

Lessons Learned from a Community Based Lifestyle Intervention for Youth at Risk for Type 2 Diabetes

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Abstract

Purpose: This pilot study examined the feasibility and acceptability of a peer led diabetes prevention intervention for youth in an underserved community.

Methods: Children and adolescents randomized to the intervention group participated in a one year program which included peer support, physical activity, and family nutrition, and behavior modification sessions. Participants were asked about their satisfaction with the study and possible benefits, what they learned, and whether they would recommend participation to a friend. Youth randomized to the control group received monthly healthy lifestyle educational materials through the mail.

Results: Children and adolescents (n=67) with an average age of 12.5 years and BMI greater than or equal to 85 percentile for age and sex were enrolled in the study. The average monthly participation rate varied between 90 and 50 percent with a mean rate of 82 percent. Ninety four percent of parents reported being very satisfied with the program and all (100%) reported they would recommend the program to a friend. All the children and adolescents (100%) reported that they enjoyed working with the youth peer coaches and 94% felt their assigned coach was a good role model. The observed changes in BMI z-score trended towards improvement in the intervention group, but this study was underpowered to detect differences between groups.

Conclusion: The peer led diabetes prevention program was feasible and acceptable and demonstrated potential for improving health behaviors.

Keywords: Type 2 diabetes; Obesity; Adolescents; Children; Youth; Prevention

Introduction

It is now estimated that nearly one out of every six overweight youth has pre-diabetes [1,2]. The burden of diabetes falls disproportionately on ethnic minority youth, particularly Native Americans, Hispanic/Latino Americans, and African Americans [3-5]. For example, nearly 50% of African-American children born in the United States in 2000 are expected to develop diabetes in their lifetime [6]. These alarming figures, combined with the increase in ethnic minorities in the United States, will result in enormous personal, societal, and economic costs for many decades. Strategies to address this problem are needed immediately because prevention of diabetes is far preferable to treatment.

Several large-scale randomized clinical trials have established that lifestyle modification can prevent or delay the onset of type 2 diabetes mellitus (T2DM) in high-risk adults who have impaired glucose tolerance commonly referred to as pre-diabetes [7,8]. Some studies have shown that moderate-intensity physical activity, such as one hour per day of games such as musical chairs, freeze tag, dodge ball, or floor hockey, combined with nutrition education that advocates an increase in fruits, vegetables, whole-grain cereal, low-fat dairy products and elimination of sweetened beverages, is effective in reducing diabetes risk in children and adults [9,10]. Unfortunately, many families from underserved communities have limited access to healthy foods, parks, and recreational areas which makes maintaining a healthy lifestyle challenging [11-13]. Culturally grounded interventions that assist families in developing healthy habits utilizing their limited resources should be developed in order to help children sustain these behaviors throughout their lifetime.

Our intervention follows the principles of community based participatory research by offering classes at local neighborhood

community centers, thus maximizing greater access for high risk youth and their parents within the community. More importantly, volunteer youths and parents of the community assisted with the design of the program and the development of age appropriate methods of helping youth make and sustain behavior change.

This paper reports on the educational and peer support intervention implemented during this study. It describes the organization, administration, and content of the education program, the adherence and rate of participation of the subjects, evaluation of the program and the effects of a diabetes prevention program on certain physical fitness variables in children.

Methods

Sample

This pilot study examined the feasibility of a community based, peer support diabetes prevention program for overweight/obese African American and Latino American youth. The study was conducted on the south side of Madison, WI which is an ethnically diverse community with 20% whites, 33% African Americans, 35% Hispanic/Latino Americans, 10% Asian Americans, and 2% American Indians and

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or Alaska Natives [12]. The study was approved by the University of Wisconsin Institutional Review Board and participants and a parent or legal guardian provided written informed consent prior to any study procedure.

The recruitment period was from March 2010 until October 2010. Diabetes screenings were conducted at several neighborhood community centers, recreational sites, and churches in south Madison for parents of children between the ages of 10-16 years. During these neighborhood gatherings, researchers distributed diabetes risk assessment surveys to parents. Parents who reported their child as having 2 or more risk factors for T2DM on the survey: overweight (body mass index \geq 85 percentile for age and sex); family history of type 2 diabetes in 1st or 2nd degree relative; high risk ethnic group; signs of insulin resistance (acanthosis nigricans, hypertension, polycystic ovarian syndrome, or conditions associated with insulin resistance) [14] were invited to have their child screened for diabetes.

Measures

The community screenings were staffed by two certified medical interpreters and three Certified Diabetes Educators (CDEs), one of whom was bilingual/bicultural. All materials were developed in English and Spanish. A nurse CDE, dietitian CDE, and pharmacist CDE obtained blood pressure, height, and body weight after obtaining written informed consent/assent from parents/children.

The child's weight and height was measured with the child in a standing position, wearing light clothing, and without shoes. The child's weight was measured using a digital electronic scale (Conair Body Analysis Weight Tracker Scale Model CON WW89T), and height was measured using a portable stadiometer. BMI was calculated as weight (in kilograms) divided by height (in meters) squared. The BP and pulse rate was obtained using an ambulatory blood pressure (BP) monitor, an automatic device that uses an oscillometric technique [15]. The child's blood pressure and pulse was measured three times, one minute apart using the protocol recommended by the Task force Report (National High Blood Pressure Education Program Working Group on Hypertension Control in Children and Adolescents, 1996) [16].

Demographic information was obtained from the parents and children. Participants were also asked about their willingness to participate in a family centered diabetes prevention program. The family was given a ten dollar gift card for their participation at the completion of the screening process.

Youths who met the following criteria were invited to participate in the study: BMI \geq 85 percentile for age and sex; and no other medical condition that would preclude regular exercise. Youths were excluded for diabetes at baseline (evaluation fasting blood glucose $>$ 126 mg/dL or glycosylated hemoglobin $>$ 6.5), history of anti-diabetic medication use (oral agents or insulin) except during gestational diabetes, pregnancy, Cushing's syndrome, acromegaly, pheochromocytoma, and chronic pancreatitis. Youths were also excluded if the parent, caregiver, or child were unable or unwilling to provide informed consent, participate in the study, or communicate with the pertinent clinic staff in English or Spanish.

Intervention

The study was conducted at two neighborhood community centers: Boys & Girls Clubs of Dane County and the Catholic Multicultural Center. Youth were randomized to a control group or intervention group for the one-year intervention.

Control subjects and their parents received educational materials regarding healthy eating and physical activity by US mail each month of the study. Children, adolescents, and parents randomized to the intervention group participated in a comprehensive one-year diabetes prevention intervention that consisted of:

1. Peer support program led by volunteer youths who have diabetes or at risk for diabetes;
2. Physical activity classes which were held three times a week after school hours at the Boys & Girls Club and the Catholic Multicultural Center for youth; and
3. Monthly family night sessions which covered culturally appropriate management skills focused on healthy eating and physical activity.

Peer support

Children and adolescents who live in the same community and share similar experiences are uniquely poised to address issues related to behavioral change which involve problem-solving and goal-setting skills. Recognizing the difficulty in making lifestyle changes, seven adolescents between the ages of 12-16 years with prediabetes and two 13 year old youths with type 2 diabetes were selected to serve as peer coaches. All peer coaches resided in the community and were actively engaged in neighborhood based activities. The peer coaches were required to participate in three, four-hour training sessions to prepare for the position. These training sessions were taught by members of the research team. The training sessions provided an introduction of the study, the role of the peer coach, basics of risk factors associated with type 2 diabetes, benefits of physical activity and exercise, role play strategies, confidentiality, and support for peer coaches. The training session also focused on communication skills, including empathetic listening, how to help participants clarify their values and life goals, problem solving, and assertiveness. Teaching the skills necessary to support participants was emphasized, rather than having the peer coach try to assume the role of a health care provider.

Each subject was matched to a youth peer coach according to ethnicity, sex, and neighborhood. The youth peer coaches assisted children in addressing a broad range of factors, including identifying facilities in the community for physical activity, coping with peer pressure, and selection of appealing convenient foods in homes, restaurants, and schools.

Peer coaches contacted subjects by phone each week to provide support and help subjects face the challenges of leading a healthy lifestyle. Peer coaches also played a role in the curriculum by interacting with subjects during family night sessions and physical activity classes. The peer coaches were encouraged to model positive participation strategies and display high motivational levels during the family sessions and physical activity classes.

Physical activity sessions

The physical activity component of the curriculum was prepared by the YMCA and incorporated activities that were multi-dimensional and included movement activity, cognitive elements (such as heart rate assessment before, during and after the activities) and social skill development (such as cooperative or group work). The classes were taught by certified exercise instructors and were offered for children ages 8-16 years 3-4 times a week after school hours at the community center. Concurrent classes were offered for parents and siblings over the age of 12 as well. The exercise activities varied each day and included

intervals, dancing, walking, exercise videos, and modified sports resembling soccer, hockey, and volleyball. The modifications were made such that all participants were continually active. All families received a family membership to the YMCA so they could continue their physical activity practices outside of class. Homework assignments included involvement in physical activities at home, after school with friends or at the YMCA. Participants developed their own home exercise program and set their own goals. Participants also shared with others their secrets to enjoying and keeping up with some types of physical activity. Investigators and peer coaches worked closely with participants to address barriers such as physical, environmental, psychological and time limitations.

Family night sessions

A two hour nutrition education/behavior modification family class was presented to both the youth and their parents once a month over the twelve month intervention period. Spanish translation was provided by a certified medical interpreter. Family classes focused on the effects of food and physical activity on blood glucose and body weight. Emphasis was placed on healthy food choices, understanding portion sizes, minimizing sugar and fat consumption, and learning the best times to eat as a family. Parents and children were taught how to read food labels, measure foods for portion sizes, control fat, and count carbohydrates. Cultural, financial, and emotional barriers to healthy eating were addressed.

Hemoglobin A1C, fasting blood glucose, insulin, total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides were taken at baseline and week 52 of the study at the University of Wisconsin Hospital Clinics. Blood pressure, waist circumference, and BMI were also measured at baseline and month 12.

Evaluation of Recruitment, Adherence, and Program Acceptability

Randomization was assessed by comparing baseline variables between the two study arms. Recruitment was evaluated by comparing the sample sizes of individuals: screened for the study; passing the screening criteria; at baseline; agreeing to be randomized; and enrolling in the study. Percent retention was measured by subtracting the number of individuals in each arm of the study returning for testing at the end of the intervention period from the total number enrolled in the study and dividing by total enrollment. The mean participation rate was measured by dividing the maximum number of sessions by the actual number of sessions of subjects randomized to the intervention, (actual number of visits)/ (maximum number of visits) X 100, throughout the program. A participant was considered adherent to the intervention if he or she attended 60% or more of the required physical activity and family night sessions.

To test feasibility and acceptability we noted the number of participants completing the study and conducted open-ended interviews at the end of the last data collection visit in order to access participants' acceptance of the program. The discussions lasted 15-30 minutes and focused on seeking participants' experiences of the intervention. The interview was led by a member of the study team who was not a teacher in the healthy lifestyle management sessions to encourage honest feedback. The participants were encouraged to share their experience in the program in the following areas: (a) positive aspects/benefits of the program; (b) negative aspects of/problems with the program; (c) suggestions for the future (what about the program should change or stay the same?); and (d) whether they would recommend the program to a friend. The interviews were audio recorded and transcribed.

Participants who dropped out or withdrew from the program were also contacted and interviewed by phone or home visit to determine (a) their reasons for leaving the study, (b) likes and dislikes about the intervention, and (c) suggestions for improving the intervention. The data from the interviews and phone/home interviews were used to assess the acceptability and sustainability of the program (Table 2 and 3).

Analysis

Differences between the intervention group and the control group were assessed using a two-sample t-test using robust standard errors to account for clustering within families. Similar analyses were performed for changes in BMI z-score from baseline to 52 weeks (the end of the intervention) and for other secondary outcomes at both follow-up time points. A nominal two-sided p-value of 0.05 was regarded as statistically significant. Analyses were conducted based on the intention-to-treat principle, e.g. participants were analyzed based on assigned group regardless of fidelity to the assigned intervention. All analyses were conducted using SAS (SAS Institute Inc, Cary NC).

Results

We screened a total of 106 parents at health fairs and neighborhood events (Figure 1). A total of 67 adolescents between the ages of 10 to 16 years who met the eligibility criteria were randomized and enrolled in the study. The mean age of the adolescents was 12 ± 2.6 years old and they were predominantly female (≥ 60%). Participants ethnicity represented 81% (n=54) Hispanic, 19% non-Hispanic (n=13). Race was reported to be 25% African American (n=17), 12% Native American (n=8), 12% multicultural (n=8), 4% white (n=3), with the remaining 47% providing no response. Eighty four percent of the adolescents were obese and 16% overweight. There were no significant differences in baseline characteristics of the children randomized to the intervention and control group (Table 1).

At baseline, 62% of parents reported family annual earnings less than \$30,000 per year, 15% reported between \$ 30,000- \$50,000 per year, 4% reported between \$50,000-\$70,000 per year, and 19% provided no response. Sixty seven percent of parents completed high school or less, 22% completed some college or technical school, 5% reported having a college degree and 6% provided no response to the question.

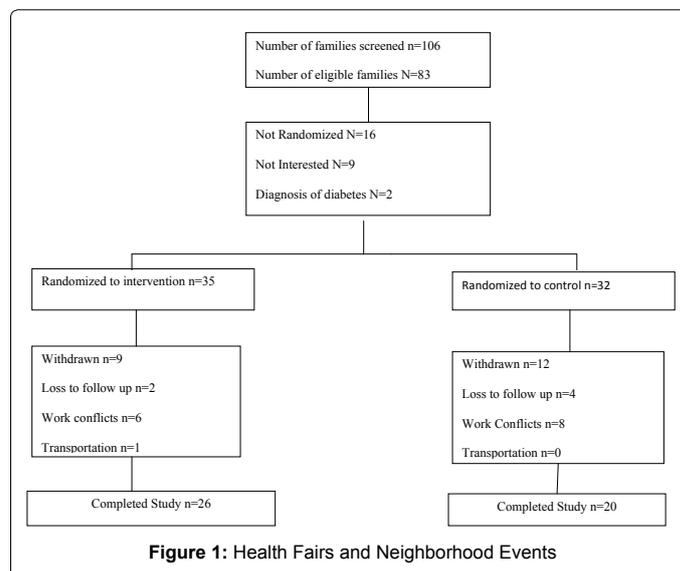


Figure 1: Health Fairs and Neighborhood Events

Baseline Characteristics	Control	Intervention	P value
Participants (n)	32	35	
Female (n)	21 (66%)	22 (63%)	0.817
Age (years)	12.1 ± 2.6	12.6 ± 2.4	0.473
Race			
White	2(6.2%)	1(3.0%)	-
African American	10 (31.3%)	7 (20.2%)	-
American Indian	4 (12.5%)	4 (11.4%)	-
More than one race	4 (12.5%)	4 (11.4%)	-
No response	12(37.5%)	19(54%)	
Ethnicity			
Hispanic	27 (84%)	27 (77%)	-
Non-Hispanic	5 (16%)	8 (23%)	-
BMI (kg/m ²)	30.2 ± 4.7	29.2 ± 4.8	0.387
Waist circumference (inches)	38.0 ± 5.1	37.2 ± 3.5	0.498
Triglycerides (mg/dL)	111.6 (92.4-130.7)	118.3 (99.0-137.6)	0.629
Total cholesterol (mg/dL)	153.2 (143.1-163.4)	145.5 (136.7-154.4)	0.269
HDL (mg/dL)	44.3 (41.0-47.5)	40.9 (37.7-44.1)	0.149
LDL (mg/dL)	86.5 (78.4-94.6)	80.9 (73.8-88.0)	0.307
Fasting glucose (mg/dL)	90.1 (87.1-91.5)	89.3 (87.1-91.5)	0.618
Fasting insulin (µU/ml)	24.0 (18.6-29.4)	20.6 (16.7-24.5)	0.324
Hemoglobin A1C	5.6%	5.6%	0.796

Table 1: Baseline characteristics

Subjects' rating of experience	N=33
1. The program content met my needs	
Positive	31 (94%)
Neutral	2 (6%)
Negative	0 (0%)
2. The Length of the was adequate	
Positive	31 (94%)
Neutral	2 (6%)
Negative	0 (0%)
3. I would recommend the program to a friend	
Positive	33 (100%)
Neutral	0(0%)
Negative	0 (0%)
4. I learned a lot about ways to lead a healthy lifestyle	
Positive	31 (94%)
Neutral	2(6%)
Negative	0 (0%)
5. My participation in this program influenced me to lead a healthier lifestyle	
Positive	31 (94%)
Neutral	2 (6%)
Negative	0 (0%)

Table 2: Outcomes & Acceptability of Study to Parents in Intervention Group

Adherence and participation

The mean participation rate of subjects randomized to the intervention, throughout the program was 82 per cent. The average monthly participation rate varied between 90 and 50 per cent. It tended to decrease during the first part of the study and leveled off at the very end. Of 67 subjects enrolled, 46 completed the study and 21 withdrew. Fourteen subjects discontinued the program because of parental scheduling conflicts with work or other family obligations that prevented regular attendance to the sessions. Two subjects relocated to a different neighborhood, one subject discontinued in order participate in a tutoring program, and three subjects relocated to Mexico. One family reported difficulty traveling to the facility.

No significant anthropometric or metabolic differences were

observed between families who completed the program and families who discontinued the program. All subsequent analyses are performed on the 46 participants who completed the intervention.

Subject's Evaluation of the Program

Thirty three families who were randomized to the intervention group were available to evaluate the acceptability of the program at the end of the study. Ninety four percent of parents (n=31) reported that the program met their needs and all (n=33) the parents indicated that they would recommend the program to a friend (Table 2). During the exit interview, all of the parents 100% (n=33) indicated that they enjoyed interacting with other families during the family night sessions. Several mothers stated that they learned about the resources available to them in their community during the family night sessions. All of the

Subjects' Rating of Experience	N=33
1. I enjoyed working with my peer coach	
Positive	31 (94%)
Neutral	2 (6%)
Negative	0 (0%)
2. My peer coach set a good example for me to follow	
Positive	31 (94%)
Neutral	2 (6%)
Negative	0 (0%)
3. I would like to have a peer coach again	
Positive	33 (100%)
Neutral	0(0%)
Negative	0 (0%)
4. I learned a lot about ways to eat healthy	
Positive	31 (100%)
Neutral	0(0%)
Negative	0 (0%)
5. I plan to eat more fruits and veggies and be more active	
Positive	28 (85%)
Neutral	5 (15%)
Negative	0 (0%)
6. How many days per week did you interact with your peer coach?	
None	0
One	0
Two	2
Three	15
Four	15
Five or more	1

Table 3: Acceptability of peer support program

Measure	Intervention n=26 Mean Change From Baseline at week 52	Control n=20 Mean Change From Baseline at week 52	P Value
BMI z score	-0.09 ± 0.16	-0.06 ± 0.23	0.35
Waist circumference (inches)	-0.70 ± 3.04	1.61 ± 1.36	0.16
Hemoglobin A1C	-0.3 ± 0.04	0.17 ± 0.09	0.27
Fasting glucose (mg/dL)	1.80 ± 5.92	-0.05 ± 5.79	0.28
Fasting insulin (µU/ml)	-1.0 ± 14.9	2.05 ± 8.93	0.44
Total Cholesterol (mg/dL)	-4.46 ± 12.98	-5.96 ± 20.34	0.42
Triglycerides (mg/dL)	-21.71 ± 45.25	-11.19 ± 45.69	0.25
LDL (mg/dL)	-2.19 ± 13.65	-0.14 ± 18.10	0.33
HDL (mg/dL)	0.12 ± 5.87	1.0 ± 5.47	0.31

Table 4: Anthropometric Data at Baseline

parents (100%) felt the youth peer support program was very beneficial and nine parents recommended that the investigators consider starting a similar program for parents.

Eighty eight percent of African American youth (n=15) in our study were from single parent households where the mother was the primary care giver. All of the African American parents reported being very satisfied with the program, but 82% identified employment responsibilities as reasons for low participation in the program (n=14). Four of the mothers recommended offering the education classes online.

Youth reported spending 3.4 mean hours per week with their peer coach. Ninety four percent of the adolescents (n=31) indicated that the youth peer coaches were positive role models and felt the coaches motivated them to attend the sessions (Table 3). All the children and adolescents reported that they would like to work with a peer coach in the future. Thirty nine percent of the (n=12) adolescents informed the

interviewer that they felt more comfortable exercising with their peers in the program versus at school where they were frequently bullied or teased about their weight.

Descriptive and anthropometric data at baseline and following the 52 week intervention are presented in Table 4. Overall, the intervention group had more clinically favorable outcomes compared to the control group; however these differences were not statistically significant. In the intent-to-treat analysis, there was no significant differences in BMI z score found between the intervention (n=26) and control groups (n=20). The intervention group had a modest reduction in waist circumference compared to the control group whose waist circumference increased however; this difference was not statistically significant.

Discussion

This article describes a community-based participatory approach for developing and testing the feasibility and acceptability of a peer coach intervention designed for youth at risk for diabetes. Many

overweight and children and adolescents experience stress due to poor body image, low self-esteem, feelings of shame and embarrassment and other feelings of social isolation [17,18] Sharing their experiences with other children who have faced similar circumstances can lead to understanding, empathy, and mutual support. Peer support among individuals with the same chronic health problem is a powerful intervention because it combines the benefits of receiving and giving social support [19-22].

Peer support interventions that are incorporated into structured educational programs have been found to help reduce problematic health behaviors, depression, and in several randomized controlled trials, have contributed to improved diabetes management, including improved behaviors related to diet and exercise in adults [19,20]. This pilot study, with a relatively limited number of subjects (67), yielded similar findings. Eighty five percent of children and adolescents (n=28) stated that they were eating more fruits and vegetables as a result of their participation in the program. 94% of youth enjoyed working with a peer coach and reported that their peers set a good example to follow (Table 3).

We offered the physical activity classes and family night sessions weekday evenings and occasionally on weekends in an attempt to accommodate the schedules of parents and children. However, over half of children and adolescents enrolled in our study were from single parent households where the parent reported working more than one job to care for the family. This attributed to the 31% attrition (n=21) which was comparable with (and lower than) that reported in similar obesity programs targeting predominately ethnic minorities of relatively low socioeconomic status [22,23]. Sixty seven percent of the parents who withdrew from the program reported employment responsibilities as the primary reason. However, 94% of all parents assigned to the intervention reported that they enjoyed the program and would recommend it to a friend. Most (94%) of the parents in the intervention arm also indicated that they learned a lot about leading a healthy lifestyle during the study and planned to modify their habits as a result of their participation in the program.

Translating a peer support program for parents in the community may increase retention because peer health promoters could meet with parents at times that were mutually convenient. Also parents who live in the same community and share similar experiences are uniquely poised to address issues related to behavioral change which involve problem-solving and goal-setting skills. Peer health promoters could assist parents in addressing a broad range of factors, including identifying facilities in the community for physical activity, improving communication with school professionals, goal setting, and providing encouragement to other family members [23-27].

Although the UNITY study has several strengths, there are limitations that are worthy of comment. Our relatively small sample size limited the power to detect smaller effect sizes, as well as limiting the generalizability of our findings. However, these limitations are overshadowed by its strengths which includes the focus on high-risk children and adolescents, a culturally grounded intervention developed in collaboration with the community for delivery in the community, and the inclusion of robust measures of type 2 diabetes risk.

Conclusion

Our results suggest that a culturally grounded community based peer led lifestyle intervention can reduce risk factors for diabetes among obese children and adolescents. Translational approaches that

include community collaboration and family involvement to improve individual health outcomes among high risk youth should be tested in various populations.

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