

Effect of the Bienestar Health Program on Physical Fitness in Low-Income Mexican American Children

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Once considered an adult onset disease, type 2 diabetes is increasingly being diagnosed in low-income Mexican American children. Studies have suggested that most of those so diagnosed were overweight, reported low levels of physical activity, and were generally unaware of their disease. The Bienestar Health Program was designed to reduce risk factors associated with the onset of type 2 diabetes. A major focus of the curriculum is health and physical education. A comparison of intervention and control group students resulted in a significant difference in physical fitness change scores ($p < .003$) after an 8-month intervention. This study suggests that it is possible to improve the physical fitness of low-income Mexican American preadolescent children through a comprehensive school-based health program.

Keywords: *diabetes; physical fitness; obesity; health promotion*

Recent studies report an increasing number of low-income Mexican American children diagnosed with type 2 diabetes (Glaser & Jones, 1998; Hale & Danney, 1998; Neufel, Raffel, Landon, Chen, & Vadheim, 1998; Treviño, Hale, Hernandez, & Yin, 2001). Type 2 diabetes was once considered only an adult onset disease (Glaser & Jones, 1998; Neufel et al., 1998).

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In San Antonio, Texas, however, of all diabetic youth seen in a pediatric endocrinology clinic, 18% were identified as having type 2 diabetes (Hale & Danney, 1998). A recent school-based study reported that of 987 low-income fourth-grade students, 4.6% had abnormal fasting capillary glucose levels (≥ 110 mg/dl) (Treviño et al., 2001). Common findings in these diabetic youth were that most were Mexican American, most were overweight, most were unaware of their disease, and all came from low-income households.

Several studies have reported low levels of physical activity in low-income Mexican American children (Hansen & Bodkin, 1993; Long et al., 1994; O'Sullivan, 1982; Treviño et al., 1998). McKenzie, Nader, Broyles, and Nelson (1992) observed the physical activity of 4-year-old, low-income Mexican American and middle-income non-Hispanic White children at home and at school during recess. They reported that at home, Mexican American children spent significantly more time lying down and being indoors, whereas non-Hispanic White children spent significantly more time walking, being active, and engaging in moderate to vigorous physical activity. Mexican American children also tended to spend more time watching television. At school, Mexican American children spent significantly less time walking and engaging in moderate to vigorous physical activity and more time sitting than non-Hispanic White children. The researchers reported a strong correlation between level of income and "active toys" (e.g., riding, climbing, or active manipulative toys). Lower income Mexican American children had less access to active toys than non-Hispanic White children did, both at home and at school.

The correlation between level of income and physical activity was also reported in a study with Mexican children (Hernandez et al., 1999). Mexican children aged 9 to 16 years from low and middle-income households completed a self-administered questionnaire to assess the hours a day spent in physical activity and TV viewing. The percentage of mothers with a college degree was 4% in the low-income and 68% in the middle-income households. Children in the low-income group, when compared with their middle-income counterparts, spent significantly less time being involved in moderate to vigorous activities and more time viewing TV.

The four risk factors identified for diabetes are high fat diets (Field, Ryan, Thomson, & Clandinin, 1988; Grunfeld, Baird, & Kahn, 1981; Helmrich, Ragland, Leung, & Paffenbarger, 1991; Marshall, Hoag, Shetterly, & Hamman, 1994; Mayer, Newman, Quesenberry, & Selby, 1993), low fiber diets (Riccardi & Rivellese, 1991; Salmeron et al., 1997), low physical activity levels (Helmrich et al., 1991; Manson et al., 1991; Mayer-Davis et al., 1998), and overweight (Hansen & Bodkin, 1993; Long et al., 1994;

O'Sullivan, 1982; Wing, Venditti, Jakicic, Polley, & Lang, 1998). The Bienestar (*well-being*) health program (Treviño et al., 1998) was developed to respond to the reports of increasing numbers of low-income Mexican American children being diagnosed with type 2 diabetes (Glaser & Jones, 1998; Hale & Danney, 1998; Neufel et al., 1998). The program targets fourth-grade children attending low-income neighborhood schools and its goal is to modify risk factors associated with diabetes. The effect of the Bienestar on dietary fat and on dietary fiber has been presented elsewhere (Treviño, Marshall, Hernandez, & Ramirez, 2000; Treviño et al., 1998). This article presents the effect of the Bienestar on physical fitness of low-income Mexican American children after an 8-month intervention period.

Method

Participants

The target population for this study was 561 fourth-grade students enrolled in nine elementary schools located in low-income inner-city neighborhoods of the San Antonio Independent School District. The nine elementary schools were randomly assigned to either intervention (five schools) or control (four schools). The schools selected were in the same geographic region of the city and were the feeder schools to three middle schools and one high school. The intervention and control schools were well matched in demographic characteristics (see Table 1). According to school district information, 97% of students were Mexican American and more than 95% were in U.S. Department of Agriculture food assistance programs in these elementary schools. The students had an average age of 9.75 (range = 8 to 11). Census tracts included in the schools' attendance area have a mean household income of \$10,337 for the intervention and \$11,691 for the control schools. An average of 3.5 persons occupied each household. The mean household income and persons per household were much different from that reported for all households in the United States (\$33,952 household income and 2.8 persons per household; U.S. Census Bureau, 1990).

All fourth-grade students enrolled in the nine elementary schools were invited to participate in the study during the 1998-1999 school year. Of these, 495 (88%) returned parental (guardian) consents. Preintervention and postintervention testing was conducted at the beginning (August) and end (May) of the school year, respectively. The program was implemented over an eight month period. At the end of the study, complete data were collected (preintervention and postintervention) from 387 students (78%). Among stu-

Table 1. Demographic Characteristics of Students and Households by Census Tracts of Participating Elementary Schools

Characteristic	Values	
	Intervention	Control
Students		
<i>N</i>	200	189
Mean age	9.8	9.7
% female	55	51
% Mexican American	97	97
Census tract households		
Persons per household (mean)	3.5	3.6
Household income (median)	\$10,337	\$11,691
Income per capita (mean)	\$3,977	\$4,462
Families with no workers (%)	28.4	24.6
Education level of person age 18+ (%)		
< high school diploma	71.8	69.4
High school diploma	20.2	21.8
> high school diploma	8.0	8.8

dents with complete data, 200 students (93 boys and 107 girls) were in intervention schools and 187 students (93 boys and 94 girls) in control schools.

Program Description

The Bienestar Health Program is based on Social Cognitive Theory (SCT; Bandura, 1986). A basic tenet of SCT is the notion of “reciprocal determinism,” where personal factors (health beliefs and knowledge), social factors (home, classroom, after-school care, and school cafeteria), and behavior (dietary fat intake, dietary fiber intake, and physical activity) are interrelated and have dynamic influences on each other. The Bienestar was designed to influence each determinant to decrease dietary fat and increase dietary fiber consumption and to promote participation in moderate to vigorous physical activities. Program activities are bilingual and made up of coordinated and integrated components: a parent education and involvement program, a classroom health and physical education curriculum, a student after-school health club, and a school cafeteria program (see Table 2).

The Bienestar Parent Program includes four activities implemented throughout the school year. The first activity introduces Bienestar through a student dance act during which students present drawings of people exercising and “eating healthy” to inform and remind their parents of the increasing

Table 2. Objectives, Description, and Schedules of the Bienestar's Four Programs

Program	Objective	Description	Schedule
Bienestar parent fun activities (includes an instructor's manual and a parent's workbook)	Decrease dietary fat Increase dietary fiber Increase physical activity Increase diabetes knowledge	Four fun activities: students performing a dance act to introduce the Bienestar, a hands-on craft project to demonstrate how diabetes develops, a loteria (bingo) game to teach healthy dietary habits, and a salsa dancing class to demonstrate physical activity benefits	Activities are held on Saturday mornings between 10 a.m. and noon and weekdays between 5:30 p.m. and 6:30 p.m.
Bienestar health class (includes a teacher's physical & health education manual, a student's workbook, test, keys, transparencies, extensions, and other support material)	Decrease dietary fat Increase dietary fiber Increase physical activity Increase diabetes knowledge	The PE curriculum is aimed at promoting a variety of physical activities. The health education is aimed at increasing diabetes knowledge. It is based on thematic instruction and experiential and multicultural learning. The 16 lesson plans cover nutrition, physical activity, self-image, and diabetes.	Health classes are held 45 minutes a day, 5 days a week. One day is indoor health education and 4 days are outdoor physical activities. The Bienestar lesson plans are implemented once every 2 weeks and the physical activities are implemented 4 days of the week.

<p>Bienestar health club (includes instructor's manual and student's workbook)</p>	<p>Decrease dietary fat Increase dietary fiber Increase physical activity Increase diabetes knowledge</p>	<p>The 32 lesson plans are aimed at rehearsing and reinforcing classroom learning and promoting leisure time moderate to vigorous physical activity. Activities are learned by games, dancing, singing, art crafts, puppet shows, and plays.</p>	<p>The club meetings are held once a week after school from 3:00 p.m. to 4:00 p.m.</p>
<p>Bienestar school food service (includes an instructor's manual and a cafeteria staff workbook)</p>	<p>Decrease dietary fat Increase dietary fiber Increase diabetes knowledge</p>	<p>Six lesson plans designed to improve the nutrition knowledge of food service staff and to persuade students to choose and eat more fruits and vegetables and less fatty foods.</p>	<p>Classes are held during the first 12 weeks of school. Each lesson plan is 20 minutes, held between 8:30 a.m. and 8:50 a.m. during the staff break time.</p>

rates of diabetes in children and how exercise and healthy eating can help to prevent diabetes. Students are prepared and rehearse several times prior to the presentation to parents. The second activity is the Diabetes Demonstration Play. In this activity, parents play the role of glucose, insulin, fat cells, or muscle cells as indicated by a card hung around his or her neck. Standing and walking around the room, parents enact the flow of glucose in a normal (insulin sensitive) and in an abnormal (insulin resistant) state. At the end, parents are reminded that exercise and healthy eating are important to maintain a normal state. The third activity is the Mexican "Loteria" game. The Loteria game is like American bingo, but instead of numbers, it has pictures of people exercising and eating high fiber low fat foods, fruits, and vegetables. Prizes are awarded to the winners of each game. The fourth activity is a physical activity event that includes an evening of dancing at the school. In all four activities, the importance of exercise and healthy eating is emphasized. Bienestar staff help facilitate all activities in both English and Spanish.

The Bienestar Health and Physical Education Program is classroom based and is made up of 16 complete ready-to-use lessons with sections on physical activity, nutrition, wellness, and diabetes. Curriculum materials include a teacher's manual, children's workbook, transparencies, extensions for integrated thematic instruction, support materials, and test instruments with answer keys. The purpose of the curriculum is to develop knowledge and skills necessary to engage in moderate and vigorous physical activities and adopt healthy dietary behavior. Certified physical education teachers deliver the program.

The Bienestar Health Club involves after-school learning activities for students aimed at rehearsing and reinforcing the knowledge and skills learned through Bienestar classroom-based instruction and promoting leisure time moderate to vigorous physical activity. The club uses dance, physical activity, song, dramatic presentations, and puppet shows to present various topics. Parents are encouraged to attend and participate in this after-school activity. This curriculum is contained in 32 lesson plans with instructor's manual and student's workbook. San Antonio City Parks and Recreation department staff help deliver the after-school health club.

Parents and students who attend and participate in Bienestar health program activities receive "Bienestar coupons" denominated in dollar amounts as an incentive and reinforcement. Every 3 months, a *tiendita*, or little store, is held at each school. Participants can purchase merchandise (donated clothes, household appliances, school supplies, toys, and gift certificates) with their Bienestar coupons.

Assessment of Physical Fitness

Physical fitness was measured using a modified Harvard step test (Keen & Sloan, 1958). Physical fitness instead of physical activity was used in this study because recall questionnaires with children younger than 10 years of age have been shown to be less reliable and less valid than with older children (Sallis, Buono, Roby, Micale, & Nelson, 1993; Saris, 1986) and because short-term recall questionnaires may reveal seasonal instead of usual physical activity. In addition, whereas physical activity recall measures an individual's perception of frequency and intensity of activity, physical fitness assessment measures an individual's physiological response to a standardized exercise task. Finally, physical fitness has been shown to have a stronger correlation with cardiovascular risk factors than physical activity (Sallis, Patterson, Buono, & Nader, 1988).

Step test data were collected by a heart rate transmitter (Polar Vantage XL, Polar Electric Company, Port Washington, NY) attached to the child's lower chest and a monitor to the wrist. After obtaining baseline heart rate, the child was asked to step onto (both feet) and off a stool 30 cm high, 42 cm wide, and 38 cm deep for 5 minutes. Students were paced at 30 cycles per minute. Students whose heart rates reached 200 beats per minute, who had difficulty breathing, or who were unable to finish were stopped. Heart rate was recorded at 0, 1, and 2 minutes postexercise (after the child either completed the exercise or was stopped). A physical fitness score (PFS) was calculated by dividing the total time of exercise in seconds by the sum of three heart rate values (Keen & Sloan, 1958). A change score of PFS (post-PFS minus pre-PFS) was used to assess the effect of the Bienestar on physical fitness in intervention and control students. A positive change score indicates an increase in PFS.

Height, weight, gender, and age were collected for all participants. Height and weight were measured by a Detecto scale with the children in indoor clothing and barefooted. Body mass index (BMI) was calculated by dividing weight in kilograms by height in meters squared.

Data Analysis

A baseline check was conducted to assure equivalence of pre- PFS and BMI levels in students in the intervention and control conditions. Differences in PFS and BMI levels between students who only participated in preintervention testing and students who participated in both preintervention and postintervention testing were also assessed to determine the effect of attrition on study outcomes. A two-tailed, one-way Analysis of Variance

(ANOVA) was used for continuous outcome variables (BMI and PFS change score). Chi-square with correction for continuity was used to assess student gender and attrition status.

A two-way (Treatment Condition \times Gender) analysis of covariance (ANCOVA) was used to examine the Bienestar's effect on the change scores of physical fitness in intervention and control students with student's age and BMI as covariates. Type III sum of squares was used to adjust for unequal cell sizes. Statistical significance was set at $p < .05$.¹

Results

The baseline check for group equivalence found no difference in PFS and BMI levels between the intervention and control groups and no difference in PFS and BMI levels between program "completers" and "drop-outs." Chi-square revealed no association between gender and attrition. (The results are not presented.)

Table 3 displays means and standard deviations of the values used in this analysis across the study groups. Results of the two-way ANCOVA found that PFS change scores were significantly different between intervention and control students after adjusting for age and preintervention BMI, $F(1, 381) = 8.69, p < .003$. With adjustment for covariates, PFS increased significantly during the 8-month period in the intervention group (+2.9 points) and decreased slightly in the control group (-.2 point). There was no significant effect due to gender and interaction of treatment and gender.

Discussion

The Bienestar, a school-based diabetes prevention program aimed at fourth-grade Mexican American children attending schools located in low-income neighborhoods showed a positive effect on physical fitness scores when compared with their control counterparts after the 8-month intervention. This is an important indication of the potential of the Bienestar to affect the risk of juvenile onset type 2 diabetes, because of the reported low levels of physical activity in this population and the strong relationship between low physical activity levels and type 2 diabetes (Mason et al., 1992; Mason et al., 1991). Furthermore, high levels of physical activity have been shown to prevent diabetes in individuals with impaired fasting glucose (Knowler et al., 2002) and to improve glucose levels in diabetic individuals (Boulé, Haddad, Kenny, Wells, & Sigal, 2001). This demonstration suggests that increasing physical activity levels through a SCT-based program could potentially be an

Table 3. Means, Standard Deviations (SD), Marginal Means, and Standard Errors (SE) of Measures Across all Study Groups

Student Gender (<i>N</i>)	Boys (93)	Girls (94)	Boys (93)	Girls (107)
Treatment Condition	Control		Intervention	
Preintervention PFS				
Mean	74.70	71.75	72.84	69.13
SD	9.87	9.46	8.57	9.73
Postintervention PFS				
Mean	74.16	71.87	76.19	71.68
SD	12.06	9.24	10.44	11.53
Change in PFS				
Mean	-0.52	0.13	3.37	2.52
SE	1.08	1.08	1.08	1.01
BMI				
Mean	19.18	19.90	19.23	18.92
SD	4.14	5.42	4.78	4.87
Student's age				
Mean	9.81	9.70	9.80	9.75
SD	0.51	0.47	0.52	0.50

NOTE: PFS = physical fitness score.

a. Estimated marginal mean adjusted to student's age and BMI (standard error).

effective and inexpensive way to prevent diabetes in this at-risk population. The success of the Bienestar in increasing physical fitness in this study might be attributed to the development of positive beliefs related to physical activity in children and/or to increased social support (from parents, teachers, and after-school providers) to engage in risk-reduction activities.

These preliminary findings are encouraging because of the potential to reduce risk factors for type 2 diabetes in Mexican American children. To prevent diabetes, at-risk children need to engage in moderate to vigorous physical activity and adopt a healthy diet as lifetime habits.

The reported low levels of physical activity and the increasing number of cases of type 2 diabetes being reported in low-income Mexican American children is an urgent call to start implementing behavior modification programs in this high-risk population. To be maximally effective, programs should be culturally relevant and evidence based. The Bienestar is a bilingual, theory-based program that used an objective measure of physical fitness as an outcome. Although study participants are being tracked to assess the long-term effect of the intervention, Bienestar participants in this study,

when compared with their control counterparts, demonstrated better performance on a physical fitness test after the 8-month intervention.

Notes

1. We initially used mixed models to analyze the data. We were not able to construct meaningful models due to the small number of analysis units (N = 9).

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