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An after-school dance and lifestyle education program reduces risk factors for heart disease and diabetes in elementary school children

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Abstract

Background—Forty-three percent of New York City's (NYC) school-age children are overweight or obese, placing them at risk for heart disease and type 2 diabetes mellitus (T2DM).

Objective—The objective of this study was to determine if an intensive after-school dance and lifestyle education program would reduce risk factors for heart disease, T2DM, and improve lifestyle choices.

Subjects—Subject include 64 fourth- and fifth-grade students at an elementary school in NYC.

Methods—Students received freestyle dance and lifestyle classes for 16 weeks and were evaluated for changes in body composition, endurance, biochemical measurements, and lifestyle choices.

Results—Significant improvements in BMI percentiles were found among children in the overweight and obese categories as well as in endurance and biochemical measurements that reflect heart disease and diabetes risk. Improvement was also reported in lifestyle choices.

Conclusion—An intensive after-school dance and lifestyle education program can reduce risk factors for heart disease and T2DM and improve lifestyle choices among elementary school children.

Keywords

childhood obesity; dance; lifestyle intervention; physical activity

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Introduction

Childhood overweight and obesity have been increasing nationwide (1), placing children at greater risk for several chronic conditions. Cardiovascular disease (CVD) and type 2 diabetes mellitus (T2DM) are seen with increased frequency in overweight children and adolescents (1–8). While rates of overweight have risen in all racial and ethnic groups, the highest rates occur in non-Hispanic African-American girls and Mexican-American boys (9, 10). In New York City (NYC), 43% of elementary school children are reported to be overweight [body mass index (BMI) ≥85th percentile] and 24% are obese (BMI ≥95th percentile) (11, 12). Lifestyle modifications in overweight children, involving physical activity (PA) levels and dietary habits, may have a significant impact on the subsequent morbidity and mortality of these children throughout adolescence and adulthood (13). Participation in all types of PA declines as age or grade in school increases, highlighting the importance of prevention and early intervention (14, 15). Despite the recommendation by the Centers for Disease Control and Prevention (CDC) that school-age children participate daily in 60 min of moderate to vigorous activity (16), a nationwide survey reported that 61% of children did not participate in any organized PA during non-school hours and 22.6% did not engage in any free time PA (17). Dance has been reported as a favored activity among children (17) and is an activity that provides moderate to vigorous physical activity (MVPA) levels (18, 19), which supports its potential as a tool to successfully modify activity levels.

Obesity among elementary school children in NYC is an important public health issue, and early intervention is paramount. To optimize impact on cardiometabolic parameters, such interventions would ideally include education for parents and children on lifestyle behaviors, including healthy nutrition and PA, and would provide opportunities for children to participate in vigorous activity during extracurricular hours. The intensity, frequency, and duration of exercise may have a significant impact on decreasing the risks of CVD and T2DM. Improvements in insulin levels, high-density lipoprotein (HDL) cholesterol, triglycerides (TG), blood pressure (BP), and adiposity have been shown in exercise programs of moderate to high intensity with 30- to 60-min sessions, 3–7 times per week, over a period of 3–8 months (16, 20–22).

The purpose of this study was to determine if a program combining high-intensity dance and lifestyle education would result in improved activity patterns, food choices, body composition, cardiovascular fitness, and biomarkers for CVD and T2DM among students in an elementary school setting in NYC.

Materials and methods

This was a prospective cohort study conducted between January 2008 and September 2010 at a public elementary school in NYC, designed to evaluate the effectiveness of an after-school program combining dance, nutrition, and lifestyle modification on reducing risk factors for CVD and T2DM. The school, where 94% of the participants are Hispanic, was chosen to target a high-risk group for obesity. Eighty-five children, ages 9–11 years, were enrolled, with 64 (75%) of the children completing the interventional study. Informed assent and consent were obtained from all children and their parents or guardians. Children were excluded from the study if they did not have parental consent and/or if they had diabetes or significant cardiac, respiratory, or musculoskeletal conditions that precluded their ability to take part in the dance class. The study was approved by the Weill Cornell Medical College and the NYC Institutional Review Boards.

All participants took part in a 16-week intervention that consisted of dance classes that lasted 60 min, three times a week as a structured, child-friendly class and once a week as a practice session (a total of four sessions per week). The high-intensity dance genres included mambo, cha-cha, hip hop, and swing. Classes were taught freestyle in which children followed dance routines with limited partnering to ensure constant activity. All participants were divided into classes of approximately 15 children. During the intervention heart rate (HR) monitors (Polar S610, Polar Electro, Kempele, Finland) were used in each class to determine the average HR and duration of activity to ensure adequate intensity of the classes. A sample of five participants, on a volunteer basis, wore HR monitors in at least one class per week to confirm that target levels of exercise intensity were met. The participants were encouraged to exercise at 75% of their maximum HR for 45 min of the exercise class, according to the recommended protocol (20, 22).

In addition, a registered dietitian, exercise physiologist, or a physician conducted weekly 30-min interactive lifestyle education seminars for parents and their children, focusing on nutritional intake and PA. The nutrition curriculum emphasized choosing low-fat food, eating appropriate portion sizes, increasing calcium intake, increasing fruit and vegetable consumption, and understanding and modifying sugar intake. The activity curriculum included optimizing strategies for aerobic exercise and decreasing television (TV) and computer time. A food and PA diary was used as part of the program to track behaviors. Attendance was taken in each class throughout the study. Before and at the end of this 16-week intervention period, the participants underwent the following tests at the Clinical and Translational Science Center (CTSC) outpatient unit (as outlined below):

1. BP and resting heart rate (RHR): These were measured using a Dinamap® C100 (GE Healthcare, Waukesha, WI, USA), an automatic BP machine with a cuff appropriately sized according to the manufacturer's manual. BP was measured after the participant had been sitting quietly for 5 min, seated with his or her back supported and feet on the floor, with his/her arm supported with the cubital fossa at the level of the heart.

2. Auxological measurements and body composition: Body weight (BW) was measured to the nearest 0.1 kg by a scale (Detecto Scales, Brooklyn, NY, USA), and height was measured to the nearest 0.1 cm by a stadiometer (Holtain Limited, Crymych, Dyfed, UK). BMI was then calculated and categorized into percentiles (BMI^{tile}) using age- and sex-specific standards from 2000 CDC growth charts. Body composition was evaluated using bioelectrical impedance (Quantum BIA model 101Q, serial Q1300; RJL Systems, Clinton Township, MI, USA). The Kushner equation was used to calculate fat-free mass (FFM), and then body fat (BF) was calculated using FFM and BW (23). Waist circumference (WC) was measured to the nearest 0.1 cm at the high point of the iliac crest at minimal respiration in a standing position using a vinyl tape measure (24).

3. Biochemistry: Blood was drawn at the CTSC to assess biochemical indicators of risk for CVD and T2DM. These included fasting total cholesterol (TC), HDL, low-density lipoprotein cholesterol (LDL), TG, plasma glucose (measured by Cholestech LDX Lipid Monitoring System; Cholestech Corporation, Hayward, CA, USA), and insulin (measured by the RIA Kit, COBRA2 Auto-gamma Counter; Millipore Corporation, Billerica, MA, USA). Insulin sensitivity was calculated using the homeostatic model assessment of insulin resistance (HOMA-IR) as fasting insulin concentration (μU/mL) multiplied by fasting glucose concentration (mg/dL) divided by 405, assuming that normal young subjects have an insulin resistance of one (25).

Questionnaire

All participants completed a descriptive non-validated questionnaire regarding their current nutrition and PA practices. Portions of this questionnaire were adapted from Bone Builders (26). Questionnaire items pertained to food intake and time spent doing various activities. The specific categories included bone health, whole grains and fiber, fruits and vegetables, eating habits, physical activities and exercise, and video, computer, and TV time. The questionnaire was administered at weeks 1 and 18, before and after the 16-week intervention period. Six months after completion of the study, the same questionnaire was given to each participant to determine if lifestyle modification persisted.

Data analysis

Statistical evaluation was performed using SAS 9.2 (SAS Institute, Cary, NC, USA). In addition to the entire study population, the participants were also grouped according to BMI ^{tile} into 85th to <95th (overweight) and ≥95th (obese), according to the CDC guidelines (27). The quantitative variables were evaluated as mean±standard deviation (SD) at baseline (pre), week 18 (post), and their difference. The one-sample t-test was used to test the null hypothesis between baseline and at week 18. Pearson correlation coefficient was applied to evaluate the correlation between two continuous variables. Statistical significance is reported at p<0.05.

Results

Demographic data

Among 61 children (95% of participants, 22 boys and 39 girls) who reported demographic information, 82% self-identified as Hispanic/Latino, 3% as African American/Black, 3% as Asian, 2% as Caucasian/White, and 10% as other or unknown. There was an average daily attendance in dance classes of 85.56% across all classes. The HR of the children during classes averaged 130 beats per minute (bpm), lasting an average of 50 min per class, which was within the range of MVPA for age.

BP, HR, body composition, and measurements

BP decreased in mean diastolic (62.92–62.42 mm Hg) and systolic pressures (109.64–107.81 mm Hg), but the decrease was not significant. RHR decreased significantly (p=0.0003) at the end of the 16-week intervention. Among all subjects, 58% had a BMI^{tile} in the overweight or obese category at baseline (23% overweight and 35% obese). There was a significant decrease in BMI^{tile} among children in both the overweight and obese categories (p=0.03 and 0.01, respectively) as shown in Table 1. Although the entire cohort and the children in the normal weight category did not show a significant change in BMI^{tile}, seven children moved into a lower BMI category. One child had an increase in his BMI due to a gain in FFM. A significant increase in FFM was observed in all BMI^{tile} categories. In addition, we found a decrease in %BF among overweight children (p=0.05). As expected, at baseline, HOMA-IR correlated with BMI (r=0.61, p<0.0001), %BF (r= 0.55, p<0.0001), and FFM(r=0.41, p=0.002)

Biochemical parameters

Among all subjects, our study resulted in significant changes in TC (p=0.02), glucose (p=0.05), LDL (p=0.05), and non-HDL (p=0.03), as depicted in Table 2. When broken down by BMI^{tile} categories, changes in various biochemical parameters became significant primarily among children in the overweight and obese groups. Non-HDL and TC decreased in both overweight group (p=0.03 and p=0.0007, respectively) and the obese group (p=0.02 and 0.01, respectively). A decreased ratio of TC to HDL (TC/HDL) and LDL were found only in children categorized as obese (p=0.04 and p=0.03, respectively). We did not see significant improvement in HDL in any of the groups, therefore, data were not shown. The improvement in glucose (p=0.02) and HOMA-IR (p=0.04) were seen only among children in the overweight group.

Questionnaire

Questionnaire of lifestyle changes were assessed at 18 weeks and 6 months after the intervention (Table 3). At 18 weeks, the results were expressed as percentage change from the baseline for each specific question. The percentages reported at 6 months reflect the percent of participants that maintained the improvement from week 18. Results are presented for the overall group, and are not broken down in BMI^{tile}.

Participants reported an average reported improvement of 25% for a variety of questions that reflected food selections promoting bone health at 18 weeks. The improvement included selecting food higher in calcium and decreasing soda intake. At the 6-month follow-up, 53% reported maintaining the aforementioned improvements. Additionally, 33% reported an increased intake of whole grains and high-fiber food at week 18, with 54% maintaining this improvement at 6 months. Improved intake of fruits and vegetables was reported as 24% at week 18; 65% maintained the improvement at the 6-month follow-up. In addition, children reported a 16% improvement on questions regarding eating behaviors; 75% maintained these improvements at 6 months. A 40% increase in PA was reported at 18 weeks; 40% maintained this improvement at 6 months. Furthermore, there was a 30% reported decrease in time spent viewing TV and videos and playing video and computer games at 18 weeks. This decrease was maintained by 32% at the 6-month follow-up.

Discussion

This study was designed to evaluate the effect of an intensive after-school freestyle dance and lifestyle education program on risk factors for CVD and T2DM. The high attendance rate (85.6%) of our intervention is likely related to the fact that classes and counseling took place at the school after school hours. It is our belief that program convenience makes higher attendance more likely.

Interventions that are culturally tailored have been shown to be most effective for children of racial or ethnic minorities (28). Our participants were predominantly Hispanic, and the program incorporated dances that were familiar to the Hispanic culture. Culturally familiar heart-healthy recipes and food were also integrated into the program. Together, these components of our intervention encourage lifelong, shared activity, and long-term sustainable lifestyle changes for children and their families.

The outreach approach used in our study exemplified the benefit of incorporating more families into a lifestyle intervention program. Furthermore, most children in the study engaged in dancing because they enjoyed the activity. We used random HR monitoring to gauge the exercise intensity and consistency, thus ensuring the validity of our dance intervention as providing MVPA. Together with lifestyle interventions, at the end of the 16-week period, an improvement was seen in a variety of risk factors, with the greatest improvement seen among children in overweight and obese BMI^{tile} categories.

BMI^{tile} is used to evaluate overweight and obesity in children. BMI levels are shown to correlate with an increase in BF and CVD risk levels (29–31). Studies have shown that obese children tend to be less active than their non-obese peers (22, 32), and decreased activity is known to lead to low levels of fitness and increased adiposity (32). MVPA impacts BF and muscular fitness (32, 33), and longer durations of PA seems to be more

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effective in changing BF (34). Our study showed that a 16-week after-school dance and lifestyle education program aimed at parents and children, with 4 h of weekly PA, had a positive impact on BMI and body composition among children who are obese and overweight. Statistically significant changes occurred in BMI^{tile} and FFM primarily in children classified as overweight and obese. Exercise interventions in adults were shown to reduce the percentage of weight lost as FFM in some studies (35), whereas in others, mainly aerobic type of exercise resulted in an increase in FFM (36, 37). The increase of FFM that we found in our participants is also consistent with the findings from a study of a school-based PA program aiming to enhance endurance, flexibility, and strength in children (38). The changes in BMI^{tile} in a positive direction suggest that interventions of significant duration, similar to our program, are likely to bring about clinically significant changes. Seven children had improvements in percentile category, whereas one child's BMI category worsened.

However, an increase in FFM accounted for the increased BMI^{tile}. A decrease in %BF among overweight children in our study is an expected outcome, according to previous data (20, 39). There was no significant difference found in BMI and BF changes in children in the normal weight group. Furthermore, these data show that our intervention is foremost successful in high-risk-category participants, such as those who are overweight and obese. Therefore, we advocate for similar future studies to specifically target this group of children. Moreover, in addition to improvements in body composition, the observed improvements in HOMA-IR and lipid profile support the benefits of an after-school program providing MVPA and lifestyle education to children and their parents.

The HOMA-IR is a validated method to assess insulin resistance, a key component in the pathogenesis of the metabolic syndrome (40–42). Overweight and obese children are at risk for this metabolic consequence. Our results of improved serum glucose and HOMA-IR among overweight children after participation in the program support previous findings of the positive effects of exercise and healthy diet on insulin sensitivity (8, 43–45) and therefore may also suggest decreased CVD and T2DM risks.

CVD is one of the biggest contributors to morbidity and mortality in industrialized nations (46, 47). The American Academy of Pediatrics states that elevated cholesterol levels in children increase the risk for coronary heart disease (CHD) later in life (46), and the American Heart Association emphasizes the importance of exercise in childhood as a way of preventing heart disease (48). Stoedefalke (47) reviewed 14 studies looking at the effect of PA on lipid profiles in children; six studies showed a positive correlation. Effects of time, intensity, and duration of exercise regimen may have played a role in these results. Our study provided aerobic exercise in the form of freestyle dance for a period of 16 weeks, three times weekly plus a once weekly practice session, for an average duration of 50 min per class, with participants having an average HR of 130 bpm. This is considered moderate to vigorous activity that approaches aerobic threshold (49). The significant reductions found in TC, LDL, and non-HDL may be the result of the combination of changes made in dietary habits and participating in the after-school dance activity. Nevertheless, the combination of lifestyle education and a moderate to vigorous exercise regimen improves the CVD risk factors of overweight and obese children, consistent with the findings of some previous studies (50, 51).

HR decreases with aerobic training, and a decrease in RHR is indicative that the heart is working more efficiently (52). Optimal physical fitness and regular training is assumed to induce adaption of the autonomic nervous system and is often observed as a decrease in resting basal HR thought to be mediated by an increase in cardiac vagal tone (53). Data support that good aerobic fitness may have protective cardiovascular effects through enhancing the cardiac vagal function during exercise (49). Various activities may have different physiological effects on children at different ages. This needs to be taken into account when designing MVPA programs to optimize cardiovascular benefits (54). In our study, children were engaged in MVPA for 50 min on average, which was 83% of class time. This resulted in a statistically significant decrease in RHR suggesting an improvement in cardiovascular fitness. Higher levels of PA have also been reported to be associated with lower BP (51). BP was only slightly decreased in our study without reaching statistical significance. This finding may well be explained by the fact that the majority of our participants were normotensive at baseline. Therefore, the improvement may have been too small to be detected. Others have reported similar results among children and adolescents (34).

The questionnaire offered child-reported information on changes in lifestyle behaviors. Some of the children reported positive changes reflecting healthy eating habits, improvements in PA, and in sedentary behavior at the end of our intervention. This finding is considered important because children who watch more than 4 h of TV have been shown to have higher BMI and % BF than those who watch 2 h or less (55). The improvement was maintained 6 months after the intervention in many of the children. These findings are very encouraging and suggest possible long-term effects of programs providing dance activity and lifestyle education. We do not have repeat blood lipids and other study parameters at 6 months, which will allow us to document a persistent improvement in our participants. As questionnaires have limitation in reflecting what really occurs, our follow-up questionnaire results should be interpreted with this caveat in mind. Nonetheless, our results justify future studies to understand the long-term impact of exercise and lifestyle programs.

Limitations

A few limitations warrant comment for this study. One such limitation is the absence of a control group. As this was a pilot outreach program to children in a local public school, it was not feasible to have a control arm without intervention. The addition of a comparison group would have strengthened the evaluation of the program's efficacy. Additionally, we would have liked to account for dietary intake and other fitness activity, changes that occur beyond the classes, over the course of the program. These were not possible due to our limited resources. As the questionnaire only captured intake of specific food and activities of the prior week, a more comprehensive assessment could provide a more accurate picture of lifestyle behaviors. Likewise, the use of a validated questionnaire would ensure appropriateness of the instrument.

With the high prevalence of childhood obesity coupled with the lack of after-school activity, there is an urgent need for after-school programs that involve exercise and lifestyle education to address the issues of childhood obesity and development of chronic diseases, such as CVD. In this study, we demonstrate that a 16-week after-school dance program that provides moderate to vigorous exercise and lifestyle education in a community setting is effective in improving risk factors for CVD and T2DM in elementary school overweight and obese children. We propose that similar type of programs may help improve eating and exercise habits, decrease sedentary behavior, and combat the epidemic of childhood obesity.

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Table 1

Changes in body composition and endurance classified by BMI groups (overweight and obese) and overall.

Parameters	BMI^{tile} group	n	Pre		Post		Difference pre and post		p-Value
			Mean	SD	Mean	SD	Mean	SD	
Body composition									
BMI^{tile}	Overall[a]	62	75.55	27.12	73.03	28.09	−2.52	11.51	0.09
	<85th	26	49.01	22.52	44.76	21.17	−4.25	17.54	0.22
	85th to <95th	14	90.03	2.72	87.46	4 59	−2.56	4.02	0.03[b]
	≥95th	22	97.70	1.62	97.24	1.77	−0.46	0.79	0.01[b]
%BF	Overall[a]	61	32.0	10.0	31.0	10.0	−1.0	4.0	0.09
	<85th	24	23	7	23	7	−1.0	50	0.39
	85th to <95th	14	34.0	40	32.0	30	−2.0	30	0.05[b]
	≥95th	22	40.0	80	39.0	80	−1.0	30	0.07[b]
FFM, kg	Overall[a]	61	28.35	6.16	29.54	6.13	1.20	1.84	< 0.0001[b]
	<85th	24	25.20	5.45	26.24	5.16	1.04	1.91	0.01[b]
	85th to <95th	14	27.61	4.96	29.22	5.51	1.61	1.47	0.001[b]
	≥95th	22	32.61	5.19	33.60	5.29	0.99	1.97	0.03[b]
Endurance									
RHR	Overall[a]	64	86.05	14.69	78.25	0.0003[b]	−7.8	16.33	0.0003[b]
	<85th	26	83.85	14.53	78.50	0.13	−5.35	17.20	0.13
	85th to <95th	14	88.64	13.08	78.14	0.03[b]	−10 5	15.8	0.03[b]
	>95th	22	88.05	16.18	77.59	0.01[b]	−1045	15.73	0.01[b]

[a]Overall: Two patients did not have BMI categories determined; therefore, “overall n” value may differ from total listed in the percentile groups.

[b]Statistical significance. Pre, before intervention; post, after intervention at the end of 16 weeks.

Table 2

Changes in biochemical measurements classified by BMI groups (overweight and obese) and overall.

Parameters	BMI^{tile} group	n	Pre		Post		Difference pre and post		p-Value
			Mean	SD	Mean	SD	Mean	SD	
GLU, mg/dL	Overall[a]	62	92.55	7.21	90.76	6.53	−1.79	6.99	0.05[b]
	<85th	26	92.15	7.74	91.08	6.79	−1.08	8.52	0.53
	85th to <95th	14	93.21	75	89.43	5.77	−3.79	5.25	0.02[b]
	≥95th	20	92.40	6.81	90.75	6.88	−1.65	55	0.20
HOMA-IR	Overall[a]	60	36	1.94	37	2	01	1.52	0.60
	<85th	25	2.39	0.88	2.84	1.06	0.44	1.39	0.13
	85th to <95th	14	3.92	1.74	31	1.11	−0.82	1.33	0.04[b]
	≥95th	19	4.95	2.25	5.26	2.59	0.31	1.67	0.43
LDL, mg/dL	Overall[a]	42	97.69	25.94	92.6	27.06	−5.1	16.64	0.05[b]
	<85th	14	92.93	23.81	94.79	30.34	1.86	15.52	0.66
	85th to <95th	11	97.73	30.57	92.18	33.2	−5.55	12.81	0.18
	≥95th	16	102.5	25.92	91.44	21.41	−11.06	18.84	0.03[b]
Non-HDL, mg/dL	Overall[a]	60	106.6	27.05	101.83	26.15	−4.77	16.95	0.03[b]
	<85th	26	97.96	24.82	99.88	27.98	1.92	14.28	0.50
	85th to <95th	13	114.54	28.57	105.85	30.19	−8.69	12.45	0.03[b]
	≥95th	19	114.74	27.2	102.68	22.79	−12.05	20.23	0.02[b]
TC, mg/dL	Overall[a]	61	154.21	30.05	148.2	29	−6.02	19.76	0.02[b]
	<85th	26	152.73	27.26	155.27	28.28	2.54	20.22	0.53
	85th to <95th	13	162	30.84	146.92	29.92	−15.08	12.00	0.0007[b]
	≥95th	20	150.80	34.86	138.85	29.26	−11.95	19.75	0.01[b]
TC/HDL	Overall[a]	46	34	0.93	3.34	0.98	−0.06	0.61	0.51
	<85th	21	30	0.71	3.10	0.96	0.11	0.63	0.44
	85th to <95th	9	3.46	0.76	3.53	0.85	0.08	0.38	0.55
	≥95th	15	4.01	0.99	3.63	1.02	−0.38	0.63	0.03[b]

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[a] Overall: Two patients did not have BMI categories determined; therefore, " overall n " value may differ from total listed in the percentile groups. GLU, glucose (multiply mg/dL by 0.055 to convert to mmol/L); non-HDL (multiply mg/dL of TC, HDL, LDL, and non-HDL by 0.029 to convert to mmol/L).

[b] Statistical significance. Pre, before intervention; post, after intervention at the end of 16 weeks.

Table 3

Detail of the study questionnaire classified into different categories.

Questions	Improvement at the completion of intervention at 18 weeks[a], %	Maintained improvement at 6 months [b], %
Bone health		
1. How often do you drink milk (includes chocolate)?↑	17	56
2. How often do you drink CA-fortified juice?↑	27	60
3. How often do you drink other fruit juice?↓	19	60
4. How often do you drink soda pop?↓	26	43
5. How often do you eat broccoli or leafy vegetables?↑	28	47
6. How often do you eat yogurt?↑	26	43
7. How often do you eat cheese?↑	22	55
8. How often do you eat nuts (almonds, cashews, or peanuts)?↑	33	59
Mean (SD)	25(5)	53(7)
Whole grains and fiber		
1. How often do you eat white bread?↓	26	64
2. How often do you eat whole wheat or rye bread?↑	35	61
3. How often do you eat white rice?↓	26	50
4. How often do you eat brown rice?↑	47	52
5. How often do you eat cold cereals from the box with fiber (Cheerios, Raisin Bran)↑	37	45
6. How often do you eat kidney, black bean, or pinto (not green beans)?↑	25	50
Mean (SD)	33(9)	54(7)
Fruit and vegetables		
1. How often do you eat fruit (not counting juice)?↑	18	80
2. How often do you eat vegetables (not counting potatoes)?↑	29	50
Mean (SD)	24(8)	65(21)
Eating habits		
1. How often do you add extra sugar to your food?↓	20	100
2. How often do you eat (or get take out) at a fast food restaurant (such as Mc Donald's, Pizza, Taco Bell)?↓	11	50
Mean (SD)	16(6)	75(35)
Physical activities/exercise		
1. In the last 7 days, how many days did you do sports, dance, or play games in which you very active for at least 30 min?↑	34	50
2. In the last 7 days, how many times did you practice dance, besides in the dance class at school, in which you were active for at least 30 min?↑	45	29
3. On the last weekend, how many times did you do sports, dance, or play games in which you were very active for at least 30 min?↑	51	30
Mean (SD)	40(8)	40(15)

Questions	**Improvement at the completion of intervention at 18 weeks[a], %**	**Maintained improvement at 6 months [b], %**
Video/computer/TV time		
1. How many hours of TV or video did you watch yesterday?↓	28	33
2. How many hours of video games or computer games did you play yesterday?↓	39	52
3. Decrease in TV, video, and computer games↓	33	43
Weekly activity checklist↑	21	12
Mean (SD)	30(7)	32(16)

[a](Answered as improved/total number of completed questions)×100.

[b](Answered as maintained the improvement/answered as improved)×100.

↓denotes decrease;

↑denotes increase.