Research Article

Pilot-testing CATCH Early Childhood: A Preschool-based Healthy Nutrition and Physical Activity Program

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Abstract

Background: *The literature on theoretically-based programs targeting healthy nutrition and physical activity in preschools is scarce.* ***Purpose:*** *To pilot test CATCH Early Childhood (CEC), a preschool-based nutrition and physical activity program among children ages three to five in Head Start.* ***Methods:*** *The study was conducted in two Head Start centers (N=75 children, their parents; 9 teachers). CEC was implemented by trained teachers over six weeks in fall 2008. Qualitative data on feasibility and acceptability was collected using post-intervention parent and teacher focus groups and lesson plan evaluation forms. Pre-to-post intervention changes in children's fruit and vegetable intake and physical activity at school were evaluated.* ***Results:*** *Results showed good feasibility and acceptability for the classroom curriculum, activity box and parent tip-sheets. There was a trend towards an increase in children's fruit, 100% fruit juice and vegetable intake and mean minutes of physical activity at school pre-to-post intervention. However, this increase was not significant.* ***Discussion:*** *The CEC program showed good feasibility and acceptability in the study population. Further evaluation of behavioral outcomes using a larger sample and a prospective design is needed.* ***Translation to Health Education Practice:*** *These results provide information important for developing and implementing evidence-based programs in preschools.*

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BACKGROUND

The prevalence of overweight and obesity among young children aged 2-5 in the United States is 24.4%.[1,2] The rates are disproportionately higher for minority children with 24.8% of African American and 29.9% of Hispanic children categorized as overweight or obese. From a lifetime physical development perspective, early childhood experiences can set an important life trajectory with regard to ideal weight status. Adiposity or body fatness typically increases in the first year of life and then decreases. A renewed rise is then seen again at 5.5 to 6 years of age. This increase is termed as adipose tissue rebound. Adipose tissue is the part of the body where fat is stored. Children, who experience *early* adipose tissue rebound or a second rise in body mass index (BMI), are at high risk for later obesity.[3] Because current BMI status is strongly predictive of future obesity, [4] intervening at a young age is important in curbing the epidemic.

Obesity is a consequence of individual factors as well as social, cultural and environmental factors surrounding an individual.[5] Modifiable behavioral determinants of obesity include diet, physical activity and sedentary behaviors.[6] These behaviors develop in childhood, making it a critical time to establish healthy behaviors.[7]

Approximately 13 million of 21 million preschool-age children in the U.S. spend a large amount of their day in child care.[8] Thus, preschools may be an optimal setting for implementing interventions targeting obesity-prevention behaviors such as healthy nutrition and physical activity to reach large numbers of children, their parents and teachers. Currently there are few guidelines for nutrition and physical activity in preschools

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and those that do exist vary considerably by state.[9] Literature on interventions aimed to promote healthy dietary and physical activity behaviors in preschool-age children is limited. Several interventions in preschool-age children have been implemented,[8, 10-16] but only a few conducted have targeted nutrition and physical activity for obesity prevention using preschools.[14, 15] Evidence-based programs in preschool settings are needed to guide policies and practices for nutrition and physical activity.

PURPOSE

The purpose of this study was to pilot test the CATCH Early Childhood (Coordinated Approach to Child Health for Early Childhood) program. CATCH Early Childhood (CEC) is a preschool-based program aimed at promoting healthy nutrition and increasing physical activity among 3 to 5 year old children (refer to http://catchinfo.org/pdf/cec%20flier.pdf for program description).

METHODS

The CEC program was piloted in two Harris County Department of Education (HCDE) Head Start centers over six weeks in fall 2008. HCDE Head Start currently has 16 centers located across Harris County, Texas, enrolling up to 1200 low income children, predominantly Hispanic and African American. Typically, children enrolled in Head Start spend on average 7 hours per day at school (7:30 A.M. to 2:30 P.M.) and receive free breakfast, lunch and one afternoon snack. The day is structured in segments of 20-30 minutes each to include various activities such as circle time, music and movement time, outdoor free play, meal times and nap times. Typically, in each Head Start classroom, all children are grouped such that all 3 to 5 year old children are together through the day.

The CEC pilot included qualitative evaluation of the feasibility and acceptability of the CEC program using post-intervention parent and teacher focus groups and, lesson plan evaluation forms. Additionally, quantitative changes in children's intake of fruits, 100% fruit juice and vegetables and physical activity at school were evaluated using a one-group, pre-post evaluation design to determine if the program had any effect on these behaviors.

Sample

A convenience sample of children enrolled in four classrooms in the two participating Head Start centers as well as their parents and teachers were recruited to participate in the study. Each classroom had no more than 23 children for a total of 92 children enrolled in the two centers. The response rate was 81%, resulting in a final sample of 75 children and their parents who consented to participate in the study. All enrolled children in the two centers received the CEC intervention (since activities were all preschool-based). However, only those children whose parents provided informed consent were measured. All teachers from the two centers, which included nine teachers and teaching aides (N = 5 from center 1; N = 4 from center 2), consented to participate in the study. Each classroom had at least one teacher and one teaching aide. Prior to starting, all parents of children enrolled in the two participating centers were provided with a recruitment packet including the consent forms in English and Spanish for themselves and their children to participate in the study. Parents and teachers who participated received $20 gift cards for their time.

Formative phase for program development

The CEC program was modeled after the original Coordinated Approach to Child Health (CATCH) program[5, 17, 18] to include a preschool-based nutrition, physical activity and family component. CEC was developed by a team consisting of CATCH curriculum experts, master trainers and national and local preschool experts. Initial program development involved a review of nutrition and physical activity recommendations for preschoolers. The guidelines reviewed included the 2005 Dietary Guidelines for Americans,[19] Dietary Approaches to Stop Hypertension (DASH) Eating Plan,[20] Food Guide Pyramid for preschoolers,[21] the Child and Adult Care Food Program (CACFP),[22] Special Supplemental Nutrition Program for Women, Infants and Children (WIC),[23] National Association for Sport and Physical Education (NASPE) guidelines for preschoolers,[24] Caring for our Children[25] and documents from the National Head Start Association.

Theoretical Model

The Social Cognitive Theory (SCT) [26,27] was utilized to guide the development of program objectives. Intervention strategies were chosen based on the formative research described above. The four major components of CEC include (see Table 1 for a detailed description of each of the components and Table 2 for objectives for each component):

1. Teacher-led, nutrition-based classroom curriculum It's Fun to Be Healthy! consisting of nine nutrition-based lessons aimed at promoting healthful eating habits such as increased intake of fruit, vegetables, whole grains, low-fat dairy and decreased intake of energy-dense foods and sugar-sweetened beverages.

2. Teacher-led Physical Activity Box designed to promote gross motor skills, improve classroom management and increase overall physical activity including moderate-to-vigorous physical activity (MVPA) during preschool hours.

3. Parent education consisting of nine parent tip-sheets designed to modify the home nutrition and physical activity environment.

4. Teacher training for participating preschool teachers by CATCH trainers on implementing all the CEC program components.

Training for teachers in the participating centers was conducted in August 2008 by CATCH master trainers prior to program implementation. All classrooms were provided with a six-week schedule for implementing program components, a CEC 'kit' consisting of the classroom curriculum, activity box, parent tip sheets and related equipment. The classroom lessons were to be implemented two lessons per week. The physical activities were to be implemented every day. Parent tip-sheets were sent home twice a week. All the classroom

Table 1. Social Cognitive Theory (SCT) Constructs Operationalized by the CEC Program Components

CEC Component	Title	Description & Highlights	SCT[a] Constructs Operationalized
Classroom Curriculum	*It's Fun to be Healthy!*	▪ Nine nutrition lesson plans ▪ Three-dimensional including use of colored pictures and hand puppets ▪ Role playing in classroom ▪ Extension activities and curriculum connectors ▪ Hands-on healthy snack activities ▪ Teacher's Resource Manual ▪ Key Vocabulary Words in English, Spanish & French	▪ Knowledge ▪ Skills ▪ Self-Efficacy ▪ Environment ▪ Self-control of Performance ▪ Reinforcement
Physical Activity	*CEC Activity Box*	▪ Over 120 activities designed to promote gross motor skills, classroom management and increase physical activity ▪ Adapted ideas for children with physical disabilities ▪ Music CD with age-appropriate music ▪ Activities can be done either indoor or outdoor	▪ Knowledge ▪ Skills ▪ Self-Efficacy ▪ Environment ▪ Observational Learning ▪ Reinforcement
Parent Education	*Parent tip-sheets*	▪ Tip-sheets complementing the CEC classroom lesson plans and PE activities ▪ Designed to be sent home to the parents ▪ Tailored to 4th grade reading level ▪ Interactive with child coloring activities, tips for healthy living, parent resources and recipe ideas ▪ Bilingual in English and Spanish	▪ Knowledge ▪ Skills ▪ Self-Efficacy ▪ Outcome Expectation ▪ Environment ▪ Reinforcement
Teacher Training		▪ Conducted by CATCH trainers ▪ Interactive role-plays and activities for implementing CEC program components ▪ In-depth review of recommendations for nutrition and physical activity ▪ Active learning and feedback from teachers to enhance the training experience	▪ Knowledge ▪ Skills ▪ Self-efficacy ▪ Observational Learning ▪ Outcome Expectation ▪ Environment ▪ Reinforcement

[a] Social Cognitive Theory

lessons were in English and included key vocabulary words translated in Spanish to accommodate Spanish speaking children. All parent tip-sheets were bilingual in English and Spanish.

Data collection

Parent demographic data: Questionnaires requesting demographic data were given to all participating parents/guardians during the consent process. Data on parent and child gender, race/ethnicity, household language and parent perception of their child's weight status collected.

Parent and teacher qualitative data: Qualitative data was collected from parents and teachers using focus groups to assess feasibility and acceptability of CEC. Six structured focus groups were conducted with parents and teachers from the two centers (4 parent and 2 teacher focus groups). All parent and teacher focus groups were recorded and transcribed by bilingual project staff. Thirty parents participated in the focus groups (center1: $N = 6$; center 2: $N = 24$). For parents, all focus groups were conducted in their respective Head Start centers during school hours on predetermined days after the parents had dropped off their children in the morning. The focus groups took approximately 60 minutes to complete, and were led by a bilingual (English and Spanish) moderator who asked open-ended questions. Parent focus group

Table 2. Description of CATCH Early Childhood Program Components

Classroom curriculum

Lesson	Title	Objectives
Lesson 1	*Hearty Heart Helps a Friend*	▪ To introduce healthy eating behaviors ▪ To identify healthy eating behaviors
Lesson 2	*All Aboard the Veggie Train!*	▪ To identify a variety of vegetables ▪ To understand the importance of vegetables in a healthy diet ▪ To eat more vegetables of different colors
Lesson 3	*Singing About Milk, Yogurt and Cheese*	▪ To identify milk and dairy foods ▪ To understand the importance of milk and dairy foods in a healthy diet ▪ To eat cheese and yogurt ▪ To drink plain white milk instead of flavored milk
Lesson 4	*Let's Eat Some Every-day Foods*	▪ To taste-test a vegetable and cheese as an example of a healthy snack
Lesson 5	*Singing About Fruits*	▪ To identify a variety of fruits ▪ To introduce fruits as part of a healthy daily diet ▪ To eat more fruits
Lesson 6	*Rabbit, turtle and Everyday Snacks*	▪ To identify a variety of healthy snack foods ▪ To understand the importance of eating healthy snacks foods
Lesson 7	*Everyday Drinks*	▪ To identify water, 100% fruit juices, and milk as healthy beverages ▪ To understand the importance of drinking healthy beverages
Lesson 8	*Let's Eat an Everyday Snack*	▪ To taste-test low-fat crackers, fruit, and water as an example of a healthy snack ▪ To eat more Everyday snacks
Lesson 9	*Singing for Everyday Foods*	▪ To review the concepts presented in It's Fun to Be Healthy! ▪ To set a goal to eat an Everyday Food

Parent Tip-Sheets

Tip-sheet #	Title	Objectives
#1	*Food and Your Family*	▪ To promote eating together as a family.
#2	*Make Veggies Fun*	▪ To increase knowledge of recommendations for vegetables in children ages 3 to 5. ▪ To understand the benefits of vegetables in a child's diet. ▪ To try easy recipe ideas to increase vegetable intake in children ages 3 to 5.
#3	*Milk Group Foods are Very Nutritious!*	▪ To increase knowledge of recommendations for milk and dairy foods and types of milk and dairy foods for children ages 3 to 5. ▪ To try easy and healthy recipe ideas containing milk and dairy foods.
#4	*Snack to Health*	▪ To understand healthy snacking habits. ▪ To try snack recipes containing fruits, vegetables and whole grains.
#5	*Fruit-alicious*	▪ To increase knowledge of recommendations fruits for children ages 3 to 5. ▪ To understand the benefits of fruits in a child's diet. ▪ To try recipes containing fruit.

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Table 2. Description of CATCH Early Childhood Program Components (Con't)

Tip-sheet #	Title	Objectives
#6	*Eating Out: taking an inside look at the nutrition*	▪ To increase nutrition knowledge of various types of foods when eating out. ▪ To increase knowledge of how to eat healthy when eating out.
#7	*Let's Get Moving*	▪ To increase knowledge of recommendations for physical activity for children ages 3 to 5. ▪ To increase opportunities for various types of physical activities inside and outside for children.
#8	*Try to cut down on Screen Time*	▪ To increase knowledge of recommendations for screen time for children ages 3 to 5. ▪ To increase knowledge for alternatives to screen time for children.
#9	*Don't Know Where to Go*	▪ To increase knowledge of reliable sources of information for parents including books and websites for information regarding child nutrition and physical activity.
Physical Activity Box		
Activity section[a]	Time Period	Objectives
Classroom Management	5-7 minutes	▪ Introductory lesson plan to help establishing the rules and behaviors expected from children ▪ To learn and practice how to move safely in a group
Warm-up	3-5 minutes	▪ To prepare students for more vigorous movements
Go activities	5-7 minutes	▪ To promote muscular strength, muscular endurance and cardiovascular endurance ▪ To provide developmentally appropriate and enjoyable activities and games for children
Cool Down	3-5 minutes	▪ To provide closure, cool down the students' bodies and help with the transition back to the classroom
Limber Limbs	3-5 minutes	▪ To promote gross motor skills, flexibility and coordination

[a] Teachers were instructed to select at least one activity from the various sections which include classroom management, warm up, go activity, limber limbs and cool down for each physical activity session.

questions included: (1) if they were aware of the CEC program being implemented in their child's Head Start center; (2) if parents perceive such programs as beneficial for their children; (3) if they received the CEC tip-sheets and how many; (4) if parents read the tip-sheets they received; (5) which tip-sheet the parents liked the most or least and why and; (6) what changes, if any, did they implement in their preschooler's eating and physical activity habits after reading the tip-sheets.

For teachers, all focus groups took approximately 60 minutes and were conducted by moderators in English in their respective Head Start centers after school hours on predetermined days. Specifically, questions included: (1) feasibility of implementing the classroom curriculum as planned; (2) discussing each lesson and what the teachers liked most or least about each lesson; (3) if they were able to implement the lesson activities in the classroom; (4) which were the children's most and least favorite lesson (i.e., did they enjoy it?); (5) how teachers felt about teaching nutrition concepts; (6) feasibility of implementing the physical activity box as planned; (7) which were the children's most and least favorite activity from the physical activity box; (8) how teachers felt about teaching physical activity using the box format; (9) feasibility of sending tip-sheets home to the parents as planned; (10) did the training fully prepare them for implementing CEC in their classrooms; and (11) suggestions for program

improvement.

***Evaluation of classroom lessons*:** Feasibility and acceptability assessments of the classroom lesson plans were conducted using teacher-reported lesson plan evaluation forms for each of the nine lessons. This has been used in previous CATCH-based studies successfully.[17, 18, 28] The form provided teacher feedback on feasibility of implementing each of the lesson plans during a class period (i.e., were all the lesson components completed?) as well as its acceptability by the children (i.e., did they enjoy it?).

Child anthropometrics: Height and weight were assessed using digital platform scales with portable stadiometers (Perspective Enterprises Portable Adult Measuring Unit PE-AIM-101) and digital scales (Tanita Professional Digital Scales with Remote Display, BWB-800S) respectively. Body mass index (BMI) was calculated from the measurements using the following equation: BMI = (weight in kg)/ (height in m)^2 where kg = kilograms, and m = meters. Age and gender specific BMI percentiles were used to categorize weight status of the children. BMI $\geq$85th and <95th percentile was categorized as overweight and $\geq$95th percentile was categorized as obese.[29, 30] This provided an estimate of the prevalence of overweight and obesity in this study population.

Child physical activity: Child physical activity levels were measured at baseline and post-intervention during outdoor and indoor active/movement times during preschool hours using SOFIT-P (System for Observing Fitness Instruction Time for Preschoolers), SOFIT-P, a modified version of the validated SOFIT instrument[31,32] was developed by the investigative team and used to measure physical activity levels, indoor and outdoor activity contexts and type of physical activity through direct observation of preschool children. Details regarding development, reliability and validity testing of SOFIT-P are presented elsewhere (S. Sharma, unpublished data, 2010). For our study, children from each classroom were observed by trained observers only at active time points during the school day: morning recess, morning movement time, afternoon recess and afternoon movement time. Total minutes of active time, physical activity level and physical activity type were recorded. Physical activity level (i.e., lying, sitting, standing, walking and fast/very active) and type (i.e., type of activity the child is engaged in such as pushing, pulling, throwing, jumping, dancing, etc.) were coded every 30 seconds using momentary time sampling (20 second observation; 10 second recording). An iPod provided the observing and recording prompts which were used by the observer to guide the recording of the physical activity level and physical activity type on a separate coding sheet. The observer preselected one student at a time randomly to a total of four children to represent the group and documented their level and activity type throughout the class time. After finishing the fourth student, if the activity was still in session, the observer started with the first student again. These four children were considered representative of the physical activity for their entire class. Thus, group, and not individual data was reported. Activity codes were assigned for each activity level that the child participated in. Overall, the instrument showed inter-observer agreement of >0.60 for physical activity level and physical activity type indicating good agreement. Also, the mean kappa scores ranged from 0.66 to 0.86 indicating good agreement of observed from expected.

Child dietary intake: Dietary intake of participating children was measured at baseline and post-intervention using direct observation by trained observers. At HCDE Head Start, the children are not allowed to bring food from outside and typically consume their breakfast, lunch and afternoon snack at school. The menus are developed by Head Start dietitians and meet the Child and Adult Food Care program (CACFP) guidelines. The meals are prepared in the kitchens of each Head Start center and the children and teacher sit around the table and eat the meals family-style, i.e. the foods are placed on the table and the teacher serves the children the foods and/or the children serve themselves. Four ounce scoops are used to serve each food item. Children are allowed to take second servings. For our study, fruit, 100% fruit juice and vegetable (FJV) intake of the children was measured at baseline and end of six weeks using direct observation of participating children during meal times (breakfast, lunch and snack) while at school. This included trained project staff directly observing (on the spot) and recording on coding sheets the food plates of all participating children before, during and after eating meals during school hours. The number of servings of food that was initially served as well as second servings were recorded. Plate waste was recorded using measuring cups after each child had finished eating the meal. Finally, the number of servings of FJV left on the plate was subtracted from that initially served (including second servings if applicable) to obtain the number of servings of FJV consumed by the children during these meal times. This type of measurement of dietary intake has been previously validated and used successfully in other studies in children.[33-35] Our study showed inter-observer reliability of >0.90 at baseline and post-intervention measurements. This was done by two trained observers observing and recording the dietary intake of the same participant at the same time. Inter-observer reliability data was collected on 15% of the participants. There was no change in the Head Start menu during the six week intervention period.

Data analysis

For focus group data, transcripts were reviewed by two study investigators separately to identify themes in the parent and teacher comments. Subsequently, the themes that were common were then organized into categories which the investigators reviewed, refined and summarized.

SAS 9.1 statistical software (SAS Institute Inc., Cary, NC) was used to conduct statistical analyses to describe participant demographics and analysis of physical activity and dietary data. All demographic variables were examined for their means ±SD or frequency distributions. The diet and physical activity data was not normally distributed. Hence subsequent analysis used non-parametric tests. The pre-to-post intervention change

in the proportion of FJV consumed during meal times at school were calculated from the direct observation measures using the Wilcoxon matched pairs test. The data for all the meals (i.e. breakfast, lunch and snack) was collapsed to determine the FJV consumption pre and post intervention. Mann-Whitney U test was used to evaluate pre-to-post intervention changes in physical activity as measured using the SOFIT-P. The mean minutes of active movement at baseline and post-intervention were calculated. For physical activity level, activity codes were assigned to describe the body position of the student (lying, sitting, standing, walking and fast/very active). The mean percent time spent in each physical activity level was calculated using the activity codes at baseline and post-intervention. Light physical activity was calculated by collapsing percent time spent at lying, sitting and standing. Moderate physical activity was calculated by percent time spent walking. Vigorous physical activity was calculated by percent time spent in fast/very active movements. Moderate-vigorous physical activity (MVPA) was calculated by collapsing percent time spent at walking and fast/very active movements.[31] Statistical significance was set at $P<0.05$. This study was approved by the University of Texas-Houston, Committee for Protection of Human Subjects (HSC-SPH-08-0414). Additionally, the study protocols and measurements were approved by the HCDE Institutional Review Board.

Table 3. Baseline Characteristics of Study Participants from HCDE Head Start, 2008

Demographic variables	Frequency (*N*)	Percent (%)
Child gender (N=75)		
Male	31	41.3
Female	44	58.7
Center (N=74)		
Center 1	33	44.6
Center 2	41	55.4
Household language (N=62)		
English	38	61.3
Spanish	24	38.7
Child's Ethnicity (n=73)		
African-American	25	34.3
Hispanic	47	64.4
Native American	1	1.4
Parents' perception of children's weight (N=65)		
Under-weight	3	4.6
Normal weight	61	93.9
Over-weight	1	1.5
Children's BMI percentile (n=61)		
Normal (BMI <85th percentile)	37	60.6
Over-weight (BMI ≥85th percentile)	12	19.7
Obese (BMI ≥95th percentile)	12	19.7

RESULTS

Table 3 shows the baseline characteristics of the children participating in the study. 58.7% of the participants were female and 64.4% were Hispanic; furthermore, 39.4% of the children were overweight or obese based on anthropometric measurement. When asked about their children's weight status, only 1.5% of the participating parents perceived their children to be overweight or obese.

Thirty-three parents participated in the post-intervention focus groups from the two centers; center 1 (*N*=7; 1 Male, 6 Females and; 5 Hispanic, 2 African American) and center 2 (*N*=26; 2 Males, 24 Females and; 12 Hispanic, 3 Caucasian, 11 African American). The primary theme for parent focus groups was that all reported having received the tip sheets and reported that using CEC to introduce healthy eating in their children was beneficial. For example:

"Yes, it was helpful to learn about the snacks, to get some ideas."

"Yes, telling them that vegetables are healthy for them and not just that we want them to eat them."

"She used to drink a lot more Cokes and we minimized that."

Nine teachers participated in the focus groups conducted at center 1 (*N*=5) and center 2 (*N*=4). All participating teachers were female. The primary theme for the post-intervention focus groups was that the teachers were able to incorporate the lessons and activities successfully into their school day. Teachers said that the children responded positively to the activities included in the CEC lessons and were able to distinguish which foods are "everyday food" and which ones are not (i.e., "sometimes foods"). For example:

"Sometimes they'll pick up food and say this is 'sometimes' food, or this is a healthy food. So, they enjoyed it."

"I think it's important teaching the kids about everyday foods because they'll go home and talk about everyday food and that's a good food. One student talked about French fries and how it's a vegetable but not an everyday food. So, I think it's a good thing."

"We colored the pictures to make things colorful, like the veggie train. And I made different games to go along with it. Like coloring the vegetables so they knew what the vegetables really were."

Suggestions for improvements included shortening the length of the classroom lessons. Teachers considered the activities as simple enough for the children in that age group to follow, interesting for them to participate and easy for the teachers to prepare. For example:

> "The stories need to be shortened some because of the attention span of the kids. I do mine (story telling) during snack time. Because the story is kind of lengthy, if you could narrow it down and have some puppets or something to keep the children's attention. The activities, I really enjoyed the activities and the kids like them. They're good for transition."

The focus group data on the activity box indicated that the teachers did *not* implement the physical activities every day as intended. However, the primary theme was that, when implemented, the activities were feasible and enjoyed by the children. For example:

> "We did the activities. They liked the activities. Didn't have any least favorites or any activities that did not work with the kids."

> "They were simple enough for them to do and it was something new so they were interested in it, like the yoga poses. They've never done that before. And it follows along with the discipline, like lining up and asking them to follow. That's what I like about that."

> "I like that they were on cards. A lot of time when you try to come up with a movement activity, you kind of go blank. So, you can just grab a card real quick and I liked that. It had exactly what you were supposed to do."

Suggestions for improvements on the activity box included a more in-depth training on implementation of the activity box in an indoor and outdoor setting and changing the music on the CD included in the physical activity box because it was found to be too slow.

Results of the nutrition lesson plan evaluation forms showed an overall good feasibility and acceptability of the classroom curriculum. Table 4 shows that a total of 21 evaluation forms out of a possible 36 (9 forms from each of the 4 participating classrooms at the two centers) were obtained indicating a 58% response rate. Results indicate that the mean time to teach the lessons was 23 minutes. Teachers reported having taught most, if not all parts of each lesson. Teacher comments, provided at the end of each lesson plan evaluation form, indicated that the children were enthusiastic and engaged in the lessons and especially liked the songs and stories in the lessons. Suggestions for improvements included reducing overall length of the lessons by breaking them down into segments and reducing the length of the stories.

For dietary intake, the mean proportion of servings of FJV consumed by the participating children for all the meals at school were calculated (Table 5). Overall, children were consuming a greater proportion of fruits and 100% fruit juice as compared to vegetables at baseline and post-intervention. On an average, children were consuming <20% of the vegetables and >60% of the fruits and juice served. Pre-to-post-intervention showed an increase in the proportion of FJV consumed by the children. However, this trend was not statistically significant.

For physical activity measurement using

Table 4. Results of Classroom Lesson Plan Evaluation Form (*N* = 21 forms)

Variable	Mean ±SD (Range)
To what extent did you teach the following parts of the lesson? *(1=Not at all to 4=Completely)*	
Introduction	3.71 ±0.46 (3-4)
Story or Songs	3.80 ±0.51 (2-4)
Interviews/Discussion	3.60 ±0.75 (2-4)
Session summary	3.59 ±0.61 (2-4)
How long did the lesson last (minutes)?	23.19 ±7.50 (10-30)
	N (%)
To what extent did you teach the following parts of the lesson? *(1=Not at all to 4=Completely)*	
Introduction	
Mostly (score=3)	6 (28.5)
Completely (score=4)	15 (71.4)
Stories	
Somewhat (score=2)	1 (4.8)
Mostly (score=3)	2 (9.5)
Completely (score=4)	18 (85.7)
Activities	
Somewhat (score=2)	3 (15.0)
Mostly (score=3)	2 (10.0)
Completely (score=4)	15 (75.0)
Session summary	
Somewhat (score=2)	1 (5.9)
Mostly (score=3)	5 (29.4)
Completely (score=4)	11(64.7)

Table 5. Pre-to-post Intervention Changes in Mean Proportion of Servings of Fruits, Vegetables and Juice Consumed by the Children during Meal Times at the Two Centers (*N* = 61)

Variable	Fruits Servings eaten/Servings provided[a]		Vegetables Servings eaten/Servings provided[a]		100% Fruit Juice Servings eaten/Servings provided[a]	
	Baseline	Posttest	Baseline	Posttest	Baseline	Posttest
Mean (SD)	0.61 (0.44)	0.81 (0.39)	0.13 (0.18)	0.16 (0.31)	0.71 (0.45)	0.75 (0.34)

Note: Wilcoxon matched pairs test used to determine pre-to-post intervention changes.
[a]Servings provided= number of servings at the start of the meal plus second servings minus servings given away. Serving size of FJV was set using the USDA Food Guide Pyramid definitions. For example, one serving of fruit is equal to one medium whole fruit or one half cup of cut fruit or ¾ cup (6 ounces) of 100% fruit juice; one serving of vegetable is equal to 1 cup (8 ounces) of raw or ½ cup of cooked vegetables.

direct observation, a total of 23 baseline and 11 post-intervention observations on the four classrooms were conducted using SOFIT-P (Table 6). The smaller number of observations post-intervention was due to fewer scheduled activity times provided to the children at the centers during this period. Results of baseline data showed that children spent on an average 39.8 (+/-14.3 SD) minutes in active movement which increased to 47.3 (+/-13.5 SD) minutes post-intervention. This increase, however, was not statistically significant. At baseline, of the total time spent in active movement, 72.1% was spent in light physical activity and only 27.9% in moderate-to-vigorous physical activity (MVPA). At post-intervention, 84.9% of the active time was spent in light physical activity and only 15.1% in MVPA. Thus, there was a decrease pre-to-post intervention in the percent time spent in MVPA. However, this decrease was not statistically significant.

DISCUSSION

Overall, the CEC pilot testing showed good feasibility and acceptability in the study population of low-income, predominantly Hispanic and African American preschoolers, their parents and teachers. The prevalence of obesity was higher than the national average in the study population with 39% of the participants being overweight or obese. This indicates the need for obesity prevention programs in this cohort of preschoolers.

Results of the post-intervention teacher focus groups and the lesson plan evaluation forms indicate that the nutrition-based classroom curriculum was well received by the children and feasible to teach in a preschool setting. The trend towards an increase in the children's FJV intake pre-to-post intervention also supports these results. It is important to note that overall, children were consuming < 20% of the vegetables served during meal times while at school. Vegetables were typically served every day at lunch and some days at snack time to meet the CACFP guidelines. While these results are exploratory in nature, given that food preferences develop in early childhood, it is important to further evaluate vegetable intake in preschoolers. Suggestions for improvements of the classroom curriculum by the teachers included shortening the length of the nutrition lessons. In response to this, the investigative team has subsequently modified the lessons such that it can be divided into segments with each no more than 5-7 minutes long. Each segment can be introduced separately to the children at different times through the day or the week. The inclusion of 'extension activities' and 'curriculum connectors' which includes activities for various learning centers make the CEC program more integrated with the current typical preschool structure.

Parent involvement and communication were found to be very important in this preschool setting. The parents indicated that they enjoyed the recipe ideas, coloring activities and being informed about the CEC program via the tip-sheets. Another interesting result was the parental perception of their child's weight. While measured height and weight showed that 39% of the participating children were overweight or obese, only 1.5% of the parents perceived their children to be in these categories indicating a significant discrepancy between the magnitude of the prevalence of overweight and obesity in this population and parent perceptions related to the same. These results emphasize the need for early childhood programs to be inclusive of parents. Parents are responsible for setting guidelines for screen time and determining family meal times, all of which are environmental factors related to the adoption of dietary and physical activity behaviors. Research has indicated that preschooler's food preferences are largely dependent on their parents/caregivers.[36-38] These results are further emphasized in studies which have shown that if parents constantly expose their children to fatty food choices, their child's fat intake and preferences for fat will be greater than those not exposed.[39,40] Spurrier et al.[41] recently reported that the home environ-

Table 6. Pre-to-post Intervention Changes in Percent Time Spent at Each of Four Physical Activity Levels during Active Times at the Head Start Centers

	Pretest (23 observations)[a]				Posttest (11 observations)[a]			
	Light (%)	Moderate (%)	Vigorous (%)	MVPA (%)	Light (%)	Moderate (%)	Vigorous (%)	MVPA (%)
Total	72.13	19.43	8.44	27.87	84.86	11.73	3.41	15.14
Center 1	69.90	17.75	12.35	30.10	83.16	12.75	4.09	16.84
Center 2	73.67	20.59	5.94	26.33	91.65	7.65	0.70	8.35

Note: Mann-Whitney U test used to determine pre-to-post intervention changes
[a]number of observations excludes double observations conducted for reliability check.
MVPA – Moderate-to-Vigorous Physical Activity

ment and parental behaviors are associated with preschool children's physical activity, sedentary behavior and dietary patterns. For those children who attend preschools/daycares, studies have shown that, in addition to parents, teacher characteristics and preschool resources play a significant role in promoting healthy behaviors.[42] Thus, interventions targeting both, preschools and families are needed.

The physical activity component of the CEC program showed mixed results. While teacher focus groups indicated that the activities were feasible and enjoyed by the children, implementation of the activities did not take place as planned. Overall, high levels of light activity and low levels of MVPA were observed in the study population. These results concur with other research in the preschool population[43-45]indicating a strong need for programs promoting physical activity while at preschool. There was an increase in the mean minutes of active movement from baseline to post-intervention which is provides positive feedback on the feasibility and acceptability of CEC. However, unexpectedly, the percent time spent in MVPA during this active movement decreased from baseline to post-intervention which could be due to several reasons. There were a significantly fewer number of post-intervention SOFIT-P measurements as compared to baseline (23 pretest vs. 11 posttest). This was primarily due to fewer scheduled physical activity opportunities provided to the children at the centers during the post-intervention period when these measurements were carried out. Thus, even though the children were provided with more minutes of physical activity during the day, the number of these opportunities was fewer during the post-intervention period. Several reasons were cited by teachers, such as cold weather, since the intervention was carried out from October to December during which time it got progressively colder, preventing the children from receiving outdoor physical activity time every day. Secondly, teachers reported that the Head Start centers did not have a scheduled physical education time or a gym area for the children to perform the CEC activities indoors. Teachers reported being unaware that the activities could also be implemented in a classroom setting even though this was indicated during the teacher training conducted prior to implementation of CEC. Teachers suggested that the training session needs to emphasize the flexibility of the activities to be implemented in any setting, whether indoors or outdoors. The investigative team has now modified the teacher training component to include instructions on how to conduct these activities indoors or outdoors and has included this information on the activity cards as well as in the activity box instruction section.

In conclusion, this study provides information on important factors to take into consideration when developing and implementing nutrition and physical activity programs for children in a preschool setting. As next steps the CEC program has been modified to: (1) strengthen teacher training towards implementation of program components; (2) include planning notes for each classroom nutrition lesson including extension activities and curriculum connectors so that it can be taught at one time or divided up into segments through the various HCDE Head Start learning times in the day or week; (3) include colorful hand puppets, plastic fruits and vegetables and colored illustrations with the nutrition lessons; (4) include information in the physical activity box on implementation of the activities indoors or outdoors; and (5) include a new music CD. The impact of this newly modified CEC program is being evaluated over the 2009-2010 school year in a larger sample of preschoolers enrolled in HCDE Head Start centers using a group-randomized controlled trial design.

Limitations

The sample size for this pilot test was small and the study was not powered to detect significant changes in dietary habits and physical activity. The analysis of the dietary intake and physical activity is exploratory and provides preliminary information on the potential effect of the program on these behaviors and effect sizes for sample size calculations in future studies. Additionally, the lack of a control group does not allow for attribution of the results of diet and physical activity to the intervention. Another limitation of the study is associated with the

parent focus groups which were conducted during school hours in the morning after the parents had dropped off their child to the school. Thus, the sample excluded parents who were possibly working or unavailable in the mornings when the focus groups were conducted limiting the generalizability of the findings. However, the time at which the focus groups were held was based on an informal feedback from the parents from the two centers on what would work best for them.

TRANSLATION TO HEALTH EDUCATION PRACTICE

The present study piloted the CEC program aimed at promoting healthy nutrition and physical activity among children ages 3 to 5 with promising initial results. This phase of testing was critical to identify areas for improvement when further modifying CEC program components. These results provide information important for interventionists, health promotion practitioners and educators interested in developing and implementing health promotion programs in preschools. The CATCH Early Childhood program is available commercially through Flaghouse Inc. (www.catchinfo.org) for implementation in preschool settings. Further research is being carried out to evaluate the efficacy of the CEC program in promoting healthy behaviors and reducing obesity prevalence in this population using a prospective randomized controlled trial evaluation design in the HCDE Head Start population.

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