Stability ball exercises
2	Kickboxing	8	Aerobics
3	Stability ball exercises	9	Resistance/aerobic circuit
4	Aerobics	10	Kickboxing
5	Resistance/aerobic circuit	11	Stability ball exercises
6	Kickboxing	12	Dance Revolution

In addition to the website, equipment such as stability balls, free weights, and exercise videos were given to aid in home exercise. Finally, goals were set each week to further motivate physical activity. Examples of the goals included walking 10,000 steps a day and exercising an additional 3 days during the week. This project has received IRB (Institutional Review Board) approval (HU0910-063M) from the University of Rhode Island Compliance office.

A Case Study

A 14-year old girl (wt = 60.5 kg, ht = 165.7 cm, BMI = 22.0 kg/m²) diagnosed with Type 1 diabetes at the age of two was used as a case study report. She was born in Russia and moved to Los Angeles, California at 5 years. She became physically active at a young age by dancing ballet and hip hop as well as playing soccer. At the beginning of the study the participant injected basal insulin, 1 unit per 10 carbohydrates. Injections were twice a day using Lantise (long acting) and Humalog (short acting). When performing physical activity such as gymnastics, the participant adjusted the insulin accordingly to avoid low blood glucose (insulin was taken 1 - 2 hrs before). During week 10 of the study the participant obtained an insulin pump that contained Novalog insulin only. With the pump the participant was taking 0.003 units of Novalog every 5- min.

The subject grew over this 3 month period and became taller (165.7 cm to 166.4 cm) and her BMI changed from 21.96 kg/m² to 23.76 kg/m² but remained in the normal range. The first week the subject walked 4,036 steps/day and by the 8th week increased to 9,893 steps/ day as recorded with a pedometer. A self-efficacy questionnaire (Exercise: Self-Efficacy) showed improvements from pre to post in confidence to exercise (5). The LEAP II Survey showed the participant improved in questions relating to performing physical activity during free time (9). In addition the questionnaire determined that she had more fun participating in activity, knew more children who enjoyed physical activity, and identified more children to exercise with.

DISCUSSION

This report indicates that a supervised one day a week exercise-education program could be successfully combined with a web based support to increase physical activity for the diabetic child. There were improvements in the number of steps walked per day and this may be attributed to an increased self-efficacy to exercise (evaluated with questionnaire). This gain in confidence to perform physical activities led to an increase in the steps walked during unsupervised times of the week.

There are a growing number of researchers using interactive technology for activity promotion and behavior change; but studies in children and adolescents are lacking. A review of the studies that incorporated an internet based strategy found few that were successful in changing physical activity behaviors (7). A 16-week study that targeted behaviors related to weight loss and body image reported improvements but found no change in physical activity among 12-18 year olds (2). Thompson and colleagues reported that an internet-based dietary and physical activity intervention for African-American girls allowed for significantly improvements in dietary and physical activity behaviors (11). However, this study had a lack of a control group which was problematic.

Despite the limitations in the number of studies and the design flaws of the available research, an internet-based technology support appears to offer a promising approach for behavior change related to physical activity in children. These studies provide insight into the current research gaps and they inform a future direction for the use of the internet as a support for exercise interventions in young people. Our case study indicates that a website can be incorporated into an intervention program to enhance behavior change. It is clear that more research on the efficacy of an internet-based technology support for children is needed. Future research on the level of sustainability of the intervention should also be considered. Of course, the most important component – the website, should be tailored to the target population. Our website was an ongoing production and we received feedback

throughout the study to alter the site design.

In summary, future researchers may wish to include a child-based website as an aid to activity promotion and this one may serve as a template. It allows for multiple subjects to communicate with each other and the researchers by using a Forum section. It is also has a useful tool to upload the hours engaged in physical activity and pedometer steps onto the website in order to monitor progress (in the My Account section). Direct data entry is helpful for subject compliance and allows supervisors to track progress. A web site such as this could also post weekly challenges for all participants to see. Comments on this site can be directed to Fun2bfit@etal.uri.edu.

ACKNOWLEDGEMENTS

This project was funded by a competitive grant from the Undergraduate Research Initiative, the Division of Research and Economic Development, the University of Rhode Island, 02881.

REFERENCES

1. Carrel AL, Clark R, Peterson SE, Nemth BA, Sullivan J, Allen DB. Improvement of fitness, body composition, and insulin sensitivity in over-weight children in a school-based exercise program. *Arch Pediatr Adolesc Med* 159: 963-968, 2005.
2. Celio AA. Early intervention of eating- and weight-related problems via the internet in overweight adolescents: A randomized controlled trial. Unpublished doctoral dissertation, the U of California, San Diego and San Diego State University, San Diego, CA, 2005.
3. Horne PJ, Hardman CA, Lowe CF, Rowlands AV. Increasing children's physical activity: a peer

A DIABETIC ADOLESCENT CASE STUDY

modeling, rewards and pedometer-based intervention. *Eur J Clin Nutr* 63: 191-198, 2009.

4. Kriemler S, Zahner L, Schindler C, Meyer U, Hartmann T, Hebestreit H, Brunner- La Rocca HP, Mechelen WV, Puder JJ. Effect of school based physical activity program (KISS) on fitness and adiposity in primary schoolchildren: cluster randomized control trial. *Br Med J* 340: 785-793, 2010.

5. Kroll T, Kehn M, Ho, P, Groah S. The SCI Exercise Self-Efficacy (ESES): development and psychometric properties. *Int J Behav Nutr Phys Act* 4: 34-40, 2007.

6. Liebreich T, Plotnikoff RC, Courneya KS, Boulé N. Diabetes NetPlay: A physical activity website and linked email counseling randomized intervention for individuals with type 2 diabetes. *Int J Behav Nutr Phys Act* 6: 18-33, 2009.

7. Nguyen B, Kornman KP, Baur LA. A review of electronic interventions for prevention and treatment of overweight and obesity in young people. *Obes Rev* 12(5): 298-314, 2011.

8. McKay HG, King D, Eakin EG, Seeley JR, Glasgow RE. The diabetes network internet based physical activity intervention. *Diabetes Care* 24(8): 1328-1334, 2001.

9. Saunders RP, Ward D, Felton GM, Dowda M, Pate RR. Examining the link between program implementation and behavior outcomes in the lifestyle education for activity program (LEAP). *Eval Program Plann* 29(4): 352-364, 2006.

10. Spittaels H, De Bourdeaudhuij I. Who participates in a computer-tailored physical activity program delivered through the internet? A comparison of participants' and nonparticipants' characteristics. *Int J Behav Nutr Phys Act* 4: 39-49, 2007.

11. Thompson D, Baranowski T, Cullen K, Watson K, Liu Y, Canada A, Bhatt R, Zakeri I. Food, fun, and fitness internet program for girls: pilot evaluation of an e-health youth obesity prevention program examining predictors of obesity. *Prev Med* 47: 494-497, 2008.