Published in final edited form as:
Obesity (Silver Spring). 2010 February ; 18(0 1): S75–S83. doi:10.1038/oby.2009.435.

The Use of Mentoring Programs to Improve Energy Balance Behaviors in High Risk Children

Debra Haire-Joshu[1], **Marilyn S. Nanney**[2], **Michael Elliott**[1], **Cynthia Davey**[2], **Nicole Caito**[1], **Deborah Loman**[3], **Ross Brownson**[1], and **Matthew Kreuter**[1]

[1]Washington University, St. Louis, Missouri

[2]University of Minnesota, Minneapolis, Minnesota

[3]Saint Louis University, St. Louis, Missouri

Abstract

Introduction—This study tested the impact of "Partners of all Ages Reading About Diet and Exercise" (PARADE), an energy balance intervention incorporated into child mentoring programs.

Methods—We used a group randomized nested cohort design which randomized mentoring program sites (n=112) and children (N = 296; age=8.5 years) to intervention or usual care conditions. PARADE mentors delivered 8 lesson plans, 8 child-focused computer-tailored storybooks, and 8 parent action support newsletters addressing positive diet and activity behavior patterns.

Results—When compared to the control group, PARADE children were more knowledgeable of diet and activity guidelines ($p<0.01$), challenged themselves more to eat 5 fruits and vegetables per day ($p=0.04$) and to be active one hour daily ($p=0.02$). Calories from high fat foods decreased in overweight/obese children ($p=0.05$) but not for normal weight children. There were no significant differences in percent time being active. Among parents there were no significant differences between PARADE and control groups. PARADE parents did report an increase in minutes of walking ($p=.13$) and modeling activity behaviors to their child ($p=.12$).

Discussion—PARADE motivated high needs children to develop healthy energy balance patterns. Children need to be supported by stronger parental involvement and behavior change in providing a positive food and activity environment.

Conclusion—PARADE provides evidence for the use of multi-component, community-based approaches to reach high risk children and their parents as a routine component of their mentoring experience.

Introduction

Patterns of poor dietary intake and sedentary lifestyle have resulted in an epidemic of pediatric overweight and obesity which is more common among economically disadvantaged and minority groups.(1-4) Dietary and physical activity interventions among these at risk children, targeted to multiple environments where children spend time such as school and home, are needed to prevent overweight and obesity.(5-7)

Corresponding author: Debra Haire-Joshu, Washington University in St. Louis, djoshu@gwbmail.wustl.edu; Phone 314-362-9554; FAX 314-362-9581.

DISCLOSURES

The authors do not have any disclosures.

School-based interventions have demonstrated some success in changing energy balance patterns in large groups of children through coordinated classroom curriculum and instruction, integration of food service training and nutrition education, staff training, and family involvement through group meetings and participatory 'homework' activities.(8, 9) However, these interventions may not be as effective for children at risk for delayed cognitive or social development (e.g. poor reading skills, low self-esteem) due to inadequacies in school, home, or community environments (e.g. poverty), all factors associated with poorer health outcomes.(4, 10-12) Instead at risk children are more likely to benefit from individualized approaches that require commitments for additional time and professional personnel, further resources that may limit the ability of most schools to conduct such programs.(13)

In addition to school, children spend their time at home with parents as the primary and most consistent lifelong influence on health patterns.(14, 15) School-based studies have therefore used a variety of methods (e.g. homework plans, group meetings, newsletters) to promote parental knowledge and support of health behavior information with varying reports of success.(16) Computer based tailoring to individualize information offers another means of enhancing impact of these approaches.(17-19)

Mentoring programs have been used to reach children at risk for poor educational outcomes.(20-22) Mentoring programs are often complimentary to school initiatives, with adults acting as both tutor and role model to children exhibiting delayed academic progress.(23-25) These programs can provide individualized attention to the child, and may also provide feedback to the parent focusing on positive aspects of the child's progress. This approach can also represent a powerful teaching tool for promoting positive health outcomes in at risk children. Incorporation of health information into the mentoring curriculum for both children and parents offers an opportunity to promote energy balance behaviors. However to date, the majority of studies on mentoring have focused on their impact on older adults.(26, 27)

The purpose of this study was to test the impact of a multi-component intervention designed to improve diet and activity behaviors as an element of mentoring programs for high needs children. This study, entitled "Partners of All Ages Reading About Diet and Exercise" (PARADE) was conducted in collaboration with the OASIS Intergenerational Reading Program (OASIS) and Big Brothers, Big Sisters Inc. (BBBS) located in St. Louis, Missouri.

METHODS

Study design

PARADE used a group randomized trial design and was implemented from 2000 to 2006.(28-30) Based on sample size estimates adjusted for inflated variance due to within group correlations and calculated to provide 90% power to detect a statistically significant difference in mean primary outcome measures between intervention and control children, 782 children and the parent of that child, were recruited from 119 OASIS and BBBS sites. A computer generated randomization scheme was used to randomly assign sites to intervention (n = 418 children at 74 sites) or control (n = 364 at 45 sites) by the study team.

Children enrolled in the tutoring programs at these sites were assessed for eligibility and willingness to participate by tutors. This resulted in the participation of 782 children (ages 5 to 12 years old) and their parents in the PARADE study.

Control children received the standard tutoring program which consisted of routine one hour visits with the child. Intervention families received the standard tutoring program plus

PARADE. Visits occurred in various community settings including libraries, community centers, after school areas, or outside of the classroom setting. A telephone survey was conducted with the same parent recruited to the study before and after the intervention to assess change in the child and the parent. Interviewers were trained to conduct the survey. Child report of diet and activity behaviors was obtained by trained mentors before and after intervention delivery. An explanation of the study and informed written consent was obtained for participation of the parent and child in the study. Parents were given a $15 gift card for completing the pretest and posttest survey. Child assent was also obtained; children were provided with a book as an incentive for completing measures. The average time between the pretest and the posttest survey was 4.8 months (range 2.3 months to 10.8 months). The Institutional Review Board of Saint Louis University approved this study.

Intervention

PARADE was organized around an ecological model addressing multiple levels of influence (individual, family, organizational); the intervention reflected constructs from social cognitive theory including observational learning, knowledge, and self efficacy.(31, 32) Consistent with our prior work (14, 33, 34) a community based participatory approach and extensive formative research guided the development of content and structure of the PARADE intervention.(35, 36) Methods to identify core content included a series of developmental meetings with mentoring program staff, structured interviews, and pilot testing with children, parents, and mentors. This approach revealed several priority areas for consideration in development. First, respondents demonstrated minimal knowledge of diet and activity guidelines, identified multiple barriers to health behavior change, and reported economic concerns associated with positive eating or activity patterns. Second, the standard mentoring curriculum was focused on academic achievement in reading and mathematics. This meant that only a very specific amount of diet and activity content could be incorporated into the already dense curriculum, and it had to be consistent with the program's academic focus. Finally, PARADE needed to fit within the delivery structure of the ongoing mentoring programs. This meant the content and messages had to be incorporated within easily packaged and accessible modules for use by mentors.

Based on this formative work, the curriculum was developed to focus on content designed to enhance knowledge of dietary and activity guidelines, identify common and accessible activities, and low cost and accessible fruits and vegetables. Each module was packaged to contain all program materials including an individual visit lesson plan, a storybook, and a parent action newsletter, described as follows:

Lesson plans—Eight lesson plans were developed for mentors to use as a guide to interactions with children during visits. Each lesson was developed to be consistent with the format of the mentoring program and provided: 1) a lesson objective; 2) brief background information for the mentors on the specific lesson topic; 3) a guide for mentors showing how each of the child's storybooks (described below) was individually tailored; and 4) activities to reinforce the messages in the storybooks.

Child tailored storybooks—Eight computer tailored storybooks were developed that comprised an adventure series including colorful graphics and engaging characters (e.g., talking animals) as well as preferred repetitive phrasing of the storyline motto (e.g. "Play for an hour a day!") and an interactive word game. To create these computer tailored storybooks, children first completed a brief five-minute assessment to gather individual data on baseline knowledge, self efficacy, dietary intake, activity level, current interests and preferred activities related to the theoretical constructs. These data were entered into FileMaker Pro (for Macintosh), a relational database management system that houses data,

message libraries and pre-determined algorithms. This program matched each child's data with the specific messages and graphics that best reflected that child's needs. These elements were then exported into storybook templates creating the eight computer tailored storybooks for each child. Since the storybook was developed for that specific child, the content varied. However all storybooks included: (1) discussion of positive patterns and ways of changing negative patterns, (2) specific action steps for the child to take to change or maintain behaviors, (3) suggestions for how the child can talk to his or her parents about possible strategies or solutions. All storybooks were created, printed and bound in-house. Children received the storybook in each session and were encouraged to take the book home to their parents.

Parent action newsletters—In addition to the eight tailored storybooks, eight newsletters were developed and sent home to the parents. Each colored newsletter was four pages in length and focused on different activity themes relating to increasing child activity levels, such as providing tips on how to role model activity for children, explaining how activities can be incorporated into busy lifestyles, and identifying methods for increasing their child's level of activity. The parent action newsletters reinforced the core content of the child tailored storybooks and addressed: (a) the session goal, (b) child-specific baseline data related to that goal, (c) review of the child-focused strategies, (d) specific diet and activity parental modeling strategies, (e) parent-child interaction strategies. Newsletters included shopping tips on saving money on fruits and vegetables compared to junk food at the grocery store, overcoming common barriers through an expert advice column, easy parent and child after-school snack recipes, tips on making healthier choices when eating fast food, and fun games to reinforce these messages. In addition, the newsletters encouraged parents to read the tailored storybooks each week with their child in order to better understand the messages they were conveying.

Training of mentors—Mentors were adults active in the participating organizations, who volunteered to be a mentor to a child. PARADE training was two hours and included a review of all materials, lesson plan objectives, and tailoring of storybooks. Training sessions were conducted as a normal part of ongoing mentor training; 201 mentors completed training.

Outcomes

PARADE outcomes were obtained from three sources; 1) child report of his/her behaviors facilitated by the mentor as part of a lesson plan called "measure me" at pre test and "healthy me" at post test, (2) objective measurement of child heights and weights, and 3) parent report of his/her own behaviors plus the dietary intake and activity levels of the child.

Child Survey—Mentor administered child baseline and post test evaluation included questions assessing preferences for fruits, vegetables (FV) and activities, FV and active play knowledge, challenging self to meet FV and active play recommendations, asking parent/guardian for FV for an after school snack and someone to play with, and parental role modeling of healthy eating and being active.

Assessing child preference for 12 fruits and 12 vegetables included colorful pictures of each FV and expression faces to represent responses: never tasted, don't like, like, favorite. These methods were also used to assess child preference for 13 active play activities (i.e., kickball, jump rope, bike, play with pet). Child knowledge was assessed from four questions related to healthy eating and activity: best choice for after school snack (milk and banana), identifying a variety of fruits, how many times a day you should eat FV and, (5) how many days a week you should play and be active (everyday). Asking skills were assessed for FV

by evaluating child response to: “If you want a fruit or vegetable for an after school snack, do you a) ask for a fruit or vegetable, b) eat what is served, c) eat what others eat?” Similarly for physical activity: “If you want to play with someone after school, do you: a) ask someone to play with you, b) wait for someone to ask you to play, c) play by yourself.” Perception of parental role modeling was assessed by the child from the following questions: “Do you see your parents being active or doing activities like walking, exercising, cleaning the house, and mowing the lawn almost every day? (yes or no)” and “Do you see your parents eat fruits and vegetables for snacks almost every day? (yes or no).” Finally, challenging self was assessed: “In the past week, did you challenge yourself to play actively at least one hour every day after school? (yes or no)” and “ In the past week, did you challenge yourself to eat five fruits and vegetables every day? (yes or no).” Child body mass index (BMI) was calculated from weight and height measured by interviewers on site in the nurse’s office or other private area at the school trained using a standard protocol with stadiometer and validated scales.

Parent Interview—Parents agreeing to participate were mailed interview packets including pictures and descriptions of physical activity categories and intensity levels, designed to assist parents’ estimate of their child’s activity categories, pictures to facilitate accurate reporting of foods and portion sizes, as well as response choices to other questions during the interview. Telephone interviewers, experienced and trained in completing dietary and activity assessments, then collected data via telephone survey questionnaires.

The telephone survey measured demographic and lifestyle characteristics of the parents. Demographic information included gender, ethnicity, education level, employment status, household income, number of children, height and weight, and personal and family health history. Parent physical activity was measured through standardized Behavioral Risk Factor Surveillance System items specifically addressing moderate and vigorous activity. The questions assess occupational physical activity, non-occupational walking physical activity, moderate-intensity recreational activities, and vigorous-intensity recreational activities and have been tested for reliability and validity. Body mass index was calculated from self reported height and weight.

Due to the age of the child, parent proxy was used to assess child dietary intake and physical activity level. Child activity level was assessed using a modified version of a Parental Proxy Survey developed through the Sports, Play, and Active Recreation for Kids (SPARK) trial. (37, 38) This 14-item survey asks parents to report about child’s performance of physical activities (e.g., eating, transportation, school, play, exercise) and to rate the intensity (i.e., light, slow breathing with little or no movement, medium, normal breathing and movement; hard, increased breathing and moderate movement; and very hard, hard breathing and quick movement). Child dietary intake was measured by a 71 item food frequency questionnaire which showed adequate reliability (ICC total daily calories=0.69). Consistent with methods reported elsewhere, parents were asked to recall their intake and that of their child in the prior month (ICC total daily calories=0.72).(14, 39, 40)

Statistical analyses

The primary outcomes of interest for this study were child nutrition and physical activity knowledge, daily caloric intake, percent of calories consumed from fat, daily servings of fruits and vegetables, percent of time spent in physical activity, BMI z-score, and parental daily caloric intake, percent of calories consumed from fat, daily servings of fruits and vegetables, and minutes walked per week. Secondary outcomes included change in child reported attempt to challenge self to eat 5 fruits or vegetables a day or to be active for at least one hour each day.

Mixed effect models were used to evaluate the intervention effect from baseline to post-intervention in the cohort of students with data at both time points. Site was included as an effect in these models as appropriate for a group randomized trial design.(28) Outcomes in children were adjusted for child age, gender, baseline BMI-z, and parent education, except BMI-z outcomes which were adjusted for parent education only. Stratified analysis was also done to examine different effects between normal weight and overweight children. Data collected in this study were entered into an SPSS database. SAS version 9.1 (Copyright (c) 2002-2003 by SAS Institute Inc., Cary, NC, USA) was used for all statistical analysis.

RESULTS

Child-mentor participation

Analysis for this study was limited to the cohort of 451 children (296 children at 69 PARADE sites and 155 children at 43 control sites) with pre and post data for child survey outcomes. The number of children per site varied, but there was no significant difference between control sites and intervention sites in the proportion with 7 or more participants.

Analysis for parent interview outcomes were further limited to the 279 children (124 PARADE and 72 control) with pre and post parent interview data. Mentors completed session content checklists after delivering project sessions. Session checklists were used to document the delivery of intervention curriculum. Mentors documented attendance and delivery of individual components of the session and were asked to rate if students actively participated in discussions and if students responded positively to their tailored storybooks. Due to the academic calendar, four months were allotted for delivery of PARADE between conduct of the pre and posttest. The mean time elapsed between pretest and posttest was 5.7 months (SD 2.6) with a minimum of 2.1 months and maximum of 16.2 months. During this time frame, 56% of children in the analysis group had received all eight sessions and 82% had received at least six sessions. Evaluation of PARADE by the parent revealed that 84% read the tailored storybooks with their child, and 88% reported that their child liked the books as much or more than other books.

Baseline characteristics

Baseline child and parent characteristics for 451 children in the analysis group are summarized in Table 1. At baseline, children in PARADE were slightly younger than those in the control group. PARADE parents were more highly educated ($p = 0.01$) and reported a higher income ($p = 0.08$) than did control parents.

Child and parent outcomes

Baseline and post-intervention least square means, adjusted for child age, gender, baseline bmi-z and parent education, are reported in Table 2 for PARADE and control children. Child knowledge of healthy eating and activity increased significantly for PARADE children compared to control children ($p< 0.01$). In addition, the percent of children who challenged themselves to eat healthy and to be more active increased significantly among PARADE children compared to control children ($p=0.04$, 0.02 respectively). While not demonstrating a significant intervention effect, adjusted mean BMIz decreased more in the PARADE children than in the control children. Fruit and vegetable consumption (mean servings/day), total calorie intake, mean percent of calories from fat, and mean percent of time active increased in both groups. Similar results were found in models restricted to PARADE children receiving all eight sessions. While both PARADE and control children had increased preference for more kinds of FV and increase in percent asking to be active, the increases were greater for control children. Within group and between group differences

for asking for FV for a snack and preferring more types of active play were in the expected direction, though not significant.

Table 3 yields different intervention effects between normal weight and overweight and obese children. Normal weight PARADE children significantly improved frequency of challenging themselves to be active and eat 5 FV every day. Overweight and obese PARADE children significantly decreased their intake of calories from high fat foods. Both normal weight and overweight and obese PARADE children improved knowledge scores. Although not significant, improvements in preference scores for FV were in the expected direction only for normal weight children, while a decrease in calories was unique to overweight and obese children.

There were no significant intervention effects for parent outcomes, presented in Table 4. Both groups of parents had increased mean fruit and vegetable consumption, percent of calories from fat and total calorie intake. Mean total walking time increased more for PARADE parents than control parents but this difference was not significant. Within group and between group differences were in the expected direction for parental role modeling of being physically active and minutes walking, although not significant.

DISCUSSION

There are several key findings from PARADE which inform the growing literature testing innovative energy balance interventions with children and parents in community settings. PARADE significantly improved the knowledge of high risk children about diet and activity, and reports of challenging themselves to healthy eating and active play, all precursors for behavior change that may influence energy balance.(41-43) Improvements are in the hypothesized direction for asking for FV and asking to play. These responses are indicators of child self efficacy which is an important precursor to diet and activity behavior change in children.(47-50) Additionally, children in the PARADE group reported an increase in seeing their parents eat healthy and be active, suggesting the home environment was perceived as more supportive of energy balance behaviors. This data trend is interesting since parental role modeling of healthy behaviors has been identified as a major influence on developing child patterns of health behavior.(14, 15, 51, 52)

The BMIz score of PARADE children decreased despite a small increase in calorie intake. This contradictory finding might be related to increased awareness of foods and portion sizes on the part of PARADE parents, influencing recall at posttest. In addition, there was a positive trend among PARADE children towards increased activity time, active play preferences, challenging self to be active, asking others to play, and observing parents being active. While promising, the limited sample size or study time frame may have mitigated the ability to establish significant findings.

PARADE appears to have had differential effects on normal weight and overweight and obese children. These findings are consistent with those found in other community-based, energy balance programs focused on families with young children.(14, 53) While improvement in proximal behaviors like challenging self and preferences related to diet and activity were unique to normal weight PARADE children, translation to eating fewer calories in general and from high fat foods specifically, were in the hypothesized direction only for the overweight and obese children. This might indicate that overweight or obese children are more sensitive to messages about food than their normal weight counterparts, perhaps due to prior weight loss information or obesity bias.(54-57) Other studies suggest that parental awareness of energy balance behaviors may also account for this finding.(53)

These data are consistent with other studies that suggest the role of parents as critical in the energy balance environment of the child.(14, 51, 58, 59) PARADE's primary impact was in motivating the child to want to change, results that are consistent with a child-focused, individually tailored energy balance program. PARADE encouraged children to take actions that were within their control (i.e., asking skills, challenging self). However, a child's food and activity environment is often controlled by the parent, not the child. The parent must assure the child is in a food environment (e.g. access and availability to FV) or activity environment (e.g. access to safe play) that supports energy balance behaviors.(44-46) PARADE parent action newsletters supported the child focused intervention, but were not tailored to the parent or their characteristics. These findings suggest that individualized interventions for children can motivate and lay the foundation for the development of healthy patterns; however changes need to be supported by strong parental involvement in modeling appropriate energy balance behaviors and in providing a positive food and activity environment for their child.(8, 16, 60, 61) Interventions tailored to the diet and activity behaviors of the parent and child might be necessary to assure a home environment which supports energy balance behaviors.

PARADE is the first study to our knowledge, that incorporates mentoring plus computer based tailoring as a key strategy for child change. PARADE provides evidence for the use of multi-component, community-based approaches to reach high risk children and their parents as a routine component of their mentoring experience. This study does not allow us to untangle the unique influence of the personal mentoring versus tailoring component. However in combination with personal contact, these data lend credence to strategies suggesting that child focused programs can support important proximal changes in high needs youth necessary for long-term health. Additionally, PARADE supported parent child interaction as a high percentage of parents reported reading the tailored books to their child. Together, these results lay the foundation for further work evaluating the importance and impact of tailored approaches directed towards both the parent and the child individually. (19, 34, 62)

Finally, the participatory approach to the development of PARADE ensuring content, structure, and flexibility, enhanced the likelihood PARADE would be institutionalized as an ongoing component of the mentoring programs.(35, 36) Since PARADE is incorporated within these mentoring agencies, changes will likely be reinforced and enhanced overtime as the intervention is continually delivered. This is an important accomplishment since mentoring programs can reach underserved and high needs school-aged children in a meaningful way, without adding to an already content laden school curriculum. The use of participatory methods may assure the appropriateness of PARADE for use in other urban settings and organizations further enhancing its uptake and impact.(35, 36, 59)

Strengths and limitations

Strengths of this study include the group randomized design which provides outcome data on a large group of at risk children and parents. In contrast this primarily urban and suburban population limits generalizability of our findings to more rural populations. Other limitations of this study include the self report nature of the survey measurement which may yield error in outcome estimates, and parent report of child intake and activity which may result in bias. However we verified that the parent who reported child intake was the person who was most aware of or controlled that child's food intake, and took steps to assure the relevance and psychometric quality of our measures. Other limitations included smaller sample size than estimated due to fewer available parent interviews than child surveys and attrition in both groups.

Conclusions

PARADE provides evidence for reaching high risk children through mentoring programs, which offer an alternative route for promoting energy balance behavior change. The combination of personal contact and computer tailored products developed through participatory methods, impact precursors to energy balance behavior change and hold promise for longterm impact through ongoing contact. Further research is needed to determine the best approaches to enhance parent involvement in promoting positive energy balance environments for the child.

Acknowledgments

Funding for this work was provided by National Institute of Nursing Research (R01NR05079) and the American Cancer Society (TURPG 0028601). The authors would like to acknowledge the substantive contributions of Brandye Mazdra, Paula Ballew, and Christina Mushi-Brunt of Saint Louis University, and Laura Brennan of Trantria. We would also like to acknowledge the tutors and staff of the OASIS Intergenerational Tutoring Program of St. Louis and the Big Brothers and Big Sisters Program of St. Louis.

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Table 1

Baseline characteristics of study participants

	Child Sociodemographic Characteristics		
	Intervention 296 children 69 sites	**Control 155 children 43 sites**	**p value for Chi-square or t-test**
	N (%)	N (%)	
Gender			
Male	154 (52)	68 (43.9)	0.1
Female	142 (48)	87 (56.1)	
Race			
White	138 (54.3)	78 (62.4)	0.14
Other	116 (45.7)	47 (37.6)	
Age			
10 to 12	33 (11.8)	30 (22.7)	0.015
8 or 9	115 (27.9)	50 (37.9)	
5 to 7	132 (32.0)	52 (39.4)	
Mean age±SD	8.3±1.4	8.7±1.7	0.013
Weight Status			
Underweight	9 (3.5)	8 (6.6)	
Normal weight	154 (59.7)	69 (56.6)	0.25
Overweight	40 (15.5)	25 (20.5)	
Obese	55 (21.3)	20 (16.4)	

	Parent Sociodemographic Characteristics		
	Intervention 124 parents 53 sites	Control 72 parents 26 sites	p value for Chi-square test
	N (%)	N (%)	
Relation to child			
Mother	113 (93.4)	61 (88.4)	0.29
Father	5 (4.1)	3 (4.35)	
Other	3 (2.5)	5 (7.25)	
Race			
White	77 (62.6)	43 (59.7)	0.69
Other	46 (37.4)	29 (40.3)	
Education			
Some college	89 (72.4)	39 (54.2)	0.01
HS grad or less	34 (27.6)	33 (45.8)	
Income			
Less than 15K	21 (17.8)	13 (18.3)	
15K-Less than 30K	23 (12.2)	21 (29.6)	0.08
30K-Less than 50K	25 (21.2)	20 (28.2)	
50K or more	49 (41.5)	17 (23.9)	
Employed	89 (73.6)	57 (79.2)	0.38
Married	67 (54.0)	36 (50.7)	0.65
Weight Status			
Normal weight	45 (38.5)	21 (31.34)	0.77
Overweight	36 (30.8)	22 (32.84)	
Obese	32 (27.3)	22 (32.84)	

Table 2

Pre- to post outcomes in children

	PARADE LSMean pretest	PARADE LSMean (SE) change	Control LSMean pretest	Control LSMean (SE) change	*P* value[1]	Hypothesized direction? [2] (within / between groups)
Outcomes from child survey						
BMI-z	0.58	-0.47 (0.32)	0.58	-0.016 (0.46)	0.420	Yes / Yes
FV preference score	67.9	0.50 (0.82)	69.0	1.05 (1.08)	0.690	Yes / No
Activity preference score	38.9	1.74 (0.58)	39.4	0.507 (0.77)	0.203	Yes / Yes
% of children who would ask for FV for snack	57.5	5.70 (7.47)	52.0	-2.64 (9.18)	0.484	Yes / Yes
% of children who would ask to play	70.5	0.60 (5.68)	65.8	12.06 (6.98)	0.208	Yes / No
% challenged self to eat 5 FV every day	20.6	23.3 (5.92)	27.3	3.59 (7.39)	**0.041**	Yes / Yes
% challenge self to be active 1 hr every day	60.2	21.0 (5.62)	69.7	0.04 (7.17)	**0.025**	Yes / Yes
Knowledge (% correct)	52.1	27.9 (3.19)	53.2	4.17 (3.81)	**<0.001**	Yes / Yes
Outcomes from parent interview						
FV intake (servings)	4.65	0.21 (0.18)	4.47	0.55 (0.22)	0.238	Yes / No
Total calories	2253	47.3 (79.3)	2132	64.0 (102.2)	0.898	No / Yes
Percent of calories from high fat foods	32.2	0.44 (0.33)	32.0	0.83 (0.42)	0.477	No / Yes
Percent of time spent being active	13.5	12.0 (1.87)	13.5	15.4 (2.23)	0.253	Yes / No

All models were adjusted for child age, gender, baseline BMI-z, and parent education except BMI-z outcomes which were adjusted for parent education only.

[1] p-values are from mixed model regression analysis of intervention effect adjusted for covariates

[2] Hypothesized direction response (yes/no) is indicated for both 1) mean change within PARADE group from pre to post test and 2) mean change in PARADE group compared to mean change in control group from pre to post test

Obesity (Silver Spring). Author manuscript; available in PMC 2013 April 16.

Table 3

Pre-post outcomes in children stratified by weight status

	PARADE LSMean pretest	PARADE LSMean (SE) change	Control LSMean pretest	Control LSMean (SE) change	*P* value[3]	Hypothesized direction? [4] (within / between groups)
Normal weight children only[1]						
Outcomes from child survey						
BMI-z	0.051	-0.136 (0.139)	0.168	0.097 (0.230)	0.389	Yes / Yes
FV preference score	67.91	0.668 (0.640)	68.08	-0.513 (0.953)	0.307	Yes / Yes
Activity preference score	39.37	1.82 (0.589)	39.80	0.898 (0.856)	0.375	Yes / Yes
% of children who would ask for FV for snack	60.94	-1.04 (6.19)	53.72	-9.25 (8.76)	0.447	No / Yes
% of children who would ask to play	63.45	1.95 (4.71)	67.40	8.55 (6.71)	0.423	Yes / No
% challenged self to eat 5 FV every day	16.73	28.09 (5.13)	34.28	-7.18 (7.50)	**0.0002**	Yes / Yes
% challenge self to be active 1 hr every day	59.84	22.69 (4.76)	74.30	-11.48 (7.06)	**0.0001**	Yes / Yes
Knowledge (% correct)	49.48	27.40 (2.98)	52.18	6.82 (4.24)	**0.0002**	Yes / Yes
Outcomes from parent interview						
FV intake (servings)	4.89	0.246 (0.245)	4.32	0.797 (0.350)	0.205	Yes / No
Total calories	2297.8	85.78 (98.56)	2215.7	27.20 (148.4)	0.745	No / No
Percent of calories from high fat foods	31.62	0.960 (0.420)	32.20	0.706 (0.630)	0.741	No / No
Percent of time spent active	13.19	11.16 (2.30)	13.76	14.77 (3.14)	0.360	Yes / No
Overweight and obese children only [2]						
Outcomes from child survey						
BMI-z	1.82	-0.921 (0.524)	1.58	-0.324 (0.792)	0.532	Yes / Yes
FV preference score	69.18	-0.525 (1.13)	68.35	1.11 (1.65)	0.416	No / No
Activity preference score	38.85	1.35 (0.624)	39.34	0.043 (0.910)	0.239	Yes / Yes
% of children who would ask for FV for snack	51.18	15.09 (7.50)	50.34	-2.78 (10.53)	0.173	Yes / Yes
% of children who would ask to play	72.11	6.20 (6.37)	59.86	9.43 (9.13)	0.773	Yes / No
% challenged self to eat 5 FV every day	29.85	8.50 (5.41)	16.22	13.70 (7.69)	0.582	Yes / No
% challenge self to be active 1 hr every day	68.82	15.22 (5.80)	69.54	6.07 (8.03)	0.359	Yes / Yes
Knowledge (% correct)	54.42	21.79 (3.87)	50.92	5.22 (5.78)	**0.021**	Yes / Yes
Outcomes from parent interview						

	PARADE LSMean pretest	PARADE LSMean (SE) change	Control LSMean pretest	Control LSMean (SE) change	*P* value[3]	Hypothesized direction? [4] (within / between groups)
FV intake (servings)	4.35	0.209 (0.288)	4.79	0.221 (0.318)	0.978	Yes / No
Total calories	2208.5	-77.78 (135.1)	2053.8	44.84 (155.8)	0.557	Yes / Yes
Percent of calories from high fat foods	32.69	-0.069 (0.509)	31.81	1.45 (0.585)	**0.059**	Yes / Yes
Percent of time spent active	14.77	12.02 (3.11)	13.15	15.93 (3.57)	0.417	Yes / No

[1] All models for outcomes from parent interview were adjusted for parent education imbalance (p = 0.002) at baseline

[2] All models except BMI-z were adjusted for gender imbalance (p = 0.025) at baseline

[3] p-values are from mixed model regression analysis of intervention effect

[4] Hypothesized direction response (yes/no)

Table 4

Pre to post test parent outcomes

	PARADE Mean pretest	PARADE Mean change	Control Mean pretest	Control Mean change	*P* value	Hypothesized direction? [1] (within / between groups)
All Parents						
Outcomes from student survey						
% children who see parent eat FV almost every day	55.8	4.48 (3.71)	46.7	4.90 (5.06)	0.947	Yes / No
% children who see parent active almost every day	82.3	4.57 (2.73)	83.1	-2.52 (3.73)	0.128	Yes / Yes
Outcomes from parent interview						
FV intake (servings)	4.40	0.39 (0.19)	3.99	0.42 (0.23)	0.923	Yes / No
Total calories	1999.7	30.1 (70.0)	1864.3	26.4 (87.9)	0.974	No / No
Mean Percent of calories from high fat foods	33.9	0.18 (0.56)	34.0	0.34 (0.71)	0.865	No / Yes
Total walk time minutes	376.2	228.3 (92.0)	466.5	9.42 (113.5)	0.139	Yes / Yes

[1] Hypothesized direction response (yes/no) is indicated for both 1) mean change for PARADE group and 2) mean change in PARADE group compared to mean change in control group