

## Development and Feasibility of a Childhood Obesity Prevention Program for Rural Families: Application of the Social Cognitive Theory

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### ABSTRACT

**Background:** Effective childhood obesity prevention programs for preschool children are limited in number and focus on changes in the child care environment rather than the home environment.

**Purpose:** The purpose of this project was to develop and test the feasibility of a home environment obesity prevention program that incorporates mindful eating strategies and social cognitive theory (SCT) constructs. Home Sweet Home (HSH) is specifically designed for rural parents and grandparents of preschool-age children. **Methods:** HSH was developed using community-based participatory research practices and constructs from SCT. Three community-based education sessions were delivered. Pre- and postintervention data were collected from 47 grandparents and mothers.

**Results:** Three of the 4 selected behavioral outcomes improved between pre- and postintervention. The number of hours engaged in sedentary behaviors and intake of “red light” foods decreased and 3 of 4 mindful eating scores increased. Graduates of the program were able to decrease the number of red light foods available in their homes. **Discussion:** Improvements in mindful eating and several key behaviors were observed after a 3-week mindful eating/home environment intervention.

**Translation to Health Education Practice:** Health Educators should incorporate mindful eating strategies and use SCT when designing childhood obesity prevention programs.

### ARTICLE HISTORY

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### Background

Although obesity rates have leveled off in the United States between 2003 and 2014, the rates of childhood and adult obesity remain high or approximately 17% and 36%, respectively.<sup>1,2</sup> Childhood obesity has both short- and long-term consequences. In the short term, obese children may experience emotional and social consequences such as body dissatisfaction, depression, disordered eating behaviors, social marginalization, discrimination, and weight-based teasing.<sup>3,4</sup> Obese children may also have signs and symptoms of adult chronic diseases such as hypertension, insulin resistance, type II diabetes, and joint problems.<sup>5</sup> When compared to normal weight children, overweight or obese children are twice as likely to become overweight or obese adults.<sup>6</sup> Persistence of obesity into adulthood can lead to the development of chronic diseases associated with obesity such as diabetes, cardiovascular disease, hypertension, and some forms of cancer.<sup>5,7</sup> In addition, physical activity and dietary behaviors that contribute to obesity are developed early in life and may also track into adulthood.<sup>7</sup>

Although preschool children have the lowest rates of obesity, non-Hispanic black and Hispanic children are disproportionately affected.<sup>1,2</sup> Older children and adolescents living in rural areas also have significantly higher rates of obesity than their urban counterparts.<sup>8,9</sup> When evaluating national data, this disparity does not exist for preschool children<sup>8,9</sup>; however, the prevalence of childhood obesity in some rural areas is 2 to 3 times higher than the national average.<sup>10,11</sup> Thus, interventions to prevent or reduce childhood obesity should start at an early age and include high-risk groups. In addition, risk factors for obesity differ by location (urban versus rural)<sup>8,9,12</sup>; therefore, prevention programs need to be designed to fit the needs of a rural audience.

### The home food environment model of childhood obesity and social cognitive theory

Childhood obesity is a multifactorial problem requiring complex interventions conducted in a variety of settings,

including the home.<sup>13</sup> Preschool children spend a large portion of their day in the home environment. Many researchers have tried to understand the relationship between aspects of the home environment and childhood obesity risk. The home food environment model of childhood obesity, proposed by Rosenkranz and Dziewaltowski,<sup>14</sup> suggests that the home microenvironment is enmeshed within the larger community or macroenvironment and familial determinants of childhood obesity can be placed into 3 domains: political and economic environments, sociocultural environments, and built and natural environments. Family socioeconomic status, household food security status, and participation in food assistance programs are components of the political and economic environments. These factors shape the types of foods that are brought into the home and consumed. The sociocultural environment of the home is influenced by family structure, stress, and schedules; parenting styles and rules; parental role modeling of eating and physical activity habits; and parental food preparation skills and nutrition knowledge. Lastly, the built environment includes home availability and accessibility of “healthy” (e.g., fruit, vegetables, low-fat milk and proteins, and whole grains) and “unhealthy” (e.g., sugar-sweetened beverages, chips, snack cakes, sweets, and candy) foods, media equipment and electronic devices, kitchen appliances, and home gardens. The 3 domains influence one another and collectively or independently influence children’s dietary and physical activity behaviors, which influences the child’s weight status.

Social cognitive theory (SCT) suggests that an individual’s behavior is shaped by his/her ability to regulate his/her behavior and shape his/her environment.<sup>15</sup> This interaction between the individual’s personal factors, environment, and behaviors is termed ‘reciprocal determinism’, whereby each factor has the potential to influence the other.<sup>15</sup> Thus, this theory developed by Bandura suggests that the environment can influence behavior and be altered to reinforce healthy eating and physical activity. This theory involves a number of constructs, including the environment, behavioral capacity, self-control, observational learning, reinforcements, and self-efficacy.<sup>15</sup> These constructs guide the development of intervention strategies targeted at altering the individuals’ personal factors, environment, and behaviors. A significant body of research suggests that parents’ behaviors and the home environment they create for their child directly influences the child’s weight and health habits.<sup>16-20</sup> Thus, SCT is an ideal theory to use in the development of a home food environment intervention. Conceptually, altering the home environment and the behaviors of the parents will lead to changes

in the behaviors of the child, which can positively impact the child’s health. In addition, constructs between the 2 theories overlap. For example, the sociocultural environment can be viewed as the personal or individual attributes of the parent(s) that encourage or discourage a climate that influences eating behaviors of the child. These parental personal attributes shape the child’s behavior, but child attributes, such as weight status, may also reshape parental attributes.<sup>4,14,16-20</sup>

Basic research on home food environments suggests that children with a healthy weight and healthy eating habits live in households where one or more of the following apply: the family eats together at home at least 3 times per week,<sup>21</sup> healthy foods are accessible and unhealthy foods are limited in the home,<sup>22</sup> parents and adults act as role models for healthy eating and physical activity,<sup>23</sup> and everyone in the household uses intuitive eating practices.<sup>24</sup>

Although there are many family-based obesity prevention programs for school-aged children, effective programs for younger children are limited in number and typically focus on changes in the child care environment rather than the home environment.<sup>13,25</sup> Several current ongoing clinical trials have attempted to address this gap.<sup>26-28</sup> These trials vary by audience, theory used to develop the educational program, target behaviors, and outcomes. The theories used in the development of ongoing trials are SCT, a social ecological approach, or not specified. These studies are similar in that the researchers are attempting to reach into the home through community or preschool-based education programs where the child, parent, or both the child and parent receive the educational components of the program. To date, there are no studies that attempt to educate the grandparent, who can be an influential person in a young child’s life. Target behaviors of these trials include increasing fruit and vegetable intake, physical activity, and willingness to try new foods or decreasing high-fat/high-sugar foods and screen time. Outcome measures vary greatly. For example, the Colorado Longitudinal Eating and Physical Activity study focuses on home food and activity environments and the child’s weight status and the Extension Family Lifestyle Intervention Project focuses on changes in physical activity, dietary intake, blood lipid and glucose levels, and weight status. Each of these studies is ongoing and the results are not yet published.

## Purpose

The purpose of this research project was to develop and test the feasibility of an obesity prevention program

Table 1. Curriculum map for the Home Sweet Home program.<sup>a</sup>

SCT Constructs	Lessons/Educational Components						
	Mindful Eating/ Mindful Eating Dinner	Cooking With Kids	Dinner Conversations	Family Rules/ Feeding Strategies	Healthy Frig and Pantry	Don't Park It, Hit the Gas	Traffic Light Card Game
Reshaping environment	FM	FM, RL	FM, ME, RL	SA, FM, ME, RL	FM, ME, RL	SA	
Behavioral capability (knowledge and skills)	ME	FM, RL	SA, FM, ME, RL	SA, FM, ME, RL	FM, ME, RL	SA	FM, RL
Self-control (goal setting and monitoring)	ME	FM, RL	SA, FM, ME, RL	SA, FM, ME, RL	FM, ME, RL	SA	
Observational learning (role modeling)	ME	FM, RL	SA, FM, ME, RL	SA, FM, ME, RL	FM, ME, RL	SA	
Reinforcements (rewards)	ME	FM, RL	SA, FM, ME, RL	SA, FM, ME, RL	FM, ME, RL	SA	
Self-efficacy (practice skill)	ME	FM, RL	SA, FM, ME, RL	SA, FM, ME, RL	FM, ME, RL	SA	RL

<sup>a</sup>SCT indicates social cognitive theory; FM, family meals; RL, red light foods; ME, mindful eating; SA, sedentary activity.

specifically designed for parents and grandparents of young children, entitled Home Sweet Home (HSH). The program is novel in that multiple generations of family members were included to improve social support for behavioral change. The target population for the program is parents, grandparents, and guardians of young children (ages 3–5) who live in rural areas. In addition, community-based participatory research methods were used to ensure that all aspects of the program are culturally appropriate for rural Southern audiences. The program also builds on traditional educational programs for childhood obesity by incorporating educational gaming, mindful eating practices, and cooking demonstrations with preschool children. The program was developed using both SCT and home food environment model of childhood obesity. Thus, the evaluation of the program includes changes in 4 targeted behaviors, home environment measures, and personal attributes of the parents and grandparents. This article discusses the development of the educational program, behavioral goals of the program, selected outcome measures, changes in behavior, and SCT measures.

## Methods

### The educational program

An interdisciplinary team consisting of a dietitian, 3 community collaborators, a Health Educator, and 2 psychologists (one specifically trained in mindfulness) developed the HSH program. The community collaborators were involved in all aspects of program development and implementation to ensure that each aspect of the program was culturally appropriate. All lessons developed for the program were compiled into a booklet that was used to train program staff. The program includes 4 behavioral goals: reduction in sedentary activity (adults and children), an increase in the number of family meals served per week, a reduction in portion sizes through the use of mindful eating techniques, and a reduction in energy-dense, nutrient-poor foods (e.g., sodas, sport drinks, chips, and snack cakes). These 4

behaviors are linked to childhood obesity with strong scientific evidence.<sup>29</sup>

The HSH program attempts to build knowledge and self-regulatory skills in parents and grandparents in an effort to reshape the home food and physical activity environments to improve the eating and physical activity habits of the participating adults and children. SCT was used in the design of the program. SCT constructs included behavioral capacity (improvements in knowledge and skills), observational learning (role modeling of appropriate behaviors by parents), self-control (goal setting and monitoring), reinforcements (setting rewards that improve health rather than diminish health), self-efficacy (building skills in small incremental steps through short-term goal attainment), and the environment (food availability and accessibility). The curriculum map depicts the educational program components and their alignment with constructs of SCT (Table 1).

### Unique program components

#### Mindful eating

Mindful eating (ME) can be viewed as an awareness of the physical sensations of hunger and satiety; taste, appearance, and texture of the foods and beverages eaten; and emotional sensations associated with the eating experience. ME is a holistic approach to obesity prevention and treatment that focuses on how to eat instead of what to eat.<sup>30</sup> Mindful eating interventions (MEIs) focus on slowing the pace of eating, removing distractions while eating, becoming aware of internal cues to eat such as physical hunger and satiety cues, responding to food without judgments (good foods or bad foods), and reducing emotional eating.<sup>31–34</sup> The audience for this intervention was rural, low-income families. These individuals may have unique barriers to obtaining specific foods/beverages due to limited access to healthy foods or limited resources to purchase healthy foods.<sup>11</sup> ME provides an alternative approach to the reduction of caloric intake that may reduce barriers to

weight loss and provide the flexibility needed to achieve and maintain a healthy weight. In addition, research suggests that preschool children tend to limit portions based on cues from the body; however, many children abandon this way of eating as they get older.<sup>16</sup> Thus, a mindful eating approach may refocus the parent or grandparent on biological cues to eating, which she or he may role model for her or his child or grandchild.

Mindfulness, in general, has been used in the treatment of obesity and eating disorder for several years. It is associated with decreased energy intake, healthier food choices, practices that slow the eating process, and reductions in binge eating episodes, emotional eating, and external eating among obese adults.<sup>32,33</sup> Although mindfulness in general is linked with many health outcomes, mindful eating skills are more likely to be related to outcomes specific to the eating experience such as reduced portion sizes.<sup>34</sup> MEIs have been shown to reduce impulsive food choice patterns among both obese and healthy weight individuals,<sup>35</sup> promote healthy eating in a positive way rather than through the use of restrictive practices associated with disordered eating,<sup>36</sup> increase self-efficacy for healthy eating in obese women,<sup>37,38</sup> decrease caloric and fat intake in obese men and women,<sup>38,39</sup> and reduce barriers to weight management in women.<sup>38</sup> This alternative approach to traditional dieting has not been applied to parents or grandparents of young children to determine whether parental role modeling would improve children's eating patterns and weight status.

#### *Application of mindful eating in Home Sweet Home*

Mindful eating techniques were taught within each educational session where topics included slowing the pace of eating, becoming aware of internal cues to eat such as physical hunger and satiety cues, removing distractions while eating, reducing emotional eating, and setting up a home environment that reduced eating due to external cues. Directly after each mindful eating educational session, family members had the opportunity to practice the skills through a mindful eating dinner with their children. In addition, each family was asked to keep a mindful eating log for the week. The children were encouraged to check their “tummy” to determine whether they were hungry or “satisfied.” While the grandparents and parents received education on the mindful eating topic for the evening, their children were cooking in a mindful manner with a local chef. Mindfulness techniques such as trying new foods without judgments were taught to the children by asking them to “eat like a chef” or by tasting ingredients before adding them to salads, parfaits, and slaws. A dietitian and

psychologist who is an expert in mindfulness wrote the mindful eating components of the program.

#### *Traffic light diet card game*

The traffic light diet has been used in clinical settings for the treatment of childhood obesity for years.<sup>40</sup> This approach simplifies foods into 3 groups: (1) red light foods can be eaten occasionally (e.g., sugar-sweetened beverages, desserts, chips, and fried items), (2) yellow light foods should be eaten in moderation (e.g., staple foods like grains, low-fat protein foods, milk and dairy products, and starchy vegetables), and (3) green light foods can be eaten in any quantity (e.g., low-calorie vegetables and fruits and no-calorie beverages).

#### *Application of the traffic light diet in Home Sweet Home*

This simplified dietary approach limits the number of red light foods that can be consumed per day. The diet reinforces the concept of moderation rather than elimination of all high-sugar, high-fat foods from the diet. In HSH, the diet was taught with the use of an educational card game. The cards depict common culturally appropriate and accessible foods and beverages. Each card depicts a food on the front with a traffic light on the back of the card. The color of the light that is “lit” on the back of the card reflects the type of food that was on the front of the card. Adults used the traffic light on the back of the card to identify the correct group when playing the game with their children. During the educational sessions, both the adults and the children learned how to play the game. Each family received a deck of cards to take home. The traffic light diet was reinforced during other portions of the program, as well. For example, the healthy refrigerator and pantry lesson focused on how to set up the home food environment so that fewer red light foods are available in the home and/or accessible to the child. The intervention team encouraged adults to limit red light foods to no more than 2 per day while limiting their child's intake to one per day.

#### *Small-group discussions*

In addition to the mindful eating dinner and traffic light diet card game, 5 additional lessons focused on home environment topics were offered: cooking with kids, dinner conversations, family rules, healthy refrigerator and pantry, and don't park it—hit the gas. These sessions were designed using available materials from the Childcare and Mealtime Active Play Partnerships (Child Care MAPP) and the Let's Move Campaign.<sup>41,42</sup>



Mindful eating and traffic light diet messages were incorporated into this portion of the curriculum. Adult participants were encouraged to select a different session each week. At the end of each small-group discussion, families were encouraged to write a goal, select a health-promoting reward for achieving the goal, and monitor their behavior throughout the upcoming week.

### **Program delivery**

The program was delivered in 3 2-hour sessions in 2 rural counties in a Southern state. Grandparents, parents, and their children were encouraged to attend all sessions. The program included an adult track and child track. The adult track included an educational session on mindful eating, skill development through a mindful eating dinner, small-group discussions, goal setting, and instruction on how to play the traffic light diet card game. Booster activities included monitoring goals, using set rewards, and completing ME skill building assignment logs. The research staff reviewed the logs with the adult participants at the beginning of the sessions. The child track included age-appropriate mindful cooking activities with a local chef, skill development through the mindful eating dinner shared with their parents and grandparents, performance of indoor active play activities, and instruction using the traffic light diet card game. The Institutional Review Board at the University of Alabama approved this research.

### **Setting and participants**

The intervention took place in 2 rural counties in a Southern state. The counties were selected because the community collaborators lived in these counties. Both counties have high rates of childhood obesity, poverty, and food hardship.<sup>10,11,43</sup> The intervention took place in the cafeteria of the local Head Start Program in one county and at a community center in the second county. All program elements were delivered at these locations except for the home booster activities. The purpose of this study was to test all aspects of the program with the target audience. Therefore, the number of families that participated was limited by room accommodations.

Families consisting of a parent, grandparent, and one child between the ages of 3 and 5 who were participating in a Head Start Program or lived in one of the 2 counties were recruited to the study. To participate in the study, the parent had to be 19 years of age or older, live with their 3- to 5-year-old child, and be able to attend 3 evening meetings with the child. A grandparent could participate if their grandchild and parent of their

grandchild were participating in the study or he or she was the sole caretaker of a 3- to 5-year-old child. When a family unit met the eligibility criteria, a member of the research team interviewed both the grandparent and parent using an interview guide developed for the program. To offset travel costs, families received \$135 for attending all 3 sessions and completion of the pre- and postinterviews.

### **Evaluation**

Program evaluation included formative, process, and summative evaluation. All team members, experts, and community collaborators reviewed each aspect of the program. A focus group of potential participants assisted in the development of the list of foods and beverages depicted on the front of the game cards. Process evaluation included exit surveys from each session, attendance records, and family logs that tracked completion of goals; use of health-promoting rewards; and mindful eating activities. Exit surveys completed after each session asked the participants to rate their experiences using 5 questions that focused on the overall experience, location, perceptions of the mindful eating dinner components, quality of information shared by discussion group leaders, and usefulness of the information. For the summative evaluation, an interview guide was developed that used valid questionnaires to measure changes in the targeted behaviors and other constructs from the SCT. The focus of this study was to assess changes in behaviors associated with childhood obesity. Heights and weights of the adults and children were not taken so that the participants would focus on behavior change rather than weight changes.

### **Interview Guide**

Pre- and postintervention interviews with adult participants were conducted one to 2 weeks prior to the first session and no more than 2 weeks after the last session. Hand cards that depicted answers to sets of questions that used the same Likert scales were used during the interview as reminders of potential responses. Interviewers asked the adults to report the behaviors of their 3- to 5-year-old child. If the family had more than one child in this age group, then the adult was asked to report only on one selected child. Grandparents who did not spend at least some portion of the day with their 3- to 5-year-old grandchild were allowed to skip the portions of the interview that related to the child's behavior, the home food environment created for the child, and their role in child feeding strategies.

**Table 2.** Characteristics of adults completing the Home Sweet Home program ( $n = 47$ ).

Characteristic	<i>n</i> (%)
Relationship to the child	
Parent	22 (46.8)
Grandparent	25 (53.2)
Gender	
Female	46 (97.9)
Male	1 (2.1)
Employment status <sup>a</sup>	
Full time outside the home	5 (10.9)
Part time outside the home	10 (21.7)
Working from home for a salary	4 (8.7)
Stay-at-home mom or retired	27 (58.7)
Frequency of grocery shopping trips <sup>a</sup>	
More than once per week	5 (10.9)
Once per week	12 (26.1)
Twice a month	13 (28.2)
Once a month	16 (34.8)
Responsibility for grocery shopping <sup>a</sup>	
Sole responsibility	29 (63.0)
Shared responsibility	14 (30.4)
Others' responsibility	2 (4.4)
No one	1 (2.2)
Meal planning and cooking <sup>a</sup>	
Sole responsibility	34 (73.9)
Shared responsibility	10 (21.7)
Others' responsibility	1 (2.2)
No one	1 (2.2)
Currently trying to lose weight	
Yes	7 (14.9)
No	40 (85.1)
Chronic disease	
Diabetes	9 (19.2)
Hypertension	10 (21.3)
	Mean (SD)
Age (years)	
Parent	29.0 ± 8.3 (range 22–68)
Grandparent	53.8 ± 9.0 (range 40–67)
Number of dependent children	
Parent	2.1 ± 1.1 (range 1–5)
Grandparent	1.7 ± 1.5 (range 0–5)

<sup>a</sup>Missing data.

### Behavior change

Sedentary activity among the adults and children was assessed using 2 questions that asked the adults to self-report the number of hours per day they and their child watched television or played video games (included educational games) in the past week. These questions have been validated with a diverse group of parents of children between the ages of 3 to 12.<sup>44</sup> Frequency of meals cooked at home per week was assessed with one question from the Consumer Behavior Survey.<sup>45</sup> Mindful eating was assessed using four of the 5 subscales from the Mindful Eating Questionnaire (MEQ): disinhibition or the inability to stop eating when satisfied (8 items); awareness of the flavor, texture, color of food (7 items); emotional eating or eating in response to negative emotional states (4 items); and distracted eating (3 items). Responses for the MEQ were captured using a Likert scale where *never* = 1 and *always* = 5. The MEQ was validated with overweight women and individuals

who regularly practice mindful activities such as yoga. The 4 chosen scales have internal consistencies ranging from 0.64 to 0.83. Higher MEQ scores are associated with the use of more mindful eating strategies and lower body mass index category.<sup>30</sup> Lastly, the red light foods were assessed using an adapted version of a food frequency questionnaire that included 11 categories of red light foods depicted on the 15 red light cards in the traffic light diet card game. Adults reported their intake and the intake of their 3- to 5-year-old child.

### Other SCT constructs

The following personal attributes of the parent or grandparent were assessed. Previously validated questions from the Healthy Home Survey assessed the frequency in which the parent used rewards of physical inactivity (e.g., additional time for television, computer games, or video games) and red light foods (e.g., desserts, salty snacks, candy, and sugar-sweetened beverages).<sup>22</sup> Responses were captured using a Likert scale where *never* = 1 and *always* = 5. Two reward measures were computed for each participant. These measures included the sum of the 3 questions that measured use of rewards with extra physical inactivity time and the sum of the 2 questions that measured use of rewards with desserts, snacks, or candy and sugar-sweetened beverage intake. Higher scores reflect the positive behavior or less use of red light foods and less use of sedentary activities as rewards. Parental role modeling of healthy snacking (3 items), mindful eating habits (3 items), and sedentary behaviors (2 items) was assessed using a valid questionnaire.<sup>46</sup> A 5-point Likert scale where *never* = 1 and *always* = 5 was used to assess the frequency with which parents role-modeled the 3 sets of behaviors. Higher scores reflect higher levels of role modeling positive behaviors. To assess the environment, a valid home food availability and accessibility questionnaire was used from the Health Home Survey.<sup>22</sup> The first set of questions addresses availability of healthy (2 items) and unhealthy food items (4 items) in the household and the second set of questions addressed child access to these items in the home. The same Likert scale mentioned above was used to assess these items and the sum of the 4 scores was computed. Higher scores indicate greater availability and accessibility of the healthy items and limited availability and accessibility of unhealthy items.

### Analysis

All interview data were entered into an Access file and verified. Statistical analysis was completed using the

**Table 3.** Mean differences in outcomes and social cognitive theory constructs of participants in the home sweet home intervention ( $n = 47$ ).<sup>a</sup>

Outcomes	Measurement Range	Before $n = 47$	After $n = 47$	Average Change	P Value
Social cognitive theory construct: Behavior (program goals)					
Adult sedentary behavior	0–5 hours/day	$3.5 \pm 1.5$	$2.8 \pm 1.5$	–0.7	.005*
Child sedentary behavior	0–5 hours/day	$3.2 \pm 1.5$	$2.4 \pm 1.4$	–0.7	.006*
Meals eaten at home		$5.2 \pm 2.7$	$4.8 \pm 2.7$	–0.55	.17
Mindful eating scores					
Disinhibition	8–40	$29.9 \pm 5.9$	$31.7 \pm 6.0$	1.9	.001*
Awareness	7–35	$25.7 \pm 4.2$	$27.5 \pm 4.4$	2.1	.001*
Emotion eating	4–20	$15.0 \pm 3.7$	$16.8 \pm 3.0$	1.6	.002*
Distractions	3–15	$10.8 \pm 2.2$	$11.0 \pm 2.2$	0.24	.47
Adult red light food intake	Servings/day	$4.4 \pm 3.9$	$3.1 \pm 2.6$	–1.4	.007*
Child red light food intake	Servings/day	$5.3 \pm 4.4$	$3.3 \pm 2.1$	–1.9	.006*
Social cognitive theory construct: Characteristics of the individual					
Limited use of sweet/salty snacks and sugar-sweetened beverages as rewards	2–10	$6.9 \pm 1.9$	$7.7 \pm 1.6$	0.70	.04
Limited use of physical inactivity as a reward	3–15	$10.3 \pm 1.6$	$10.0 \pm 2.1$	–0.3	.51
Role-modeling: healthy eating	3–15	$10.2 \pm 2.3$	$11.1 \pm 2.1$	0.70	.06
Role-modeling: mindful eating	3–15	$10.2 \pm 3.0$	$11.6 \pm 2.6$	1.4	.006*
Role-modeling: physical activity	2–10	$5.9 \pm 1.6$	$6.4 \pm 1.5$	0.5	.02
Social cognitive theory construct: Characteristics of the environment					
Availability of fruits and vegetables	2–10	$9.4 \pm 1.5$	$9.6 \pm 0.9$	0.11	.54
Limited availability sweet/salty snacks and sugar-sweetened beverages	4–20	$10.4 \pm 4.0$	$12.3 \pm 3.6$	2.13	<.0001*
Access to fruits and vegetables	2–10	$7.2 \pm 2.1$	$7.6 \pm 1.9$	0.37	.33
Limited access to sweet/salty snacks and sugar-sweetened beverages	4–20	$12.7 \pm 4.4$	$14.7 \pm 4.5$	1.97	.004*

\*Significantly improved scores or  $P < .01$ .<sup>a</sup>Two-tailed paired  $t$  tests were used to determine whether the intervention produced significant changes in the 4 behaviors and SCT constructs.

Statistical Analysis System (Ver 9.4, SAS Institute, Cary, NC). Descriptive statistics were used to depict attendance rates, demographic characteristics of the population, behavioral outcomes, and variables representing SCT constructs. Two-tailed paired  $t$  tests were used to determine whether the intervention produced significant changes in the 4 goal behaviors and other SCT constructs. Due to the number of  $t$  tests completed, a  $P$  value of  $< .01$  was considered a significant finding.

## Results

Sixty parents, grandparents, and guardians and 44 (3- to 5-year-old) children from 44 families started the program. Forty-seven adults (78% retention rate), representing 34 families, completed both interviews and 3 intervention sessions. Sessions 1, 2, and 3 were attended by 55, 54, and 50 adults, respectively. The average number of sessions attended by a family was 2.6. All of the adult participants were African American and 97% were female. The average age of the parents and grandparents was  $29.0 \pm 8.3$  years (range 22–68) and  $53.8 \pm 9.0$  years (range 40–67), respectively (Table 2). Among the grandparents who finished the program, 88% (22/25) either lived with their grandchild or provided childcare frequently. A large percentage of adult participants had sole responsibility for meal planning/cooking (73.9%) and grocery shopping (63%). Grocery

shopping was completed either twice monthly or monthly by 63% of the participants.

## Process evaluation

Results from the exit opinion surveys for each session revealed that the selected locations, mindful eating dinner options, and educational materials were desirable, appropriate, and useful. Only one participant disliked the location. Three individuals rated the mindful eating dinner options as neutral. An open-ended question on the exit survey was used to determine favorite aspects of the program. Every component of the program was mentioned by at least one participant, with the cooking segment for the children receiving the most favorable comments. A second open-ended question was used to determine the least favorite aspect of the program. Comments to this question were few and usually focused on specific food items served during the mindful eating dinner.

After each educational session, the adult participants were asked to write a family goal. Between 38% and 50% of adults who wrote goals (varied by session) stated that they achieved the goal 100% of the time over the past week. The adult participants were also asked to complete mindful eating logs between sessions. Approximately 55% of the participants completed at least one mindful eating activity with their family each week. Lastly,

approximately 53% of the adult participants played the traffic light diet card game with their child at least once a week.

### Summative evaluation

#### Goal behaviors

Three of the 4 target behaviors improved over the intervention period. The number of hours that parents and children watched television or played video games significantly decreased between the pre- and postintervention interviews ( $P = .005$  and  $P = .006$ , respectively; Table 3). The number of red light foods consumed daily by the adult and child also decreased significantly ( $P = .007$  and  $P = .006$ , respectively). Three of the 4 mindful eating scores, disinhibition ( $P = .001$ ), awareness ( $P = .001$ ), and emotional eating ( $P = .002$ ), significantly improved between the pre- and postintervention assessments. Distracted eating scores did not increase significantly ( $P = .47$ ). Lastly, the number of family meals consumed per week did not change between the pre-intervention period ( $5.2 \pm 2.7$  meals per week) to the postintervention period ( $4.8 \pm 2.7$  meals per week;  $P = .17$ ).

#### SCT constructs

The only personal construct from the SCT that significantly improved from pre- to postinterview was role modeling of mindful eating ( $P = .006$ ). Role modeling of healthy eating habits and physical activity improved only slightly ( $P = .06$  and  $P = .02$ , respectively). Scores representing limited use of salty snacks, sweets, and sugar-sweetened beverages as rewards increased slightly between the pre- and postinterventions ( $P = .04$ ). Use of sedentary activities as a reward did not change over the intervention period ( $P = .51$ ). For the environmental construct, there were significant improvements in scores that represent improved parental limits on the availability and child accessibility of sweet and salty snacks and sugar-sweetened beverages ( $P < .0001$  and  $P = .004$ ). There were no changes noted in the availability and child accessibility of fruits and vegetables between the pre-intervention and postintervention interviews ( $P = .54$  and  $P = .33$ ).

### Discussion

To date, there are few childhood obesity interventions that target rural parents and their preschool-age children. The majority of these trials use behavioral-based family interventions that focus on parenting skills and child behaviors. These interventions include some components of mindful eating using principles outlined by Ellen

Satter, but a full range of mindful eating techniques are not utilized.<sup>24,26,27</sup> This is the first childhood obesity prevention study to use multiple mindful eating techniques to address awareness, disinhibition, emotional eating, and distracted eating among parents and grandparents so that they may role model these behaviors with their children. Study results suggest that low-income adults can significantly improve disinhibition, awareness, and emotional eating after attending three MEI sessions. These same adults also reported significantly higher levels of role modeling mindful eating practices in the presence of their preschool child. Previous research suggests that college students with greater mindful eating scores eat less convenience-type foods.<sup>34</sup> Due to the small sample size, it is difficult to determine the relationship between changes seen in mindful eating practices and the changes seen in dietary intake of red light foods. Rather than use cognitive restraint messages (e.g., “eat more of this food” and “eat less of this food”), MEIs ask the participant to slow the pace of eating, remove distractions, be aware of satiety and hunger cues while eating, develop alternative behaviors to address stress, and remove external cues to eating.<sup>31-34</sup> Future studies need to address the overall diet after the MEI intervention and compare to a control group that only received information on the cognitive restraint messages so that a true disparity between an MEI with limited cognitive restraint messages can be compared to an intervention that includes parenting advice and cognitive restraint messages only. In addition, future research needs to assess the relationship between mindful eating practices and behavioral capacity, self-efficacy, and self-control.

This is also the first study to integrate mindful eating strategies with SCT to produce a home environment intervention program for rural families with preschool children. Several constructs from the SCT improved over the course of the HSH intervention, whereas others did not. Regarding the behavioral construct, the only behavioral goal that did not change from pre- to postintervention was the number of family meals cooked and consumed as a family in the home. The average number of meals cooked and consumed in HSH participants' homes was 5.2 meals per week, which is consistent with national trend data.<sup>46</sup> From the SCT environmental construct, fruit and vegetable availability and accessibility did not change over the course of the intervention but red light food availability and accessibility improved significantly. Recent research links home availability of sugar-sweetened beverages and fruits and vegetables to higher consumption levels.<sup>22,47,48</sup> HSH needs to be repeated with a larger sample size to detect significant relationships among home environment scales, other SCT constructs, and dietary intake.



HSH may have improved sedentary behavior in both the parents and children. This is an interesting finding because the program was completed during the summer months in a Southern state where the temperatures exceeded 100°F on at least 10 days of the intervention period. Most of the physical activity goals written by adult participants focused on walking outdoors or going to the park with their child. When adults were asked whether they allowed their child to go outside and play as a reward for good behavior, most of the adults stated that it was “too hot” to safely play outside. Although the children learned several active indoor play activities, when asked about it, many of the adults did not understand the concept or approve of it. In addition, many of the grandparents did not have computers, gaming consoles, or mobile electronic devices. The child may have less opportunity to be sedentary at the grandparent’s house. Future iterations of HSH need to focus on providing education to parents on the types of active play that can be done indoors. In addition, a more in-depth survey tool, such as the Preschool-Age Physical Activity Questionnaire, along with objective measures of physical activity are needed to quantify changes in the level of sedentary activity and compensatory changes in physical activity.<sup>49</sup> Although the educational components focused on many aspects of SCT as it applies to physical activity, the only outcome measures used in the evaluation to assess SCT and physical activity was role-modeling and use of sedentary activity as a reward for good behavior. Future research should utilize a greater number of SCT variables for the assessment of physical activity.

In conclusion, the formative and process evaluation of HSH suggests that the program is culturally appropriate and meets the target population’s needs. The majority of participants enjoyed the program and more than half of the participants completed additional educational activities between sessions. HSH graduates had better mindful eating scores and possibly lower levels of sedentary activity and lower intakes of nutrient-poor, energy-dense foods. In addition, several other variables representing SCT constructs improved.

This research does have its limitations. The program was specifically designed for rural, low-income families living in the Southern United States. Adoption of the program for use in other areas of the country may require changes in the curriculum. The purpose of this research was to determine the feasibility of completing the HSH program in a rural setting. Thus, the study was not designed to capture statistically significant differences in the outcome measures. Caution should be taken when interpreting the results. Lastly, sedentary activity and red light foods intake were self-reported using simplified

techniques to limit respondent burden. We report changes in these measures; however, we do not know whether alternative behaviors such as increased physical activity or additional fruit, vegetable, and milk servings replaced these behaviors. Future adaptations of the program should evaluate the program using more robust physical activity and dietary intake measures. Lastly, future iterations of the program should assess weight changes.

## Translation to Health Education Practice

Effective childhood obesity prevention programs for preschool children are limited in number and focus on changes in the childcare environment rather than the home environment. The purpose of this research project was to develop and test the feasibility of a home environment obesity prevention program that incorporates mindful eating strategies with SCT constructs. HSH is specifically designed for rural parents and grandparents of preschool-age children. HSH was developed using community-based participatory research practices and constructs from SCT. Improvements in mindful eating and several key behaviors were observed after a 3-week mindful eating/home environment intervention.

Mindful eating interventions taught by experts in mindful eating can improve mindful eating strategies among very low-income parents and grandparents. The techniques used in MEI teach individuals to refocus on the body’s needs rather than cognitive restraint. Disinhibition, emotional eating, and distracted eating are common practices among obese individuals.<sup>50-52</sup> Disinhibition is correlated with weight regain after a loss.<sup>53</sup> Mindfulness is not a set of rules to follow but rather a way of viewing your immediate environment and behavior. Health Educators and other health professionals who would like to develop and conduct mindful eating interventions are encouraged to seek training and to practice these strategies along with other mindful techniques such as yoga and mindful meditation. Training programs on mindfulness are available online or through many universities. Several self-guided manuals are also available.

SCT and the home food environment model of childhood obesity have overlapping constructs. Therefore, Health Educators and other health professionals should consider using both mindful eating strategies and SCT in childhood obesity prevention and treatment programs. It is important to address the child’s social and home environments by including the parents and grandparents in the educational program. Mindful eating interventions often include practice of mindful eating strategies. In HSH, mindful eating and mindful cooking

were completed under simulated home environment conditions with family members. These simulations addressed model constructs such as self-efficacy, observational learning, and behavioral capability. Health education specialists should consider developing programs that simulate challenging environments that the participants encounter. Constructs from both SCT and home food environment model of childhood obesity such as limiting availability and accessibility of nutrient-poor, energy-dense foods and role-modeling of healthy behaviors by parents should be included in childhood obesity prevention programs. Health-promoting rewards should be encouraged when setting goals.

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