Healthy Lifestyle Fitness Camp: A Summer Approach to Prevent Obesity in Low-Income Youth
Gretchen Lynn George, PhD, RD1,1; Constance Schneider, PhD, RD2; Lucia Kaiser, PhD, RD3

ABSTRACT
Objective: To examine the effect of participation in a summer camp focused on nutrition and fitness among low-income youth.
Methods: In 2011–2012, overweight and obese youth (n = 126) from Fresno, CA participated in a free 6-week summer program, Healthy Lifestyle Fitness Camp (HLFC), which included 3 h/wk of nutrition education provided by University of California CalFresh and 3 hours of daily physical activity through Fresno Parks and Recreation. The researchers used repeated-measures ANOVA to examine changes in weight, waist circumference, and waist-to-height ratio (WHtR) between HLFC and the comparison group (n = 29).
Results: Significant pre–post WHtR reductions were observed in HLFC: 0.64 to 0.61 (P < .001). In addition, WHtR reductions were maintained in HLFC 2 months afterward whereas an increase occurred in the comparison group (P < .007).
Conclusions and Implications: Understanding the impact of nutrition- and fitness-themed summer camps during unstructured months of summer is integral to obesity prevention among low-income youth.
Key Words: summer day camp, low income, nutrition education, physical activity, childhood obesity (J Nutr Educ Behav. 2016;48:208-212.)
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INTRODUCTION
School, after-school, and clinic-based programs have successfully improved the weight status and/or cardiovascular health of youth.11-18 However, these successes can be undermined during the summer when youth regain weight in the absence of structured programs.9-12 Although the prevalence of overweight and obesity, defined as body mass index (BMI) ≥ 85th percentile, has decreased in children aged 2–5 years, it exceeds 34% in youth aged 6–11 and 12–19 years13 and remains a major public health concern.14-17 Moreover, ethnic and racial disparities persist. Among youth aged 2–19 years, the prevalence of overweight and obesity is highest among non-Hispanic black girls (36.1%) and Hispanic boys (40.7%).13 These differences emphasize the importance of programs targeting high-risk youth, especially during the summer.13

Over the summer, youth may experience greater than expected increases in weight and waist circumference,9-12 and decreases in moderate physical activity.18 Changes in diet when low-income youth are on vacation may contribute to an increase in BMI over the summer19 because youth are away from healthier school cafeteria options. Regardless of socioeconomic status, youth who spend most of their vacation under parent care gain the most weight and report the least activity.12 Independent of caregiver arrangement, youth at the highest BMI percentiles gain significantly more weight during summer than do youth at lower BMI percentiles.10,12,20-22

Prevention of excess weight gain and abdominal adiposity is important to lower the risk of chronic diseases, including type 2 diabetes mellitus and cardiovascular diseases.23 Indicators of risk for cardiovascular disease in youth include elevated weight, waist circumference, and waist-to-height ratio (WHtR) ≥ 0.5.10 This ratio is comparable across ethnic groups and pubertal stages and is a sensitive indicator of abdominal adipose accumulation and metabolic imbalances.24 Many childhood obesity intervention studies report only changes in weight and BMI, which may not capture

1Department of Consumer and Family Studies/Dietetics, San Francisco State University, San Francisco, CA
2Youth, Families, and Communities Statewide Program, University of California, Agriculture and Natural Resources, Davis, CA
3Department of Nutrition, University of California, Davis, CA
† Dr George was a doctoral student during this research study and has since begun a tenure position at a different university.
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Address for correspondence: Gretchen Lynn George, PhD, RD, Department of Consumer and Family Studies/Dietetics, San Francisco State University, 1600 Holloway Ave, San Francisco, CA 94132; Phone: (415) 710-0868; Fax: (415) 338-0947; E-mail: glgeorge@sfsu.edu
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Nutrition- and fitness-themed summer camps targeting overweight youth may have an important role in preventing excess weight gain that occurs during vacations.

The Healthy Lifestyle Fitness Camp (HLFC) was a free community-based summer camp in Fresno, CA for low-income overweight and obese youth aged 9–14 years. In 2010, a pilot study reported HLFC’s success in teaching campers to like more fruits and vegetables.26 A few studies have examined the effect of nutrition- and fitness-themed summer camp programs for low-income families on preventing health risks in overweight youth.4,5,7,27,28 Because summer care options can be limited in low-income communities owing to cost, more research is needed to determine whether expanding summer programs might contribute to preventing childhood obesity.4 Therefore, the purpose of this study was to determine whether low-income youth in HLFC, compared with those in a camp not focused on nutrition and fitness, exhibit greater pre-post changes in weight, waist circumference, and WHTR after the 6-week camp.

A health-focused summer camp can be sustainable through university–community partnerships involving Cooperative Extensions and local parks and recreation departments.

METHODS
Study Design
In 2011 and 2012, the researchers conducted a quasi-experimental study to determine whether participation in HLFC could improve anthropometric measurements in overweight and obese youth. The comparison group (CG) attended a camp that was not focused on nutrition and fitness. The City of Fresno Parks and Recreation operated both camps within the same neighborhood, with no overlap in participation.

Participants and Recruitment
The Institutional Review Board at University of California, Davis approved the protocol for the study. All procedures aligned with standards of the Helsinki Declaration of 1975, revised 2008. The sample size calculation was based on 2010 HLFC pilot data. The study required 20 participants per group to have 80% power to detect a minimal change of WHTR of 0.03 among youth, adjusting for attrition.

Fresno Parks and Recreation HLFC staff recruited campers using radio, fliers, and visits to local schools advertising a free-of-cost camp that focused on summer fun, nutrition, and fitness. To be eligible for the study, youth met the following criteria: (1) they resided within low-income neighborhood served by the camp;29 (2) they were aged 9–14 years; (3) they had a BMI $z$ score $\geq +1$ and/or WHTR $\geq 0.5^{10,25}$; (4) they had no metabolic disease as determined by medical examination; and (5) 1 parent or caregiver was willing to participate in weekly education nights. Study-eligible youth, who had been wait-listed for HLFC and subsequently enrolled in the comparison camp, were recruited for the CG. Children signed assent forms and parents signed consent forms.

Intervention
The HLFC was a 6-week summer day camp. The aim of the program was to promote diet and physical activity that adheres to the Dietary Guidelines for Americans.30 Campers participated in 3 hours daily of moderate physical activity taught by Fresno Parks and Recreation staff and trained fitness professionals,18 including sports, structured high-intensity games, fitness workouts (sit-ups and push-ups), and dancing (Zumba). The Summer Lunch Program provided free snacks (eg, graham crackers, nut butter, apples, carrots, and low-fat milk). Weekly, the campers participated in 3 hours of nutrition education and a Friday field trip. The CG consisted of games (physically active and sedentary), arts and crafts, and some non–health focused cooking activities. Both groups participated in Friday trips.

A team of 4 University of California CalFresh educators taught the nutrition lessons using the EatFit curriculum, which was designed for middle school students and based on Social Learning Theory.31 Key obesity prevention messages included eating more fruits and vegetables, decreasing sugar-sweetened beverages, eating healthier types of fats, and increasing daily moderate to vigorous physical activity. Parents also received nutrition education and a physical activity component in a weekly class, using Eating Smart•Being Active,32 which is designed for low-income families and delivers the same messages.

Instruments
The researchers collected anthropometric and demographic data 2 weeks before and after camp, and then 2 months afterward. Five University of California Program Educators, federally known as the Supplemental Nutrition Assistance Program (SNAP), who were different from the original team, attended standardization training led by the first author to ensure precision and accuracy in collecting measurements.33 Subjects were weighed and measured in light summer clothing. Waist circumference was measured using a Seca 201 ergonomic circumference measuring tape, which is a retractable cinching tape. Heights were measured using a portable adult/child stadiometer (Model PE-AIM-101). Weights were measured using a portable digital scale (Seca 813 Electronic Flat Scale, Chino, CA).
Data Analysis

The researchers used SAS for Windows (version 9.3, SAS Institute, Cary, NC, 2012) for data analysis. Tests for normality verified nonsignificant differences between groups for baseline BMI z scores, parent age, and household size. Repeated-measures ANOVA was used to examine changes in weight, waist circumference, and WHtR between youth enrolled in HLFC and CG, controlling for ethnicity and baseline BMI z score. Data were analyzed as intent to treat, with the assumption that youth returned to baseline measurement value if reported as dropout. The significance level for outcomes, with Bonferroni correction, was $P < .007$.

RESULTS

Of 192 youth applicants, only 155 were eligible for the study portion of the camp in relation to the inclusion criteria and for an optimal ratio of camper to counselor. Once the sample size was met, remaining eligible youth were invited to join the CG. Therefore, the HLFC group consisted of 126 youth and the CG had 29 youth. At the end of camp, there were 111 HLFC and 23 CG youth. Among those who did not complete HLFC or CG, no significant differences were noted in anthropometric or demographic characteristics (data not shown). At the 2-month follow-up, 45 HLFC campers and 14 CG participants remained. Two-month attrition was attributed to communication difficulties (eg, undelivered e-mails and disconnected phones).

Compared with the HLFC campers, the CG participants had lower baseline weight, waist circumference, WHtR, and BMI z scores, but all youth met study eligibility criteria (Table 1) and variables were normally distributed (not shown). Although the sample was from the same neighborhood, ethnicity differed; the CG group was primarily African American and the HLFC group was primarily Latino. No significant differences in gender were observed. Language spoken at home; child's origin of birth; and parents' education, income, employment status, and participation in food assistance programs (except summer lunch) were not significantly different between groups.

A significant reduction in pre–post camp weight and WHtR measurements was observed in the HLFC group compared with the CG group (Table 2). Adjustment for other potential confounders including the child's ethnicity, gender, and age, as well as parents' employment; age did not change the effect of treatment group on anthropometric outcomes (not shown). Reductions in WHtR were maintained in the HLFC group 2 months after the intervention, whereas an increase occurred in the CG group ($P < .007$) (Table 2).

DISCUSSION

Compared to a general-themed camp, participation in a nutrition- and fitness-themed summer camp resulted in significant pre–post camp changes in weight and WHtR after adjusting

| Table 1. Baseline Anthropometric and Demographic Characteristics of Healthy Lifestyle Fitness Camp (HLFC) and Comparison Group (CG) Youth |
|-----------------------------------------------|------------------|------------------|
| Participant Characteristics | HLFC (n = 126) | CG (n = 29) |
| Age, y | 11.9 (1.5) | 11.2 (1.6) |
| Weight, kg | 74.2 (20.4) | 59.7 (14.9) |
| Waist circumference, cm | 97.9 (14.2) | 82.3 (10.1) |
| Waist to height ratio | 0.64 (0.07) | 0.54 (0.04) |
| Body mass index z score | 2.02 (0.49) | 1.51 (0.42) |
| Parent age, y | 40.5 (7.8) | 42.1 (9.4) |
| Household size | 5 (2) | 6 (2) |
| Youth sex (male) | 62 (49) | 14 (48) |
| Youth ethnicity | | |
| White, non-Hispanic | 16 (13) | 1 (4) |
| Latino | 74 (59) | 6 (21) |
| African American, non-Hispanic | 36 (29) | 22 (76) |
| Language at home (mostly English) | 121 (96) | 29 (100) |
| Birth origin (US) | 100 (79) | 25 (86) |
| Parent education | | |
| Less than high school diploma | 35 (28) | 5 (17) |
| High school to 2-y college | 75 (60) | 20 (69) |
| ≥ 4-y college | 16 (13) | 4 (14) |
| Monthly parent income | | |
| < $500 to $1,500 | 32 (25) | 9 (31) |
| $1,501 to $3,000 | 51 (41) | 12 (41) |
| ≥ $3,001 | 30 (24) | 0 (0) |
| Declined | 13 (10) | 8 (19) |
| Parent employment | | |
| Employed (full, part, homemaker) | 17 (14) | 6 (20) |
| Unemployed (student, out of work) | 37 (29) | 15 (51) |
| Declined | 72 (57) | 9 (28) |
| Participation food assistance programs, n | | |
| 1 | 74 (60) | 17 (59) |
| 2 | 33 (27) | 9 (31) |
| ≥ 3 | 16 (13) | 3 (10) |
| 0 | 0 | 0 |
| Declined | 3 | 0 |

aData were evaluated with t test; bData were evaluated with chi-square; *$P < .05$; **$P < .01$. 

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for baseline anthropometric measurements. Although reductions in WHtR were seen at 2 months, these findings should be interpreted with caution owing to attrition and the small sample size in the comparison group. Results may be explained by involvement in a structured camp away from parent supervision, which encouraged physical activity and healthy eating habits while having fun.

Other studies have reported weight loss among overweight youth in summer camp programs.7,27,34 This study also reports abdominal fat changes (WHtR reductions) at the end of camp. Potential contributors to HLFC abdominal fat changes are increased moderate and easy activity, as well as diet changes resulting from youth and parent exposure to the nutrition education intervention.2

Strengths of the study include program evaluation in a real-world setting, comparison group analysis, and the inclusion of WHtR as an outcome measure.24,29 In addition, the local parks and recreation department leveraged resources by providing the physical activity component to enhance the evidence-based, nutrition education programs that experienced Cooperative Extension staff delivered both to HLFC low-income campers and their parents. Limitations were the lack of true randomization between the experimental group (HLFC) and the CG group, the unbalanced group size, and group differences in ethnicity (although all families spoke English at home). The youth enrolled in HLFC had larger baseline anthropometric measurements, which could have influenced more adipose loss. However, initial BMI status and ethnicity were controlled for in the analysis.

Linking nutrition- and fitness-themed summer camps to existing school year programs may support sustainable health changes in low-income disadvantaged youth.

**IMPLICATIONS FOR RESEARCH AND PRACTICE**

Nutrition- and fitness-themed summer camps targeting overweight and obese youth may have an important role in preventing excess weight gain and WHtR. Youth who attend summer camp are in a structured environment, which may provide social interaction and physical activity and reduce compulsive eating. However, youth who are involved in camps with a specific healthy focus show better anthropometric outcomes than do youth participating in a usual summer camp.12 Future studies should explore how diet, physical activity, or home environment changes resulting from the HLFC model contribute to better outcomes of nutrition- and fitness-themed camps. This model is promising because it is sustainable through a university–community partnership involving Cooperative Extension and local parks and recreation resources. Linking nutrition- and fitness-themed summer camps to existing school year programs could have a role in sustainable health change year-round for low-income disadvantaged populations.

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CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.