Continuing Education Contact Hour Opportunity

Active Intervention Program Using Dietary Education and Exercise Training for Reducing Obesity in Mexican American Male Children

Sukho Lee, Ranjita Misra, and Elizabeth Kaster

Abstract

This study evaluated the effectiveness of a 10-week active intervention program (AIP), which incorporates dietary education with exercise training, among 30 healthy Mexican American male children, aged 8-12 years, in Laredo, Texas. Participants were randomly divided into 3 groups: education (EDU), dietary education to participants and parents and individualized step goal setting using pedometers; education with exercise (EEX), dietary education, step goal setting with pedometers, and personal training; and control (CON), no education, step goal setting, or exercise. AIP significantly improved select anthropometric, nutritional, clinical, and non clinical parameters. Participants in the EEX group had a significant reduction in percent body fat, visceral fat (as measured by magnetic resonance imaging [MRI]), improved perception of the importance of physical activity, and greater average step/day as compared to the EDU and CON groups. The results affirm the effectiveness of exercise training combined with dietary education to lower the prevalence of obesity in this high risk ethnic group.

Introduction

Hispanic Americans are the largest and fastest growing ethnic group in the United States (U.S. Census Bureau, n.d.). According to the census bureau, by the year 2050, nearly 25% of the population will be represented by Hispanics (U.S. Census Bureau, n.d.). This population shift has been accompanied by substantial health disparities (Wakimoto, Block, Mandel, & Medina, 2006), such as higher rates of overweight and obesity in this group than among non-Hispanic Whites (NHWs) (Centers for Disease Control and Prevention [CDC]), 2009). Wakimoto et al. (2006) reported that among the Hispanic population, rates of overweight and obesity are 11% and 7% higher in men, and 26% and 32% higher in women, respectively, than among NHWs.

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Pediatric obesity and overweight in particular have been shown to be increasing at a rate greater than or equal to that of the adult population (Hoelscher et al., 2004). This raises concerns as Mexican American adults and children in the U.S. demonstrate trends in overweight and obesity that are similar to other segments of the U.S. population. Mexican American children and non-Hispanic Black girls have the highest prevalence of obesity (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). In addition to increasing the risk of obesity in adulthood, childhood obesity also is the leading cause of pediatric hypertension, is associated with Type II diabetes mellitus, increases the risk of coronary heart disease, increases stress on the weight-bearing joints, lowers self-esteem, and affects relationships with peers (Lawlor & Leon, 2005). Thus, action needs to be taken to combat the growing problem of childhood obesity.

Implementation of lifestyle interventions such as healthful dietary choices and participation in physical education classes have been shown to reduce overweight and at-risk overweight status among students (Perez, Reininger, Aguirre Flores, Sanderson, & Roberts, 2006). Consistent with lifestyle interventions for obesity, the key components of a successful weight-management program for overweight children includes strategies for adopting more healthful eating habits, becoming more physically active, and reducing time spent in sedentary activities (Kirk, Scott, & Daniels, 2005).

Research indicates physical education plays an important role in weight control and management among overweight or at-risk-of-overweight girls (Kirk et al., 2005). Additionally, the majority of the physical education programs are focused on girls rather than boys (Datar & Sturm, 2004). This is significant given the projected increase in the prevalence of overweight and obesity in male children. Hence, a physical education program for boys, especially Mexican American boys, will provide important information as well as help achieve our national goal of eliminating health disparities and improving the health of all groups by the year 2020 (U.S. Department of Health and Human Services, n.d.).

The purpose of this study was to determine the effectiveness of a 10-week AIP to reduce prevalence of overweight/obesity in Hispanic male children in Laredo, Texas. The novelty of the study includes lifestyle intervention in a minority youth using control groups, and the use of use of MRI to evaluate visceral and subcutaneous fat currently not available in the health education literature. Results can provide important information of behavior change (or lack of) to address obesity/overweight among Hispanic male youth currently lacking in the literature.

Methods

Subjects and Experimental Design

A total of 30 overweight/at risk for overweight (≥ 85th Body Mass Index [BMI] percentile) Mexican American male children aged from 8 to 12 years participated in this quasi-experimental study. Subjects were recruited by word of mouth, flyers, and announcements at local television news stations. The study was approved by the Texas A&M International University's Institutional Review Board. After consent and assent for participation were obtained from parents or legal guardians and participants, the children were randomly assigned into one of three groups of size $n = 10$ (CON, EDU, or EEX). For ethical and educational purposes, subjects assigned into the CON and EDU groups received the same interventions as subjects in EEX group after completion of the research study.

Active Intervention Program

Basic data.

The AIP was for a 10-week period. Baseline and post-intervention anthropometric, clinical, and nutritional parameters were obtained from participants at the beginning and the end of the program (Figure 1). The parameters included the BMI, percent body fat, waist/hip ratio (WHR), lipid profile (total cholesterol, high density lipoprotein [HDL], low density lipoprotein [LDL], and triglycerides) and blood chemistry, and local fat deposition in the abdominal area. The BMI was calculated by dividing the weight by height squared (kg/m^2). Percent body fat was estimated using a skin fold caliper (Beta Technology Incorporated, Cambridge, MD). Fat calipers provide a low cost and accurate measurement of body fat using the subcutaneous tissue. Briefly, the thickness of the skin was measured and used for calculation for percent body

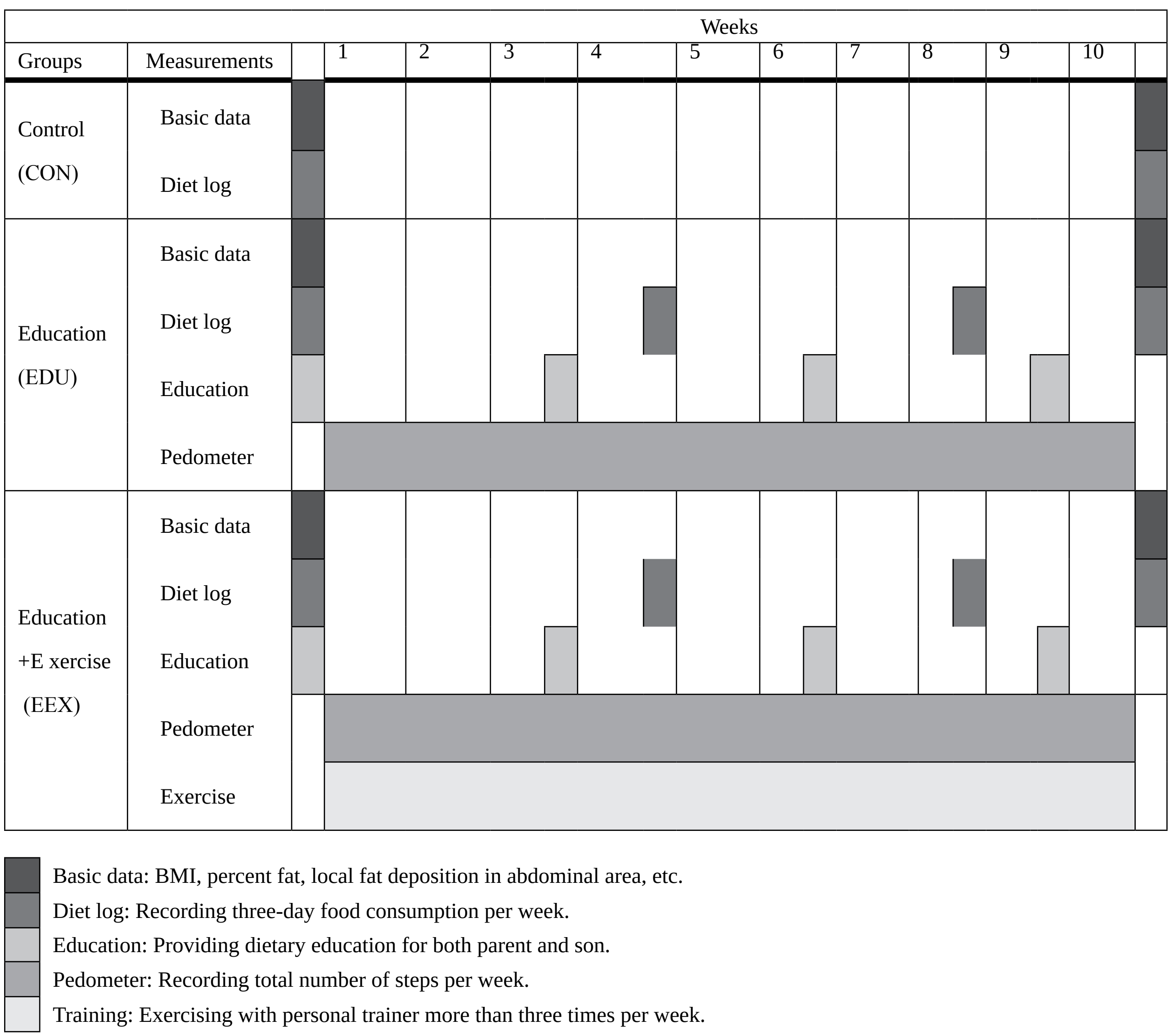


Figure 1. The active intervention program.

fat (Jackson & Pollock, 1985). WHR was calculated from the waist and hip circumferences measured by a measuring tape in inches (2.54cm). All anthropometric measurements were conducted by a trained exercise physiologist with more than 20 years of experience with these measurements.

Trained health professionals (a physician or registered nurse) drew fasting blood samples for assessment of the lipid profile and screening for cardiovascular disease risk factors (total cholesterol, HDL, LDL, blood sugar, and triglycerides). All blood samples were centrifuged and shipped to a hospital-associated research laboratory using standard shipping guidelines.

Abdominal adiposity, which includes visceral fat (intra-abdominal adipose tissue) and subcutaneous fat (under the skin), is a strong predictor of morbidity, mortality, and health outcomes. Visceral fat and subcutaneous abdominal fat were measured using MRI (AIRIS Elite, HITACHI, Twinsburg, OH) at a local clinic (MRI Image, Laredo TX). A 10 mm thickness transverse image was acquired between the L4 – L5 region of each subject using a scouting marker and the image was analyzed using imaging software (HITACHI version V50H) to calculate surface area (mm^2).

Dietary education and diet log.

Dietary education was provided by a nutritionist to the EDU and EEX groups based upon the intervention schedule (Figure 1). Dietary sessions [30 minutes/session] consisted of explaining the food pyramid, healthy food options, major nutrients, and teaching how to read food labels. A total of four dietary education sessions were provided to participants and their parents and/or any interested family members on week one, three, six, and nine, every third week throughout the 10-week period. A personal daily diet log was used to assess the dietary pattern of the participants. Personal daily logs (recording sheets for food consumption) were distributed to the subjects, and parents/legal guardians were asked to record food consumption of their children for three days per week (two weekdays and one weekend). These diet logs were used to assess the dietary macronutrient intake (total caloric intake, percent calories from fat, protein, and carbohydrates) of the participants using dietary software called Diet Power (Diet Power, Inc., 7 Kilian Drive, Danbury, CT 06811).

Physical activity log using pedometer.

Subjects in the EDU and EEX groups were asked to wear a pedometer (Omron HJ-112 Digital Premium Pedometer, Bannockburn, Illinois) for 10 weeks as a measure of their level of physical activity (PA) (Figure 1). New goals (20% increases from their previous two week's value) were set by researchers every other week with a cap set for each respondent. Pedometers have been used in numerous research studies, and have been shown to be accurate for estimating the level of physical activity (Beets, Patton, & Edwards, 2005). There is some literature that reports low accuracy in pedometers for measuring walking in children (Mitre, Lanningham-Foster, Foster, & Levine, 2009); however, these studies have also reported that accuracy differs between different models, different walking speeds, and among different weights. Though discretion must be used for determining what model pedometer to use with children, pedometers remain a good measure of physical activity and tool for promoting physical activity.

Exercise training.

Exercise training was conducted for the EEX group on a small group basis (one to four participants per session) with personal trainers. Each participant met the recommended federal physical activity guideline (i.e., 150 minutes of moderate intensity or 75 minutes of vigorous intensity). All participants had to attend one hour sessions of activities of moderate to vigorous intensity at least three times per week for a ten week period at the Texas A&M International University (TAMIU) gym (Figure 1). Examples of activities included basketball, volleyball, soccer, jogging, table tennis, or any recreational sports activities tailored to the participant's preference. Exercise training sessions were offered several times a day (one hour sessions) including Saturday. Participants were allowed to attend more than the required number of sessions (three/week) if they were interested. The personal trainers comprised of trained student athletes majoring in Fitness and Sports at TAMIU.

Questionnaire

A survey measured pre- and post-intervention healthy lifestyle, including barriers and motivators to exercise, barriers and motivators to healthy dietary habits, and acculturation for all participants. The questionnaire took approximately 25-30 minutes to complete.

Barriers to physical activity.

Barriers to physical activity were measured by nine different reasons that respondents chose that prevent them from getting more exercise. Examples included to lose weight, I get home late, I do not have anyone to exercise with, my neighborhood is not safe, I can't afford to join a gym, and I don't have time (Markland & Hardy, 1993). Response format was yes (1) or no (0). All the items were summed for a barrier score (range 0-9); higher score represented greater barriers to physical activity. Cronbach's alpha for this measure in this study was 0.67.

Motivators to physical activity.

Motivation for physical activity was measured by seven different motivators to increase physical activity among the respondents. Examples included to lose weight, if my friends or family members asked me, to become a better role model, having a membership to a gym, to look better, to prevent a disease or illness, and/or having someone to exercise with (Markland & Hardy, 1993). Response format was yes (1) or no (0). All items were summed for a motivation score (range 0-7), with a higher score indicating that more factors are necessary to motivate the individual for physical activity. Cronbach's alpha was 0.83 for the motivation to physical activity in this study.

Nutrition behavior.

Nutrition behavior was measured by the nine-item nutrition subscale of the revised Health Promoting Lifestyle Profile II, modeled after the Food Guide Pyramid recommendation (Walker, Sechrist, & Pender, 1995). Respondents self-reported on their consumption of fruits, vegetables, meat/meat products and milk/products on a four-point response format never (1) to routinely (4). All items were summed with higher score indicating better nutrition behavior. Cronbach's alpha was 0.89 in this study.

Barriers to healthy diet.

Barriers to a healthy diet were measured by nine different barriers that prevented them from eating a healthy diet. Examples included not a priority, too busy, healthy food is expensive, too much time to prepare, does not taste good, does not look good, would not eat healthy food, no support from others, or prefer traditional Mexican foods (Holgado et al, 2000). Response format was yes (1) or no (0). All items were summed for a barrier score (range 0-9); higher score indicated more barriers to a healthy dietary adherence. Cronbach's alpha was 0.91 in this study.

Motivators to healthy diet.

Motivation for a healthy diet was measured by nine different motivators to increase a healthy diet among the participants (Holgado et al, 2000). Examples included I want to lose weight, to become better role model, prevent diseases, etc. Response format was yes (1) or no (0). All items were summed for a motivation score (range 0-9), with a higher score indicating that more factors are necessary to motivate the individual to eat a healthy diet. Cronbach's alpha was 0.84 for the motivation construct in this study.

Acculturation.

Acculturation was measured by the Acculturation Rating Scale for Mexican Americans (ARSMA-II) (Cuellar, Arnold, & Maldonado, 1995). ARSMA-II addresses the following facets of acculturation: language familiarity and usage, ethnic interaction, ethnic pride and identity, cultural heritage, and generational proximity. Response options ranged from not at all (1) to almost always (5). Using the ARSMA-II scale, a Mexican orientation subscale (MOS), and an Anglo orientation subscale (AOS) were identified. The MOS was subtracted from the AOS to derive a score on a scale of 1-5, with 1 representing "very Mexican" and 5 representing "very assimilated." Of the respondents, 61.5% were considered very acculturated while only 38.5% were considered very Mexican to somewhat acculturated.

Statistical Analysis

All data were expressed as means ± SD. Paired-sample *t*-tests were used to compare all variables pre- and post-test. A one-way analysis of variance (ANOVA) was used to compare all variables among groups. Fisher's least significant difference was used to test for group differences. A significance level of $p < 0.05$ was used for all comparisons. Student t-test and Chi-square analysis (for categorical variables) evaluated pre- and post-intervention changes. analysis of covariance (ANCOVA) was used to examine significant post-intervention differences among the CON, EDU, and EEX groups with baseline scores used as covariates in the model. The acceptance level for statistical significance was lowered from 0.05 to 0.01, a Bonferroni correction for multiple comparisons; statistical significance for the lipid profile and anthropometric measures was set at 0.05. Data analysis was performed using the Statistical Package for Social Science (SPSS – version 17.0) software.

Results

Demographic characteristics of the sample indicated a mean age of 10.43 ± 1.19 years. The most of participants were 2nd - 4th generation Mexican Americans, acculturated, and self-reported a familial history of chronic diseases such as heart disease, diabetes, and hypertension. The three groups (CON, EDU, EEX) were similar in their demographic characteristics (age, generation, acculturation, and family history of chronic diseases).

Table 1 indicates barriers and motivators for physical activity reported by the participants. One third (35%) of the participants did not perceive physical activity as a priority. The barriers to physical activity included no safe place for activities, lack of time, and too late in the day after school for physical activities (Table 1). Busy schedule and lack of priority for physical activity were the only two barriers that were not significant ($p = 0.09$) among the three groups, with children in the CON and EDU groups perceiving higher barriers to physical activity than the EEX group. To lose weight and look better were the top two motivators of physical activity reported by the children. Having someone to exercise with was also considered an important motivator. However, none of the motivators differed significantly among the three groups (Table 1).

Important barriers to consuming a healthy diet were that healthy food does not taste good (46%) and healthy food does not look good (42%) (Table 1); less than half of the participants did not consider healthy diet as a priority (42%). Top motivators for consuming a healthy diet included losing weight, prevention of health problems, healthy options available at restaurants, and family's willingness to change

Table 1

Baseline Physical Activity and Nutrition Barriers and Motivators

	Total % (n = 30)	CON % (n = 10)	EDU % (n = 10)	EEX % (n = 10)	p-value
Barriers to Physical Activity					
Not a priority	34.6	60.0	16.7	20.0	0.09
Too busy	11.5	0.0	0.0	30.0	0.06
Hair care	3.8	0.0	16.7	0.0	0.17
No one to exercise with	19.2	20.0	16.7	20.0	0.98
No safe place	15.4	10.0	33.3	10.0	0.38
Cannot afford	11.5	0.0	16.7	20.0	0.34
Too late in the day	15.4	20.0	0.0	20.0	0.49
No time	15.4	10.0	0.0	30.0	0.22
No babysitter	3.8	0.0	0.0	10.0	0.43
Motivation for Physical Activity					
Lose weight	76.9	60.0	83.3	90.0	0.25
Look better	69.2	60.0	83.3	70.0	0.61
Have a disease or illness	23.1	30.0	33.3	10.0	0.45
Want to be a role model	26.9	20.0	33.3	30.0	0.81
Have someone to exercise with	30.8	40.0	16.7	30.0	0.61
Have a gym membership	11.5	10.0	0.0	20.0	0.47
Barriers to Healthy Diet					
Not a priority	42.3	60.0	66.7	10.0	0.03
Too busy	26.9	30.0	0.0	40.0	0.20
Healthy food is expensive	7.7	10.0	0.0	10.0	0.72
Too much time to prepare	11.5	10.0	16.7	10.0	0.90
Does not taste good	46.2	30.0	66.7	50.0	0.34
Does not look good	42.3	40.0	66.7	30.0	0.35
Would not eat healthy food	7.7	20.0	0.0	0.0	0.18
No support from others	7.7	10.0	16.7	0.0	0.45
Prefer traditional foods	7.7	10.0	0.0	10.0	0.72
Motivations for Healthy Diet					
Lose weight	84.6	80.0	83.3	90.0	0.82
Have disease or illness	7.7	10.0	16.7	0.0	0.45
Want to be a role model	23.1	10.0	33.3	30.0	0.45
Family/peers diagnosed with a disease or illness	15.4	10.0	16.7	20.0	0.82
Prevention of health problems	57.7	50.0	33.3	80.0	0.15
Restaurants provide healthy food	30.8	50.0	0.0	30.0	0.11
Recipes for healthy foods	11.5	30.0	0.0	0.0	0.06
Cooks prepare healthy food	11.5	10.0	0.0	20.0	0.47
Family willing to change	34.6	20.0	33.3	50.0	0.37

dietary practices.

Pre-intervention nutritional behaviors indicated the majority of children *never* or *sometimes* chose a diet low in fat, saturated fat, and cholesterol; limited their use of sugar and food containing sugar; ate the required servings of fruits and vegetables per day; and read food labels. However, they responded favorably to eating breakfast, consuming milk and dairy products, and consuming meat/poultry/eggs/ nuts each day. Post-intervention results demonstrated an improvement in the importance of a healthy diet in the EDU group (Figure 2).

Pre-intervention physical activity indicated half of the participants were sedentary. More probing questions for light, moderate, and vigorous physical activity confirmed their initial response. AIP was successful in improving the perception of the importance of physical activity in the EEX group (Figure 2).

The AIP intervention successfully improved many

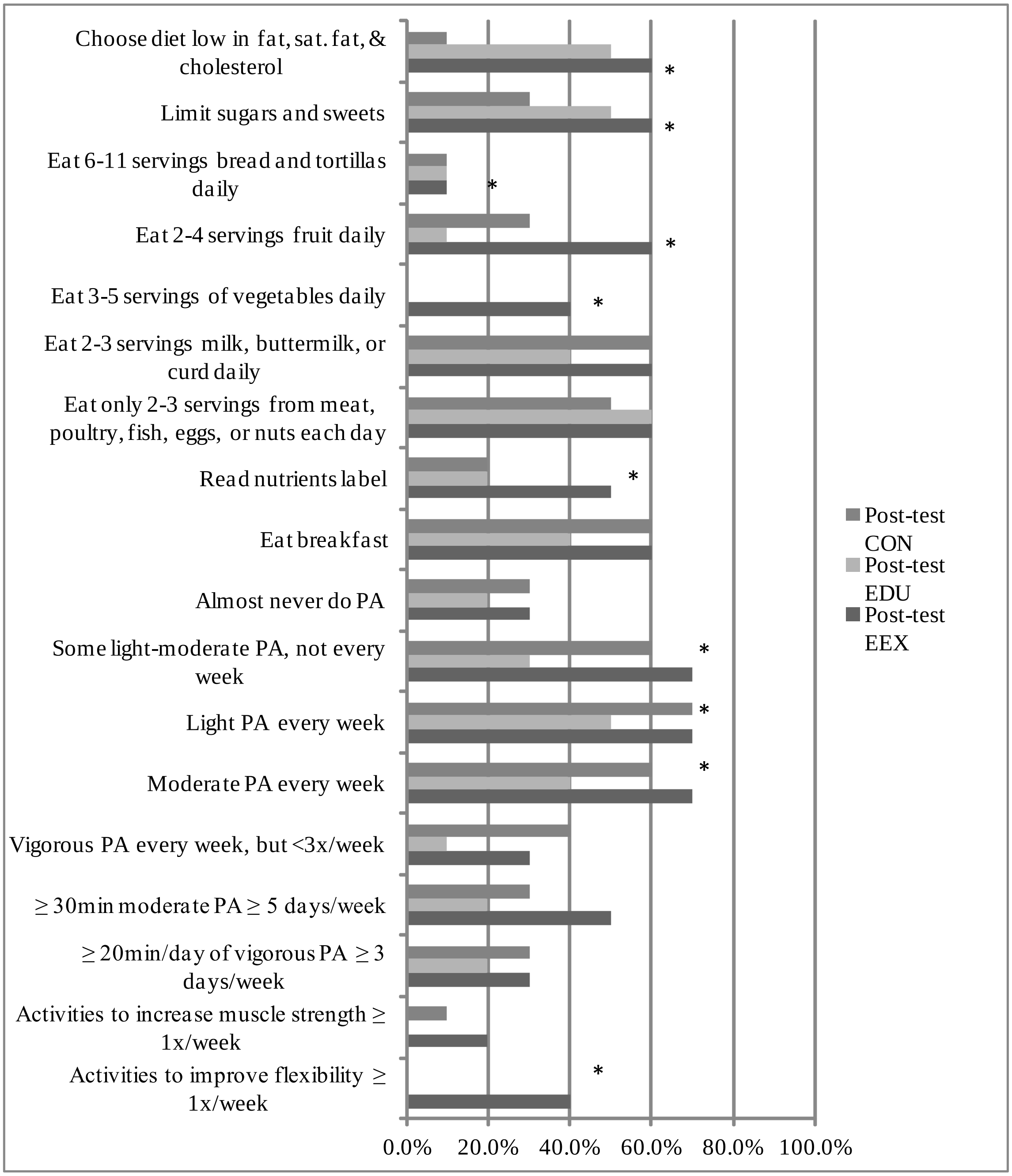


Figure 2. Changes in nutrition and physical activity (PA) behaviors after active intervention program. Percentages for nutrition behaviors are given for participants who answered "always" and "often," and percentages for PA behaviors are given for participants who answered "yes." The symbol * denotes statistically significant changes to the study measures as compared to the baseline data ($p < 0.05$).

Table 2

Changes in Clinical, Anthropometric, Non-Clinical, and Nutritional Parameters After Active Intervention Program (Part 1)

Parameter	Before				After			
	Total (*n* = 30)	CON (*n* = 10)	EDU (*n* = 10)	EEX (*n* = 10)	Total (*n* = 30)	CON (*n* = 10)	EDU (*n* = 10)	EEX (*n* = 10)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Clinical parameters								
Glucose	92.11 ± 7.03	90.80 ± 6.12	95.11 ± 8.62	90.56 ± 5.94	98.80 ± 7.70*	97.67 ± 5.45*	98.14 ± 3.02	100.44 ± 11.68*
Cholesterol	177.96 ± 25.42	184.20 ± 27.14	170.78 ± 27.07	178.22 ± 22.64	177.32 ± 32.64	181.00 ± 37.71	169.57 ± 43.42	179.67 ± 16.90
Triglycerides	130.28 ± 38.38	122.20 ± 35.66	131.33 ± 56.54	132.22 ± 42.92	107.60 ± 46.64*	106.22 ± 36.21	94.14 ± 29.64	84.33 ± 24.90*
High density lipoprotein	45.61 ± 8.13	45.30 ± 7.38	48.56 ± 9.80	43.00 ± 6.95	42.24 ± 9.05*	43.67 ± 8.71	46.00 ± 10.32*	37.89 ± 7.33*
Low density lipoprotein	108.28 ± 22.22	114.50 ± 23.14	100.89 ± 23.64	108.78 ± 19.87	113.68 ± 27.65	120.56 ± 32.13	104.86 ± 35.08	113.67 ± 14.69
Systolic blood pressure	114.19 ± 11.66	114.28 ± 11.68	111.85 ± 13.40	116.42 ± 11.16	117.85 ± 12.22	121.14 ± 11.43	116.14 ± 14.99	116.28 ± 11.13
Diastolic blood pressure	67.66 ± 17.47	71.71 ± 10.57	61.00 ± 26.84	70.28 ± 10.33	73.04 ± 10.11	72.14 ± 9.20	74.14 ± 11.68	72.85 ± 10.83
Anthropometric and non-clinical parameters								
Body mass index	29.94 ± 5.44	28.17 ± 1.81	28.76 ± 6.51	32.89 ± 6.12	30.14 ± 5.02	28.39 ± 3.98	30.00 ± 6.28	32.03 ± 4.58
Waist circumference	38.27 ± 4.60	38.32 ± 1.44	36.96 ± 6.14	39.54 ± 5.20	38.56 ± 5.05	38.11 ± 2.34	37.11 ± 6.27	40.46 ± 5.77
Hip circumference	40.08 ± 4.33	39.32 ± 0.82	39.32 ± 4.57	41.61 ± 6.07	40.45 ± 3.40	40.07 ± 0.98	40.11 ± 4.35	41.18 ± 4.20
Percent body fat	50.26 ± 7.58	53.33 ± 3.50	46.40 ± 9.88	51.04 ± .25	47.33 ± 6.10*	50.65 ± 4.76	45.90 ± 7.07	45.45 ± 5.66*
Physical activity barriers	2.33 ± 2.82	1.20 ± 0.79	1.60 ± 1.26	4.20 ± 4.18	2.13 ± 1.85	3.10 ± 1.45	2.50 ± 2.22	0.80 ± 0.92
Physical activity motivators	3.13 ± 2.33	2.20 ± 1.81	2.50 ± 0.97	4.70 ± 3.02	3.27 ± 2.15	4.10 ± 2.08	3.20 ± 2.30*	2.50 ± 1.96
Diet barriers	2.93 ± 2.61	2.20 ± 1.14	1.60 ± 0.84	5.00 ± 3.56	2.30 ± 2.12	4.30 ± .16*	0.80 ± 0.92*	1.80 ± 1.32*
Diet motivators	3.60 ± 2.54	2.70 ± 1.77	3.20 ± 1.14	4.90 ± 3.66	2.63 ± 2.09	4.10 ± 2.28*	1.60 ± 1.50	2.20 ± 1.69

Note. CON = control; EDU = education; EEX = education with exercise. *N* is not necessarily the same across groups or across parameters.
* p < .05.

clinical and anthropometric parameters of the participants (Tables 2 and 3). In general, triglyceride levels declined for the participants (p = .043); participants in the CON and EDU groups demonstrated a slight decline but it did not attain statistical significance. However, triglyceride levels significantly declined in the EEX group (132.22 ± 42.92 vs. 84.33 ± 24.90, *p* = 0.001). HDL cholesterol levels decreased for participants in the EDU and EEX groups. Overall, glucose levels increased significantly. However, it increased in the CON (*p* = .017) and EEX group (*p* = 0.02) but not the EDU group. Perhaps the improved dietary intake increased the intake of complex carbohydrates with resulting increase in glucose levels.

AIP was unsuccessful in lowering total cholesterol,

Table 3

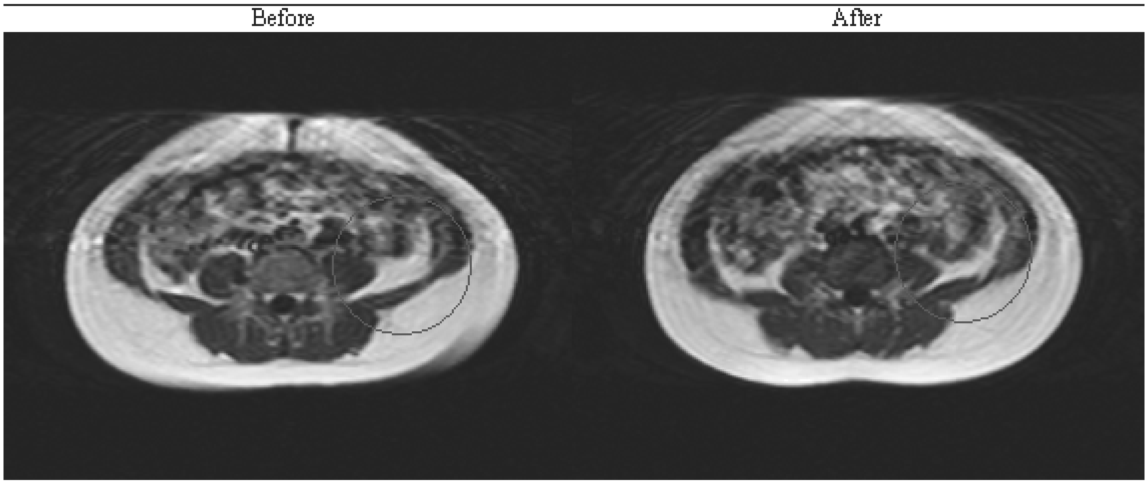
Changes in Clinical, Anthropometric, Non-Clinical, and Nutritional Parameters After Active Intervention Program (Part 2)

Parameter	Before				After			
	Total (n = 30)	CON (n = 10)	EDU (n = 10)	EEX (n = 10)	Total (n = 30)	CON (n = 10)	EDU (n = 10)	EEX (n = 10)
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Nutritional parameters								
Calories	2021.95 ± 407.03	2052.47 ± 525.09	2169.85 ± 317.98	1843.52 ± 334.16	1946.55 ± 376.11	2044.42 ± 315.50	2084.66 ± 446.98	1710.57 ± 271.64
Fat	153.60 ± 49.40	154.19 ± 33.40	150.71 ± 62.32	155.90 ± 55.85	122.84 ± 37.44*	108.85 ± 17.62*	133.61 ± 27.54	126.04 ± 56.82
Carbohydrates	73.19 ± 20.79	81.09 ± 27.24	74.76 ± 18.53	63.71 ± 13.21	67.14 ± 23.07	58.52 ± 17.73*	83.52 ± 27.66	59.38 ± 14.97
Cholesterol	114.84 ± 59.33	128.47 ± 83.80	117.42 ± 46.71	98.61 ± 44.71	87.55 ± 48.01	69.14 ± 19.51	118.71 ± 61.42	74.80 ± 42.57
Sodium	206.11 ± 59.63	221.57 ± 74.21	206.42 ± 68.51	190.33 ± 32.88	196.52 ± 66.16	163.52 ± 56.86	228.04 ± 86.65	198.00 ± 37.68
Fiber	32.03 ± 14.82	36.52 ± 20.57	34.76 ± 11.52	24.80 ± 9.13	39.25 ± 16.95*	38.00 ± 11.90	51.80 ± 19.87	27.95 ± 9.30
Sugar	33.79 ± 35.45	54.09 ± 43.79	31.47 ± 36.19	15.80 ± 9.94	31.33 ± 30.60	23.95 ± 20.77	51.90 ± 43.11	18.14 ± 8.47
Protein	99.93 ± 28.09	114.85 ± 34.40	98.61 ± 23.17	86.33 ± 20.80	89.25 ± 27.34	81.66 ± 29.05	104.85 ± 28.62	81.23 ± 20.09
Calcium	56.85 ± 21.08	56.57 ± 18.07	48.85 ± 18.55	65.14 ± 25.62	64.38 ± 22.75	66.00 ± 29.28	65.23 ± 14.30	61.90 ± 25.56
Percent protein	0.16 ± 0.03	0.17 ± 0.04	0.15 ± 0.02	0.15 ± 0.00	0.18 ± 0.08	0.17 ± 0.02*	0.21 ± 0.14	0.16 ± 0.01
Percent fat	0.39 ± 0.05	0.37 ± 0.04	0.38 ± 0.05	0.41 ± 0.05	0.36 ± 0.05	0.34 ± 0.05	0.36 ± 0.04	0.38 ± 0.07
Percent carbohydrates	0.44 ± 0.07	0.45 ± 0.08	0.45 ± .07	0.42 ± 0.04	0.45 ± 0.09	0.48 ± 0.05	0.42 ± 0.14	0.45 ± 0.06
Physical activity[a]								
Pedometer reading	-	-	5704.3	5737.5	-	-	6206.7**	6701.8**

Note. CON = control; EDU = education; EEX = education with exercise. *N* is not necessarily the same across groups or across parameters.
[a]Pedometer reading was taken for the two intervention groups (EDU and EEX) and data is presented for these two groups only.
* p < .05. ** p < .01.

LDL cholesterol, and blood pressure (systolic/diastolic) for participants in the EEX and EDU groups ($p > 0.05$). Also, it did not make changes in HDL cholesterol level. With anthropometric measures, AIP made the most significant improvement in % body fat in the EEX group. Successful improvements were also noted in the macronutrients intake. For example, fiber intake slightly improved in the EDU group ($p = 0.07$; failed to attain statistical significance) while participants in the EEX group also reported a slight reduction in their total calorie intake (p = 0.07; not statistically significant). Dietary cholesterol intake decreased overall, but did not differ significantly among the three groups.

Changes in physical activity levels, as measured by pedometers, in the EEX and EDU groups demonstrated a significant improvement in the number of steps taken by the participants in both of these groups ($p < 0.005$) (Tables 2 and 3). AIP intervention improved physical activity levels more in the EEX group (p = 0.003; approximately 1,000 steps increase between the first and last week of the intervention) than the EDU group (p = 0.004; approximately 500 steps



Mean = 5,978.3 mm^2 Mean 5,589.1 mm^2

Figure 3. Change in visceral fat deposition in magnetic resonance imaging (MRI) after active intervention program. MRI shows the transverse section at L4-L5 of participant #4. T-value for education with exercise group is 6.23 (p value = 0.001).

increase between the first and last week of the intervention). MRI (Figure 3) demonstrated a significant decrease in the visceral fat levels ($p < 0.001$) with no significant change in the subcutaneous fat levels in the EEX group as compared to the CON group ($p = 0.87$).

Discussion

The AIP is the first study to demonstrate a significant reduction in percent body fat, caloric intake, improvements in dietary fiber, and improvements in physical activity levels among Mexican American male students. The program proved to be effective in behavioral modifications that decreased triglyceride levels (36% decreases), lowered blood sugar (10% decreases) and visceral fat (6.5% reductions) in the EEX group. Dietary education was also effective in improving the importance of healthy diet and physical activity among participants. These findings are significant considering that studies which have similar findings were implemented over 12 weeks (Annesi, Marti, & Stice, 2011) according to American Diabetic Association's (ADA) guidelines (Egede, Strom, Durkalski, Mauldin, & Moran, 2010).

The improvements in visceral fat (but not subcutaneous fat) as well as overall percent body fat are significant findings of the AIP, and concur with prior studies. Visceral fat adversely affects children's health and appears to cause cardiovascular diseases and diabetes (Saelens, Seeley, van Schaick, Donnelly, & O'Brien, 2007). Therefore, early prevention of local fat deposition of children is necessary. Children with greater physical activity have lower visceral fat deposition (Saelens et al., 2007). A study conducted on a 12-week aerobic exercise program found a significant reduction in visceral fat deposition in the obese group; however, subcutaneous fat deposition was not changed. Barbeau and colleagues (2007) also reported that ten months of exercise significantly decreased visceral fat deposition in Black girls as compared to the control group. In the present study, researchers found that even 10 weeks of exercise combined with dietary education reduces visceral fat deposition. Therefore, physical activity among male Mexican American children seems to be an effective intervention for reducing and/or maintaining visceral fat.

It is alarming that 48% of the children were overweight and 33% were obese. Because a high calorie diet and an increasingly sedentary lifestyle are associated with obesity in children, schools have endeavored to implement various interventions including physical activity and dietary education programs for reducing obesity. This is due to schools having the capacity, as one of the main centers for children in a community, to ensure that children develop healthy lifestyles through participation in physical activity and dietary education (Pate et al., 2006).

Nonetheless, children (like adults) do not easily achieve alterations in body composition following interventions focused solely on exercise training. One group of researchers even reported that health promotion programs consisting of three components (nutrition, physical activity, and healthy body image) did not improve BMI (Stock et al., 2007). In the present study, exercise and dietary education did not significantly decrease the BMI and WHR at the end of the 10-week intervention, suggesting a longer intervention necessary for a change in these anthropometric parameters. Results do indicate that percent body fat in the EEX group decreased significantly ($p = 0.004$) after 10 weeks of intervention.

These findings are similar to another study that reported a significant reduction in percent body fat in the group that participated in a school-based fitness program (Carrel et al., 2005). Researchers were unable to compare the MRI data with the CON and EDU groups; MRI analysis was limited to the EEX group due to the costs of the tests. Though there was improvement in nutritional parameters before and after the intervention in the EEX group, these were not statistically significant, perhaps due to small sample size. However, the intervention group (EEX) showed significant decrease in percent body fat i.e., from 51.04 ± 7.25 to 45.45 ± 5.66 (p = 0.004) which can be viewed as a meaningful outcome of the study. Additionally, the results imply that dietary education may produce far greater effects when concomitant with the supervised exercise training.

Step goal setting with the use of pedometers was successful in assessing the level of physical activity and perhaps even motivating the users for engaging in more physical activity, as indicated from results (1,000 steps/day and 700 steps/day increase in the EEX and EDU group, respectively). Zizzi, Vitullo, and Rye (2006) showed that pedometer goal-setting resulted in a moderate increase in number of steps (from approximately 8,900 steps/day baseline to 9,200 steps/day after four weeks). Setting goals is also reported to promote increases in physical activity up to a daily average of 1,000–2,000 steps (Schofield, Mummery, & Schofield, 2005). A recent study reported that setting step goals individually is the more effective way to achieve goals than setting step goals as a group (Kang & Brinthaupt, 2009). This concurs with this present study's methodology as new goals were tailored for each individual in the EEX and EDU group, based on his previous two weeks of activity.

Non-exercise physical activities (e.g., schoolwork, puttering, walking between classes, traveling to schools, playing in a park, etc.) as well as low-impact physical activity (e.g., walking, sitting, stepping, etc.) may reduce risks for onset of overweight/obesity, metabolic syndrome, Type 2 diabetes, and cardiovascular disease in children (Hamilton, Hamilton, & Zderic, 2007). Hence, setting new (incremental) step goals with the pedometer may improve both exercise and non-exercise physical activities among male Mexican American children, resulting in incremental health benefits.

Exposure of children to high caloric foods with excessive fat and sugar result in an energy imbalance. This energy imbalance causes pediatric diseases and, as a result, threatens children's healthy lifestyles. In order to maintain an energy balance, modification of multiple behaviors would be required (Gentile et al., 2009): decreasing dietary fat and sweetened beverages and increasing fiber intake from fruits and vegetables (Ventura et al., 2009). However, studies report that third through fifth graders are reluctant to choose fruit and vegetable as snacks (Kimm et al., 2002). In this study, participants met the Recommended Dietary Allowances for fiber intake (25g), perhaps due to the use of dietary education sessions every alternate week for the children, their parents and any interested family members throughout the 10-week period. Participation of parents or guardians in the diet education program with their children has shown to be more beneficial than programs that just target health behaviors (increasing physical activity, increasing fruit and vegetable consumption, and decreasing screen time), and encourages children to change their diet patterns (Gentile et al., 2009).

Encouraging Mexican American children to be physically active involves providing them with a built environment in which they can safely walk, bike, run, play games, or engage in other physical activities. Because the obesity epidemic is a serious health problem among Mexican American children, prevention programs such as the AIP that can improve healthy lifestyles to lower obesity and positively affect weight outcomes in this high-risk group (Casazza, Dulin-Keita, Gower, & Fernandez, 2009).

Another implication of the AIP is the potential for a successful collaboration among schools, parents, and the community to develop and promote programs that encourage healthy eating behaviors and physical activity. Many school-based programs have resulted in improvements in clinical parameters as well as nutrition and physical activity. According to the scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism; Council on Cardiovascular Disease in the Young; and the Council on Cardiovascular Nursing, schools play an important leadership role in helping foster dietary education and physical activity (Pate et al., 2006). However, in order to improve school-based programs, it has been recommended to include parents as well as the community (Gentile et al., 2009). Because studies have shown that parent's physical activity and nutritional habits predict the child's risk for being overweight and because they also provide the support and environment for the child, parents should be involved in the programs with their children. Such collaborations can improve parental involvement which contributes to a program's success (Garcia-Dominic et al., 2010).

Several limitations deserve consideration when interpreting the results of this study. The small sample size may have resulted in lack of statistical significance for many parameters measured in this study. It also prohibited analysis of exercise intensity and duration among participants in the exercise group. A further limitation was that dietary intake and physical activity were assessed through self-report. Information was not collected from parents or family members that could have provided useful information on the correlations between adults receiving education and behavior change among participants; it should be explored in future studies. Due to the high cost of the MRI tests, neither visceral nor subcutaneous fat were assessed in the CON or EDU groups, thus limiting comparison of decreased visceral and subcutaneous fat among the groups. Potential mediating variables such as barriers and motivators to diet and exercise were also not validated in children in prior studies.

In conclusion, there is a lack of lifestyle interventions for Mexican American boys. This study provides preliminary evidence that the AIP can be a successful university/

school/parent collaborative to prevent childhood obesity in this ethnic group. Interventions, specifically among the Mexican American pediatric male population, also need to incorporate incremental step goal setting with pedometers, include parents in the programs with their children, and incorporate other ecological factors and resources such as the community. Although results in this study cannot be generalized, effectiveness of behavioral modifications with the use of physical activity and dietary education strengthens its potential for application in schools on the Texas-Mexico border.

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This article may provide one
Continuing Education Contact Hour Opportunity for CHES

Instructions and self-study questions may be found on page 43.

This Editor's Final Notes

The Spring 2012 issue of *The Health Educator* is unique in three respects. First and foremost, the transition has been made to an online delivery format. While authors will continue to receive complimentary print copies of the issue in which their articles appear, everyone else will access the journal online. Second, this issue marks the first time CHES/MCHES Continuing Education Credit Hours (CECH) have been offered through journal article self-study. Members will have the opportunity to earn up to two CHES/MCHES credits per issue (see pp. 43-44). Third, this issue is my last as Editor as I have decided to retire from this position. I want to thank Maureen Liefer, Editorial Assistant, (who also is retiring) for her dedication and enthusiasm over the past ten years. Maureen has been responsible for formatting the journal and her thoughtful and careful attention to detail has enhanced the quality and appearance of the journal. It has been a pleasure to work with her.

At press time a new Editor had not yet been named. I'm confident that Warren Schaller's vision and the legacy of the former Editors (Denise Amschler, Judith Luebke, and myself) will continue. It has been an honor to serve.