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A Community Engaged Approach to Health and Physical Education

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Abstract

Background: The purpose of the Smart Nutrition and Conditioning for Kids (SNACK) pilot study was to increase fitness levels and overall health of children 7 to 9 years of age in two elementary schools, one urban and one urban rim. Fundamental Integrative Training (FIT) was incorporated into physical education class and was considered a vital component of SNACK.

Methods: The FIT intervention was performed twice weekly during physical education class for 8 weeks. Pre and post Fitnessgram fitness tests were completed by each child.

Results: Fitnessgram fitness test scores improved for all fitness tests for both the experimental and control groups in both schools ($p<0.05$). Significant differences between groups was found in 4 areas: PACER, push-up, curl-ups, and long jump ($p<0.05$).

Conclusion: FIT is one example of an interdisciplinary (nursing, health and exercise science students and faculty, elementary school administration and staff) collaborative approach to improving fitness levels with limited time and resources.

Keywords: Elementary school children; Fitness; Integrated training; Coordinated school approach; Interdisciplinary collaboration

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Introduction

It is imperative for students to experience learning in a variety of settings with the transition in healthcare to primary care, health promotion and population health. The need for collaborative practices in the community is an ever increasing necessity [1]. Interprofessional/community collaborative practice is the foundation for the Smart Nutrition and Conditioning for Kids program (SNACK). The SNACK program consisted of: A community needs assessment; fitness and health assessments; fitness, healthy eating, obesity and diabetes risk education; fun activities to get the children "moving"; exercises based on nutrition education; Fundamental integrative training (FIT); and education and engagement of parents and teachers. Activities to get the children "moving" took place both in the classroom and during physical education (PE) class. PE activities were 30-45 minutes long including at least 15 minutes of "FIT" activities (i.e., strength building activities with balloons that the children could repeat at home). Healthy eating and nutrition education also took place in the classroom, lunchroom and PE class. The SNACK program included interdisciplinary collaboration of nurses, a nutritionist, an exercise science specialist, school administrators, teachers, undergraduate Nursing and Health and Exercise Science (HES) faculty and students, and parents [2]. One successful component of this collaborative approach to combating childhood obesity was Fundamental integrative training (FIT).

Regular participation in PE has the potential to develop physically fit children who have the knowledge, skills and confidence to engage in physical activity as an ongoing lifestyle choice [3] With qualified instruction and practice, children can improve their motor skill performance and enhance their muscle strength. These skills are the building blocks for future participation in games, sports and fitness activities [4]. Therefore, the development and mastery of selected physical abilities early in life is a prerequisite for continued participation in moderate to vigorous physical activity (MVPA) and protection from overweight and obesity later in life [5].

Developmentally appropriate learning experiences can improve muscular strength and fundamental movement skill proficiency

in youth according to meta-analytical findings [6]. The potential health benefits of muscular fitness for school-age youth are improvements in adiposity and cardiovascular disease risk factors, highlighting the importance of muscle-strengthening physical activities for children and adolescents [7]. Literature confirms the importance of integrating both health- and skill-related fitness components into youth PE class. The need to develop and evaluate interventions while addressing common barriers to implementing school-based programs is also recognized [8].

Fundamental integrative training (FIT) is a method of conditioning that incorporates both health- and skill-related components of physical fitness into well-designed lesson plans [9]. FIT is designed to enhance muscular fitness and fundamental movement skill performance with meaningful instruction, deliberate practice and progression based on technical proficiency. In addition, with qualified instruction and supervision, participants can learn health-promotion concepts and skills while participating in a program that is safe, effective and fun. The concept of FIT was based on earlier reports on resistance training and motor skill development for school-age youth and was refined based on process evaluation from previous investigations [10].

Materials and Methods

Testing procedures

As part of the SNACK program, the FIT program was implemented. All children participated in an orientation session including a review and practice of fitness testing. After orientation all participants were assessed by a PE teacher and trained research assistants (RA). Standardized protocols for fitness testing were followed according to the FIT protocol [11]. Aerobic fitness was assessed with the progressive aerobic cardiovascular endurance run (PACER), a shuttle run test that requires participants to run back and forth across a 20 meter space at a specified pace that gets faster each minute. The running pace was set by audio signals from a pre-recorded CD. Each participants' score was the total number of laps completed. Muscular fitness was assessed with two different tests. The curl-up and push-up tests were used to assess abdominal and upper body endurance/strength, respectively. The cadence of the curl-up and push-up tests was set with a metronome (1 curl-up/3 sec). The maximum number of repetitions performed with proper technique was recorded. Lower body power was evaluated by the standing long jump [12]. The long jump test was performed three times and the best score was recorded to the nearest whole centimeter. Lower back and hamstring flexibility for the left and right legs was evaluated by the sit and reach test. The best score of three trials for each leg was recorded [13].

Training procedures

The FIT program was specifically designed for primary school children and was based on previous research [14]. The intervention was performed twice per week on non-consecutive days during the first 12-14 minutes of each 40-45 min PE class; and was designed to be time-efficient and developmentally appropriate for children. The PE teacher and RA's provided instruction and were available for educational support and encouragement during the PE class. The FIT program included a circuit of six to seven exercise stations that focused on enhancing muscular fitness and fundamental movement skills (primarily jumping, balancing, throwing and catching) [15]. The FIT circuit included a series of progressive exercises using one's body weight as well as medicine balls (1-2 kg), fitness ropes, equalizer bars, BOSU balance trainers, fitness spots, dome cones, punch balloons and spooners (plastic boards that simulate skateboarding). **Table 1** outlines the structure and content of the fitness program which took place in a school gymnasium during PE class.

Following a warm-up which included dynamic movements (e.g., calisthenics and jumping jacks), the PE teacher/RA reviewed the daily lesson plan and demonstrated proper exercise technique [16]. Participants exercised in pairs during the fitness program and progressed through one set of all exercises in the circuit with the aid of music set to the desired work to rest interval. Participants performed two exercises at every station in the circuit; each exercise was performed for 30 seconds [17]. Participants performed the second exercise at a given station then progressed to the next station following a 30 second recovery period. The order of the exercise stations in the FIT circuit remained consistent although participants started the circuit at different stations each week. Students were able to navigate their own learning experience by choosing their starting station [18].

At every exercise station the children were encouraged and the learning process was reinforced throughout the 8 week program. Participants' mastered proper form and technique on basic exercises before progressing to more challenging skills [19]. FIT emphasizes the development of basic conditioning movements in a supportive environment and can be an effective approach for improving the physical fitness of school-age youth. During weeks five to eight, participants created their own exercises at a mix and match station using knowledge learned during the first four weeks of the fitness program. For example, participants created new exercises with medicine balls or spooners, overcoming self-determined challenges while applying learned skills in novel situations. Participants in the control did not participate in FIT but attended their regular PE class twice per week throughout the study period [20].

Education procedures

Participants in the SNACK program received age and grade level appropriate nutrition education based on the New Jersey core curriculum standards for second graders. The nutrition education increased awareness of the importance of healthy food choices and the risk of obesity and Type 2 diabetes. After nutrition lessons were presented, children were given the opportunity to apply their knowledge during fun PE activities.

Nursing students developed educational videos reinforcing children's nutrition lessons in an easy to follow format for parents, teachers, and children. Videos were made available to all parents via the parent portal and YouTube regardless of their child's participation in FIT. Videos were well received based upon

Table 1 Exercise mode and choice for fundamental integrative training program.

Station	Exercise	Weeks 1-2	Weeks 3-4	Weeks 5-6	Weeks 7-8
1	Fitness Ropes (FR) and Equalizer Bars (EB)	ALT FR wave	FR Jump jack*	FR Jump jack	FR Slams*
		Air walker	Air walker	EB Push-up*	EB Push-up
2	Medicine Balls	Chest push	Chest push	OH slam*	OH slam
		Chest pass	Target toss*	Target toss	MB Jump*
3	Punch Balloons	ALT Knee tap	Get up and go*	Get up and go	ALT hand tap*
		Crab walk	Crab walk	Bear crawl*	Bear crawl
4	Bosu	Bosu climber	Bosu climber	Burpee*	Burpee
		Bosu bridge	Bridge tap*	Bridge tap	Prone raise*
5	Dots and Spots	Cone trail	Cone trail	Touch and go*	Touch and go
		Quick jump	Square jump*	Square jump	Triple jump*
6	Spooner (SP)	Sit and spin	Prone SP*	Prone SP	Supine SP
		ST Surfer	ST Surfer	Hand surfer*	Hand surfer
7	Mix and Match	--	--	MB or SP	MB or SP

FIT=Fundamental Integrative Training, * new exercise for 2 week microcycle; FR=Fitness Ropes; OH=Overhead, ST=Standing, ALT=Alternate Right and Left Limb. See text for additional details.

Table 2 Fitnessgram mean scores for pre and post intervention.

	FIT Group			Control Group		
	Pre	Post	Mean Improvement	Pre	Post	Mean Improvement
Pacer (laps)	10.75	16.94*	6.20**	11.69	14.14*	2.44**
Push-ups	1.72	6.69*	5.11**	1.50	2.67*	1.17**
Curl-ups	10.30	30.89*	21.51**	6.72	13.44*	6.50**
Long Jump (inches)	41.74	48.29*	6.56**	39.04	44.86*	5.82**
Sit and Reach-Left (inches)	8.42	9.91*	1.65	9.08	10.29*	1.21
Sit and Reach-Right (inches)	8.40	10.42*	1.77	9.18	10.61*	1.43

*Significant difference between Pre and Post Test ($p<0.05$)
**significant difference in mean improvement of exercise between study groups ($p>0.05$)

the number of views. Second grade teachers reinforced nutrition content and supported the FIT intervention by flexing their class schedules to accommodate additional PE.

Descriptive data were calculated for all variables. Paired t-tests were used to determine significant differences between pre- and post-fitness test success and overall scores for PACER, push-up, curl-ups, standing long jump and back saver single-leg sit & reach (right & left). Independent t-tests were utilized to examine differences between the FIT experimental and control groups (CG) pre- and post-fitness test overall scores. All analyses were carried out using SPSS version 22.0 [21] and statistical significance was set at $p \leq 0.05$.

Results and Discussion

A total of 71 students participated in the program. The control group consisted of 35 students (N=35), 14 in the urban rim school and 22 in the urban elementary, with attrition of 1 (4.55%) student. The FIT experimental group consisted of 36 students (N=36), 16 in the urban rim school and 20 in the urban elementary with all students completing the program.

Comparison of group pre- and post-test scores for the dependent variables following the training program can be found in **Table 2**. The primary finding was that participation in an 8 week FIT training program was found to be a safe, effective and worthwhile method of fitness conditioning for elementary school children. Following the intervention, the FIT experimental and control groups both made significant improvements in all six Fitnessgram tests (PACER, push-up, curl-ups, standing long jump and back saver single-leg sit & reach (right & left). The FIT training resulted in significantly greater improvements in the PACER, push-up, curl-up, and long jump than the control group. The FIT training program was well-tolerated by the subjects and well-received by the PE teachers. It should be noted that the FIT training program used in this study was purposely designed for elementary school children who had limited or no fitness training experience [22,23].

Conclusion

A novel approach for the present investigation was that FIT training was geared specifically for second grade students, resulting in significantly greater post-test scores between groups for PACER, push-ups, curl-ups, and long jump. The improved scores indicate FIT participants completed the study with higher levels of cardiorespiratory endurance, upper and lower body strength and abdominal strength. Collectively, these findings suggest that elementary school students respond to PE lessons that include FIT training by increasing their muscular strength and ability to perform selected motor skills. FIT training provides a unique type of resistance training for elementary school children that can be used for a variety of exercises to mimic natural body positions and game situations. The frequency and intensity of the FIT training program used in this study (8 weeks, 2 times per

week, 30 second on/30 seconds off at 6 stations, 12 activities) may explain these findings.

Limitations

Fitness results of the study may have been affected due to uncontrollable confounders. The activity levels of both the FIT and CG tested in this study were not regulated outside of PE class. Therefore, students involved in spring sports or other after school movement based programs may potentially have improved fitness on their own. Since the FIT intervention was implemented at two different schools, two different physical education teachers were involved. The urban school teacher was tenured with over 20 years of experience, the urban rim teacher was non-tenured, hired shortly before the start of the intervention with limited elementary teaching experience. One of the physical education teachers may have delivered FIT in a more engaging or stimulating way, or the students could be more/less likely to misbehave for the teacher based on the leadership and class control. At the urban school the PE teacher worked with all physical education classes, at the urban rim school, the CG was taught by another PE teacher. In this case, it is possible that the teacher of the CG may have provided lessons that focused on strength and/or endurance related activities which could skew the results.

Impact on Learning

In this study of second grade urban and urban-rim students in New Jersey, it was demonstrated that the FIT intervention increased fitness levels and overall health of the children.

Although all Fitnessgram scores improved for both groups, the FIT group's scores showed larger gains for the PACER, curl-ups, push-ups, and long jump. An explanation for the results may be two-fold: that the physical education programs addressed both skill based activities (running, hopping, throwing, catching, etc.) and fitness based education (muscular strength, muscular endurance, cardiorespiratory, and flexibility) previously and that FIT was a novel idea to the PE teacher and the students.

The study had several strengths. High student participation rates were attributed to a novel program with new and fun equipment. Additionally, the FIT content was presented by the physical education teachers and the RA's. The students enjoyed having the RA's present and seemed to work harder when RA's provided feedback or encouragement. PE teachers were excited to learn new materials and be able to share with students, teachers, and staff, allowing for all to be part of the study and be involved in health promotion of the students, themselves, and the school community. Family members indicated that students were coming home and sharing new fitness ideas with them and encouraging them to participate.

Students as well as faculty benefit from this type of educational setting Students acquire the ability to apply what they have learned in "the real world", improved social responsibility and citizenship skills, and connections with professionals and community members allowing for learning and improvement of assessment and clinical skills. Faculty benefitted from new relationships with community partners and networking with engaged faculty in other disciplines or institutions, allowing for new opportunities for research and publication.

School Physical Education/Future Works

The purpose of physical education is to provide instruction and activities with the goal of improving motor skills and fitness. This study outlines how FIT can be incorporated to better enhance overall level fitness levels of students while still providing adequate time for other necessary skill development and lesson content. Continued collaboration between college faculty, school administrators, physical education teachers, school nurses, and classroom teachers is necessary to combat childhood obesity, decrease the chances of Type 2 Diabetes, and future health related issues. Collaborative efforts can also further curricular development and program offerings. Notwithstanding the brevity of the program, FIT results were significant and support ongoing research that is both larger in scope and over extended period.

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