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The CATCH Kids Club: a pilot after-school study for improving elementary students' nutrition and physical activity

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Abstract

Background: Although many school-based diet and physical activity interventions have been designed and evaluated, relatively few have been tested for the after-school setting. After-school day-care programmes at either elementary schools or private locations provide a ready-made opportunity for health programmes that may be difficult to incorporate into an already-full school day. The purpose of this paper is to report on a pilot study of an after-school adaptation of the CATCH (Coordinated Approach To Child Health) elementary school programme called the CATCH Kids Club (CKC).

Methods: The CKC was pilot-tested and formatively evaluated in 16 Texas after-school programmes: eight in El Paso and eight in Austin (four intervention and four reference sites each). Evaluation consisted of direct observation of moderate to vigorous physical activity during play time, self-reported food intake and physical activity, and focus group interviews with after-school programme staff.

Results: Students responded well to the physical activity and snack components and were less interested in the five-module education component. Routine staff training was a key variable in achieving proper implementation; the ideal would be a full day with repeated follow-up model teaching visits. Staff turnover was a logistic issue, as was programme leader readiness and interest in conducting the programme. Strong and significant effects were observed for the physical activity but not for the education component. The results of the physical education component suggest it is feasible, effective and ready for larger-scale evaluation or dissemination.

Keywords
Child
Adolescent
CATCH
Primary schools
Nutrition
Physical activity
Child day-care centres

Although many diet and physical activity interventions based in elementary schools have been designed and evaluated, relatively few have been evaluated for the after-school setting[1,2]. Attempting to reach children after school is important because school districts are increasingly reluctant to release class time for such non-academic activities as health promotion[3–6]. It has been estimated that 31% of elementary and 39% of middle school parents have a child attending a school-based child-care programme, a percentage that is expected to grow given the increasing number of families in which both parents work[7]. After-school child-care programmes provide a ready-made opportunity for health programmes that may be difficult to incorporate into an already-full school day.

CATCH (Coordinated Approach To Child Health) is a school-based health promotion programme with demonstrated efficacy[8,9]. CATCH was designed for the early prevention of cardiovascular disease, and development was funded through the National Heart, Lung, and Blood Institute (NHLBI)[10,11]. The intervention components of CATCH target 3rd- to 5th-grade students, and include behaviourally based classroom curricula; school environmental modifications related to food consumption, physical activity and tobacco use; and family- and home-based programmes to complement in-school activities[10]. Results from the main trial of CATCH indicated that the programme was successful in decreasing self-reported fat consumption and fat served in school meals, and in increasing self-reported physical activity and observed physical activity during physical education[8]. Long-term results indicated that significant positive effects were maintained[9]. Specific characteristics of the programme as well as the current success in dissemination efforts[12,13] suggest that CATCH may be well suited for adaptation to after-school programmes.

The purpose of the present paper is to report on a pilot study of an after-school adaptation of the CATCH Program called the CATCH Kids Club (CKC). CKC was pilot-tested

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and formatively evaluated in 16 Texas after-school programmes, eight in El Paso and eight in Austin (four intervention and four reference sites each). Evaluation consisted of self-reported food intake and physical activity, direct observation of moderate to vigorous physical activity (MVPA) during free play time, and focus group interviews with after-school programme staff.

Methods

Intervention overview

CKC is a physical activity and nutrition education programme for elementary school children (grades K–5) in an after-school setting. The CKC comprises three programmatic elements, based on those of the CATCH elementary school health promotion programme: a five-module education component, a physical activity component and a snack component. Each education module was split into two grade levels (K–2 and 3–5) of developmentally appropriate activities. The nutrition activities were structured into 15 lessons divided into five 3-week units, which highlighted a particular concept. Each individual lesson was packaged in a convenient and easy-to-use three-ring binder. Separate binders containing lessons describing programme activities were developed for grades K–2 and 3–5 for the education components. The snack component was included in the education component manual. The physical activity component included an activity box containing hundreds of 5 in × 8 in cards describing fun, active and inclusive games and activities appropriate for children in grades K–5. The materials were designed to be flexible and featured concise information and instructions for staff to implement the programme.

Five-module education component

CKC teacher-led lessons and activities were based on Social Cognitive Theory[14] and were modelled after activities developed for the CATCH Program, focusing on making children's healthy food choices (lunches, snacks and eating out) optimal for the prevention of chronic disease and on increasing moderate to vigorous exercise at school and at home. Specific conceptual elements for the education component included modelling, monitoring, goal setting, contracting, skill training, practice and reinforcement; basic information on healthy eating was presented using cartoon stories; and children were given role models for healthy food and exercise choices. The educational activities used a variety of educational strategies, including whole language, individual practice, co-operative learning groups and large-group discussions. The five educational modules were designed to equip children with the knowledge, skills, self-efficacy and intentions to make healthy dietary and physical activity decisions. The lessons were designed to last 15–30 min (the original CATCH lessons were 30–45 min). Enrichment activities were developed to allow more in-depth coverage of certain topics, such as physical activity, fruits and vegetables, fat, fibre and the Food Guide Pyramid. Although the lessons were intended for use as 'stand-alone' activities, a programme guide was developed to allow programme implementers to arrange these lessons within a modular format that has a specific scope and sequence. Activities were specifically developed to be fun and entertaining in order to compete with the after-school activities in which children typically engage (e.g. watching television, playing computer games).

Physical activity component

The physical activity component had four main objectives:

1. involvement of students in at least 30 min of daily physical activity;
2. involvement of students in MVPA for at least 40% of daily physical activity time;
3. providing students with many opportunities to participate and practise skills in physical activities that could be carried over into other times of the day and maintained later in life; and
4. providing students with a variety of enjoyable physical activities.

The physical activities were based on those developed and proved efficacious in the CATCH main study. The CKC physical activity box included a variety of activities including warm-ups, main activities (walk/run/jog and aerobic recreation games) and cool-downs. CKC physical activities underscored simple generalisable skills such as gross motor movement (throwing, catching and kicking) and large muscle movement, while heavily emphasising student enjoyment. After-school staff were trained in methods to maximise the number of students involved in an activity during the session and to increase the amount of available time for MVPA, regardless of the specific physical activities selected.

Snack component

The purpose of the snack component was to introduce children to tasty and healthful foods and to teach students the skills to enable them to select and prepare snack foods for themselves. Snack lessons emphasised fruits and vegetables, whole grains and low-fat dairy products. Once a week, children were involved in preparation of healthful snack foods. These weekly lessons included a discussion of food composition (e.g. fat content) as well as sensory taste evaluation of the prepared food.

Training

After-school programme staff were trained prior to programme implementation in two, 4 h sessions. One training session focused on the physical activity component, while the other session addressed the other two components, snacks and education. The training sessions

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were dynamic, interactive workshops designed to provide the knowledge and skills necessary for successful implementation of the programme components. Training included background information about the programme, physical activity demonstrations, basic group management techniques and tips on using the CKC programme materials. In addition to the primary training sessions, a booster training session was held midway through the intervention at each site, in which after-school staff received a refresher on conducting structured physical activities and supplementary information about the classroom lessons.

During implementation of the programme, weekly visits were made to each intervention site to check on implementation progress, ensure quality control and to provide assistance. In Austin, CKC staff conducted these site visits; in El Paso two local physical educators were hired as consultants to do so. Site visits included such activities as observation, providing feedback to after-school personnel, model teaching and forming strategies about further programme implementation. Austin CKC staff made monthly trips to El Paso to meet with the consultants, visit CKC sites and oversee the programme.

Design

This pilot study used a pre-test/post-test quasi-experimental design with a control group to test the effectiveness of the CKC programme. In El Paso, all children received all three programme components. In Austin, children received only the physical activity component of the programme. The decision to split the intervention intensity was based on logistics and cost considerations; we received separate funding for each field site and the Austin funding agency was primarily interested in supporting physical activity.

Although students from grades K to 5 participated in the pilot study, measurement efforts were limited to students in grades 3–5. The study team chose not to assess child outcomes in the K–2 group because of the children's early level of cognitive development, limited reading ability and cost restraints. The impact measures for grades 3–5 included those developed and validated by the CATCH study for use with that age group.

Sample

Across the 16 after-school programmes, 157 students participated in both baseline and follow-up measurements; 258 were present at baseline, 182 participated in the post-test measurement and 101 were lost to follow-up, representing a 61% retention rate over the course of the 5-month study. The mean age was 9 years, split among grades 3 (42%), 4 (36%) and 5 (22%). Children were predominantly white (43%) and Hispanic (34%); 17% were African American and 6% were other. Analyses were conducted among all students in El Paso and Austin for evaluation of the physical activity component, but only in El Paso for the five-module education component. Among El Paso children, 69 participated in both baseline and follow-up measures; 117 were present at baseline and 48 were lost to follow-up, representing a 59% retention rate.

Measures

The measures used to assess the effectiveness of the programme were the System for Observing Fitness Instruction Time (SOFIT), the After-School Student Questionnaire (ASSQ) and post-intervention focus groups with after-school staff.

SOFIT

SOFIT is a validated method for assessing the quality of physical activity programmes; it has been used in both the main CATCH study[15–17] and for SPARK (Sports Play Active Recreation for Kids)[18] and other NHLBI-funded programmes[19]. SOFIT uses direct observation to obtain a simultaneous measure of students' physical activity levels and lesson contexts during class time. Measured in absolute time units are the total lesson length, time spent at various activity levels and time spent in various lesson contexts. Activity and context are also measured in percentages of the total lesson. The Walking and Very Active categories are summed to measure the time spent in MVPA, a quantity addressed in the National Health Objectives for the Year 2010. Trained observers conducted SOFIT measurements and used a standardised protocol. SOFIT observers visited each after-school programme, observing the physical activity sessions prior to implementation of the programme and post-intervention.

ASSQ

The ASSQ is a self-administered questionnaire (approximately 30 min) designed to measure the behavioural and psychosocial variables targeted by the intervention. ASSQ survey items were modified from the Health Behavior Questionnaire[20,21] and the School-Based Nutrition Monitoring Student Questionnaire[22], both of which have been found to have acceptable internal consistency (greater than 0.6). Measured constructs in the ASSQ included: food preferences, dietary knowledge, self-efficacy, intentions to choose healthful food options, and participation in sedentary activities and sports activities. Trained data collectors administered the ASSQ prior to and immediately following the intervention period.

Focus groups

Following the intervention, focus groups were conducted at the after-school programmes. A total of 12 focus groups (six in Austin and six in El Paso) were completed. Any of the personnel involved with the implementation of the after-school programme could contribute to the focus groups, including programme leaders (individuals who led daily after-school instruction), programme co-ordinators (individuals who scheduled and organised after-school

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activities) and site supervisors (individuals who managed the entire after-school programme). On average, five individuals participated in each of the six focus groups in Austin and seven subjects participated in each of the six El Paso focus groups. A protocol was developed to guide the trained moderators with the line of questioning. Topics for questioning included the after-school staff's opinion on the strengths, weaknesses and efficacy of the programme; after-school staff's suggestions for improving the programme (training, timing, lesson content, etc.); whether they will continue using the programme; and perceptions of student learning and enjoyment.

Analysis methods

For school-level variables generated from SOFIT observations, analysis of covariance modelling was employed to determine impact of the CKC intervention. For measures collected at the individual level, the primary endpoints at post-test were analysed with regression adjustment for the baseline measure of the primary endpoints. We used general linear and non-linear mixed models procedures to model change in children's likelihood of previous-day dietary intake, healthy behaviours and nutrition knowledge, and food intentions and knowledge. This was a three-level analysis, with the first level being repeated observations of children, the second level being children themselves and the third level being the schools within which the children were nested. General mixed models[23] can be used to model change over time for individual subjects using a polynomial function of time or age. When data are nested, the mixed model approach also gives accurate assessment of the variances, which may be attenuated by nesting[24]. Age, race/ethnicity and gender were used as additional covariates. All analyses were conducted in SAS version 8 (SAS Institute Inc., Cary, NC, USA, 1999).

Results

SOFIT

SOFIT is a school-level measure and was used to measure students' physical activity levels and contexts for physical activity. Several large and significant effects were observed in the student activity categories and all measures registered in the desired direction. Comparisons of the pre-test and post-test measurements are presented in Table 1. The most important finding pertains to the proportion of time on the playground engaged in MVPA, which increased among children at the intervention sites and decreased among children at the reference sites. Children in the intervention schools exceeded the Healthy People 2010 recommendation of 50% MVPA for physical education classes[25]: the overall intervention MVPA post-test measure was 56.8% while the overall reference MVPA post-test measure was 31.3% ($P = 0.001$). MVPA is composed of time spent in two SOFIT variables: walking (32 min intervention effect; $P = 0.001$) and very active physical activities (12 min intervention effect; $P = 0.057$). In addition to increases in MVPA, large reductions in standing (−26% intervention effect; $P = 0.027$) and sitting (intervention effect −22%; $P = 0.125$) were observed.

Table 1 also shows the intervention effects for lesson context categories. A large and significant effect was observed for other/free play, where intervention schools reduced unstructured free time by 64 min ($P = 0.002$) and increased in game play by 30 min (marginally significant at $P = 0.10$), a clear intervention effect. All other variables were in the desired direction, although no others achieved statistical significance. Three were marginally significant results: student management (12 min effect; $P = 0.08$), general knowledge (10 min effect; $P = 0.08$) and game play (30 min effect size; $P = 0.10$).

Table 1 Net difference in percentage of lesson time for mean SOFIT measures: El Paso and Austin

	Intervention		Reference			
	Pre-test	Post-test	Pre-test	Post-test	Net effect*	*P*-value
Student activity categories						
Moderate to vigorous physical activity	29.46	56.84	47.79	31.34	43.83	0.001
Lying down	0.13	1.33	2.81	0.28	3.74	0.225
Sitting	24.36	8.84	20.90	27.11	−21.74	0.125
Standing	46.04	33.05	28.53	41.26	−25.73	0.027
Walking (moderate physical activity)	22.36	43.34	37.34	26.03	32.29	0.001
Very active (vigorous physical activity)	7.10	13.51	10.48	5.34	11.55	0.057
Lesson context categories						
Student management	10.89	17.13	9.55	3.31	12.48	0.084
General knowledge	3.40	12.68	0.70	0.00	9.98	0.084
Fitness activity	3.53	1.84	0.00	0.00	−1.69	0.694
Skill drills and scrimmage	0.00	12.75	0.00	0.00	12.75	0.199
Game play	26.26	38.24	33.43	14.98	30.43	0.100
Other/free play	55.93	17.36	56.33	81.71	−63.95	0.002

SOFIT – System for Observing Fitness Instruction Time.
Analysis conducted at school level ($n = 16$).
* Net effect is $(T2 - T1)_I - (T2 - T1)_R$ or (treatment at post-test − treatment at pre-test) – (reference at post-test – reference at pre-test).

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ASSQ

The ASSQ is a student-level questionnaire examining previous-day dietary intake for selected foods, healthy behaviours and nutrition knowledge, food intentions and knowledge. Results are presented in Tables 2–5. Since only students in the El Paso pilot after-school programmes were exposed to the CKC five-module education component, results from the ASSQ were largely underpowered and equivocal due to the small sample size. Among the students in El Paso, only food knowledge registered as a significant effect, and two other variables were marginally significant (vegetable intake and eating fruit for lunch; $P < 0.10$). Nevertheless, it is worth noting that nearly all of the intervention effects were in a positive direction, four of 23 comparisons indicating very small improvement in the control condition. In addition, we calculated a standardised pooled effect size for each comparison which ranged from 0.02 to 0.77, 11 of which were greater than or equal to 0.20, and five greater than 0.40[26].

Focus groups

At the conclusion of the pilot study, focus groups were conducted with after-school personnel at each site, six in Austin and six in El Paso. Four main areas of discussion emerged from the 12 focus groups: the five-module

Table 2 ASSQ measures for previous-day dietary intake (El Paso only)

	Adjusted mean of post-test		Intervention effect			Variance for raw means				Variance for least-square means			
	Intervention	Reference	(T2 – R2)	SD	*P*-value	σ^2_{T2}	σ^2_{R2}	σ_{pooled}	*d*	$\sigma^2_{T\_lsmean}$	$\sigma^2_{R\_lsmean}$	σ_{pooled}	*d*
French fries	0.84	0.88	−0.04	0.239	0.8706	0.86	0.90	0.94	−0.04	0.0752	0.0621	0.26	−0.15
Vegetables	1.16	0.48	0.69	0.178	0.0003	1.23	0.53	0.94	0.73	0.0409	0.0333	0.19	3.56
Beans	0.24	0.13	0.11	0.177	0.5540	0.54	0.54	0.73	0.14	0.0405	0.0334	0.19	0.55
Fruit	1.35	1.08	0.26	0.237	0.2729	0.99	0.93	0.98	0.27	0.0754	0.0611	0.26	1.01
Fruit juice	1.21	0.84	0.37	0.218	0.0980	0.75	0.90	0.91	0.40	0.0621	0.0500	0.24	1.55
Sweets	1.17	1.44	−0.27	0.271	0.3305	0.66	1.44	1.02	−0.26	0.0965	0.0735	0.29	−0.91

ASSQ – After-School Student Questionnaire; SD – standard deviation.
Mean score of dietary intake: 0, 1 time, 2 times, 3+times.

Table 3 ASSQ measures for healthy behaviours and nutrition knowledge (El Paso only)

	Adjusted % correct of post-test		Intervention effect			Variance for raw means				Variance for least-square means			
	Intervention	Reference	(T2−R2)	SD	*P*-value	σ^2_{T2}	σ^2_{R2}	σ_{pooled}	*d*	$\sigma^2_{T\_lsmean}$	$\sigma^2_{R\_lsmean}$	σ_{pooled}	*d*
Healthy behaviours													
Always reads nutrition labels	0.30	0.22	0.08	0.075	0.3040	0.11	0.08	0.31	0.25	0.0073	0.0060	0.08	0.95
Always eats high-fibre cereal	0.33	0.18	0.15	0.105	0.1530	0.22	0.12	0.41	0.37	0.0144	0.0116	0.11	1.33
Always eats whole-wheat bread	0.32	0.37	−0.05	0.113	0.6429	0.19	0.22	0.45	−0.12	0.0168	0.0134	0.12	−0.43
Always drinks 100% fruit juice	0.60	0.39	0.21	0.115	0.0695	0.26	0.25	0.51	0.42	0.0174	0.0138	0.12	1.70
Always eats fruit for lunch	0.23	0.05	0.18	0.109	0.1115	0.22	0.12	0.41	0.43	0.0153	0.0126	0.12	1.49
Always eats veggies for dinner	0.48	0.48	0.00	0.112	0.9942	0.22	0.22	0.47	0.00	0.0162	0.0132	0.12	0.01
Food Guide Pyramid knowledge													
Group with most servings	0.34	0.22	0.11	0.113	0.3184	0.24	0.19	0.46	0.24	0.0164	0.0137	0.12	0.93
Group with least servings	0.53	0.40	0.13	0.104	0.2178	0.24	0.26	0.50	0.26	0.0142	0.0117	0.11	1.14
5-a-day of fruits & vegetables	0.31	0.07	0.24	0.113	0.0398	0.24	0.12	0.43	0.56	0.0172	0.0138	0.12	1.90

ASSQ – After-School Student Questionnaire; SD – standard deviation.

Table 4 ASSQ measures for food intentions and knowledge, and self-efficacy (El Paso only)

	Adjusted mean of post-test		Intervention effect			Variance for raw means				Variance for least-square means			
	Intervention	Reference	(T2 – R2)	SD	*P*-value	σ^2_{T2}	σ^2_{R2}	σ_{pooled}	*d*	$\sigma^2_{T\_lsmean}$	$\sigma^2_{R\_lsmean}$	σ_{pooled}	*d*
Food intentions	3.32	2.67	0.65	0.587	0.2744	5.57	5.74	2.38	0.27	0.4509	0.3673	0.64	1.01
Food knowledge	6.06	4.61	1.45	0.675	0.0364	10.41	10.16	3.21	0.45	0.6050	0.4945	0.74	1.95
Self-efficacy													
Healthy food choices	2.13	2.05	0.08	0.151	0.6142	0.28	0.45	0.60	0.13	0.0294	0.0239	0.16	0.47
Physical activity participation	2.38	2.18	0.21	0.153	0.1854	0.29	0.54	0.64	0.32	0.0306	0.0249	0.17	1.23

ASSQ – After-School Student Questionnaire; SD – standard deviation.

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Table 5 ASSQ measures for television (TV) viewing and video game playing (El Paso only)

	Adjusted mean of post-test		Intervention effect			Variance for raw means				Variance for least-square means			
	Intervention	Reference	(*T2* − *R2*)	SD	*P*-value	σ^2_{T2}	σ^2_{R2}	σ_{pooled}	*d*	$\sigma^2_{T\_lsmean}$	$\sigma^2_{R\_lsmean}$	σ_{pooled}	*d*
TV viewing (week)	2.686	2.847	−0.161	0.171	0.3522	0.48	0.38	0.65	−0.25	0.037608	0.03041	0.18	−0.87
TV viewing (weekend)	2.657	2.833	−0.176	0.186	0.3492	0.57	0.59	0.76	−0.23	0.043846	0.036801	0.20	−0.87
Video game playing (week)	1.457	1.358	0.099	0.312	0.7520	1.73	2.13	1.39	0.07	0.1273	0.10737	0.34	0.29
Video game playing (weekend)	1.702	1.417	0.285	0.315	0.3694	2.00	2.47	1.49	0.19	0.12928	0.1064	0.34	0.83

ASSQ − After-School Student Questionnaire; SD − standard deviation.
Mean score of TV/video game behaviours: TV − did not watch, 1 h, 2 h, 3+h daily; video games − < 1 h, 1–2 h, 3–4 h, 4+h daily.

curriculum, the physical activity programme, snacks and implementation issues. The following summarises the information obtained from the focus group sessions.

Physical activity component

Overall, programme staff reported that children enjoyed the structured physical activity sessions, but that daily implementation was difficult to achieve. It was recommended to reduce the number of structured sessions per week from five to two or three. Although many of the activities were designed for implementation without PE (physical education) equipment, the provision of PE equipment proved to serve as a motivator for programme staff who appreciated receiving the proper tools to implement a wide variety of programme activities. Among the activities, younger children particularly enjoyed simple activities such as beanbags, hula-hoops and parachute games; and activities with music were a significant motivator to these children for participation. Our direct observations revealed varying levels of confidence and skill among programme staff conducting the physical activity lessons, indicating the importance of staff training and continued support and supervision.

Five-module education component

Programme implementers reported the lessons as easy to conduct but found the curriculum lessons too extensive and complex for the after-school setting and probably more appropriate for classroom teachers to implement during the school day. Role-playing activities, games of charades and leaders' involvement encouraged and increased child participation. They felt that demonstrations such as the pretzel and potato chip (a fat demonstration by placing chips in a paper bag), pear and celery (a fibre demonstration by peeling the fruit) and the nutrition label-reading presentations facilitated learning.

Snacks

The children thoroughly enjoyed the snack preparation and other 'hands-on' activities. Having a variety of snacks was an advantage. 'Hands-on' experience with snacks encouraged children to start a dialogue with their parents regarding healthy food choices in the home.

Implementation issues

Programme implementers reported enjoying the training sessions and desired additional training, yet were faced with several implementation challenges. They gained more from the 'hands-on' training sessions. Although initially apprehensive, they became more comfortable and confident with their own abilities as the programme progressed. After-school personnel turnover hindered implementation; continuous training throughout the year is recommended to combat staff turnover. CKC activities proved to reduce behaviour problems from the children. Older children instructing younger children in the CKC activities increased participation in both age groups. The opinion of parents regarding CKC activities varied, with several parents requesting that homework be given priority over participating in CKC activities while other parents were pleased that their children were learning about nutrition and physical activity. Activity boxes provided programme leaders with helpful instructional and management tips and a variety of games and activities to implement. Even though the equipment provided was helpful, and much appreciated, equipment storage areas were often unavailable. Overall, the after-school personnel reported CKC as a good programme and are interested in continuing its implementation.

Discussion

The need for after-school health programmes is expected to continue to rise, based on the number of families in which both parents work and the limited availability of classroom time during regular school hours devoted to health education[27]. The CKC physical activity and nutrition programme was designed and pilot-tested to offer an alternative to school-based health education through after-school child-care programmes. The physical activity component was found to increase moderate to vigorous physical activity significantly, was easy to implement, and was enjoyed by teachers and students. The effects of the classroom component were much less impressive and nearly all failed to reach statistical significance. Although programme implementers reported the classroom curriculum was easy to use and the snack component was widely accepted, it proved too

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complex and lengthy for practical implementation. Clearly, the results offer guarded enthusiasm for the after-school intervention approach and warrant further investigation, building on the results and feedback obtained from this pilot study.

The most impressive result of this pilot study was in the physical activity component, where unambiguous intervention effects were observed. Moderate to vigorous physical activity increased substantially in the intervention group, and several other student activity categories moved significantly in the desired direction. A very large and significant reduction was observed on other/free play and a large and marginal increase in game play; again indicating positive effects of the physical activity component. Among lesson context categories, game play and student management are teacher-directed structured physical activities, whereas other/free play are non-directed unstructured physical activities, the latter a less active form of time spent.

Results from the five-module education component were assessed by the ASSQ and were more equivocal, indicating merit to this approach, but requiring further research and development. Although the measured results were nearly unanimously positive and many were reasonably large (as measured by the Cohen standardised effect size), only a single variable reached statistical significance, an increase in food knowledge. Focus group interviews with programme leaders revealed that children were less inclined to enjoy participating in educationally oriented activities during after-school hours. Programme leaders also felt less confident implementing such lessons. Both these factors may have led to less than optimal programme implementation and attenuated impact results. Finally, the five-module education component was delivered only to four after-school sites in El Paso, dramatically reducing study power. It is encouraging that the results are in the desired direction, but power issues preclude definitive statements regarding the effects obtained.

Logistical concerns impeded full implementation of the CKC programme and need to be considered for future after-school research and programme implementation. Staff training was a key variable in achieving proper implementation; the ideal would be a full day of training with repeated follow-up model teaching visits. Similar findings from the CATCH elementary school study also indicated a strong relationship between staff training, programme fidelity and school-level effects[28]. In addition, level of interest and skill among programme leaders influenced implementation: off-duty elementary school teachers and college students in training for elementary education were far better qualified and interested in implementing the CKC programme than programme staff, who considered their position just a job or 'babysitting'. Staff absenteeism and turnover is a very real issue for programme fidelity. Not only was staff absenteeism a frequent interruption to programme implementation, but 'substitute' staff were often pulled from another site to make up for absent employees. When the substitute employees are needed at another after-school site, it left fewer CKC-trained programme implementers at that site, in effect multiplying the interruption of the original absent employee. Finally, turnover was also a problem; approximately 35% of programme staff left after-school employment in the 6-month study period.

Conclusion

The CKC programme offers another avenue for implementation of child diet and physical activity programming. In an educationally crowded school day and with after-school enrolment burgeoning, after-school health programmes may help supplement health programme activities that take place at school and increase the dose of such education. The results obtained in this pilot study demonstrate that after-school child care is feasible and effective as a setting for physical activity health education, but not without implementation challenges. Strong and significant effects were observed for the physical activity programme but not for the classroom education component. The results of the physical education component suggest it is feasible, effective and ready for larger-scale evaluation or dissemination. Revisions to the five-module education component should aim to reduce lesson length and complexity, and further research is needed.

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