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Article in *Journal of developmental and behavioral pediatrics: JDBP* · September 2017

DOI: 10.1097/DBP.0000000000000499

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Summer Healthy-Lifestyle Intervention Program for Young Children Who Are Overweight: Results from a Nonrandomized Pilot Trial

Paulo A. Graziano, PhD,* Alexis Garcia, MS,* Crystal S. Lim, PhD†

ABSTRACT: *Objective:* To examine initial outcomes of an 8-week Healthy-Lifestyle Intervention Program (HIP) which included children's participation in a daily summer camp along with parents' participation in a parenting program focused on overweight/obesity. *Methods:* Using a nonrandomized pilot trial design, 16 children (*M* child age = 6.42 yr; 81% male; 100% Latino) classified as overweight/obese and their mothers completed 3 assessments (baseline, posttreatment, and 6–8 mo follow-up). *Results:* Children who completed HIP experienced significant decreases in their body mass index z-scores (primary outcome) from baseline to posttreatment ($d = -1.11$) with such decreases being moderately maintained at follow-up ($d = -0.64$). In terms of secondary outcomes, HIP was effective in improving and maintaining healthy habits in both children and mothers and children's nutritional knowledge and fitness. Objective food data showed that children's dietary intake during HIP improved. High attendance and satisfaction were reported for families who completed HIP. *Conclusion:* This pilot treatment development study shows that a family lifestyle intervention conducted in a summer camp setting that targets both children and parents is a promising option for addressing pediatric obesity in young children.

(*J Dev Behav Pediatr* 38:723–727, 2017) **Index terms:** pediatric obesity intervention, BMI, fitness, nutritional knowledge, healthy-lifestyle.

Behavioral family-based interventions have short- and long-term results, supporting their efficacy in improving weight-related health outcomes (see Ref. 1 for a review). Core features of behavioral family-based interventions include increasing activity levels and improving eating patterns in the child and parent.² More recent attention has focused on developing pediatric obesity prevention and intervention programs that are delivered in the school setting. School-wide interventions in elementary schools (e.g., The Child and Adolescent Trial for Cardiovascular Health [CATCH]) have documented improvements in children's self-reported daily energy intake from fat³ and increases in fruits/vegetables and increased physical activity compared with control schools.⁴ Health education programs within preschools have also documented gains in children's willingness to try new foods⁵ and increasing the consumption of fruits/vegetables.⁶

Finally, not only is there well-documented weight gain that occurs across the summer months when children are out of school,^{7–11} but such weight gain is more likely to occur among children who are already overweight/

obese.¹² Thus, summer camps have emerged as another setting to integrate obesity interventions and to capitalize on improvements in body mass index achieved in school year interventions. Residential summer camps for youth who are overweight/obese have produced weight loss efficacy^{13–17} and improvements in quality of life and psychological functioning.^{18,19} However, most residential and nonresidential day camps focus on older children or adolescents.^{13,14,17,20} More relevant to the current study, which focuses on young children, is the limited and passive nature of parental participation in past residential²⁰ and nonresidential programs (e.g., use of texting/social media/informational handouts provided to parents²¹).

Combining a summer camp structure along with a more active parental component (weekly behavioral family-based intervention along with daily consultations during camp dismissal), the current study examined the initial promise of an 8-week Healthy-Lifestyle Intervention Program (HIP) delivered in the summer, targeting young children from a predominantly Latino background who are overweight/obese. Designed as a nonrandomized pilot trial, we hypothesized that children who participated in HIP would significantly improve their health outcomes (i.e., body mass index z-score, nutritional knowledge/awareness, and fitness), while families would improve their healthy habits.

METHOD

Participants/Recruitment

The study took place in a large, predominantly Latino, city in the United States. Families were recruited from

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Received December 2016; accepted July 2017.

Disclosure: The authors declare no conflict of interest.

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local schools and pediatrician offices through brochures and open houses/parent workshops. Interested parents completed a screening appointment to determine eligibility. Inclusion criteria included children being 4 to 8 years (which was selected based on work suggesting obesity significantly increases during this period⁷) and having a body mass index \geq 85th percentile. The cost of the 8-week intervention ranged from \$800 to \$1600 on a sliding fee scale, depending on the financial need of families. Families were excluded if the child had dietary/exercise restrictions, a developmental delay, and was on psychotropic medication and also if the parent/child was enrolled in another weight control program. See Figure 1 for details on recruitment/retention of participants.

The final sample consisted of 16 children ($M^{\text{age}} = 6.42$ yr, range 4.73–8.41; 81% boys) classified as overweight ($n = 4$) or obese ($n = 12$) per Centers for Disease Control and Prevention (CDC) age/sex norms ($M^{\text{BMI z-score}} = 2.02$, $SD = 0.39$). All children were Latino-white and fluent in English. Fifty-six percent of children were from an intact family. Mothers completed all assessment measures. Forty-three percent of the sample were referred by a health professional, 38% were self-referred, whereas 19% were referred by school personnel.

Study Design/Procedure

This study was approved by the university's institutional review board. A nonrandomized pilot trial

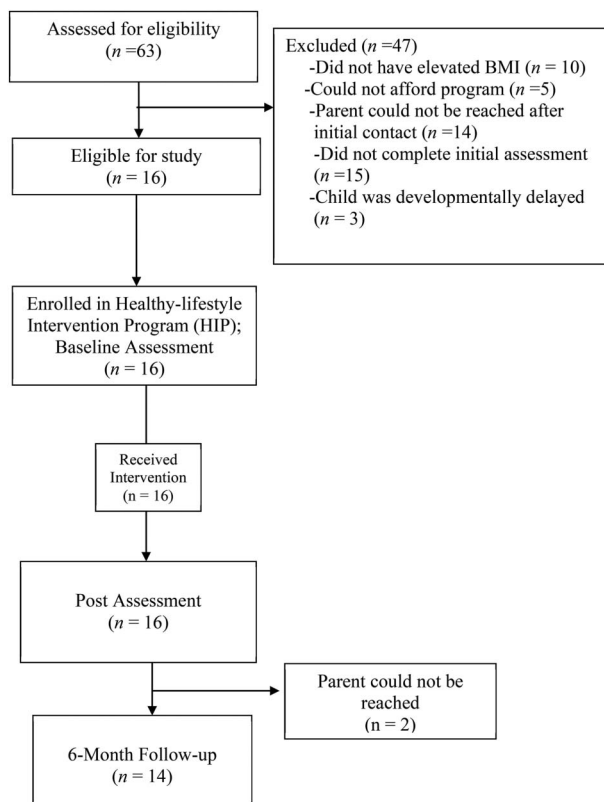


Figure 1. CONSORT flow diagram of participants enrolled in HIP and assessed at posttreatment and follow-up. BMI, body mass index; HIP, healthy-lifestyle intervention program.

design was used to obtain preliminary evidence for Healthy-Lifestyle Intervention Program's (HIP) efficacy in improving children's health outcomes and families' engagement in healthy habits. All families participated in a baseline assessment before the start of HIP and a post-treatment assessment 1 to 2 weeks after HIP ended. Fourteen of 16 families completed a follow-up assessment (FU) approximately 6 to 8 months after HIP ended. Families did not receive compensation for completing assessments.

Intervention Description

As part of HIP, children participated in a daily (Monday to Friday) Healthy-Lifestyle Summer Camp for 8 weeks during the summer, whereas parents attended a Healthy-Lifestyle Parenting Program once weekly. The Healthy-Lifestyle Summer Camp is a full-day (8:00 AM–5:00 PM) program that promotes children's nutritional knowledge/awareness and physical activity by the use of a behavior modification system adapted from the evidence-based system used in the Summer Treatment Program for children with attention-deficit hyperactivity disorder.^{22,23} Children were assigned to 1 classroom staffed by 1 lead counselor and 3 assistant counselors. Children engaged in educational yet fun hands-on group activities aimed at teaching them basic nutritional knowledge regarding food groups and healthy habits. They also learned to use MyPlate for portion control at meals and were taught using fun games to identify the healthiness of food through the Stop-Light System.²⁴ For physical activity, children participated in various group-based aerobic exercises (e.g., soccer and dodgeball) for 1.5 hours/day.

A crucial aspect of HIP was the integration of parental engagement and involvement. Parents received daily verbal and written feedback regarding (1) their child's health/behavioral progress at camp and (2) their own progress in providing their child with a healthy lunch. Parents also participated in a weekly Healthy-Lifestyle Parenting Program in which they learned behavioral modification strategies, adapted from parent-child interaction therapy,²⁵ to support their child to engage in healthier eating and physical activity habits. Parents were also taught the Stop-Light Diet System²⁴ and implemented MyPlate (provided to them) at home.

Primary Outcomes

Anthropometrics

Children's height and weight (without shoes/heavy clothing) were measured using a wall-mounted stadiometer (Seca, Columbia, and MD) and a balance beam scale (Healthometer, Bridgeview, IL). Body mass index z-scores were calculated based on age/sex norms from the CDC.²⁶ Mothers self-reported their height and weight, and their body mass index was calculated as kg/m^2 .

Secondary Outcomes

Healthy Habits

Parents completed the Family Healthy-Lifestyle Questionnaire.²⁷ The Family Healthy-Lifestyle Questionnaire is

a 12-item questionnaire with a 7-point Likert scale that measures the frequency of family's healthy habits (i.e., eating fruits/vegetables and engaging in physical play/exercise). An overall score was calculated for both parents and children by averaging across all items ($\alpha = 0.71-0.78$), with higher scores indicating healthier habits.

Nutritional Awareness/Knowledge

Children were given the Dietary Interview Assessment of Nutritional Awareness.²⁸ The Dietary Interview Assessment of Nutritional Awareness is a 24-item test that presents children with pictures of foods that map onto the Stop-Light Diet System. It requires children to expressively name each item and receptively indicate the healthiness of each food using a 3-point visual system (smiley face = very healthy, neutral face = somewhat healthy, and sad face = unhealthy). The current study examined children's overall health classification score ($\alpha = 0.59-0.91$).

Dietary Assessment

Children's meals (lunch/snacks) at camp were recorded. The average number of daily Green/Go foods and Red/Whoa foods were coded by doctoral-level students in child psychology and dietetics/nutrition using data obtained during the first 3 days of camp (before the start of the first Healthy-Lifestyle Parenting Program class) and the 5 days before the last Healthy-Lifestyle Parenting Program class. Twenty percent of the recordings were checked for reliability with all kappas above 0.80.

Fitness

Children completed the side-to-side jump test that is part of the Karlsruhe motor screening test battery.²⁹ Greater number of side jumps was indicative of better fitness status.

Data Analysis Plan

Multiple repeated measures analyses of variance were conducted. Although we did not have a between-subjects factor, within-subjects follow-up contrast tests, with a Bonferroni correction to minimize Type I error, were conducted to examine any changes from baseline to posttreatment and to follow-up. Cohen's d effect size estimates ($[\text{baseline-posttreatment}/\text{follow-up}]/\text{pooled SD}$) were calculated for all analyses.

RESULTS

Preliminary Analyses

All families completed the Healthy-Lifestyle Intervention Program, which was implemented by counselors with high fidelity ($M = 99\%$; range = 97-100% per session). The staff use of positive social reinforcement with children was also high ($M = 6.2$ out of 7; range = 4-7). Children attended, on average, 94% of the Healthy-Lifestyle Summer Camp days, whereas parents attended, on average, 87% of the Healthy-Lifestyle Parenting Program sessions. Parents reported an overall high treatment satisfaction in terms of the Healthy-Lifestyle

Summer Camp (M rating of 6.87 out of 7, $SD = 0.35$) and the Healthy-Lifestyle Parenting Program (M rating of 6.80 out of 7, $SD = 0.41$).

Preliminary analyses of the demographic variables revealed a significant association between child age at the start of the Healthy-Lifestyle Intervention Program and their nutritional knowledge, with older children obtaining higher overall health classification scores across assessments, r 's 0.52 to 0.95, $p < .05$. Because of these findings, all nutritional knowledge analyses controlled for child age. No other significant associations between demographic variables (e.g., socioeconomic status) and child outcomes emerged.

Primary Outcomes

As seen in Table 1, a large effect size was observed from baseline to posttreatment (PT) in terms of children reducing their body mass index z-score, $d = -1.11$. However, children's body mass index z-score reduction was only moderately maintained at follow-up (FU) ($d = -0.64$), which was 6 to 8 months after the camp ended. Of note, the quadratic nature of the time effect indicated that child body mass index z-score significantly increased between PT and FU. No effect was found for mothers' self-reported body mass index scores.

Secondary Outcomes

Family Healthy-Lifestyle Changes

A significant linear effect for time was found, such that both mother and child's healthy habits significantly improved across time, with large effect sizes observed from baseline to PT, $d = 0.95$ for mother and $d = 1.36$ for child, and were maintained during the FU, $d = 0.97$ for mother and $d = 1.83$ for child.

Nutritional Awareness/Knowledge

A similar linear effect for time was found for children's overall health classification scores. This indicates that children improved their ability to correctly classify the relative healthiness of each food according to the Stop-Light System across time, with a large effect size observed from baseline to PT ($d = 1.27$) and maintained at the FU, $d = 1.05$.

Dietary Assessment

Objective data from lunch/snack recordings indicated that from the start of Healthy-Lifestyle Intervention Program to the last week of Healthy-Lifestyle Intervention Program, children increased their number of daily Green/Go foods, $d = 1.32$, while decreasing their number of daily Red/Whoa foods, $d = -1.78$.

Fitness

A large effect size was observed from baseline to PT in terms of children increasing the number of side jumps completed within a 30-second period, $d = 1.03$. Of note, children's fitness improvement was not only maintained ($d = 1.29$) but also a small but further significant increase in fitness performance was found from PT to the FU ($d = 0.36$).

Table 1. Summary of Results

	BL, <i>M (SE)</i>	PT, <i>M (SE)</i>	FU, <i>M (SE)</i>	Time Effect, <i>F</i>	Type of Time Effect	BL-PT, <i>d</i>	BL-FU, <i>d</i>	PT-FU, <i>d</i>
Primary outcomes								
Child BMI z-score (O)	2.02 (0.10)	1.54 (0.12)	1.74 (0.12)	27.66**	quadratic	-1.11***	-0.64***	0.41***
Parent BMI (P)	28.20 (1.21)	27.58 (1.18)	27.62 (1.12)	1.59	linear	-0.14	-0.13	0.01
Secondary outcomes								
FHLQ: Healthy Habits Child Score (P)	4.59 (0.20)	5.43 (0.17)	5.64 (0.14)	31.22***	linear	1.36**	1.85***	0.04
FHLQ: Healthy Habits Mother Score (P)	5.14 (0.23)	5.79 (0.16)	5.80 (0.16)	9.82**	linear	0.95*	0.97**	0.21
DIANA: Overall Health Classification Score (O)	23.08 (0.98)	34.58 (1.80)	33.25 (2.56)	22.17***	linear	1.27***	1.05*	-0.26
Child dietary intake: Green/Go foods (O)	1.44 (0.32)	3.09 (0.30)	NA	64.35***	linear	1.32***	NA	NA
Child dietary intake: Red/Whoa foods (O)	2.31 (0.37)	0.40 (0.09)	NA	22.81***	linear	-1.78***	NA	NA
Fitness: number of side jumps (O)	15.57 (2.92)	26.36 (3.00)	30.57 (3.26)	47.29***	linear	1.03***	1.29***	0.36**

Mean values for child nutritional knowledge outcomes are marginal estimates after controlling for age during assessments. ****p* < .001, ***p* < .01, **p* < .05. BL, baseline assessment; BMI, body mass index; DIANA, dietary interview assessment nutritional awareness; FHLQ, family healthy-lifestyle questionnaire; FU, follow-up assessment 6 to 8 mo after completion of intervention; (O), observational/standardized test; (P), parent report; PT, posttreatment assessment.

DISCUSSION

Given the more limited and passive nature of parental participation in past residential²⁰ and nonresidential programs,²¹ our program's approach was to combine a typical child summer camp experience (daily Monday to Friday), which included a behavioral modification system, with daily parent engagement and a behavioral family-based parenting intervention (i.e., HLPP). Another novel aspect of our HLPP was including components of parent-child interaction therapy to help parents reinforce healthy habits at home. Our pilot study's results suggest that this approach was successful in actively involving parents and improving healthy habits at home. In fact, our parental attendance rate in the HLPP of 87% is higher than those reported for other behavioral family lifestyle interventions (63%³⁰). Future research with larger sample sizes and comparison with a control group is warranted to confirm these preliminary findings.

In regard to our primary outcome, children who completed the Healthy-Lifestyle Intervention Program (HIP) experienced a significant decrease in body mass index z-score (*d* = -1.11) across a short 8-week period with moderate maintenance 6 to 8 months later (*d* = -0.64). Of note, children's body mass index z-score did significantly increase between posttreatment and follow-up. The effect sizes we obtained were similar to those reported for residential and nonresidential summer programs targeting older children and adolescents.^{13,14,17,31} Hence, a nonresidential summer program may be an equally promising treatment modality for young children who are overweight/obese or perhaps even as an obesity prevention measure. Although preliminary, our effects could be due to the inclusion of both the behavioral modification system that is part of the Healthy-Lifestyle Summer Camp and greater active parent involvement by the HLPP. It would be important for future research to conduct a randomized trial comparing the efficacy of the Healthy-Lifestyle Summer Camp alone to HIP (Healthy-Lifestyle Summer Camp + HLPP).

In terms of our secondary outcomes, children who completed HIP significantly improved and maintained their fitness and nutritional awareness/knowledge. The posttreatment improvement in fitness is not surprising, given that children engaged in more than 100 minutes of moderate-to-vigorous physical activity (assessed with actigraphs), which is well above the national recommendations for children to engage in more than 60 minutes a day in physical activity.³² However, the encouraging part is that children maintained their improvements at follow-up, perhaps indicating that the positive behavioral modification system implemented during the camp and with parents aided children in continuing their increased level of physical activity during the school year. Future work should include objective measures of physical activity (e.g., accelerometers). Within the nutritional awareness domain, the current study expands past work by showing that young

children can learn and retain how to classify food according to their health content in a way that maps onto the widely used Stop-Light System.¹ Of course, parents remain the agents of change for improving children's health outcomes, but it is feasible that children being more knowledgeable of the Stop-Light nutritional system made it easier for parents to implement such changes at home. Future work would benefit from the inclusion of a 24-hour dietary recall assessment.

In terms of limitations, the small sample size along with our nonrandomized pilot study design prevents us from making definitive statements regarding the effectiveness of HIP. Families also had to pay for HIP (although the amount was comparable with regular summer camps in the area), which may indicate a higher level of motivation among participants. Nevertheless, our findings highlight the promise of HIP as a multicomponent family intervention for young children who are overweight/obese. Moderate-to-large effect sizes across parental report and standardized assessments showed that HIP was effective in improving and largely maintaining families' healthy habits and child health outcomes, even 6 to 8 months after HIP ended. Further evaluation of HIP in the form of a larger sample size, along with the inclusion of a control group, will be critical in determining the efficacy of HIP in improving health outcomes among young children who are overweight/obese.

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