Evaluation of a Pilot Hospital-Based Community Program Implementing Fitness and Nutrition Education for Overweight Children

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PURPOSE. *Evaluate the effect of the Kids Living Fit™ hospital-based intervention on body mass index (BMI) percentile, adjusted for age (months) and gender in children ages 8–12 years with BMI percentiles ≥ 85.*

DESIGN AND METHODS. *Twelve weekly exercise sessions and three nutrition presentations were held. Nurses recorded BMI and waist circumference at baseline, week 12, and week 24. Participants completed food and activity diaries.*

RESULTS. *Of the 32 participants enrolled, 16 completed all outcome measures and experienced a decrease in average BMI, BMI percentile, and waist circumference between baseline and weeks 12 and 24.*

PRACTICE IMPLICATIONS. *Hospitals can offer exercise and nutrition programs to decrease childhood obesity in their communities.*

Search terms: *Body mass index, child health education, child nutrition, child obesity, nutrition education, physical activity*

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Introduction

Beginning in 1963, surveys have been steadily documenting the obesity epidemic in the United States (Wyllie, 2005). Since that time, the incidence of childhood obesity has tripled (Inge et al., 2004). Overweight, defined as a body mass index (BMI) equal to or greater than the 95th percentile, currently affects 11% of children and adolescents in the United States (Dehghan, Akhtar-Danesh, & Merchant, 2005). When broadened to include the "at risk" for overweight, defined as a BMI of equal to or greater than the 85th percentile, the numbers of affected U.S. children and adolescents increase to 25%. It is estimated that 70% of overweight children will become obese adults (Dehghan et al.).

The long list of diseases associated with obesity in children can affect their health for a lifetime. Type 2 diabetes, rampant among our youth, accelerates the development of cardiovascular disease, stroke, blindness, kidney failure, and limb amputations (North American Association for the Study of Obesity, 2007). Obesity developed in childhood, and particularly in adolescence, is also associated with morbidity and mortality in adulthood from asthma, diabetes (type 2), hypertension, orthopedic complications, psychosocial stigmas and effects, and sleep apnea (American Obesity Association, 2005). Economic costs associated with obesity have been estimated at $117 billion by the United States Surgeon General (Sheehan & Yin, 2006).

Numerous societal trends have contributed to decreased caloric expenditure, one of the major causes of obesity. A notable shift is the increase in sedentary behaviors, such as decreased walking and bicycling and less time spent playing outside (Baker et al., 2005). The increased use of computers and video games, as well as television, has also contributed to decreased activity and greater numbers of obese children (Atherton & Metcalf, 2006).

Sedentary behaviors are further confounded by changes to mandated physical education in schools by the majority of the states in the country. Most states do not require a specific amount of instructional time, and about half allow exemptions, waivers, and/or substitutions for physical education (Shape of the Nation, n.d.).

Since 1971, the National Health and Nutrition Examination Surveys have been providing documentation of the nation's increase in mean caloric intake, paralleling the obesity epidemic (Centers for Disease Control and Prevention [CDC], 2004). High-calorie food products, larger portion sizes, meals eaten outside of the home, fast food, and the decline of the "family meal" have all been cited as troubling issues.

A review of the literature reveals many published studies on childhood obesity programs that focus on exercise or nutrition education in the United States (Summerbell et al., 2003). There are fewer that incorporate a two-pronged approach of both exercise and nutrition education (Dreimane et al., 2007).

The KLF intervention, a two-pronged program incorporating exercise and nutrition education, focused on best lifestyle choices regarding daily activities chosen and foods consumed.

To facilitate improved lifestyle choices for children regarding activities chosen and foods consumed, nurses at a community hospital designed and tested a series of three Kids Living Fit™ (KLF) childhood obesity studies. (KLF is an exercise program designed and offered by Good Sports Fitness, LLC, Leesburg, VA.) The KLF intervention, a two-pronged program incorporating exercise and nutrition education, focused on best lifestyle choices regarding daily activities chosen and foods consumed. In each of the studies the objective was to determine if the KLF exercise and nutrition program could affect change in participants' BMI percentile, adjusted for age (months) and gender.

Two of the three KLF studies conducted were after-school-based programs (Speroni, 2006; Speroni, Earley, & Atherton, 2007), and one, the study reported below, was a hospital-based program. All three KLF studies included the following: weekly exercise programs, monthly nutrition education, BMI and waist circumference measures, participant completion of food and activity study diaries, and the wearing of pedometers. Parental attendance was encouraged.

The two after-school-based programs that were tested included a pilot study design and a larger comparative study design. In the pilot study, BMI and other obesity-related outcomes were measured for 14 third to fifth graders who participated in an 8-week after-school program at one public elementary school in the community that the hospital serves. Results demonstrated an overall BMI percentile decrease of 0.07% and a 14% increase in "healthy" weight percentiles in this first KLF pilot study (Speroni, 2006). In the larger after-school-based study, BMI and other obesity-related outcomes were compared between a KLF intervention group and a contrast group that received no intervention (Speroni et al., 2007).

There were a total of 185 self-selected participants in the two study groups, KLF intervention group ($n = 80$) and the no intervention/contrast group ($n = 105$), all of whom were in the second to fifth grades at one of four elementary schools. According to pairwise change in BMI percentile from baseline to week 24, a paired *t*-test was conducted for both the KLF and contrast groups. For the KLF groups across all schools, participants experienced a pairwise drop of 2.3 in mean BMI percentile ($p < .01$), from 76.1 to 73.8; the pairwise change in mean BMI percentile among the contrast group was an increase in mean BMI percentile of 1.5 ($p < .05$).

The hospital-based KLF study, also a pilot study, is reported below. The purpose of this study was to evaluate the effect of the KLF intervention on BMI percentile, adjusted for age (months) and gender, and on waist circumference, in children 8–12 years of age

who were determined to be "at risk" (BMI 85th–94th percentile) or overweight children (BMI ≥ 95th percentile).

Methods

Institutional Review Board approval was obtained for this pilot study. Informed consent was obtained from parents of all study participants, and all study participants (n = 32) provided assent. The KLF program was held at two community hospital sites (site 1 = a 155-bed hospital; site 2 = a 182-bed hospital that includes a Bariatric center). Both are part of a hospital system operating in the geographic region where the study was conducted.

Sample

Study participants were a convenience sample comprised of community members who responded to study advertisements to participate in the KLF study program offered at the hospital. Participants who met the following eligibility criteria were sequentially enrolled in the study: 8–12 years old; BMI for age and gender of ≥ 85th percentile; able to read and write English; able and willing to perform physical fitness activities as required in the KLF exercise component of the program; and able and willing to complete study diaries. There were no children excluded from the study based upon the eligibility screening evaluation conducted at baseline. Participants were charged a $100 fee to participate in the KLF program.

Study Procedures

Overall study procedures are provided in the study procedures flowchart (see Table 1). At baseline, week 12, and week 24, registered nurses measured height, weight, and waist circumference. The CDC's online BMI child and teen percentile calculator adjusted for age and gender (CDC, 2006) was used to determine the participants' BMI scores.

Exercise Methodologies

The 1-hr KLF exercise sessions were held once weekly over 12 consecutive weeks (weeks 1–12) at the hospital. Exercise sessions were led by a physical fitness trainer. The exercise component of the KLF

Table 1. Study Procedures Flowchart

Study Procedure	Baseline	Week 1	Weeks 2–3	Week 4	Weeks 5–7	Week 8	Weeks 9–11	Week 12	Week 24
BMI for age and gender/ Height and weight	X							X	X
Waist circumference	X							X	X
Weekly exercise: 1 hr			X		X		X	X	
Weekly exercise: 30 min		X		X		X			
Dietary presentation: 30 min		X		X		X			
Food and activity questionnaires	X							X	
Satisfaction questionnaires	X							X	X
Daily diaries		X		X		X		X	
Parental attendance recorded		X		X		X		X	

intervention focused on physical fitness (e.g., aerobic dance, basic muscle groups, stretching, balancing techniques, and heart rate monitoring associated with exercise), yoga, and relaxation techniques (e.g., meditation, breathing). During the exercise sessions, the trainer also addressed lifestyle choices. Best or healthier lifestyle choices were reinforced by encouraging participants to select more active behaviors (i.e., being active whether running or cycling versus being sedentary by viewing television or playing video games) compared to sedentary behaviors. Participants were also encouraged to make best choices with respect to foods consumed for snacks and meals.

The objective of the exercise sessions was to expose the study participant to a variety of active behaviors that he or she could perform independently following the conclusion of the program.

During weeks 1, 4, and 8, the exercise sessions were 30 min to accommodate the 30-min nutrition presentations.

Nutrition Education Methodologies

The dietary/nutritional component included three lectures taught for 30 min once per month by a registered dietitian. The objective of all presentations was to provide information that facilitates children's abilities to make best choices daily regarding meal and snack selections. The purpose of focusing on best/healthier choices was to expose the participants to thinking in terms of most nutritious or best/healthiest choice versus momentary food desires.

During week 1, balanced nutrition was taught using the United States Department of Agriculture (USDA) food pyramid (USDA, n.d.). Food models were used to provide participants a visual and tangible model of recommended serving sizes, the group to which food belonged, and whether the item represented a "best choice," "OK choice", or "limited choice" food item. Participants worked together in groups to construct balanced healthy meal and snack selections.

Week 4 focused on the "portion distortion" presentation modified to be age appropriate (Department of Health and Human Services [DHHS], National Heart Lung and Blood Institute, n.d.). The presentation was used to teach calories in simplistic terms. It demonstrated side-by-side comparisons of serving sizes 20 years ago versus serving sizes of today. As part of this interactive teaching, participants guessed how long it would take to perform specific activities to burn the extra energy due to the larger serving sizes (see Figure 1a, b, c). There was an emphasis on making healthy choices also in this presentation.

At week 8, the fast food dietary presentation focused on making best choices at fast food restaurants, with an emphasis on eating fast food in moderation and less than one time per week. The concept of making a healthy versus not healthy choice was taught by providing menus from fast food restaurants and having groups of participants review the menus and present their best choice findings.

Parental attendance was encouraged and recorded for the dietary lectures.

Study Questionnaires and Diaries

Study questionnaires and daily diaries were completed at various time points during the study (see Table 2), to raise study participants' awareness regarding activities chosen and foods consumed rather than for purposes of analyzing data.

The types of questionnaires and study diaries that participants were asked to complete are as follows:

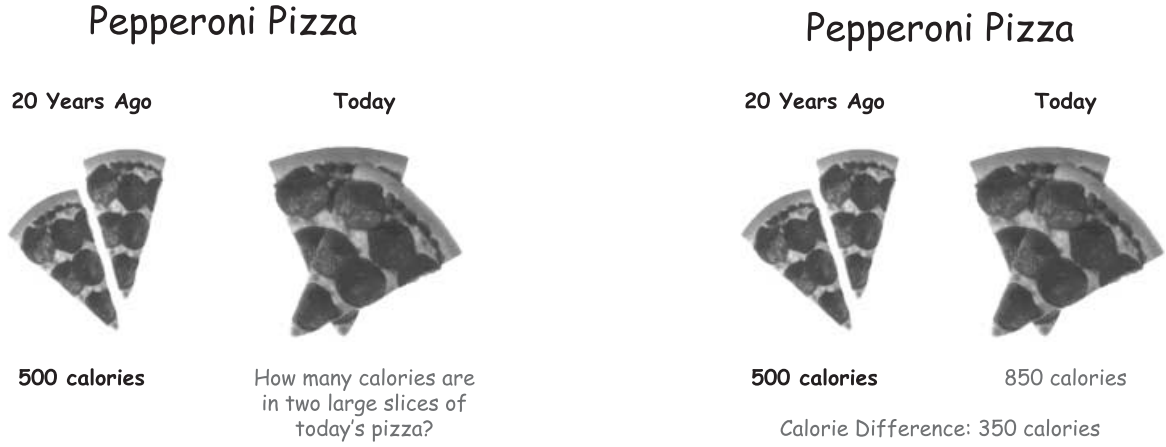
Food and activity questionnaires completed at screening and at week 12:

1. Participant's favorite foods and participant's family's favorite foods: Delineated by the six food groups per the food group pyramid (e.g., grains, vegetables, dairy, meat, fruit, and fats, oils, sweets) and whether the favorite food is a "best choice," "OK choice," or "limited choice" item.
2. Participant's favorite activities: Delineated by whether the activity is a "best choice," "OK choice," or "limited choice" activity and also whether the choice is active or inactive.

Satisfaction questionnaires completed at screening and at weeks 12 and 24:

1. Evaluation of self: Participant's satisfaction level regarding food choices and activity levels (very satisfied, satisfied, not satisfied).
2. Evaluation of family: Participant's satisfaction level regarding family food choices and activity levels (very satisfied, satisfied, not satisfied).

Figure 1. Pepperoni Pizza



Daily diaries completed during weeks 1, 4, 8, and 12:

1. Daily activities: List of the number of hours/minutes per day of the 10 things the participant did most that day, not including sleeping or going to school.
2. Pedometer totals: Total number of daily steps.
3. Food diary: Number of servings per day by food group and also the number of fast-food restaurant meals.

During the weekly KLF exercise program, study participants were reminded which study documents were to be completed and returned at the next study session.

Participants were followed through week 24; however, there was no intervention after week 12. At week 12, participants were encouraged to make daily best choices with respect to activities chosen and foods consumed during the time of no intervention.

Table 2. Demographic Characteristics of Participants by Hospital Site

	Hospital Site *n* = 32		
Characteristic	**Site 1 *n* = 10**	**Site 2 *n* = 22**	**Total *n* = 32**
Age (*M*-years)	9.4	10.1	9.9
Gender			
Female	6	10	16
Male	4	12	16
Race			
Caucasian	8	14	22
African American	0	1	1
Asian	1	1	2
Hispanic	1	3	4
Other	0	3	3
Baseline BMI percentile (*M*)	96.5	97.5	97.2
Number "at risk" (85th–94th percentile)	2	2	4
Number overweight (≥ 95th percentile)	8	20	28
Baseline waist circumference, inches (*M*)	34.27	37.39	36.42

Table 3. Participants' Change in BMI, BMI Percentile, and Waist Circumference by Week of Re-measure from Baseline to Weeks 12 and 24

BMI Risk Group	Baseline	Week 12	Change over baseline	Week 24	Change over Baseline
Overall					
Number	16	16		16	
BMI (*M*)	25.9	25.5	–.4	25.3	–.6
BMI percentile (*M*)	96.9	96.3	–.6	96.0	–.9
Waist circumference, inches (*M*)	35.5	35.0	–.5	34.8	–.7
"At risk" (85th–94th percentile)					
Number	2	4	2	3	1
BMI (*M*)	21.8	22.3	.5	22.4	.6
BMI percentile (*M*)	93.0	93.3	.3	91.7	–1.3
Waist circumference, inches (*M*)	30.5	33.6	3.1	31.8	1.3
Overweight (≥ 95th percentile)					
Number	14	12	–2	13	–1.0
BMI (*M*)	26.4	26.6	.1	26.0	–.5
BMI percentile (*M*)	97.5	97.3	–.2	97.0	–.5
Waist circumference, inches (*M*)	36.3	35.5	–.8	35.5	–.8

Data analysis for this study was completed by a biostatistician using SAS version 9.1, statistical software. Measures of central tendency (mean and variance) were performed to describe the participant groups.

Results

There were 32 participants who enrolled in the study (site 1 = 10; site 2 = 22) (see Table 2). There was an even distribution by gender; the average age was 10 years; and 69% were Caucasian. Of the 32 enrolled participants, 16 (50%) attended sessions at baseline, week 12, and week 24, when measures of BMI-for-age, BMI-for-age percentile, and waist circumference were taken. The overall BMI mean, BMI percentile, and waist circumference results are for the 32 participants completing baseline measures.

A total of 16 participants completed study measures at baseline, week 12, and week 24 (see Table 3). Those who did not complete all three time points

Table 4. Participants' BMI at Baseline, Week 12, and Week 24, Percent Change, and Z-scores

Site	Baseline BMI	Week 12 BMI	Week 24 BMI	Weeks 1–12 percent change (%)	Weeks 12–24 percent change (%)	Week 1–24 percent change (%)	Week 1 BMI *z*-score	Week 12 BMI *z*-score	Week 24 BMI *z*-score
Site 1	23.9	22.9	23.6	–4.20	3.10	–1.30	–.909	–1.057	–.633
	24.6	25.4	24.4	3.30	–3.90	–.80	–.701	–.236	–.335
	30.8	31.1	29.8	1.00	–4.20	–3.20	1.135	1.637	1.676
	22.3	22.5	22.0	.90	–2.20	–1.30	–1.383	–1.189	–1.229
	24.5	25.0	24.8	2.00	–.80	1.20	–.731	–.367	–.186
	21.3	22.0	21.0	3.30	–4.50	–1.40	–1.679	–1.353	–1.601
	27.6	27.1	26.3	–1.80	–3.00	–4.70	.187	.323	.372
	27.0	26.5	27.1	–1.90	2.30	.40	.009	.126	.67
	28.3	27.5	28.5	–2.80	3.60	.70	.394	.454	1.191
Site 2	26.4	26.1	25.6	–1.10	–1.90	–3.00	–.168	–.006	.112
	31.2	29.6	29.0	–5.10	–2.00	–7.10	1.253	1.145	1.378
	22.7	20.7	21.3	–8.80	2.90	–6.20	–1.264	–1.78	–1.489
	25.6	24.7	23.5	–3.50	–4.90	–8.20	–.405	–.466	–.67
	24.9	23.1	24.3	–7.20	5.20	–2.40	–.613	–.992	–.372
	24.3	25.9	25.9	6.60	.00	6.60	–.79	–.071	.223
	28.3	28.1	27.7	–.70	–1.40	–2.10	.394	.652	.894
SD	3.38	3.04	2.69						

either missed one of the sessions or dropped from the study.

As shown in Table 3, the overall mean BMI decreased between baseline and week 12 (–0.4) and week 24 (–0.6). The overall mean BMI percentile also decreased at these time points (–0.6 and –0.9, respectively). The overall mean waist circumference (inches) also decreased between baseline and week 12 (–0.5") and week 24 (–0.7"). Thus, overall, the mean BMI, BMI percentile, and waist circumference decreased between baseline and weeks 12 and 24.

When analyzed by the two groups identified at baseline as "at risk" for overweight (85th–94th percentile) or overweight (95th percentile and above), there were also decreases (see Table 3). At baseline, 2 (12.5%) of the 16 participants were classified as "at risk" for overweight, and 14 (87.5%) were classified as overweight. For those "at risk" for overweight, the mean BMI percentile decreased from baseline to week 24. In the overweight group, the mean BMI decreased between baseline and week 24. For this group, a decrease in BMI percentile and waist circumference was seen at both weeks 12 and 24. The decrease in BMI percentile change was more than twice as large in the "at risk" group (–1.3) compared to the overweight group (–0.5). The number of participants in the overweight group also decreased from baseline to week 24.

The *Z* scores calculated for all participants indicate that no BMI value for all follow-up periods was more than 2 standard deviations away from the mean (see Table 4). Thus, the data are approximately normally distributed.

Total average steps as measured by participant pedometer recordings increased by more than 45% between week 1 (6,033 steps) and week 12 (8,788 steps). Average steps at weeks 4 and 8 were 7,832 and 6,975, respectively.

The average overall participant attendance at the 12 weekly sessions was 66%. Fifty-three percent of participants attended 75% or more of the weekly sessions. The average parental attendance for the weeks of dietary lecture was 76%.

Table 5 shows participants' satisfaction regarding self and family food and activity choices. There were increases in the percent satisfied for each of the categories from baseline to weeks 12 and/or 24.

Discussion

The KLF intervention was effective in decreasing BMI and waist circumference in children both "at risk" for becoming overweight and those who were overweight. These findings are consistent with other studies that incorporate both exercise and nutrition

Table 5. Participants' Satisfaction Reporting at Baseline, Week 12, and Week 24

Satisfaction type	Baseline $n = 32$	Week 12 $n = 15$	Week 24 $n = 15$
Satisfied with self-food choices (%)	81	93	93
Satisfied with self-activity choices (%)	94	87	100
Satisfied with family food choices (%)	84	93	100
Satisfied with family activity choices (%)	75	80	93

education (Dreimane et al., 2007; Summerbell et al., 2003). As concluded by Summerbell et al. (2003), there is limited quality data on the effects of treatment programs, and the extent to which the results of these programs can be generalized is not known. Much of the research has been conducted in populations who are most likely to respond to interventions, such as White, middle class, educated families. In the hospitals' communities where this research was conducted, the majority met these criteria. Hence, it is difficult to specify the degree to which these results may be generalized to other populations.

The primary limitations of this study included a small sample size and the lack of a control group, both of which are inherent in a pilot study.

Inherent in research on children is the problematic nature of a participant's ability to attend study sessions due to family social and professional time constraints. A limitation of this study was that 68% of study participants attended only half of the sessions, and just 50% completed all BMI measures. However, there were no notable differences in BMI percentile change by attendance level.

It was noted that the KLF intervention appeared to be more effective in the "at risk" group compared to the overweight group, judging from the size of the decrease in BMI percentile among the "at risk" group compared to the overweight group. In studies that lack a control population, as is the case for this study, the "regression to the mean" effect in the experience of both groups could explain the change in measures over time. It is further notable that the majority of these pilot study participants at baseline were classified as overweight (BMI ≥ 95th percentile for age and gender).

Programs, such as the one evaluated in this study, can be conducted as hospital-based or after-school-based programs. The benefit of a hospital-based program may be the ability to target overweight populations that otherwise might not participate in an after-school program for fear of being identified as overweight by their peers. Also, there are disadvantages in after-school-based programs, such as space to hold the exercise programs because other after-school programs compete for the same space. The benefit of a school-based program is the opportunity to work with nurses in the school system to facilitate the provision of a program that teaches exercise and nutrition.

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The impetus for this study being hospital-based was to offer a program to children in the communities the hospitals serve, regardless of school status, who were overweight or at risk of becoming overweight because there were no other known programs at the time targeting this population. A challenge of a hospital-based program is the requirement for the participants' round-trip transportation to the weekly sessions and follow-up.

Completion of study diaries can also be problematic in research, particularly when children are charged with task completion. Parents were told not to complete the diaries for their children because the completion of the diary by the children was intended to raise the participants' awareness regarding activities chosen and foods selected. An example of raised awareness, as

seen in this study, was participants wearing pedometers and challenging themselves to walk 10,000 steps per day on days they were not required to wear pedometers.

A control population was not selected and enrolled in this study; participants at both hospitals served as their own controls. The maturation effect is one explanation for the modest improvement that was observed in BMI percentile in both "at risk" and overweight groups.

Another limitation of this study may have been the ability of a family to pay the $100 fee for the child to participate in this study, and thus some at risk or overweight children may not have participated in this study for financial reasons.

How Do I Apply This Information to Nursing Practice?

One important finding of this study is that nurses can spearhead exercise and nutrition-based programs, offered by hospitals, to decrease overweight in children from the hospital's community. If programs are not available, organizing and implementing exercise and nutrition programs, such as KLF, can be accomplished by registered nurses, registered dietitians, and exercise trainers. Nursing administrators can lend support by providing funding and securing staff hours. Nurses working in pediatrics, emergency, and home health care could provide information to parents of overweight children on programs offered by the hospital and/or available in the community.

Another important finding is that weight loss was sustained by study participants during the time of no intervention. With societal trends of increasing sedentary lifestyles plus caloric intake, an educational approach focusing on exercise and nutrition could empower not only children but also their families to improve daily lifestyle choices with respect to activities chosen and foods consumed to lose weight and to sustain weight loss. Ideally, improvement in lifestyle choices would correlate with improved health over a lifetime.

With $117 billion in healthcare costs associated with obesity and an increasing obesity rate in children, provision of programs focusing on exercise and education is of utmost importance, both for children and their families. As nurses routinely see patients with diabetes, cardiovascular disease, asthma, orthopedic and psychological disorders, they are well poised to be advocates for exercise and nutrition programs to decrease overweight and ultimately to maintain healthy weights for a lifetime.

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