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Impact of a Summer Nutrition and Physical Activity Intervention to Attenuate Obesity in Urban African-American Youth

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Impact of a Summer Nutrition and Physical Activity Intervention to Attenuate Obesity in Urban African-American Youth

Cover Page Footnote

This article stands in memory of first author, Jermaine B. Mitchell, a community-engaged scholar gone too soon. May his work continue to inspire students and researchers to engage in work that will improve health outcomes for disadvantaged populations. We surviving co-authors acknowledge the contributions and assistance of the Barnes Branch YMCA, Tuscaloosa Parks and Recreation Authority, Dr. Samory Pruitt, Dr. Matthew Curtner-Smith, Mishon Flannigan, Julia Sanders, Madalyn Riggins, Chelsea Sheffield, Stefan Casale, Scott Clements, Madison Eads, Allison Freeman, Caitlyn Freeman, Teresita Gill, Joshua Harper, Jennifer Jensen, Carrington Rye, Jarod Stephenson, Savannah Millsaps, Jennifer Jenson, Scott Clements, Jerod Stephenson, Allison Freeman, Chelsea Sheffield, Dr. Angelia Paschal, and The First Tee of Tuscaloosa.

Authors

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Abstract

Improved eating behaviors and daily participation in physical activity such as swimming might abate the likelihood of African American youth becoming obese. Yet many African American youth neither consume the recommended daily servings of nutritious foods nor know how to swim. The purpose of this study was to investigate the impact of a culturally tailored multicomponent summer intervention to reduce obesity and unintentional drownings among underserved African American youth. Children ($n = 145$) participated in a three-hour, community-based intervention for four weeks. Measures of children's attitudes perceived behavioral control, and subjective norms toward swimming, nutrition, and physical fitness were taken at baseline and 4 weeks later ($n = 47$). The only post-intervention significant finding indicated an improvement in children's skillfulness in floating on their back without help. The limited changes in this multi-component program suggested that such interventions need to be longer in duration, intensity, and be required to reduce attrition.

Keywords: obesity prevention, diet, children, learn-to-swim, drowning, physical fitness

In the United States, the prevalence of overweight and obese children is a public health challenge. Childhood obesity can lead to several adverse health outcomes including hypertension, hyperlipidemia, chronic inflammation, insulin resistance, and increased death rates in young adulthood (Rosemond et al., 2015). Further, the psychological effect of negative body image and decreased self-esteem can impact the long-term health of overweight and obese children (Wofford, 2008).

African American youth have disproportionately higher rates of overweight and obesity than most racial groups in the United States (Fryar et al., 2014). Of children and adolescents aged two to 19, 16.9% are obese and 14.9% are overweight; moreover, 19.9% of African American males and 20.5% of African American similarly aged females are obese (Fryar et al., 2014). Research suggests that low-income African Americans youth are more likely to remain overweight or obese into adolescence and adulthood when compared to their white counterparts (Baskin et al., 2015; Ogden et al., 2014; Tate et al., 2015).

Children who are at high risk for disease typically have higher intakes of sugar and lower intakes of vegetables (Sharma et al., 2014). Conversely, diets high in fruits and vegetables and physical activity have been associated with reduced risks of cardiovascular disease, type II diabetes, obesity, depression, and cancer among youth (Harris & Ramsey, 2015; Physical Activity Guidelines Advisory Committee [PAGAC], 2018; Woodside et al., 2013). Despite the increase in evidence-based literature about the health benefits of diets high in fruits and

vegetables and physical activity, many African American youth still do not meet the current recommendations for daily serving sizes for fruits and vegetables and physical activity (Kann et al., 2014).

Physical activity tends to decline across childhood with the largest decline occurring from 13 to 18 years of age (Baskin et al., 2015). Current physical activity guidelines state that children and adolescents should accumulate 60 minutes or more of moderate-intensity aerobic activity each day and perform muscle and bone strengthening activities at least three days each week (PAGAC, 2018). Youth who adhere to these guidelines are more likely to have better strength and endurance, healthier bones and muscles, controlled body weight, reduced stress, and increased self-esteem (PAGAC, 2018). Notwithstanding, only 28.7% of adolescents nationwide meet the current recommendation of 60 minutes of daily physical activity (Baskin et al., 2015).

Swimming, one form of physical activity, can reduce one's risk of obesity; however, unintentional fatal drownings occur frequently across the globe including in the United States. Children have the highest rates of drowning which is the leading cause of unintentional childhood deaths worldwide (Taneja et al., 2008). White youth are less likely to fatally drown than their African American counterparts (ages 5-9 years: 2.6 times higher; ages 10-14 years: 3.6 times higher) (Clemens et al., 2021). Furthermore, 68.9% of urban African American children have reported having low or no swimming skill (Irwin et al., 2010). The International Life Saving Federation (ILSF) (2012) noted that learning basic water survival skills can reduce a child's risk of unintentional fatal drowning. In the same vein, participation in formal swimming lessons can reduce drowning risk by as much as 88% in children (Brenner et al., 2009); thus, swimming can provide one safe alternative form of physical activity for at risk youth.

Underutilized, outside-of-school time (OST) weight-related interventions, comprised of after-school and/or summer-time periods, have been shown to influence diet and physical activity in African American youth (Barr-Anderson et al., 2014). Even though OST interventions have the potential to provide African American youth with positive weight-related benefits, the ideal setting and type of behavioral intervention has not been clearly established. Furthermore, no community-based OST (i.e., summertime) intervention has simultaneously addressed both injury and obesity prevention in African American youth. The primary purpose of this study, therefore, was to evaluate the impact of a multicomponent OST (summertime) intervention on urban African American youth's attitudes, perceived behavioral control, and subjective norms toward swimming, physical fitness, and nutrition.

Method

Participants

A total of 145 participants, ages 4 to 14 years, enrolled in an Alabama inner-city YMCA summer program participated in the Swim to the Top program. To ensure a high participation rate, primary caretakers of potential participants were contacted by the YMCA staff to attend an informational meeting prior to the start of the Swim to the Top program to disseminate program goals and objectives and obtain informed consent from the participants' parents and/or guardians. Additionally, parental informed consent and child assent were obtained during daily YMCA summer camp registration. All procedures were approved by The University of Alabama's Institutional Review Board.

Intervention

Each day (Monday-Thursday) for four weeks, children participated in the Swim to the Top program, a three-hour, community-based multicomponent intervention to improve at-risk youth's swimming skillfulness (or competence), physical fitness, and nutrition. Each child was provided a nutritious morning snack, consisting of fruits and vegetables during the first 30 minutes of each day. The morning snack supplemented the MyPlate-based nutritional component of the program.

Prior to the morning snack, during check-in, each child was placed in one of three age groups (A: 4-6 years of age; B: 7-9 years of age; C: 10-14 years of age) by YMCA staff members to provide adequate age-appropriate instruction for each child and ensure each child's safety. After the morning snack, swim instruction, physical fitness (non-swimming forms of physical activity), and nutritional information sessions were provided to each child by community educators and university students daily for approximately 2.5 hours.

The swim component consisted of skill-appropriate instruction based upon the American Red Cross' Learn to Swim Program. During the initial sessions, university student swim instructors identified and placed each child into groups based on their swimming skill level. Each lesson provided water safety tips and focused on improving participants' initial swimming and basic water survival competency. Monday through Wednesday sessions consisted of five minutes of outside-of-pool basic skills review and 60 minutes of swimming skills such as pool entry, blowing bubbles, submerging body parts in the water, floating, retrieving objects under water, kicking, arm motions, and the streamline position. Each lesson concluded with a review of learned material and a water safety fact. Each Thursday session was comprised of a review of previous topics and water safety evaluation.

Physical fitness sessions consisted of activities (kickball, basketball, soccer) performed in group settings to encourage positive social interactions with peers,

enhance children's overall motor skills development, and increase their adherence to physical activity. Each Monday through Wednesday, children were engaged in various 5- to 10-minute discussions on the importance of being physically active, developing strategies to overcome barriers of physical activity, and adhering to recommended physical activity and strength guidelines for youth. Following each discussion, various games and activities were performed to apply the learned discussion information. Every Thursday, the children were exposed to The First Tee program, an international youth development organization introducing the game of golf and its inherent values to young people.

The nutrition component consisted of food tastings, portion size modeling, skill-building, and goal setting activities delivered by university graduate students. Each day a different designated color corresponded to each morning snack item. For example, "Red Thursday" would consist of a red apple and strawberry yogurt. Thursdays consisted of age-appropriate content and activities adapted from the MyPlate curriculum pertaining to water, fruit, and vegetable consumption. To encourage these outside-of-the-intervention healthy behaviors, students were given take-home assignments and pamphlets about fruit, vegetable, and water consumption to share with family members.

Measures

Participants completed a 29-item, five-point visual scale participant questionnaire at baseline and post-intervention, ranging from: ☹-no (equivalent to strongly disagree), kind of no, I do not know, kind of yes, and ☺-yes (equivalent to strongly agree). The development of the questionnaire was guided by the Theory of Planned Behavior (Ajzen, 1991; Ajzen, 2002) which posits that one's attitudes, subjective norms (or peer influences), and perceived behavioral control influence one's intentions to engage in a behavior change. This theory-guided questionnaire assessed children's attitudes, subjective norms, and perceived behavioral control changes toward swimming, nutrition, and physical fitness. The swimming section consisted of three attitude, five perceived behavioral control, and three subjective norm items, while the physical fitness and nutrition sections contained three attitude, three perceived behavioral control, and three subjective norm items. Children, ages 7 to 14 years, participated in baseline and post-intervention assessments during the first and final week of the intervention. Children, ages four to six years, were excluded due to low literacy skills to comprehend questionnaire items. Baseline and follow-up assessments were administered in small groups by university graduate students.

Statistical Analyses

Paired sample *t*-tests were used to compare baseline and post-intervention changes in children's attitudes, perceived behavioral control, and subjective norms toward

swimming, nutrition, and physical fitness. Frequencies, percentages, and means via descriptive analysis were used to describe the sample. In compliance with the Geisser-Greenhouse adjustment, an alpha level of 0.001 was determined to be appropriate to account for the 29 paired sample *t*-tests which were conducted in the analysis. All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) Version 23.0.

Results

Forty-seven children, 32 % of participants, ages 7 to 14 years completed both the baseline and post-intervention questionnaire, and their demographics are shown in Table 1. The demographics were the last items to be collected on the questionnaires and were not fully completed by these participants since participants had the option not to complete certain questions that they did not know the answers to or were uncomfortable answering. The majority (95.7 %) of the participants were African American and 2.1% were white and identified as other. Additionally, 93.6% of participants reported receiving free or reduced lunch during the preceding academic year. Most of the participants either reported living in a two-parent household (40.0%) or only with their mother (42.2%).

Paired *t*-tests were conducted on each individual survey item for swimming, nutrition, and physical fitness portions of the survey. The mean scores are illustrated in Table 2. Of the 29 paired sample *t*-tests conducted, a significant improvement was only observed in participants' ability to float on their backs without help. There were no significant differences detected in any of the nutrition or physical activity responses.

Discussion

The rate of obesity in children has more than quadrupled among adolescents over the past 30 years (National Center for Health Statistics [NCHS], 2012; Ogden et al., 2014). The current study attempted to address this issue by implementing a summer community-based obesity prevention program aimed at improving African American youth's swim skills, nutrition, and physical fitness. Although, a summer-time intervention may serve as a useful tool, a literature review conducted by Barr-Anderson et al. (2014), suggested that summer-time interventions required longer than four weeks or to be combined with after-school interventions in order to influence African American youth's diet and physical activity behavior.

Table 1.
Sociodemographic Characteristics for Participants

Demographics	Frequency	Percentage (%)	n	n Missing
<u>Age</u>			<u>47</u>	—
7 years of age	7	14.9		
8 years of age	9	19.1		
9 years of age	8	17.0		
10 years of age	9	19.1		
11 years of age	5	10.6		
12 years of age	6	12.8		
13 years of age	1	2.1		
14 years of age	2	4.3		
<u>Grade</u>			<u>47</u>	—
1 st	1	2.1		
2 nd	5	10.6		
3 rd	7	14.9		
4 th	9	19.1		
5 th	10	21.3		
6 th	8	17.0		
7 th	5	10.6		
8 th	0	0.0		
9 th	2	4.3		
<u>Gender</u>			<u>46</u>	1
Female	23	50.0		
Male	23	50.0		
<u>Race</u>			<u>47</u>	—
Black	45	95.7		
White	1	2.1		
Other	1	2.1		
<u>Free/reduced lunch</u>			<u>47</u>	—
Yes	44	93.6		
No	3	6.4		
<u>Primary Caretaker</u>			<u>45</u>	2
Mother Only	19	42.2		
Father Only	1	2.0		
Mother and Father	18	40.0		
Guardian	7	15.6		

Table 2.
Means for Survey Items at Pretest and Posttest

Item	Pretest	Posttest	p
Swimming			
I know how to swim without help.	3.4	3.9	0.07
I know how to tread water without help.	3.8	3.9	0.63
I know how to float on my back without help.	3.0	3.6	<0.001*
I know how to float on my front without help.	3.5	3.8	0.20
I can stay in the deep end without help.	2.7	3.0	0.29
I enjoy going to the swimming pool.	4.9	4.7	0.20
I enjoy swimming, but with help.	3.3	3.5	0.53
I enjoy swimming underwater.	4.0	4.5	0.05
My parents think that I will enjoy swimming.	4.8	4.5	0.06
My friends think that I will enjoy swimming.	4.6	4.5	0.31
My teachers think that I will enjoy swimming.	4.7	4.5	0.18
Nutrition			
I know how to eat healthy.	4.7	4.4	0.06
I know how to pick healthy foods away from home.	4.2	4.4	0.18
I can drink more water than juice or soda each day.	3.6	3.8	0.62
It is good for me to have three meals a day and snacks.	4.5	4.6	0.55
I like to try new foods.	3.9	3.6	0.39
Eating healthy food is important.	4.9	4.6	0.09
My parents think that I should eat healthy.	4.8	4.6	0.23
My friends think that I should eat healthy.	4.2	4.1	0.67
My teachers think that I should eat healthy.	4.8	4.7	0.46
Physical Fitness			
I know how to build healthy bones.	4.5	4.3	0.39
I know how to have an active life.	4.7	4.5	0.33
I know how to build healthy muscles.	4.7	4.3	0.08
It is good for me to be active each day.	4.7	4.6	0.54
It is important to me to be strong.	4.8	4.6	0.14

Being active every day is important for my health.	4.8	4.7	0.55
My parents think that it is good for me to be active.	4.8	4.8	0.84
My friends think that it is good for me to be active.	4.5	4.3	0.49
My teachers think that it is good for me to be active.	4.6	4.7	0.61

*Significance $p < 0.001$

Swim to the Top did not result in attitude and subjective norm differences at the end of the 4-week intervention. In fact, only one perceived behavioral control item significantly improved following the intervention (the remaining 10 swimming survey items did not improve significantly). This finding was a significant increase in how participants answered the question about their ability to float on their back without help. This change from baseline to posttest is significant as it indicated that children expressed improved skill in this life-saving action. The skill to successfully float on your back is a critical technique of swimming and basic water survival (ILFS, 2012) and indicated that these children possibly felt more comfortable in their capability to reduce their risk of drowning. This increased perceived skill by children to successfully float on their back may have been due to the daily reviews since most children were of low swimming skills. Drowning among African American youth is life-threatening, causing this result to be important and notable (Clemens et al., 2021; Gilchrist et al., 2004; Gilchrist & Parker, 2014). It is unclear why this one swimming behavior significantly improved while the other items did not.

For questions mentioning teachers, the children may have been confused about which teachers were being referenced since the program was held during the summer between grade promotions and the intervention provided by college student who served as teachers. In addition, the summer program included children from several local schools, so the friends that the children may have thought about may be those at their respective schools at pretest but may have involved new friends who they had made within the summer program by the time the posttest was administered.

Children's understanding and attitudes on the importance of healthy nutrition and physical activity are important factors to produce positive behavioral change. None of the changes measured in nutrition and physical activity components were statistically significant consistent with previous studies that noted descriptive, but not significant physical activity and nutrition improvements

following interventions which target youth (Klesges et al., 2010; Raman et al., 2010).

One study finding illustrated the swimming component as an effective method of improving children's water competency and comfort, which can translate to increased swimming performance (Theodorakis, 1995). For the age group of our participants, no literature is available on swimming skill using the constructs of the Theory of Planned Behavior; however, it has been suggested that subjective norms have the weakest relationship between intentions to engage in healthy eating, and low to moderate influence on engagement in physical activity (Plotnikoff et al., 2012; Riebl et al., 2015). Further, literature is scant to support the relationship between self-efficacy or perceived behavioral control and intentions to perform or engage in specific swimming behaviors; therefore, further studies are needed to explore these relationships.

Limitations

The duration of the current study was eight weeks less than the full OST (summer-time) obesity prevention study conducted by Baranowski et al. (2003). In addition, the age range of students taking part in the pre- and posttests varied (7–14 years) and a participant attendance criterion for completing the post-intervention assessment was not established. Therefore, participants who may have only attended a couple of days of the intervention could have potentially completed both the baseline and post-intervention assessments. That likelihood potentially skewed the results of the responses of children who regularly attended the four-week intervention. Further, this study did not include a parental component, a control group, or calculating the body mass index as an outcome measure. This study was, however, strengthened by a collaboration among university-based researchers and community partners.

Future Recommendations

An extended Swim to the Top program for the entire summer or year may provide additional benefits, while follow-up assessments of three and six months might capture self-regulated change in behavior. Furthermore, assessments may need to be shortened and administered during children's respective session timeframes which may enhance the focus of children by decreasing the likelihood of survey fatigue. The reliability of the survey requires further exploration in similar populations. Using alternative teaching strategies as well as direct measures of water competence as alternatives to the survey would be good additions to this program.

The newfound skill of floating on one's back in the pool provides very limited evidence that Swim to the Top participants may be more likely to continue

swim instruction and reduce their risk of obesity and unintentional fatal drownings. Still in its infancy, the Swim to the Top Program may serve as an effective OST multicomponent intervention that may be generalizable to African American children and similar populations in southern urban areas in the United States.

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