LEAP Works! Outcomes of a Family-based Nutrition Education and Physical Activity Promotion Program

Michelle A. Monastra, Judith Bordin, and Cindy B.Wolff

California State University, Chico

Abstract

Overweight is an endemic public health concern for children, adolescents, and adults. Reducing the prevalence of childhood overweight is a national health objective and nine million U.S. children, currently classified as overweight, require effective nutrition education and physical activity promotion services. The intent of this study was to evaluate the effectiveness of a family-based nutrition education and physical activity promotion program, Lifelong Eating and Activity Patterns (LEAP), as an effective approach for the prevention and treatment of child overweight. The study design was an eight-week intervention and participant files were analyzed retrospectively to ascertain information for the study variables. The main outcome measures were changes in body mass index (BMI), percent body fat, fitness level, and eating and activity behaviors for child and parent participants. Qualitative data gathered from an exit survey for both children and parents were used to assess perceived benefits, value, and effectiveness of the program. Participants included 107 boys (n=48) and girls (n=59) ages 7-14, mean age 10.6 years, and their accompanying parents. The child participants were either "at risk for overweight" (3%) or "overweight" (97%). The results showed a significant decrease in BMI for both child and parent participants and percent body fat for child participants. There was a significant increase in reported fruit and vegetable consumption, regular physical activity, and in fitness parameters for both child and parent participants. The qualitative exit survey results indicated that the LEAP program resulted in significant improvements in knowledge, attitude, and behavior. In conclusion, this family-based nutrition education and physical activity promotion program was effective in decreasing BMI and body fat, increasing fitness level, and eliciting positive changes in eating and activity attitudes and behavior in both child and parent participants.

Keywords: child overweight, pediatric weight management, body mass index, family nutrition education

Introduction

Overweight is an endemic public health concern for all ages in the United States and worldwide. The Centers for Disease Control and Prevention (CDC) defines pediatric overweight as a sex-specific body mass index (BMI)-for-age at or above the 95th percentile and adult obesity as a BMI of 30-39.9 (CDC, 2004). Prevalence of pediatric overweight and adult obesity tripled in the United States between 1980 and 2000 (Daniels, Arnett, Eckel, Gidding, Hayman, Kumanyika, et al, 2005) and approximately 10% of children worldwide are classified as overweight (Lobstein, Baur, & Uauy, 2004). The most recent National Health and Nutrition Examination Survey (NHANES 1999-2002) indicated that the U.S. prevalence of overweight for children 6- to 19-years of age was 16% while 30% of adults 20-years of age and older were obese (Hedley, Ogden, Johnson, Carroll, Curtin, & Flegal, 2004). Together with the increased prevalence of childhood overweight in the past three decades there has been a concomitant increase in the extent by which 2- to 19-year-old boys and girls exceed the overweight threshold (95th percentile) (Joliffe, 2004). Not only are more children becoming overweight, they are heavier then ever before.

Overweight is associated with a greater risk for several chronic and debilitating conditions including metabolic syndrome, diabetes mellitus, hypertension and cardiovascular disease (Daniels et al., 2005; Steinberger & Daniels, 2003) as well as a decreased health-related quality of life (Williams, Wake, Hesketh, Maher, & Waters, 2005). Overweight children are more likely to become overweight or obese adults and the risk increases with age and extent of overweight (Freedman, Khan, Serdula, Dietz, Srinivasan, & Berenson, 2005; Gou, William, Cameron, Roche, 2002). Overweight children who remain overweight and obese in adulthood have more severe morbidities (Dietz & Robinson, 2005) and shorter life expectancies (Olshansky, Passaro, Hershow, Layden, Carnes, Brody, et al, 2005; Fontaine, Redden, Wang, Westfall, & Allison, 2003).

While the economic burden of childhood overweight is not clearly defined, it is estimated that over the past two decades the cost of hospitalization of overweight children due to weight related health problems such as asthma and diabetes, has increased three-fold from $35 million to $127 million (Wang & Dietz, 2002). In addition, health care costs for cardiovascular disease and diabetes, and total health care charges can be 84-88% higher for older men and women assessed as overweight or obese during young adulthood (Daviglus, Liu, Yan, Pirzada, Manheim, Manning, et al, 2004). Co-morbid conditions that result from overweight and obesity account for approximately one-third of total direct health costs in the U.S. (Kibbe & Offner, 2003). According to a recent U.S. Department of Health and Human Services (USHHS) news release (2005), childhood overweight has been recognized as a primary focus for public health officials with over four million dollars slated for prevention and treatment research this year.

Prevention and Treatment of Pediatric Overweight

Whereas reducing prevalence of childhood overweight is a major national health objective (USHHS, 2000) nine million U.S. children currently classified as overweight require effective nutrition education and fitness promotion services. While genetic predisposition is a factor in childhood overweight, it is widely accepted that genetic factors alone are not enough to explain the increased prevalence of overweight among children. Research on the association of genetic influences on overweight and obesity indicates that 30-50% of the variance in adiposity within a population is attributed to genetic differences (Birch & Fisher, 1998). Environmental factors that influence overweight have been identified as lack of physical activity and unhealthful eating patterns or a combination of these factors (CDC, 2005).

Reducing sedentary behavior, increasing activity and eating an appropriate number of calories with a diet that is low in fat and simple sugars is the best way to manage weight. Approximately 20% of children aged 8 to 16 years exercise twice a week or less and 67% of children watch more than 2 hours of television per day (Jonides, Buschbacher, & Barlow, 2002). In addition, food preferences have changed and children today prefer and choose sweet and high fat foods more often (Birch & Fisher 1998). The imbalance between eating and activity behavior is a major contribution to the pediatric overweight epidemic and is influenced by many interrelated factors. Story, Neumark-Sztainer, and French, (2002) describe factors that influence behavior as individual (psychosocial and behavioral factors), social environmental (family, friends and peer networks), physical environmental (schools, fast-food and vending machines) and macrosystem (social and cultural norms, mass media and government policies). Interventions need to target multiple areas at both the individual and environmental levels to initiate change.

At the Conference on Preventing Childhood Obesity in December 2002, experts in the field identified parents as being an effective target population for intervention regarding childhood obesity (Lederman, Akabas, Moore, Bentley, Devaney, Gillman, et al, 2004). Birch and Fisher (1998) reported parental influences most associated with risk of overweight among children are availability and accessibility of food, direct modeling, the extent of media exposure in the home, and interactions

surrounding eating. It has been indicated that family-based weight management programs that include both parent and child involvement and target behaviors related to eating and activity behavior are a logical and effective approach for the prevention and treatment of overweight in children (Kibbe & Offner, 2003; St. Jeor, Perumean-Chaney, Sigmund-Grant, Williams, & Foreyt, 2002).

The intent of this study is to evaluate short-term outcomes of a family-based lifestyle change intervention, Lifelong Eating and Activity Patterns (LEAP), as an effective approach for the prevention and treatment of childhood overweight and to initiate lifestyle changes that promote healthy eating and activity patterns for the whole family. The research hypothesis is that there is a significant difference between pre and post BMI, percent body fat, fitness level and eating and activity behaviors for child and parent participants.

Methods

Subjects and Methods of Selection

Of the 174 participants initially enrolled in the program, 107 (64%) children ages 7-14 completed the LEAP program with one or both of their parents (n=94) between June 2002 and August 2004. Completion of the program constituted attendance at a minimum of six of the eight weekly sessions provided. The number of parents is less than the number of child participants as several families had more than one child participate. The majority of the program participants was low-income and was referred to the LEAP program by their primary healthcare provider. The child participants were either "at risk for overweight" (n=3, 3%) or "overweight" (n=104, 97%) as defined by the CDC definitions of BMI-for-Age percentile of 85-94.99% or >95th percentile, respectively. The California State University, Chico Human Subjects Committee approved this research in the spring of 2001.

Intervention Design

The LEAP program a family-based nutrition education and physical activity promotion program developed by the OPT for Fit Kids program (http//:www.optforfitkids.org) to address lifestyle changes that promote overweight and weight related health problems among children. At least one parent is required to attend eight weekly sessions with their child in a group setting. During each two-hour session the participants are separated into a child group and a parent group for half the time and work together for the remaining time. A multi-professional staff (registered dietitian, nutritionist, exercise physiologist, and health educator) guides and supports families in making changes in eating and physical activity patterns, lifestyle behaviors, and attitudes toward the achievement and maintenance of a healthy weight. One of the goals of the LEAP program is to decelerate the rate of weight gain among at risk children. Other goals of the program include improved physical activity patterns, communication within families, parental role modeling, and the modification of individual behaviors through nutrition education and problem solving.

The program consists of nutrition education, physical activity, and behavior modification therapy that encourage a lifestyle that is compatible with dietary and activity guidelines for healthy Americans (U.S. Department of Health and Human Services, 2000; 2005). For children these goals include physical activity of 60 minutes or more daily and a decrease in sedentary activities and recreational screen time to less than 2 hours daily. The nutrition education component of the program targets reduction in consumption of sugar sweetened beverages and high fat foods and an increase in consumption of fruits, vegetables and whole grain foods. A modified "stoplight diet" developed by Epstein and Squires (1988) is used to promote dietary changes. The "stoplight diet" categorizes foods into three groups (red, yellow and green) based on frequency of consumption (rarely, sometimes and anytime). Pedometers are given to all participants to record their daily steps with a goal of at least 10,000 steps each day for parents and 12,000 for children.

Parents and children set their own goals including specific changes in eating and activity behaviors and, if appropriate, weight maintenance or weight loss of no more than two

pounds per week. Rewards that are predefined by the family members served as positive reinforcement when their goals are achieved. The participants maintain daily food and activity journals and complete a variety of self-assessments. The LEAP program materials are encapsulated in support guidebooks for parent and child participants. An instructor's guidebook is also used to ensure consistency in program delivery.

Data Collection Instruments

All participant files were analyzed retrospectively to ascertain information for the study variables. Demographic information was retrieved from the LEAP enrollment form and initial assessment notes recorded by program staff. Anthropometric and fitness data were collected from the instructor's records kept for the children and parents throughout the program. Data for knowledge, attitudes, and behavior were retrieved from the LEAP surveys, which were administered to each participant at the beginning and at the end of each eight-week program

The surveys consisted of Likert statements adapted from the program goals and objectives that pertain to desired eating and activity behaviors specific to either children or the parents. Participants indicated the degree to which they agree or disagree with each statement. The responses were quantified from 1 to 5 with 1=strongly agree, 2=agree, 3=neither agree nor disagree, 4=disagree and 5=strongly disagree.

Finally, qualitative data were gathered from an exit survey administered at the last session. Open-ended questions were used to obtain responses from both children and parents in order to gain an understanding of their opinions about the benefits, value, and effectiveness of the program. Four questions were asked: What did you like about the program? What was the most valuable part of the program? What was the most difficult part of the program? What changes would you like to see in the program?

Data Collection Procedures

Demographic

Parents completed an enrollment form, which included information regarding child gender, date of birth, and type of insurance coverage. Age and insurance status were recorded as age at the first session in years and public or private insurance, respectively. Public insurance was classified as MediCal, Healthy Families and uninsured; all other types of insurance were classified as private. Ethnicities ascertained during the initial assessment were reported by 85 (79%) of the participants.

Anthropometric

Weight was recorded for all participants for weeks one through eight. Height, weight, BMI (n=107) and percent body fat (n=93 pre, n=87 post) were recorded for child participants at weeks one, four and eight of the program. In addition, adult height was recorded at week one and weight, BMI, and percent body fat at weeks one, four and eight. Measurements from weeks one and eight were used for analysis. Since completion required only six of eight sessions, missing weight values for weeks one or eight were replaced with weight values from weeks two and seven, respectively. Weight and height were measured using a physician's balance scale with an attached stadiometer by trained staff, recorded as pounds and inches, respectively. BMI was calculated as weight in pounds divided by height in inches squared and multiplied by 703 for child and adult participants. Percent body fat was measured using the Tanita® body composition analyzer (BF-350E Tanita Body Fat Monitor, Health Check Systems).

Fitness Testing

Fitness tests were completed during sessions one and eight and consisted of sit-and-reach and a one-minute curl-up test to measure flexibility, and strength and endurance, respectively. The sit-and-reach and curl-up tests were conducted according to the President's challenge procedures described elsewhere (The President's challenge, 2005). Sit-and-reach scores were recorded in inches and converted to centimeters for analysis by multiplying inches by 2.54. The number of curl-ups completed in one minute were recorded for the curl-up test. Prior to

testing, participants were given instructions in the proper techniques of each test to reduce risk of injury.

Surveys

Child and parent surveys, previously described, were administered at week one and eight. Children and parents completed the surveys within close proximity of each other and both parents and program staff were available to help the child participants if they had questions. Numbered responses were used for analysis; a change between pre and post was calculated as pre score minus post score.

Statistical Analysis

All available data were used for analysis. Analysis of data was completed using the Statistical Package for the Social Sciences (version 12.0, 2003, SPSS Inc., Chicago, IL). Descriptive statistics included means and standard deviations. Paired samples t-test was used to test for change in body composition, fitness, and pre-post surveys. Chi square was used to test for differences in categorical demographic variables between boys and girls and Student's t-tests were used to compare means of continuous variables. A significance level of .05 was used for all analyses.

Qualitative Analysis

In addition to pre and post Likert surveys, 44 adult and 27 child participants completed qualitative exit surveys that consisted of open-ended questions, described earlier. All written responses were transcribed verbatim. The transcripts were analyzed to understand how the families assessed their participation in the LEAP program. This study utilized commonly accepted procedures for analyzing qualitative data. The researcher used an inductive technique for finding commonalities among comments, whereby raw data is transformed into units that stand alone and describe content. The subsequent inclusions or exclusions of data into these units are based upon whether or not the new data exhibit the unit's properties. Thus, the exit survey comments become focused into themes. These themes represent a description of the parental opinions about the program and are illustrated by family anecdotes of their experiences. This same process was used for the feedback from child participants.

Results

Demographics

Demographic and body composition characteristics for the child participants are presented in Table 1. The mean age for all children was 10.6 years (SD=2.1). While the older children (11-14 years) tended to be taller and heavier then the younger (7-10 years), there were no significant differences found between boys and girls or within the groups for BMI or percent body fat. Therefore, 7-14-year old boys and girls were combined for analysis unless otherwise specified.

Mean BMI and percent body fat was 31.1 (SD=5.6) and 40.8 (SD=8.2), respectively. Ethnic affiliation was reported by 85 (79%) of the participants; there were 66 (78%) white non-Hispanic participants and 19 (22%) non-white participants. Sixty-three (60%) of the children and families had public insurance in the form of MediCal or Healthy Families and 44 (41%) had private insurance. Data were available for 94 parents at baseline. Eighty-seven (93%) of the parents were female and 7 (7%) were male. Male parents were excluded from the analysis due to their small number. The baseline characteristics for the female parents are shown in Table 2. Mean BMI and percent body fat was 33.8 (SD=8.5) and 40.4 (SD=8.6), respectively. 11 (13%) mothers had a normal BMI (18.5-24.9), 23 (26%) were overweight (BMI=25-29.9), 34 (39%) were obese (BMI>30-39.9) and 19 (22%) were extremely obese (BMI > 40) (see Figure 1).

Table 1
Baseline characteristics of child participants (Mean ± SD)

	Boys		Girls		Total
Age	**7-10 y (n=22)**	**11-14y (n=26)**	**7-10 y (n=30)**	**11-14y (n=29)**	**N=107 10.6 ± 2.1**
Height (in)	55.4± 3.5	63.0 ± 2.8	54.7 ± 3.6	62.1 ± 3.0	58.8 ± 4.9
Weight (lb)	129.9 ± 35.9	188.9 ± 36.1	127.0 ± 28.8	176.1 ± 43.0	155.9 ± 45.1
BMI	29.4 ± 8.7	33.5 ± 4.8	29.6 ± 5.6	31.8 ± 5.9	31.1 ± 5.6
% BF [a]	41.8 ± 8.7	41.9 ± 11.9	39.4 ± 5.0	40.6 ± 6.1	40.8 ± 8.2
N (%)					
Ethnicity [b]					
White	10 (71.4)	19 (82.6)	17 (77.3)	20 (76.9)	66 (77.6)
Non-White	4 (28.6)	4 (17.4)	5 (22.7)	6 (23.1)	19 (22.4)
Insurance					
Public	15 (68.2)	17 (65.4)	14 (46.7)	17 (58.6)	63 (58.9)
Private	7 (31.8)	9 (36.6)	16 (53.3)	12 (41.4)	44 (41.1)

[a] n=93 [b] n=85; Abbreviations: BMI body mass index, BF body fat, BIA Bioelectrical-impedance analysis

Table 2
Baseline measurements for female parents

	Health Weight	Overweight	Obesity	Extreme Obesity	Total
	BMI < 25	**BMI 25-29.9**	**BMI 30-39.9**	**BMI ≥ 40**	**Mean ± SD**
N%	11(13)	23(26)	34(39)	19(22)	87(100)
Ht (in)	64.3 ± 2.3	64.1 ± 2.4	64.1 ± 3.4	63.8 ± 2.4	64.0 ± 2.8
Wt (lb)	131.7 ± 12.2	160.3 ± 12.4	202.7 ± 24.3	269.1 ± 45.3	194.6 ±50.0
BMI	22.5 ± 2.2	35.9 ± 4.1	42.7 ± 4.0	50.7 ± 4.1	40.4 ± 8.6

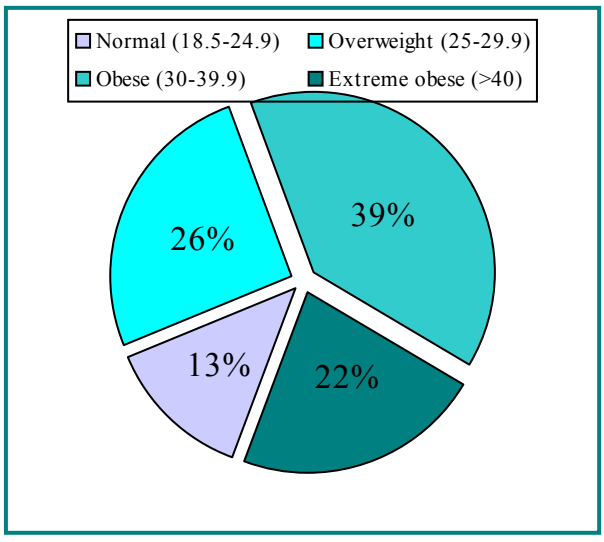

Figure 1
BMI Categories

Anthropometric

Paired samples t-tests were used to test for differences between pre and post height, weight, BMI and percent body fat for child and parent participants (see table 3). There was a mean increase in child height of approximately one-half inch (SD = 0.48) and a mean decrease in weight of one pound (SD=4.2). There was a significant decrease in BMI for child (mean = -0.74; SD = 1; p<.001) and parent participants (mean = -0.47; SD = .08; p<.001) and percent body fat (mean = -1.3; SD = 3.7; p = .001) for child participants. Boys achieved a significantly greater decrease in percent body fat compared with girls (mean = -2.27; SD = 4.2 and mean = -0.50; SD = 2.9; p = .04, respectively). Although percent body fat change was not significant for parents there was a mean decrease of -0.35% (SD=2.1) and parent weight significantly decreased pre to post (mean = -2.7 pounds; SD = 0.85; p <.001). The number of child and parent participants that achieved a decrease or no change in weight, BMI and percentage body fat was significantly greater (p < .01) then the participants that had increases in the relative variables (see Figure 2).

Table 3
Body composition changes for child and parent participants before and after intervention

	Pre	Post	Change	p
Children n=107				
Height (in)	58.7± 4.9	59.2± 4.8	.48± 0.48	.001
Weight (lb)	155.9± 45.1	154.7± 44.8	-1.1± 4.2	.007
BMI	31.1± 5.6	30.4± 5.5	-.74± 1.0	.001
% BF[a]	41.1± 8.2	39.7± 7.6	-1.3± 3.7	.001
Parents n=90				
Weight (lb)	194.7±51.0	192.1± 51.0	-2.7± 0.85	.001
BMI	33.3± 8.3	32.8± 8.2	-.47± .08	.001
% BF[b]	39.5± 9.4	39.2± 9.4	-.35± 2.1	.142

[a] n=87
[b] n=77

Fitness

Fitness test scores changed significantly from pre to post for both child and parent participants (see Table 4). A significant increase in strength and endurance, measured by the number of curl-ups performed in one minute was obtained for girls (mean = 3.8; SD = 8.0; p = .001) but not boys (mean = 1.4; SD = 9.9; p = .4). The same results were found for flexibility, measured by sit and reach, between boys and girls. Girls had a significant increase in flexibility (mean = 1.2; SD = 3.3; p = .02) compared with boys (mean = 0.8; SD = 5.4; p = .4). When boys and girls were combined for analysis there was a significant increase for both curl-up and sit and reach measurements overall (mean = 2.7; SD = 9.0; p = .004 and mean = 1.0; SD = 4.3; p = .03, respectively). Parent fitness test scores increased for both strength and endurance and flexibility (mean = 3.1; SD = 5.6; p < .001 and mean = 2.4; SD = 3.8; p < .001, respectively). Figure 2 represents the percentage of child and adult participants that achieved significant (p<.01) increases in fitness test scores pre to post. For those with pre and post fitness test scores, 62% of child and 69% of parent participants achieved increases in strength and endurance, measured by the number of curl-ups completed in one minute. In addition, 57% of child and 62% of parent participants achieved increased flexibility, measured by the sit-and-reach test.

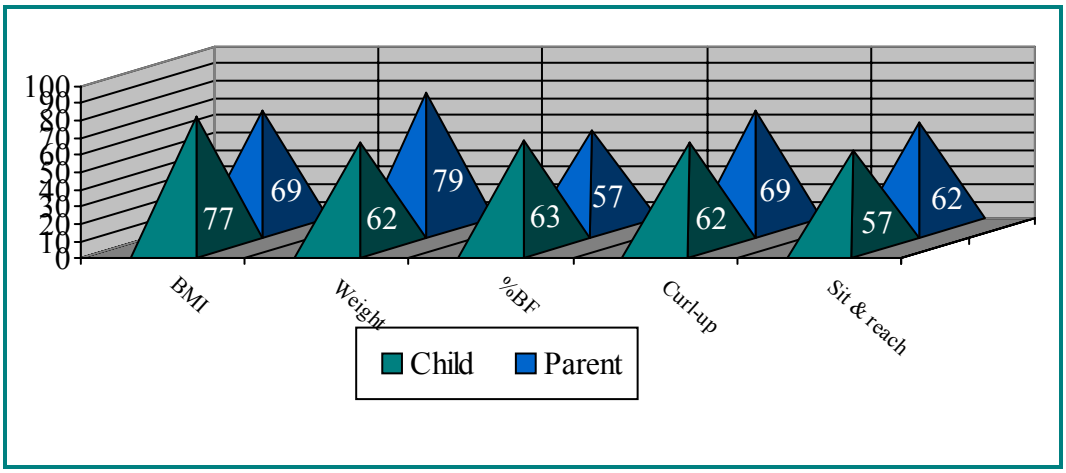

Figure 2
Percentages with significant improvement pre to post

Table 4
Pre to post changes in fitness test scores for boys, girls, and parent participants*

	Pre	Post	Change	P	N
Boys					
Curl-up	22.3 ± 16.2	23.7 ± 12.3	1.4 ± 9.9	.355	43
Sit & Reach	28.9 ± 6.2	29.7 ± 6.7	0.8 ± 5.4	.383	39
Both					
Curl-up	19.5 ± 15.0	23.3 ± 14.1	3.8 ± 8.0	.001	51
Sit & Reach	32.5 ± 6.5	33.7 ± 6.8	1.2 ± 3.3	.015	50
Parents					
Curl-up	20.3 ± 11.3	23.4 ± 10.7	3.1 ± 5.6	.000	48
Sit & Reach	32.2 ± 7.4	34.7 ± 7.3	2.4 ± 3.8	.00	53

*Curl-ups measured as # of curl-ups in 1- minute. Sit & reach measured in centimeters

Eating and Activity Behavior Survey

Approximately one-half of the 107 child-parent pairs who began the LEAP program completed both pre and post Likert questionnaires. Changes in knowledge and behavior toward diet and activity patterns were examined using paired samples t-tests. Lower scores indicate stronger agreement with desired behavior. Tables 5 and 6 show the mean change scores pre- to post- test for the child and parent participants, respectively. Girls tended to have a greater change scores in the desired direction compared to boys. Even so, changes occurred in the desired direction (toward a lower score) in that children were more likely to agree with the eating and exercise behavior statements from pre to post. When boys and girls responses were combined for analysis there were significant changes for the eating behavior statements ($p < .01$) and for the activity statement ($p < .05$) on the child questionnaire. There were also significant changes in the desired direction among the parent participants for all knowledge and behavior statements ($p < .001$). The mean pre scores for both child and parent participants were generally in the "neither agree" nor "disagree" and "agree" categories. Mean post scores indicated a change toward the "agree"

and "strongly agree" categories. For example, children were more likely to agree to the statements, "I eat five servings of fruits and vegetables every day" (pretest mean = 3.1; SD = 0.9) to (posttest mean = 2.5; SD = 1.2 and "I exercise at least 60 minutes most days of the week" (pretest mean = 2.5; SD = 1.3) to (posttest mean = 2.0; SD = 1.1); parents were more likely to agree to the statements "I encourage my child to eat at least five servings of fruits and vegetables daily" (pre mean = 2.4; SD =1.2) to (post mean =1.8; SD =0.8) and "I structure and active lifestyle for my child that includes at least 60 minutes of exercise daily" (pre mean = 3.3; SD = 1.2) to (post mean = 2.7; SD = 1.0). Additionally, parents were more likely to agree with statements regarding role modeling, participating in at least 30 minutes of activity with their child, eating at least five servings of fruits and vegetables daily, and knowledge regarding accurate portion sizes and reading food labels. These findings illustrate desired changes in child and parent self-reported eating and activity knowledge and behavior.

Table 5
Pre to post changes in eating and activity Likert statement responses for child participants*

Boys and Girls	Pre	Post	Change	P	N
I eat mainly low-fat (green light) foods	3.1 ± 1.1	1.1 ± 1.1	0.9 ± 1.4	.000	56
I eat at least five servings of fruits and vegetables every day	3.1 ± .09	2.5 ± 1.2	0.5 ± 1.4	.009	55
I eat when I'm hungry and stop when I'm satisfied	2.7 ± 1.2	1.9 ± 0.9	0.8 ± 1.6	.000	56
I exercise at least 60 minutes most days of the week	2.5 ± 1.3	2.0 ± 1.1	0.5 ± 1.5	.022	56
Boys					
I eat mainly low-fat (green light) foods	2.8 ± 0.9	2.0 ± 1.0	0.8 ±1.3	.009	24
I eat at least five servings of fruits and vegetables every day	2.8 ± 0.8	2.7 ± 1.2	0.1 ± 1.2	.601	23
I eat when I'm hungry and stop when I'm satisfied	2.5 ± 1.2	2.2 ± 1.1	0.4 ± 1.6	.258	24
I exercise at least 60 minutes most days of the week	2.5 ± 1.4	2.1 ± 1.3	0.4 ± 1.5	.195	24
Girls					
I eat mainly low-fat (green light) foods	3.3 ± 1.3	2.3 ± 1.2	0.9 ± 1.5	.001	32
I eat at least five servings of fruits and vegetables every day	3.2 ± 1.0	2.4 ± 1.1	0.8 ± 1.5	.006	32
I eat when I'm hungry and stop when I'm satisfied	2.8 ± 1.3	1.7 ± 0.7	1.1 ± 1.5	.000	32
I exercise at least 60 minutes most days of the week	2.5 ± 1.3	1.9 ± 1.0	0.5 ± 1.5	.061	32

*Lower score indicates stronger agreement with the desired behavior.

Table 6
Pre to post changes in eating, activity and behavior Likert statement scores for parents*

Eating, Activity and Behavior	Pre	Post	Change	p	n
I act as a role model by improving my own weight, eating or inactivity problems	2.6 ± 1.2	2.0 ± 0.9	0.6 ± 1.1	.000	55
I participate in at least 30 minutes of exercise with my child daily	3.5 ± 1.1	2.7 ± 1.0	0.8 ± 1.2	.000	55
I structure an active and enriching lifestyle for my child that includes at least 60 minutes of exercise daily	3.3 ± 1.2	2.7 ± 1.0	0.6 ± 1.3	.001	55
I create a light but not depriving food environment at home	2.5 ± 0.9	1.8 ± 0.8	0.7 ± 0.9	.000	53
I encourage my child to eat at least five servings of fruits and vegetables daily	2.4 ± 1.2	1.8 ± 0.8	0.6 ± 1.0	.000	55
I eat five servings of fruits and vegetables daily	2.6 ± 1.3	2.0 ± 1.0	0.6 ± 1.0	.001	31
I am aware of accurate portion sizes	2.3 ± 1.0	1.7 ± 0.8	0.6 ± 1.1	.000	41
I know how to read a food label	1.8 ± 1.0	1.4 ± 0.7	0.4 ± 0.9	.005	39

*Lower score indicates stronger agreement with the desired behavior.

Qualitative Exit Survey

Themes were identified and are organized by the questionnaire categories along with representative responses from parents followed by child responses supporting each theme. Forty four parents and 27 children completed exit surveys. The four themes identified in the transcripts for what was liked and what was most valuable about the program were: 1) information and skills, 2) awareness and feelings, 3) behavior and family interactions, and 4) social support and encouragement. Themes identified for what was most difficult included: 1) time requirement, 2) behavior change, and 3) feelings, interactions and awareness.

Responses to the question regarding what was liked about the program are important to help the program identify what the participants enjoyed and therefore develop those features. Comments indicated that participants liked the information and skills learned during the sessions. In addition, it appeared that the learning brought out an awareness that may have spurred desired behavior changes toward healthier eating and activity patterns. Comments from parents that represent themes 1 and 2 are listed below.

- "I like every thing, because I learned about eating well, how to buy healthy foods for the family."
- "We learned many valuable tools to help us change our habits. We are much more aware of healthy food choices & appropriate daily activity levels."
- "I like the way it helps children/adults understand a weight problem and how it helps us to make changes."
- "Learning so much. This class has really motivated us to get moving. We actually exercise now! We're happier too.

Comments from the children indicate that they also liked learning and that the information helped them learn skills and become aware of behaviors in order to make desired changes. Responses from children that represent themes 1 and 2 follow.

- "It's fun and you learn valuable eating solutions."
- "It helps me make better food choices and portion control."
- "I like that I see great results and I'm eating better."
- "It just made me feel better."

The most frequently mentioned comments for what was liked was the social support (theme 4) and encouragement from staff and other group members. Representative responses from parents include:

- "It was fun a fun program. There was always encouragement. My son loved it."
- "It is a small group, with leaders that are helpful, not judgmental."
- "I liked the way they taught kids to make better choices without making the feel bad about their weight."
- "It was interesting learning that others had similar obstacles and being able to share solutions."
- "Families coming together with their own overweight children and discussing concerns. Very accepting and non-derogatory environment."

Three children commented: 1) I like the fact that I met a couple of people that felt the way as I did. 2) Hanging out with the kids and 3) I liked it because of the family time, and talking about each other.

Responses to the question, "What was the most valuable part of the LEAP program?" help elucidate perceived benefits of the program. Comments from parents are presented in Table 7 and are organized by themes. The parents valued learning information and skills, increased awareness, improved attitudes or feelings, family interactions and the social support and encouragement. The responses from the children exemplified similar thoughts about the value of the program to them. Representative responses from children are listed below.

- "How they showed us to eat better kinds of foods."
- "Learning proportions."
- "I learned a lot of healthier habits."
- "Probably the food summary where I check if the foods I eat are green, red, or yellow."
- "The most valuable thing of leap is being satisfied with yourself."
- "Learning about my feelings." and "Talking about how I feel."
- "Knowing that there are others like me so you are not embarrassed."

When asked what was the most difficult part of the program the participants responses were categorized into three themes: 1) time requirements, 2) behavior change and 3) feelings, interactions and awareness. In regards to time twelve parents and seven children commented that completing the homework each week was difficult. Three parents and four children made comments regarding difficulty completing the food records. Seven parents and six children mentioned time for exercise or simply exercise as being difficult for them. Seven parents indicated that getting to class on time or the time involved in travel to and from class, the length of the class or making it each week was a difficulty. Samples of comments regarding time as a difficulty are listed below.

Parents:

- "Making time to exercise every day."
- "Filling out the daily logs-Getting the exercise in."
- "Trying to schedule activity."
- "Making it here every week. It was worth the effort."
- Children:
- "It was probably getting the exercise in."
- "Getting all the steps in."
- "The most difficult thing about leap is keeping a daily food record."

Behavior change is not an easy task for anyone. Ten parents and five children considered behavior changes as the most difficult part of the program for them. When time was not mentioned in a statement about exercise the assumption was that the exercise behavior was the difficulty. The following statements were written regarding behavior changes.

Table 7
Perceived value/benefits: What was the most valuable part of the LEAP program? (n = 44 parents)

Knowledge and Skills Learned
Nutrition education my child could understand & put into use.
The Food Pyramid, and portion size of Foods explained in a child's understandable way was great.
Learning how to make healthy choices-Learning how to help my son make choices.
Food Guide lessons; Red, green, yellow light food sheets.
Getting a better idea of nutritional content in different foods, serving sizes, good vs. bad fats & good alternatives to some of the things we had been eating.
Nutritional info. Daily logs.
I feel the nutrition information was very valuable.
Stressing the importance of the physical activity and utilizing the pedometer.
Awareness Building
My child's awareness of the relationship among food, level of activity and weight gain.
Seeing all the Fat in Food.
Food intake for us. We both need to work on our exercise.
Knowledge gained by eating non processed foods (I should have known) Fast foods have gotten way to convenient.
Getting my child to understand what unhealthy eating habits are. And teaching her better choices.
Showing that good eating habits, exercise etc. can be a part of our daily lives.
I felt the monitoring and food charts were important. It gave you an idea of your progress and what you did eat.
Not concentrating on diets, but rather on correct portion sizes & watching what you put in your mouth.
Attitudes and Feelings
Helping me to learn to accept my child's body.
Improvement in my child's self-esteem.
Learning how to eat healthier and really enjoy how to have a healthier environment.
Seeing my daughters percentage of body fat ↓ and seeing wt. loss in her, and seeing her feel better about herself
For me it's that my child and myself both enjoyed the class it held our interest and we both got a lot out of it. We really wanted to come to class.
That the kids weren't made to feel bad about their weight. They were taught to make good choices.
I think discussing feelings
Talking about feelings.
Learning my son's feelings.
Family interaction and communication
Connecting with my child "more". Gave my daughter some tools to help her improve her "lifestyle".
Having the knowledge to make better choices and the connection our family has, talking & communication with each other.
Time I had with my son and made look what he eats
Being with my daughter, together, in on this.
That I encourage my daughter about how to eat well and do more activities.
Social Support and Encouragement
That she saw others working towards the same goals, learning control & nutritional info & family interactions.
Having someone else besides myself tell my son how to help w/ his weight & activity.
Having my child hear from someone other than myself about healthy eating. ↑ physical activity and acceptance of himself.
Weekly feedback and the support of other families in the same situation.
Listening to ideas seeing how we are not the only family that has these problems.
Reading books and class discussion.
Encouraging healthy eating & daily exercise.

Parents:

- "Exercising (being disciplined to do so)."
- "Trying to break old habits!"
- "The most difficult part of this program was changing eating habits to healthier foods most of the time."
- "Changing initially old habits and establishing more of an awareness of better choices."

Children:

- "Trying to eat healthy and exercise more."
- "Eating more wheat."
- "Giving up Taco Bell and getting up and dancing."

Several parents responded that the most difficult part of the program surrounded feelings, family and group interactions, and increased awareness of inactivity, which is the last theme in this category. Representative statements from four parents follow.

- "Admitting to my feelings about my daughter & my own weight issues."
- "My need to communicate w/ my spouse."
- "Sharing my feelings with the other adults."
- "Following through on the family-team concept of meeting daily. Getting all the reading in."

Three parents and four children felt that there was nothing really difficult about the program for them.

The last question from the exit survey was what changes would you like to see in the LEAP program? This is an important question that can help identify wants and needs of the participants. Two parents and two children again made comments regarding time; changing the amount of outside work, the amount of time for class and replacing the food journal seemed to be a factor. However, for six parents it was not a matter of managing the time as it was for the previous question but instead the comments leaned toward increasing the length of the program. Three of those responses are listed below.

- Nothing it was great. Be longer than 8 weeks."
- "I think to have the class last two to four weeks longer. Seems like we read a lot per week."
- "I'd like to see the same number of sessions, but over a longer period of time. For example meet every two weeks. I feel this would give more time to absorb & practice some of the concepts."

Twelve parents and nine children felt that no changes were needed. One parent wrote, "No changes necessary-just keep on serving the kids in our community." and one child wrote, "I would like to see no changes in the program because it is perfect!!!!!!!!!!!."

Discussion

The LEAP nutrition education program is a family-based intervention that includes nutrition education, physical activity, and behavior choice theory to increase awareness and promote adoption of a healthy lifestyle including healthy eating & activity patterns. The program focuses on both the individual level and the social environmental level to influence behaviors and attitudes associated with risk for overweight.

Study results support the research hypotheses that there is a significant difference in the variables tested for children and parents before and after participation in the eight-week program. Both the LEAP children and parents achieved a mean decrease in BMI, an increased fitness level and desired changes in self-reported eating and activity behavior. In addition, the child participants achieved a significant decrease in percent body fat as measured by bio-impedance analysis. Qualitative survey results implied that behavior changes might have been influenced by increased nutrition knowledge, self-awareness, and attitude changes as well as the support system provided by program staff, family interactions, and group members.

Outcome-based reviews of family-based interventions that include nutrition education, parent involvement, behavior modification and physical activity have shown varied results

(Berry, Sheehan, Heschel, Knafl, Melkus, & Grey, 2004; Edmunds, Waters, & Elliott, 2001; Wilson, O'Meara, Summerbell, & Kelly, 2003). It should be noted that it is difficult to compare results across studies due to differences in methodologies, intervention design and target age groups. Wilson et al., (2003) concluded that multidisciplinary family-based interventions that involve parents are effective for the treatment of pediatric overweight. Kibbe and Offner (2003) report that pediatric weight management programs similar to the program investigated in the current study have been effective for weight loss and decreases in BMI and percent body fat in the short-term (8-20 weeks) as well as at long-term follow-up (6 mo-10 y).

On its website, Kidshape, an eight-week weight management program for youth and their families, reported weight loss for 87% of the participants with 80% maintaining the weight loss for at least two years (Kidshape, 2005). A smaller percentage, 56%, of children in the current study achieved significant weight loss while 6% had no change in weight, which is consistent with the program goal of decelerating weight gain. Levine, Ringham, Kalarchian, Wisniewski, & Marcus, (2001) reported a 1.7 unit decrease in BMI in 16 severely overweight children after completion of 10 and 12 week intervention programs. While the changes in mean BMI are greater than that of the current study, Levine et al. used diet restriction and structured physical activity with the goal of reducing weight in severely overweight children for the longer period of 10 to 12 weeks. The Committed to Kids program is a family-based intervention that includes diet, physical activity, behavior change and parental involvement for overweight children and youth. Sothern and associates (2002) reported a 3.0 unit decrease in BMI in 56 adolescents at 10-weeks and an additional 1.1 unit decrease at 1 year using the Committed to Kids approach. The greater decrease in BMI as compared with the current study might be attributed to the intervention design, which utilized a structured exercise-training component, and the older age of the participants. The L.E.S.T.E.R. (Let's Eat Smart Then Exercise Right) program, which uses a modified stoplight diet, behavior modification, physical activity and targets family lifestyle had positive weight loss for 26 children ages six to 11 after an eight-week intervention (Kibbe & Offner, 2003). Consistent with the current study, L.E.S.T.E.R. participants had improvements in eating & exercise patterns, knowledge and attitude and significant decreases in anthropometric measures. Heard (2004) reported that 87% (n=425) of the L.E.S.T.E.R. children achieved a significant decrease of about 1.0 BMI unit ($p = .03$). 77% (n = 107) of the LEAP children achieved a significant decrease of 1.0 BMI unit ($p < .01$) versus the 0.74 BMI unit mean decrease for all children in the study, which included children that had an increase in BMI.

The results of the current study indicate a significant mean decrease in percent body fat for the child participants from week one to week eight. Bio-impedance analysis to measure percent body fat is less commonly used as an outcome measure for body composition changes in children undergoing small changes in weight. The use of the Tanita body composition analyzer has been reported to be an accurate method for measuring body fat in adult women during weight loss (Powell, Nieman, Melby, Cureton, Schmidt, & Howley, et al, 2001). A validation study reported no significant differences in % body fat measures with leg-to-leg BIA and UWW between obese and non-obese women and was accurate in measuring small body composition changes during weight loss in the obese (Utter, Nieman, Ward, & Butterworth, 1999). However, leg-to-leg BIA as an assessment of body fat change for children is not as well defined and results can vary by age, gender, especially for girls, and among different ethnicities (Daniels, Khoury, & Morrison, 1997; Taylor, Jones, Williams, & Goulding, 2002).

Results from the Likert scale eating and activity survey and the exit survey demonstrated that both the child and parent participants achieved desired changes toward healthy behaviors. The child participants reported an increase in daily physical activity levels in response to the pre and post survey statement — "I exercise 60 minutes or more each day". In support, the

parent survey scores indicated stronger agreement to the statements — "I structure an active family lifestyle" and "I exercise 30 minutes a day with my child". Both the children and parents indicated stronger agreement with the statement "I eat 5 or more fruits and vegetables each day" at the end of the program. These results are consistent with results from a six-week program, FIT KIDS, for overweight children aged six to 12 and their parents, which is similar to the LEAP program in design and goals. According to information currently distributed by FIT KIDS, pre-post questionnaires showed that "86% of the children report eating more fruits and vegetables, 71% drink more water and 64% report exercising more as a family" (Passehl, 2005).

The qualitative surveys implied that the nutrition information presented resulted in gained knowledge and skills that were utilized by the participants. As the participants began to use the skills and tools provided in the program curriculum their awareness of undesired behaviors and healthy alternatives increased. Participants reported that they were eating better and exercising more.

Limitations

This study was non-controlled and relied only on outcomes from those who participated and completed the program. Reliance on self-reports for eating and activity behavior assessed by the Likert survey could be biased due to test-retest bias and increased knowledge rather than actual behavior changes. Collection of eating and activity record data from the participants may have helped to assess and verify behavior changes. There are limitations to the use of leg-to-leg BIA for assessing small changes in percentage body fat, especially for growing children. The data for ethnicity, age, income, and education level of the parent was not collected, nor was food availability/security issues or availability of safe recreation environments. This type of information can be helpful for identifying barriers to change for the participants.

Conclusion

The family-based lifestyle change intervention, LEAP program, was effective for decreasing BMI and increasing fitness level for both the child and adult participants. Survey responses for both the parents and the children indicated positive changes in eating and activity behaviors and attitudes after completing the program. Parental involvement may be associated with the achievement of desired changes for children. Social and family support is an important factor in the modification of family-based lifestyle behaviors. Interventions need to target multiple areas at both the personal and family environmental levels, as there is a reciprocal interaction between behavior and multiple levels of influence. Short-term outcomes were favorable for both the child and parent participants. Further research is needed to evaluate the long-term effects.

References

Berry, D., Sheehan, R.., Heschel, R., Knafl, K., Melkus, G., & Grey, M. (2004). Family-based interventions for childhood obesity: A review. Journal of Family Nursing, 10, 429-449.

Birch, L. L., & Fisher, J. O. (1998). Development of eating behaviors among children and adolescents. Pediatrics, 101, 539-549.

Centers for Disease Control and Prevention. (2004). BMI-body mass index. National Center for Chronic Disease Prevention and Health Promotion, Division of Nutrition and Physical Activity. Retrieved May 10, 2005, from http://www.cdc.gov/nccdphp/dnpa/bmi/

Daniels, S. R., Arnett, D. K., Eckel, R. H., Gidding, S. S., Hayman, L. L., Kumanyika, S., Robinson, T. N., Scott, B. J., St. Joer, S., & Williams, C. L. (2005). Overweight in children and adolescents: Pathophysiology, consequences, prevention, and treatment. Circulation, 111, 1999-2012.

Daniels, S. R., Khoury, P. R., & Morrison, J. A. (1997). The utility of body mass index as a measure of body fatness in children and adolescents: Differences by race and gender. Pediatrics, 99, 804-807.

Daviglus, M. L., Liu, K., Yan, L. L., Pirzada, A., Manheim, L., Manning, W., Garside, D. B., Wang, R., Dyer, A. R., Greenland, P., & Stamler, J. (2004). Relation of body mass index in young adulthood

and middle age to Medicare expenditures in older age. Journal of the American Medical Association, 292, 2743 - 2749.

Dietz ,W. H., & Robinson, T. N. (2005). Overweight children and adolescents. New England Journal of Medicine, 352, 2100-2109. Retrieved June 20, 2005, from http://content.nejm.org/content/vol352/issue20/index.shtml

Epstein, L. H., & Squires, S. (1988). The stoplight diet for children. Boston: Little, Brown and Company.

Edmunds, L., Waters E., & Elliott, E. J. (2001). Evidence based pediatrics: Evidence based management of childhood obesity. British Medical Journal, 323, 916-919.

Fontaine, K. R., Redden, D. T., Wang, C., Westfall, A. O., & Allison, D. B. (2003). Years of life lost due to obesity. Journal of the American Medical Association, 289, 187 - 193.

Freedman, D. S., Khan, L. K., Serdula, M. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2004). Inter-relationships among childhood BMI, childhood height, and adult obesity: The Bogalusa heart study. International Journal of Obesity, 28(1), 10-16.

Freedman, D. S., Khan L. K., Serdula, M. K., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (2005). The relation of childhood bmi to adult adiposity: The Bogalusa heart study. Pediatrics, 115, 22-27.

Guo, S. S., William W. W., Chumlea C., & Roche, A. F. (2002). Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. American Journal of Clinical Nutrition, 76, 653–8.

Heard, J. (2004). Evaluation of the effectiveness of a childhood weight management program: Unpublished Thesis. University of Alabama at Birmingham. Received by e-mail on August 5, 2005.

Hedley, A. A., Ogden, C. L., Johnson, C. L., Carroll, M. D., Curtin, L. R., & Flegal, K. M. (2004). Prevalence of overweight and obesity among U.S. children, adolescents, and adults, 1999-2002. Journal of the American Medical Association, 29, 2847-2850.

Jolliffe, D. (2004) Extent of overweight among U.S. children and adolescents from 1971 to 2000. International Journal of Obesity, 28, 4-9.

Jonides, L., Buschbacher, V., & Barlow, S. E. (2002). Management of child and adolescent obesity: Psychological, Emotional, and Behavioral Assessment. Pediatrics, 110, 215-221.

Kibbe, D., & Offner, R. (2003). Childhood obesity – advancing effective prevention and treatment: An overview for health professionals. The National Institute for Health Care Management Foundation. Issue Paper, April 9, 2003. Retrieved May 18, 2005, from, http://www.nihcm.org/childframe.html

Kidshape. (2005). Frequently asked questions. Retrieved July 26, 2005, from http://www.kidshape.com/Pages/faq.htm

Lederman, S. A., Akabas, S. R., Moore, B. J., Bentley, M. E., Devaney, B., Gillman, M. W., Kramer, M. S., Mennella, J. A., Ness, A., & Wardle, J. (2004). Summary of the presentations at the conference on preventing childhood obesity December 8, 2003. Pediatrics, 114, 1146-1173.

Levine, M. D., Ringham, R. M., & Kalarchian, M. A., Wisniewski, L., Marcus, M. D. (2001). Is family based behavioral weight control appropriate for severe pediatric obesity? International Journal of Eating Disorders, 30(3), 318-28.

Lobstein, T., Baur, L. & Uauy R. for the IASO International Obesity Task Force. (2004). Obesity in children and young people: a crisis in public health. Obesity Review, 5(Suppl. 1), 4–85.

Olshansky, S. J., Passaro, D. J., Hershow, R. C., Layden, J., Carnes, B. A., Brody, J., Hayflick, L., Butler, D., Allison, B., & David S. L. (2005). A potential decline in life expectancy in the United States in the 21st century. New England Journal of Medicine, 352, 1138-1145.

Passehl, B. (2005). FIT kids program summary, 2002. Received July 25, 2005 via personal correspondence e-mail.

Powell, L. A., Nieman, D. C., Melby, C., Cureton, K., Schmidt D., Howley, E. T., Hill, J. O., Mault, J. R., Alexander, H., & Stewart, D. (2001). Assessment of body composition change in a community-based weight management program. Journal of the American College of Nutrition, 20, 26–31.

Sothern, M.S., Schumacher, H., Von Almen ,T. K., Carlisle, L. K., & Udall, J. N. (2002). Committed to kids: An integrated 4-level team approach to weight management in adolescents. Journal of the American Dietetic Association, 102, S81-85.

Steinberger, J., & Daniels, S. R. (2003). Obesity, insulin resistance, diabetes and cardiovascular risk in children: an American Heart Association scientific statement from the Atherosclerosis, Hypertension, and Obesity in the Young Committee (Council on Cardiovascular Disease in the Young) and the Diabetes Committee (Council on Nutrition, Physical Activity, and Metabolism). Circulation, 107, 1448-1453.

St. Jeor, S. T., Perumean-Chaney, S., Sigmund-Grant, M., Williams, C., & Foreyt, J. (2002). Family-based interventions for the treatment of childhood obesity. Journal of the American Dietetic Association, 102, 640-643.

Story, M., Neumark-Sztainer, D., & French, S. (2002). Individual and environmental influences on adolescent eating behaviors. Journal of the American Dietetic Association, 102, S40-S51.

Taylor, R. W., Jones, I. E., Williams, S. M., & Goulding, A. (2002). Body fat percentages measured by dual-energy X-ray absorptiometry corresponding to recently recommended body mass index cutoffs for overweight and obesity in children and adolescents aged 3–18 y. American Journal of Clinical Nutrition, 76, 1416–21.

The President's Challenge. (2005). Physical activity and fitness awards program. Physical fitness test. Retrieved May 23, 2005, from http://www.presidentschallenge.org/educators/program_details/physical_fitness_test.aspx

U. S. Department of Health and Human Services. (2000). Healthy people 2010 (2nd ed). With understanding and improving health and objectives for improving health (2nd vol.). Washington, DC: U. S. Government Printing Office. Retrieved June 20, 2005, from http://www.healthypeople.gov/Document/tableofcontents.htm#under

U. S. Department of Health and Human Services. (2005). HHS secretary Leavitt, NIH director tell parents: Together, we can! Prevent childhood obesity. Retrieved September 16, 2005, from http://www.hhs.gov/news

U. S. Department of Health and Human Services. (2005). U.S. department of agriculture. Dietary guidelines for Americans 2005. Retrieved June 20, 2005, from http://www.health.gov/dietaryguidelines/

Utter, A. C., Nieman, D. C., Ward, A. N., & Butterworth, D. E. (1999). Use of the leg-to-leg bioelectrical impedance method in assessing body-composition change in obese women. American Journal of Clinical Nutrition, 69, 603–607.

Wang, G., & Dietz, W. H. (2002). Economic burden of obesity in youths aged 6-17 years: 1979 1999. Pediatrics, 109, 81-92.

Williams, J., Wake, M., Hesketh, K., Maher, E., & Waters, E. (2005). Health-related quality of life of overweight and obese children. Journal of the American Medical Association, 293, 70-76.

Wilson, P., O'Meara, S.O., Summerbell, C., & Kelly S. (2003). The prevention and treatment of childhood obesity. Qual Saf Health Care, 12, 65-74.

Acknowledgements

The authors would like to acknowledge the Chico and Oroville Overweight Prevention and Treatment (OPT) for Fit Kids offices, including Jamie Shackelford, MS, RD, Regina Munster, PhD, and the entire staff, for their support and assistance with this study.

This research was supported by funding from the U.S. Department of Agriculture Food Stamp Program through the California Nutrition Network, the Butte County Commission on Children and Families, and California State University Chico.

Author Information
Michelle Monastra
Nutrition and Food Sciences Program
Department of Biological Sciences
California State University, Chico
Chico, CA 95929-0002
E-Mail: mmonastra@mail.csuchico.edu

Judy Bordin, Ph.D.
Child Development Program, Coordinator
California State University, Chico
Chico CA 95929-0220
E-Mail: jbordin@csuchico.edu

Cindy Wolff, PhD, MPA, RD
Nutrition and Food Sciences, Professor
Department of Biological Sciences
OPT for Fit Kids and SCNAC, Director
California State University, Chico
E-Mail: cwolff@csuchico.edu