Original Research

Forever-Fit Summer Camp: The Impact of a 6-Week Summer Healthy Lifestyle Day Camp on Anthropometric, Cardiovascular, and Physical Fitness Measures in Youth With Obesity

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Abstract

Pediatric obesity is a public health concern with lifestyle intervention as the first-line treatment. Forever-Fit Summer Camp (FFSC) is a 6-week summer day program offering physical activity, nutrition education, and well-balanced meals to youth at low cost. The aim of the study was to assess the efficacy of this program that does not emphasize weight loss rather emphasizes healthy behaviors on body mass index, cardiovascular and physical fitness. **Methods:** The inclusion criteria were adolescents between 8 and 12 years and body mass index (BMI) $\geq 85^{th}$ percentile. The data were collected at baseline and week 6 (wk-6) and was analyzed for 2013-2018 using paired-sample *t* tests. **Results:** The participants' (N = 179) average age was 10.6 ± 1.6 years with a majority of females (71%) and black race/ethnicity (70%). At wk-6, BMI and waist circumference decreased by 0.8 ± 0.7 kg/m^2 and 1.0 ± 1.3 in, respectively. Resting heart rate, diastolic and systolic blood pressure decreased by 8.5 ± 11.0 bpm, 6.3 ± 8.8 mmHg, and 6.4 ± 10.1 mmHg, respectively. The number of pushups, curl-ups, and chair squats were higher by 5.8 ± 7.5, 6.7 ± 9.1, and 7.7 ± 8.5, respectively. **Conclusion:** The FFSC is efficacious for improving BMI, cardiovascular, and physical fitness in the short term. The effect of similar episodic efforts that implement healthy lifestyle modifications throughout the school year should be investigated.

Keywords

childhood obesity, diabetes prevention, weight loss, prediabetes

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Introduction

Childhood obesity is a grave public health concern in the United States.[1-3] Obesity affects 20.6% of adolescents preferentially females, minorities, and lower socioeconomic classes.[4-6] The first-line treatment for pediatric obesity is general lifestyle modifications.[7,8] However, this is particularly challenging in youth as they eat whatever is readily available at home or school[9] and have lower interest in being part of "adult exercise" like exercising at a gym and taking walks.[10,11] Adolescents who belong to a minority race/ethnicity or to a lower socioeconomic status have lower access to healthy foods like fruits and vegetables,[12] and to safe spaces for exercise as they might be living in unsafe neighborhoods.[13,14] This can further exacerbate sedentary lifestyles when school is out of session, which puts them at increased risk for excess weight gain during the summer.[15,16]

Forever-Fit Summer Camp (FFSC) was an initiative started by a nonprofit organization in Indianapolis, Indiana, in 2011. This organization served predominantly minority youth who were on summer break from school by providing a safe place for kids to be during the day, encouraging the

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recommended amount of daily physical activity to promote physical fitness, and serving healthy meals and snacks. Although the program was designed to provide general health education, there was no emphasis on weight loss.

The aim of this analysis was to assess the efficacy of a summer day camp that emphasized healthy lifestyle instead of weight loss on anthropometric, cardiovascular, and physical fitness parameters. We hypothesized that 6 weeks of FFSC would be associated with decreased body mass index (BMI) of participants, despite the lack of emphasis on weight loss. We also expected that in the relatively short period, measures of cardiovascular fitness and physical strength would improve.

Methods

Study Design and Participants

This study is a retrospective review of data obtained at FFSC during the years 2013-2018. The FFSC program was organized annually by the American Foundation for Preventive Medicine (AFPM), a nonprofit charitable organization in Indianapolis, Indiana. Participants were enrolled in partnership with the school system and with support from other partnering not-for-profit organizations. The program accommodated adolescents between the ages of 8 and 12 years with a BMI of 85th percentile or more for age and gender. The cost of the program was $100 weekly to cover the expenses of meals and activities with the availability of financial assistance. Our local institutional review board approved this data analysis (Protocol ID: 1804190389, approved 06/21/2018).

Forever-Fit Program

The FFSC took place over 6 weeks between June and July of every year on a 24-acre farm located near downtown Indianapolis, Indiana (http://www.foreverfitcamp.org/). The program aimed to promote healthy lifestyles by engaging youth to participate in physical activities that could be enjoyed throughout the life span, including learning to swim. Meals and snacks were provided and included fresh produce from the farm, with coinciding nutrition education. A typical day at FFSC included tending to the vegetable garden or animals, participating in indoor and outdoor group activities (Zumba, swimming, scavenger hunt, or kick ball) and group sessions to promote the development of interpersonal communication skills (Table 1).

Measures

Anthropometric and physical measures were documented on the first day of camp (baseline) and on the second day of the last week of camp (week 6). The measures documented were: BMI calculated using the formula: weight [in kilograms]/height squared [in meters],[17] waist circumference measured at the midpoint between the lowest rib and the iliac crest [in inches],[18] and resting heart rate (HR) and blood pressure, which were documented after resting for 5 minutes. Blood pressure was measured using a sphygmomanometer.[19] Participants were also assessed for their capacity to do push-ups, curl-ups, and squats at baseline and at follow-up. Between 2013 and 2018, the volunteer staff of each cohort documented anthropometric and physical measures. As the setting of this camp was not intended to be a research project, the stadiometers and scales used were not uniform throughout the years and hence, could not be documented for the purposes of this analysis. Six-week data were only available for participants who finished the program.

Data Analysis

Data were analyzed using Statistical Package for the Social Sciences 25 (SPSS 25). We used paired-sample *t* tests to determine the effect of FFSC on BMI, resting HR, systolic blood pressure (SBP), diastolic blood pressure (DBP), as well as physical fitness parameters: number of pushups, curl-ups, and chair squats. Data from each cohort (2013-2018) were analyzed separately because the participants varied from year to year.

Results

The available baseline characteristics of the participants by year are shown in Table 2. Between 2013 and 2018, the number of participants (N = 179) varied between 24 and 36 participants per cohort with a mean age of 10.6 ± 1.6 years and a majority of female (71%) and black (70%) participants. Most participants attended a single year (n = 108), but some attended multiple years (n = 71).

Anthropometric, physical, and fitness measures at baseline and after completion of the 6-week program are detailed in Table 3. On average, during a 6-week session, BMI decreased by 0.8 ± 0.7 kg/m^2, waist circumference decreased by 1.0 ± 1.3 in. Resting HR decreased by 8.5 ± 11.1 bpm, SBP decreased by 6.4 ± 10.1 mmHg, and diastolic DBP decreased by 6.3 ± 8.8 mmHg. Participants also demonstrated improved physical fitness as shown by the increased number of pushups by 5.8 ± 7.5, curl-ups by 6.7 ± 9.1, and chair squats by 7.7 ± 8.5.

Discussion

The need for efficacious interventions for the prevention and management of obesity in youth is urgent, now more than ever, as the obesity-related medical conditions continue to rise. We found that participation in a 6-week summer day camp that emphasized general health rather than weight loss results in lower BMI and waist circumference, lower HR, SBP, and DBP, and a higher capacity of doing push-ups,

Table 1. Weekly Activities at Forever-Fit Summer Camp.

Forever-Fit Summer Camp Schedule
Week 2–2017

	Monday	Tuesday	Wednesday	Thursday	Friday
7:30-8:30	Tuesday parent weigh-in/Drop off/Morning walk (approximately 2 miles)				
8:30-9:30	Breakfast (Food prep, Eat, Journal)				
9:30-9:45	Finish mound	Group game	All-day field trip Bag lunches	Group chore	Reserve Officers' Training Corps (ROTC)
9:45-11:00	Get dirty Ceramics then bikes	Chores • Animals • Garden • Inside • Outside	Camptown at Eagle Creek	Zumba with De!	ROTC
11:00-12:00	Tennis Group 1 Groups B/C Next week Groups A/D	Tennis Group 2 Stations • Cardio • Flexibility • Muscular strength		Laps for cool down	
12:15-12:30	Gather/Hand washing				
12:30-1:00	Lunch (Eat, Journal, Lunch chores)				
1:00-1:30	Afternoon walk (approximately 2 miles)/Stretching				
1:30-2:30	**Stations** • Cardio • Flexibility • Muscular strength	**Nutrition and Ben** Half groups/each group 30-min session and switches Classes: Nutrition Portion sizes		**U.S. Kids Activity** • Groups 1 and 2 1:00-1:30 • Groups 3 and 4 1:30-2:00 **Crafts** While one group is with U.S. Kids, others are doing afternoon laps. Switch into swim wear	**Dave Creel** Half groups/each group 45-min session and switches **Softball for activity switch** **Soccer for activity switch**

(continued)

Table 1. (continued)

Forever-Fit Summer Camp Schedule
Week 2–2017

	Monday	Tuesday	Wednesday	Thursday	Friday
2:30-4:30			**Back from field trip 3:00**	Games	
	Swimming Pool Pushers • Group A • Group B Hour of swim instruction New to pool activity • Group C • Group D (groups are switched with dry land activity going in the water)	**Swimming** Pool Pushers • Group A • Group B Hour of swim instruction New to pool activity • Group C • Group D (groups are switched with dry land activity going in the water)	**Sports Stations** **Basketball** **Soccer** **Tennis**	**Swimming** **Pool Pushers** • Group A • Group B Hour of swim instruction **New to pool activity** • Group C • Group D (groups are switched with dry land activity going in the water)	**Swimming** **Pool Pushers** • Group A • Group B Hour of swim instruction **New to pool activity** • Group C • Group D (groups are switched with dry land activity going in the water)
4:30-5:00	**Snack/Journal Prep Bikes**				
5:00-5:30	**Pick-up/Free play**				
5:30-7:30	**Closing and Clean up**	**Family Zumba**		**Parent's Night:** Dr Thomas **Cooking Demo:** Chef Suzanne	

Table 2. Participant Characteristics at Baseline.

	Year					
Characteristic	2013 (n = 24)	2014 (n = 24)	2015 (n = 30)	2016 (n = 31)	2017 (n = 34)	2018 (n = 36)
Age, y, mean ± SD	9.9 ± 1.9	11.5 ± 1.4	10.6 ±1.5	10.8 ± 1.5	10.7 ± 1.7	10.5 ± 1.6
Sex, female, n (%)	18 (75.0)	12 (50.0)	20 (66.7)	24 (77.4)	24 (70.6)	27 (75.0)
Race, n (%)						
Black	17 (71.0)	17 (77.0)	19 (60.0)	23 (74.2)	21 (62.0)	27 (75.0)
White	6 (25.0)	3 (14.0)	8 (26.7)	3 (9.7)	7 (20.0)	6 (16.6)
Other	1(4.0)	2 (9.0)	3 (13.3)	5 (16.1)	6 (18.0)	3 (8.4)
Dropout, n (%)	4 (17.0)	9 (40.0)	0 (0.0)	0 (0.0)	5 (15.0)	2 (5.5)

Table 3. Anthropometric, Physical, and Fitness Measures at Baseline (Wk1) and After 6 Weeks (Wk6) of Participation in Forever-Fit Camp.[a]

	Year																	
	2013 (n = 20)			2014 (n = 13)			2015 (n = 30)			2016 (n = 31)			2017 (n = 29)			2018 (n = 36)		
Measure	Wk1	Wk6	*P*	Wk1	Wk6	*P*	Wk1	Wk6	*P*	Wk1	Wk6	*P*	Wk1	Wk6	*P*	Wk1	Wk6	*P*
BMI (kg/m^2)	30.7 ± 6.6	29.5 ± 6.4	.00*	31.0 ± 5.2	30.3 ± 5.0	.00*	32.9 ± 6.9	32.3 ± 6.7	.00*	32.9 ± 6.5	32.4 ± 6.4	.00*	33.6 ± 7.8	32.6 ± 7.9	.00*	31.9 ± 8.7	30.9 ± 8.5	.00*
Waist (in)	—	—	[b]	37.4 ± 6.0	36.6 ± 5.8	.01*	39.1 ± 6.5	38.0 ± 6.0	.00*	40.0 ± 5.8	39.1 ± 5.6	.00*	37.2 ± 6.1	35.5 ± 6.1	.00*	37.7 ± 7.5	36.8 ± 6.8	.00*
HR	91.3 ± 11.9	81.0 ± 9.7	.00*	78.9 ± 14.6	78.2 ± 11.3	.83	85.2 ± 10.1	82.8 ± 9.8	.09	81.7 ± 9.3	73.3 ± 8.8	.00*	95.7 ± 15.7	75.6 ± 10.0	.00*	86.3 ± 10.9	80.3 ± 10.0	.00*
SBP (mmHg)	118.6 ± 12.2	112.2 ± 15.0	.07	119.2 ± 12.3	117.8 ± 10.6	.57	116.5 ± 10.3	114.4 ± 8.0	.03*	118.0 ± 7.8	109.1 ± 8.9	.00*	125.8 ± 18.4	112.5 ± 11.4	.00*	118.9 ± 13.6	114.6 ± 8.3	.00*
DBP (mmHg)	80.0 ± 12.0	71.2 ± 7.4	.00*	75.8 ± 12.2	72.3 ± 6.6	.26	74.0 ± 7.3	72.0 ± 6.0	.01*	77.7 ± 8.9	69.6 ± 5.2	.00*	78.9 ± 12.2	66.5 ± 5.5	.00*	74.4 ± 7.5	71.7 ± 5.8	.00*
Pushups	3.4 ± 4.8	8.6 ± 5.7	.00*	7.3 ± 3.9	8.4 ± 5.1	.37	16.9 ± 9.4	22.3 ± 8.3	.00*	1.0 ± 2.1	3.1 ± 4.4	.00*	17.8 ± 8.2	26.8 ± 11.4	.00*	13.2 ± 10.0	22.4 ± 17.0	.00*
Curl-ups	10.9 ±9.4	19.1 ±12.3	.00*	4.2 ± 5.4	10.0 ± 5.0	.02*	16.6 ± 6.5	17.5 ± 6.4	.40	4.5 ± 6.0	9.4 ± 10.1	.00*	16.1 ± 10.7	22.0 ± 8.5	.00*	12.4 ± 8.2	27.0 ± 17.4	.00*
Chair squats	32.2 ± 11.0	42.9 ± 14.1	.00*	40.6 ± 6.0	42.1 ± 8.3	.36	38.6 ± 9.5	40.0 ± 7.8	.27	31.0 ± 6.7	43.3 ± 6.9	.00*	36.0 ± 11.7	48.0 ± 12.7	.00*	30.6 ± 9.8	37.3 ± 11.2	.00*

Abbreviations: BMI, body mass index; HR = resting heart rate; SBP, resting systolic blood pressure; DBP, resting diastolic blood pressure.

[a]Values are presented as mean ± standard deviation.

[b]In the year of 2013, waist circumference was not documented per protocol. Hence, these data were excluded from the data set.

*Denotes statistical significance with $P < .05$.

curl-ups and squats. This is important as proof-of-principle that participation in engaging, structured summer programs such as FFSC can rapidly improve BMI, markers of cardiovascular health, and measures of fitness.

In children with obesity, accelerated weight gain occurs in the summer break from school[15,20-22] with some reports suggesting that childhood obesity only increases during the summer.[23] During summer, with the absence of the structure and/or fitness programs at schools, children might lead a more sedentary lifestyle with increased access to unhealthy food, both of which promote excessive weight gain.[20] Our findings indicate that participating in a structured physical activity program during the summer can halt this seasonal progressive weight gain and even promote a decrease in BMI, despite there being no emphasis on weight loss during the camp. Thus, summertime or other prolonged breaks from school may provide a window of opportunity to address the prevention and treatment of childhood obesity without the need to advertise it as such. Public health interventions such as this program that promote healthier lifestyles are vital if we are to reverse the obesity epidemic. In fact, this strategy may prove more effective than traditional strategies targeting youth with the goal of weight loss especially when the data from summer camps has been inconsistent with some studies reporting improved BMI, anthropometric measures and aerobic fitness[24-26] while others reporting no significant changes in these outcomes.[27] Although our results mirror those of projects published earlier,[24-26,28,29] this is the first study, to our knowledge, to show that a nonresidential, summer-day program lasting for only 6 weeks is efficacious for weight loss and cardiovascular fitness improvement, despite its lack of emphasis on weight management.

The strengths of this study lie in that it offers an assessment of a robust comprehensive summer program that is designed to tackle multiple risk factors for obesity, without advertising itself as such and not emphasizing weight loss as a concept the youth needed to internalize. The programming is enjoyable to the youth participants and families find great value in participation, as evident by the low attrition rate. This study, however, is limited by the absence of a consistent protocol for the documentation of the anthropometric measures, the absence of long-term data and data during the school year, the low numbers of participants who can enroll during any one year and the availability of the program at one site. However, the structure and model for such a program can be readily replicated and thus could be translated and disseminated for broader use.

Conclusion

More effective strategies for prevention and management of childhood obesity are critically needed. If funding were available to support the implementation of programs such as the FFSC on a more regular basis, it may be possible for more youth to achieve health and fitness goals. Despite the lack of emphasis on weight loss as the primary goal, such programs provide significant benefit to families and youth while improving public health.

Authors' Note

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Declaration of Conflicting Interests

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