Opportunities for youth physical activity promotion: An examination of youth summer camps

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Abstract:

Background:

Youth summer camp programs have the potential to provide opportunities for physical activity, but little to no research has been conducted to determine activity levels of campers. This study aimed to examine physical activity occurring in day and resident summer camps and how activity levels differed in these camps based upon demographic characteristics.

Methods:

Pedometer data were collected during hours of camp operation from 150 day campers and 114 resident campers between the ages of 8 and 12 years old. Independent *t* tests were used to compare physical activity by sex, race, and Body Mass Index.

Results:

Campers at day camps averaged 11,916 steps per camp day, while resident campers averaged 19,699 steps per camp day. Day campers averaged 1586 steps per hour over 7.5 hour days and resident campers averaged 1515 steps per hour over 13 hour days. Male sex, Caucasian race, and normal Body Mass Index were significant correlates of more physical activity.

Conclusions:

Youth summer camps demonstrate the potential to provide ample opportunities for physical activity during the summer months. Traditional demographic disparities persisted in camps, but the structure of camp programs should allow for changes to increase physical activity for all participants.

Keywords: pedometry | recreation

Article:

To promote physical development and prepare children for a healthy future, the United States Department of Health and Human Services (USDHHS) recommends 60 or more minutes of physical activity (PA) daily.[1] For children, meeting these recommended PA guidelines can result in leaner bodies, increased muscular strength, endurance and flexibility, healthier cardiovascular and blood lipid profiles, reduced blood pressure, development of higher peak bone masses, and greater musculoskeletal health.[2–6] A sizable percentage of youth in the United States do not partake in adequate amounts of PA, however.[7,8]

Some researchers have found that children may be prone to sedentary behaviors during summer months because of a lack of structure and supervision throughout the day.[9,10] Since many children are not in school during these months, alternative forms of services can be offered with the aim of encouraging healthy behaviors. It has been suggested that structured summer programs such as youth camps could be a venue for providing PA opportunities.[11] Summer camps present an intentionally designed experience where campers visit for a set time period (eg, 1 week) to participate in activities that are planned and led by trained staff in a group setting. In total there are more than 12,000 camps in the United States.[12]

Camp services are primarily delivered by nonprofit organizations and local park and recreation agencies. The types of camps vary, with some campers staying overnight (ie, resident camp) and others leaving each afternoon (ie, day camp), but the intentions to facilitate positive youth development are consistent. Some resident camps may offer a larger variety of programming opportunities because of the length of the camp day, exposure to heat, and availability of different facilities (eg, forests, places of worship). Resident camp programming can also be influenced by unique conditions created by the setting such as homesickness and injuries resulting from the natural environment.

Little research has been conducted to explore PA participation in youth summer camps,[11,13] but camp professionals recognize health and physical inactivity as a pertinent issue. In a 2007 survey of 365 camp professionals, 90% of respondents rated healthy eating and PA as important or very important emerging issues needing attention during the camp planning process.[14] Although little empirical PA information about camp exists, researchers have found that camp participation is linked with other positive outcomes such as friendship development, adventure/exploration skills, positive identity, independence, leadership, and spirituality.[15]

Summer camps have the potential to make a profound developmental impact for an estimated 10–12 million children who participate in organized camping each year.[16] To further investigate healthy behaviors in the camp setting, the purpose of this study was to determine children's levels of PA while participating in day and resident summer camp programs. The research questions aimed to address PA levels of 8- to 12-year-old children in day and resident camps and analyze the PA of campers by demographic characteristics.

R1: Do children meet USDHHS PA guidelines while participating in summer camps?

R2: Does PA participation vary by the type of camp format (ie, day or resident)?

R3: Do summer campers participate in different levels of PA based on demographic characteristics including sex, race, and Body Mass Index?

Methods

Sampling

This study used purposive sampling to include a diverse set of camps and campers. Both resident and day camps with general programming participated in the study. General programming indicates that the camps provided a broad offering of outdoor opportunities including waterbased activities, team building, sports, nature exploration, and outdoor living skills. The sample was delimited to camps with a duration of 1 week for the following reasons: 1) 1 week is the most common format for summer camp sessions; 2) this study planned only to collect a snapshot of camp PA instead of behavioral PA changes that could occur over a full summer of camp participation; and 3) at least 3–5 days of activity monitoring are necessary to obtain a reliable measurement of PA.[17,18] Eight distinct camps (ie, 4 day and 4 resident) from 1 state in the southeastern United States participated in the study. The Institutional Review Board of the researchers' university and each camp consented to the methods of study before participant recruitment. Campers attending the selected camps were recruited by mail or on-site during camp registration. Children between the ages of 8 and 12 years old chose to participate in the study with the consent of a parent or legal guardian. Participating campers provided their age, sex, and race at the beginning of the camp week. With their consent, each camper was also measured for height and weight to determine their Body Mass Index (BMI).

Measures

New Lifestyles SW-200 pedometers were used for PA data collection. Excellent reliability and ease of use were the primary reasons for choosing the pedometers.[19] Campers wore the pedometer during their waking hours at camp to collect a total step count for each day to indicate their level of PA. For resident camps, pedometer data were recorded before the specified "lights out" time. At day camps, data were recorded before children were picked up to leave camp each day. Resident camps had 13 hours of programming that lasted from sunrise until later in the evening. Day camps consisted of 7.5-hour days where parents dropped their children off in the morning and picked them up at the end of a traditional work day. The differing lengths of camp days in addition to the potential for more programs and facilities at resident camps led to a separation of the 2 formats for data analysis.

Equivalency of Pedometer Counts and Minutes of PA. For adults, 10,000 daily steps has gained acceptance as the threshold for reducing the risk of obesity and disease caused by a lack of PA.[20] However, the daily PA guidelines for children (ie, 60 minutes per day) exceed the standards for adults (ie, 150 minutes per week). Researchers have used mean-based approaches with large

datasets and comparisons to accelerometers to estimate that 12,000 to 13,000 steps counted on a reliable pedometer are necessary for children to accrue 60 minutes of moderate-vigorous PA.[21–25]

Nonambulatory PA. One issue with pedometer data is that step counts may not reflect all physical activities. A moderate portion of camp activities are water-based including swimming and boating. During nonambulatory activities the pedometer was not in use. To add this data to the total PA count, estimates based on previous research were used. Two methods have been recommended for adding nonambulatory activity into total step counts, the Simple Conversion Method (SIM) and the Intermediate Conversion Method (INT).[26] The SIM method is based on the principle that all nonambulatory activities are equivalent to walking (ie, 3 METs). Therefore, under the SIM method, 100 steps per minute should be added to a step count total for each minute of participation in a nonambulatory activity. The INT method is similar to the SIM method, but suggests that highly active nonambulatory activity (eg, cycling, swimming, boating) is undertaken at 2 times the MET level of walking (ie, 6 METs). Therefore, step counts should be replaced with double the steps of the SIM method for 200 steps per minute.

Since the activity of campers could vary between the INT and SIM methods, an additional data collection step was added. A self-reported estimate of energy expenditure during nonambulatory activities was asked at the end of each camp day. A 3-point, rapid-estimate scale was used to categorize the activity as light, moderate, or vigorous. For example, children were asked if they participated in the following manner: Did they swim or boat 1) very little, 2) some of the time, or 3) most to all of the time. These rapid-estimates were then used to convert step count data with a mixture of the SIM and INT methods. Children who reported that they swam or boated very little had 100 steps per minute of programming time added to their data, those who reported some of the time had 150 steps per minute added, and those who reported most to all of the time had 200 steps per minute added.

Missing Data. The dependent variable, camper PA or step count, was created by totaling a camper's daily step counts for the camp week and dividing by the number of days the pedometer was worn (eg, 40,000 total steps/5 days = 8000 steps per day). Only full camp days (ie, no half days) were included. An issue with this calculation was that some campers were missing step count data for 1 or more of the days of the camp week. Missing pedometer data were replaced using the expectation-maximization algorithm. The data points were not estimated based upon the whole dataset, but separately for day and resident camps. To assess the risks of imputing data, a correlation analysis was used to compare the dependent variable for steps per day without imputation and steps per day with imputation. The 2 versions did not differ significantly and had a high correlation ($r = .990$).

Results In total, 277 campers participated in this study. Participants in the study were 8 to 12 years old (see Table 1). The mean age of day campers was 10 years old (SD = 1.20). At day camps, sex was evenly split with one-half male and one-half female participants. Race was nearly equally dispersed for minorities (48.0%) and nonminorities (ie, Caucasian; 52.0%), but each minority race was not equally represented. The majority of campers had a normal BMI (68.55%), but some were at risk for overweight (17.74%) or overweight (13.71%).

Table 1 Demographic Characteristics of Day and Resident Campers

	Day camps				Resident camps			
Variable	**DC1**	**DC2**	**DC3**	**DC4**	**RC1**	**RC2**	**RC3**	**RC4**
Age								
8 years	26.19%		13.33%	8.11%	2.78%	3.03%	11.11%	
9 years	50.00%	27.50%	6.67%	32.43%	11.11%	24.24%	25.93%	23.08%
10 years	23.81%	27.50%	23.33%	21.62%	25.0%	12.12%	22.22%	26.92%
11 years		37.50%	30.00%	24.32%	19.44%	18.18%	29.63%	30.77%
12 years		7.50%	26.67%	13.51%	41.67%	42.42%	11.11%	19.23%
Sex								
Male	42.55%	52.50%	63.33%	45.95%	44.44%	39.39%	66.67%	37.04%
Female	57.45%	47.50%	36.67%	54.05%	55.56%	60.60%	33.33%	62.96%
Race								
Hispanic	2.78%			2.70%			4.00%	
Black	16.67%	7.14%	23.08%	97.30%	2.78%			18.18%
White	77.78%	67.86%	73.08%		91.67%	93.94%	72.0%	9.09%
Am. Indian		3.57%			2.78%	3.03%	12%	72.72%
Asian/Pacific Islander		21.43%					4.0%	
Other	2.78%		3.85%		2.78%	3.03%	8.0%	
BMI								
Underweight					2.78%			
Normal	64.86%	70.97%	90.45%	57.14%	75%	78.13%	70.37%	24.00%
At risk	24.32%	19.35%	4.76%	17.14%	16.67%	6.25%	22.22%	36.00%
Overweight	10.81%	9.68%	4.76%	25.71%	5.56%	15.63%	7.41%	40.00%

The average age of resident campers was 11 years old (SD = 1.23). Resident camper sex was nearly evenly distributed with 46.34% males and 53.66% females. Nonminorities (72.41%) were more represented than minorities (27.59%). The majority of resident campers had normal BMI (64.17%), but there were underweight (.08%), at risk for overweight (19.17%), and overweight (15.83%) campers.

Step Counts by Camp

Day campers averaged 11,916 steps per camp day, while resident campers averaged 19,699 steps per camp day. This significant difference ($P < .01$) was most likely due to the longer duration of time the pedometer was worn in resident camps. When averaged over the number of program hours (7.5 at day camps v. 13 at resident camps), day campers took more steps per hour (mean = 1588.85) than resident campers did (mean = 1515.32), but the difference was not significant. The mean amount of camper PA varied among the camps participating in this research study (see Tables 2 & 3). Day campers averaged 9284–13,222 steps per day depending upon the camp, while resident campers at different camps averaged 16,481–23,726 steps per day.

Table 2 Camper Mean Step count at Day Camps

Site	n	Mean	SD	Min	Max	Steps per hour
DC1	45	13,222.40	3112.77	8047.57	20,041.60	1762.99
DC2	38	12,683.70	2444.83	6805.96	16,219.20	1691.16
DC3	30	12,232.04	2532.40	8146.91	17,128.25	1630.93
DC4	37	9283.86	2405.50	4494.68	15,380.63	1237.85
Total	150	11,916.35	3065.62	4494.68	20,041.60	1588.85

Table 3 Camper Mean Step count at Resident Camps

Site	n	Mean	SD	Min	Max	Steps per hour
RC1	35	23,726.11	4433.13	13,330.00	31,151.50	1825.09
RC2	33	19,294.48	4014.24	11,790.40	28,977.40	1484.19
RC3	21	17,453.94	3605.86	10,930.90	24,117.72	1342.61
RC4	25	16,481.80	3460.59	9304.49	23,316.50	1267.83
Total	114	19,699.21	4859.92	9304.49	31,151.50	1515.32

Note. Resident campers wore the pedometers for a longer time period than day campers.

Demographic Variables and Camp PA

Male campers were more physically active than female campers at day and resident camps (see Table 4). Males took 2671 more steps per day than females did at day camps and 2611 more steps per day at resident camps. Significant PA differences were also found between minority and nonminority races. Nonminorities took 2604 more steps per day than minorities at day camps and 3757 more steps per day at resident camps. Campers' PA also varied depending upon BMI. Campers below the 85th percentile for BMI (ie, normal or below average weight) took 1858 more steps per day than campers above the 85th percentile (ie, at risk for overweight or overweight) at day camps and 2226 more steps per day at resident camps.

Discussion

A primary aim of this study was to determine levels of daily PA for youth summer campers. One camp week of pedometer monitoring provided evidence that resident campers took 19,699 steps per camp day and day campers took 11,916 steps per camp day. Camper step counts nearly met (ie, day camp) or exceeded (ie, resident camp) USDHHS guidelines for youth PA. The step count results also suggested that a day of summer camp provides equal or more PA than a regular school day. In 3 previous studies where pedometers were used to determine PA during waking hours on a school day, participants averaged approximately 12,200 steps.[22,23,27]

Resident campers took more steps than day campers, but a primary reason for this difference was the length of the program (13 hours v. 7.5 hours). Day campers, however, took more steps per hour than resident campers, suggesting that day camps may provide more PA opportunities over the course of the program day. These findings do not prioritize one setting over the other, but suggest that both types of camps have the potential for providing summer PA.

Based on the number of steps taken at day camps, parks and recreation agencies may benefit from marketing their services as a viable opportunity for PA. These services are generally not free, but they come at a low cost from tax subsidization. If camps can provide a source of PA and other positive outcomes, local agencies may be able to have a great impact on a large number of participants. For this to occur, however, camp providers will need to consider the service delivery and facility characteristics that can be used to deliver optimal experiences. Strategies would include the use of intentional (ie, deliberate) programming to plan PA opportunities for each day and facilities to accommodate PA opportunities for a large number of participants (eg, sports courts and swimming pools).

Although the average camp participant in this study took part in adequate amounts of PA, traditional demographic disparities persisted. Female campers were less active than males, minority campers were less active than nonminorities, and campers with higher BMIs were less active than campers with lower BMIs.

These disparities indicate that summer camp administrators may need to consider changes to the programming, facilities, and social environment in camps. For example, females may need a wider offering of activities to increase their motivation to be physically active. Camps are often a source of experimentation with new activities in a novel environment, and more variety may be better. It has been suggested that females and males would have similar PA patterns if they had equal opportunities for desirable activities.[28] Many females, including young girls, mention their activity preferences differ from choices they are offered.[29,30] Girls prefer to participate in lifestyle-type PA and commonly choose biking, walking, swimming, jogging, dance, rollerblading, and tennis.31 Intentionally planning programs and offering facilities for girls may increase the likelihood that they participate in higher levels of PA.

Table 4 Independent *t*-test Step Count Comparisons (Age, Sex, Race, and BMI)

	n	Mean	SD	*t*	*P*
Sex					
Day camps					
Male	76	13,233.75	3081.00	5.91	.01
Female	74	10,563.34	2401.49		
Resident camps					
Male	52	21,119.09	5410.73	2.88	.01
Female	62	18,508.34	4014.50		
Body mass index					
Day camps					
Under/normal weight	84	12,397.76	3045.81	3.16	.01
At risk/overweight	39	10,539.99	3004.29		
Resident camps					
Under/normal weight	72	20,581.50	4858.09	2.34	.02
At risk/overweight	39	18,355.51	4633.73		
Race					
Day camps					
Nonminority	65	13,153.93	2890.96	5.03	.01
Minority	61	10,549.97	2915.08		
Resident camps					
Nonminority	81	20,689.57	4682.32	3.65	.01
Minority	28	16,932.70	4751.48		

This research also provided some insight about race and PA participation in camps. The camps with the highest concentrations of minorities (ie, RC4 & DC4) had the lowest levels of PA. Many studies have suggested that minorities may be less physically active because they live in neighborhoods that do not provide quality facilities and programs.[32–34] Observations at these 2 particular camps and the data from this study suggest that similar conditions may exist in summer camp offerings. In camps with a greater dispersion of race, hierarchies often exist and race may be an exclusionary characteristic for entry into non-minority-dominated peer groups.[35] A national study of camp participation found that Caucasians make up the majority of campers at both day (70%) and resident camps (78%).[36] Minorities may be more likely to participate in PA if they have fellow campers who identify with them and allow entry into their peer circles. In this case, more diversity should be encouraged in camps.

Much like racial minorities, physically active social groups may discriminate against individuals with a high BMI. Children of healthy weight are less likely to associate with children who are obese and have lower perceptions of obese children's social worth.[37] Obese children also frequently cite social exclusion as one of the greatest deterrents to their PA participation,[38,39] and perhaps this exclusion occurs in camp settings. Researchers have found that camp staff members are excellent providers of support and guidance so they may be able to help alleviate these

conditions.[40] Future research and camp practice could be aimed toward examining the potential for the use of camp staff to encourage broader social groups and influence PA.

Our research study provides a baseline for PA occurring in camps, but it did not examine a longitudinal participation pattern (ie, before, during, and after camp). Previous research indicates that developmental gains (eg, positive identity, social skills, physical skills) that occurred during camp were maintained 6 months later.[41] Future research could be conducted to determine if this pattern is similar for PA.

This study also had other limitations. First, the study was cross-sectional by design and only included 8 different camps. A larger number of camps and campers would allow more generalizable results. Second, the study assessed PA through pedometer step counts. While easier to implement, pedometers are unable to record nonambulatory activities (eg, bicycling, swimming, rowing) and cannot differentiate between vigorous and moderate bouts of participation. Other methods of PA data collection were considered for this study, but pedometers were chosen because of their accuracy, cost, and ease of use for the participants.

Children's PA has been examined in neighborhoods, schools, and parks, but little information exists about camps. Millions of young people go to camp each year and this setting could offer an opportunity for children to be physically active during the summer. As the PA literature base continues to develop, more theory-driven research is needed to determine salient correlates of youth PA in particular settings including summer camps. For example, the social ecological model could be used to examine the factors influencing camp PA such as intrapersonal, social, environmental, and political forces.

Overall, camp programs seem to be a viable opportunity for PA promotion. Campers who participated in the programs offered by the camps in this study nearly met or exceeded the PA guidelines of the USDHSS. The camp experience may also introduce children to new physical activities they could continue following camp. A closer analysis of the programs offered in camps could allow further improvement and lead to camps emerging as a primary opportunity for summer PA.

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