THE IMPACT OF A COMMUNITY BASED EXERCISE PROGRAM IN CHILDREN AND ADOLESCENTS WITH DISABILITIES: A PILOT STUDY

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ABSTRACT

This pilot study sought to determine if participation in an after school community-based exercise program would result in improved fitness, self-concept, and social skills in a heterogeneous sample of children and adolescents with disabilities. Eighteen participants with physical and/or cognitive disabilities were recruited for an 8-week exercise program. Pre/post testing measures included: a modified Presidential Fitness Test (PFT), Energy Expenditure Index (EEI), body mass index (BMI), and the Piers-Harris 2. Social interactions were recorded each week. The results of this pilot study indicated that children and adolescents with disabilities could improve in measures of fitness as a result of participation in a structured group exercise program. More importantly, study results underscore the need for further research to address the limitations and challenges inherent in providing and studying the effects of community-based programs in heterogeneous samples of children and adolescents with disabilities.

According to the National Center for Health Statistics, one in every five children is obese (Troiano, Flegal, Kuczmarski, Campbell, & Johnson, 1995). This increasing trend toward obesity puts children at increased risk for cardiovascular disease (Freedman, Dietz, Srinivasan, & Berenson, 1999). Children with disabilities are particularly at risk due to a lack of participation in physical activity (Ayyangar, 2002).

While physical activity is a necessary component in preventing obesity in children with disabilities, it also plays a large role in preventing secondary impairments. Participation in physical activity may prevent the development of contractures, decrease spasticity, prevent the onset of spinal misalignment, reduce the incidence of fractures, and prevent pressure ulcers (Ayyangar, 2002). Additional benefits of participation in physical activities include improved mental and physical health, development of self-worth, and the opportunity to build friendships among peers (Specht, King, Brown, & Foris, 2002).

While many benefits of physical activity have been documented, barriers to participation exist which limit opportunities. Barriers such as cost, lack of appropriate equipment, limited building accessibility, and lack of information about appropriate programs may limit engagement in physical activity (Rimmer, 1999). Another barrier noted by Kleinert, Miracle, and Sheppard-Jones (2007) for children and adolescents with moderate and severe disabilities is lack of direct recreation/leisure instruction and planned opportunities for participation in many school and community recreation activities. Furthermore, children with disabilities may choose not to participate because of emotional factors such as the fear of not fitting in with peers (Rimmer, 1999; Rimmer, Riley, Wang, Rauworth, Jurkowski, 2004).

The activity patterns of children with disabilities appear to be directly related to the many barriers to participation. It has been demonstrated that children with cerebral palsy and spina bifida tend to spend the majority of their day engaged in dependent activities, quiet recreation, and personal care (Brown & Gordon, 1987). Children with physical disabilities also tend to spend more time with adults and watch more television than their peers do (Howard, 1996). Children with physical disabilities have been shown to participate less in social engagements, active recreation, household tasks, and activities away from home (Brown & Gordon, 1987). These barriers to participation would logically suggest and reinforce a sense of social isolation.

Decreased active engagement in functional and community activity and a tendency towards sedentary behaviors observed in children with disabilities imply decreased overall fitness levels. This is evidenced by several factors including difficulty controlling weight, decreased cardiopulmonary endurance, and decreased strength (Fernhall, 1992). Studies suggest that participation in exercise programs can improve a variety of fitness measures.

Fragala-Pinkam, Haley, Rabin and Kharasch (2005) reported that 6/9 children with physical disabilities were able to improve their walking efficiency as measured by Energy Expenditure Index (EEI) after participating in a group exercise program for 14 weeks. Participants in this study also improved in strength and demonstrated improvements on the Presidential Fitness Test (PFT). Similarly, Darrah, Wessel, Nearingburg, and O'Connor (1999) found statistically significant improvements in strength in children with cerebral palsy after participation in a 10-week exercise program. While these studies suggest that improvements in fitness can be observed through participation in exercise programs, the studies have limited generalizability as the samples were small and limited to children with cerebral palsy.

The impact of decreased participation extends beyond decreased fitness levels. Children and youth with disabilities who do not have the opportunity to participate with their peers in age appropriate activities may also lack social skills allowing them to be competent in social situations. They tend to be isolated from their peers, thereby making it difficult for them to form personal relationships (Richardson, Florey, & Greene, 2001).

Lack of participation in physical activities may also lead to a negative self-concept. A positive self-concept is developed through experiences of success with activities. Children with disabilities may not have opportunities for these successes and may be impacted negatively as a result (Hills & Lutkenhoff, 1993). While few studies have examined the relationship between participation in exercise programs and self-concept, Darrah, Wessel, Nearingburg, & O'Connor (1999) found significant differences between pre and post measures of the physical appearance sub-domain on the Self-Perception Profile for Adolescents (SPPA). This finding suggests that participation in exercise programs may improve self-concept in children with disabilities.

The purpose of this study was to determine the impact of an after school community-based exercise program on fitness, self-concept, and social skills in children and adolescents with physical and/or cognitive disabilities. The goals of the program were: (1) to provide a fitness program for children and youth with disabilities in a non-intimidating environment, (2) to provide an opportunity for children and adolescents with disabilities to participate with their peers, and (3) to positively impact measures of fitness, self-concept, and social skills.

METHODS

Subjects

Children and youth with physical and/or cognitive disabilities were recruited for participation in the fitness program through either the local *Easter Seals*

TABLE 1 PROGRAM PARTICIPANTS

Participant Number	Age	Sex	Diagnoses
1	14 yrs 1 mo	M	ADHD, MR, asthma
2	11 yrs 4 mo	F	Anxiety disorder, MR
3	19 yrs 10 mo	F	CP, MR
4	19 yrs 3 mo	F	Down syndrome
5	10 yrs 7 mo	M	Autism
6	12 yrs 2 mo	M	ROP
7	20 yrs 3 mo	M	Down syndrome, autism, ADHD, hearing loss
8	16 yrs 5 mo	F	Down syndrome
9	11 yrs 8 mo	F	PDD NOS
10	5 yrs 0 mo	M	PDD, Aspergers syndrome
11	12 yrs 9 mo	M	Down syndrome, PDD, verbal apraxia
12	8 yrs 5 mo	F	Spina bifida
13	9 yrs 6 mo	M	Spina bifida
14	6 yrs 0 mo	F	Autism
15	8 yrs 10 mo	F	Down syndrome
16	17 yrs 6 mo	F	MR, developmental delay
17	5 yrs 8 mo	M	Autism
18	9 yrs 2 mo	M	Developmental delay, blind

ADHD: Attention Deficit Hyperactivity Disorder, MR: Mental Retardation, CP: Cerebral Palsy, ROP: Retinopathy of Prematurity, PDD NOS: Pervasive Developmental Disorder: Not Otherwise Specified, PDD: Pervasive Developmental Disorder

agency or through a letter sent home by related services providers in local school districts. Inclusion criteria were specifically not limiting and children were recruited regardless of type or degree of disability, although the only exclusion criterion was that they had to be ambulatory to participate. This was to provide as heterogeneous and representative a sample of individuals from our community as possible. While the number of families that inquired into the program was not tracked, after initial contact, the parents of nineteen

children agreed to participation in the exercise program. One child was a sibling without a disability and while he was involved in the activities, was not included in data collection or analysis. This resulted in a total sample of 18 children. All parents signed informed consent for participation as approved by the institutional review board.

The sample consisted of 9 males and 9 females between the ages of 5 and 20 years with a variety of physical and/or cognitive disabilities. These disabilities included: spina bifida, cerebral palsy, mental retardation, autism, and retinopathy of prematurity. Of the nine participants diagnosed with mental retardation, five had Down syndrome. A wide range of ability was observed in our participants with mental retardation. Two of the students with Down syndrome were nonverbal and used sign language to communicate. Four of these students, at times, would resist participating in the exercise activity, requiring some coaxing. The other five were willing to participate in the planned activities each night and even assumed a helping role, on occasion. Table 1 provides a description of the participants.

Outcome Measures

Several outcome measures were employed to establish baseline data one week prior to initiation of the program. The Presidential Fitness Test (modified) (PFT), Energy Expenditure Index (EEI), and body mass index (BMI) were utilized as measures of fitness; the Piers-Harris 2 was used to measure self-concept; and the number of positive and negative social interactions were tracked each week by student observers in an effort to determine incremental changes in these behaviors over time. These measures were again administered one week after completion of the program.

Presidential Fitness Test

The Presidential Fitness Test was modified for use in this study. The PFT includes curl-ups, a shuttle run, a one-mile endurance walk/run, pull-ups, and a sit and reach component (President's Council on Physical Fitness and Sports, 1985). The majority of participants were unable to physically perform the pull-up portion of the test, so this was not included in pre or post testing. The PFT is norm referenced and described for use in children aged 6-17 years and is a commonly utilized tool to gauge fitness in the school setting. However, no specific guidelines exist for use of this test in children with disabilities. The curl-ups, shuttle run, one-mile endurance walk/run, and sit and reach component were all performed using the descriptions provided by the President's Council on Physical Fitness and Sports (President's Council on Physical Fitness and Sports, 1985).

Body Mass Index

The body mass index (BMI) was calculated from height and weight data acquired on the dates of pre and post testing using an online calculator which adjusts for both age and gender through the Presidents Council on Physical Fitness and Sports (PCPFS) (President's Council on Physical Fitness and Sports, 2006).

Energy Expenditure Index

The EEI was used to determine if changes in walking efficiency occurred over the 8-week period. The EEI was calculated for each of the participants using the following formula:

$$EEI = \frac{(wHR - rHR)}{s}$$

where EEI is equal to walking heart rate (wHR) minus resting (rHR) divided by walking speed(s) (Rose, Gamble, Lee, Lee, & Haskell, 1991). The use of HR has been validated as an index of energy expenditure (Rose, Gamble, Medeiros, Burgos, & Haskell, 1989).

To determine the participants' EEI, the researchers first recorded a resting HR then asked each participant to walk for three minutes at their self-selected pace, then again recorded the participant's HR. The distance that each participant walked was measured by trailing the subjects with a measuring wheel and recorded in order to determine walking speed. Heart rate was recorded utilizing a Polar Vital Signs heart rate monitor (Model 60909, Country Technology, Inc., Gay Mills, WI). For those few participants (the number was not tracked formally) who were not able to tolerate the chest strap – typically because of tactile sensitivity to the gel or the restrictive nature of the band – heart rate was measured via radial pulse and a stop watch count for 30 seconds.

Piers-Harris 2

The Piers-Harris Children's Self-Concept Scale, Second Edition (Piers-Harris 2) (Piers & Herzberg, 2002) was used to determine if changes in self-concept occurred during the 8-week exercise program. The Piers-Harris 2 is norm referenced and described for use in children ages 7-18. This scale has been utilized to measure self-concept in children with emotional disturbance, mental retardation, and specific learning disabilities (Beck, Roblee, & Hanson, 1982; Fernell, Gillberg, & von Wendt, 1993; McCauley, Ross, Kushner, & Cutler, 1995). However, the authors advise extra caution in interpreting results for children and youth with mental retardation, as they are not well represented in the standardization sample (Schreiber, Marchetti,

& Crytzer, 2004). Similar caution must also be used in interpreting results for students with physical disabilities as they, as well, were not included in the standardization sample.

The Piers-Harris 2 consists of 60 items. Children respond "yes" if the statement is true or mostly true for them and "no" if the statement is false or mostly false for them. The authors advise that the test items be read aloud for younger children. Also, the authors recommend that administrators answer any questions that arise about individual test items (Piers & Herzberg, 2002). Our test administrators read the items aloud to all participants and answered any questions posed about individual items.

When scoring and interpreting the Piers-Harris 2, the validity issues of exaggeration, response bias, and random responding are first taken into account. Then, a total self-concept score and six domain scale scores are calculated and graphed. The six domains are: behavioral adjustment, intellectual and school status, physical appearance and attributes, freedom from anxiety, popularity, and happiness and satisfaction. In each domain, T-scores can be utilized to place individuals or groups into categorizes defined by the following ranges: Above average (≥ 56), Average (55 to 40), and Low (≤ 39). For example, scores in the low range on any domain indicate low self-concept in that particular area.

The total score (TOT) is a measure of general self-concept, with higher scores indicating a favorable self-concept and low scores indicating a lower self-concept. The TOT is the single most reliable measure on the Piers-Harris 2 (Piers & Herzberg, 2002). For the total score, T-score categories are defined by the following ranges: High (≥ 60), Average (59 to 40), and Low (≤ 39).

Social Skills

Each week, college students documented observations of social interactions with peers using event recording. Positive peer interactions included responding to an interaction initiated by a peer and participant initiated interactions. Inappropriate social interactions included refusing to participate or interact with a peer, walking away from a peer, or hitting another participant.

Intervention

One week following pre-testing, participants began the 8-week exercise program. The program was designed and modeled after similar program's described in the literature (Darrah, Wessel, Nearingburg, & O'Connor, 1999; Fragala-Pinkham, Haley, Rabin, & Kharasch, 2005; Schreiber, Marchetti, & Crytzer, 2004). The regimen was implemented at a college sports center, which allowed access to an indoor track, basketball courts, a fitness center, and large classrooms that served as a distraction free environment when needed. Five

physical therapy and five special education students assisted in the design and implementation of the program as part of required practical experiences for their major.

Exercise sessions were held one time per week for 8 weeks and were one hour in length. The participants began with a 10-minute walk/run that took place on an indoor track. The participants walked/ran in pairs along with a college student. The participants were paired to allow for increased interaction during this activity. After completion of the walk/run, the participants stretched in a large group. A college student led the stretching each week. Stretching consisted of major muscle groups, including the hamstrings, adductors, quadriceps, and gastrocnemius.

The participants then engaged in a large group activity, which was designed to promote strength, balance, and endurance, while also promoting positive social interactions. This portion of the program included activities such as stations (jump rope, trampoline, balance beam, ball skills), step aerobics, and kick ball. The physical therapy and special education students facilitated positive social interactions during this component of the program through prompting participants to encourage one another or count for one another.

After the large group activity, the children participated in strength training in the college sports center. Five of the participants were not appropriate for the fitness center due to their small size or physical ability and therefore engaged in strengthening activities in a small group setting. The strengthening program involved two upper extremity activities (biceps, triceps), two lower extremity activities (quadriceps, hamstrings), and sit-ups. Each of the children who participated in strengthening in the sports center also engaged in at least 5 minutes of a cardiovascular activity including either the treadmill, stationary bike, or elliptical. The children who did not participate in the sports center ended their session with an additional walk/run on the indoor track.

Statistical Analysis

Due to the small non-probability based sample, a non-parametric statistical procedure (Wilcoxon signed ranks test) was chosen for pre-post test pair-wise comparisons for the individual elements of the PFT (number of curl ups, shuttle run time, sit and reach distance), EEI, and BMI. Chi-square goodness of fit testing was performed to determine if the frequencies of those who could and could not complete the one-mile endurance run changed following participation in the program. Differences in total self-concept score for the Piers-Harris 2 pre- and post-participation were also analyzed via the Wilcoxon signed ranks test. Repeated measure analysis of variance (ANOVA) was calculated to determine if there was a change in positive social interactions over time. The experiment-wise type I error rate was = 0.05. However, it is

of note that a Bonferroni correction was performed so that the type I error rate for the 7 pair-wise comparison tests was = .007. Statistical analyses were performed using SPSS v14.0 for Windows (SPSS Inc, 233 S. Wacker Dr., Chicago Il, 60606).

RESULTS

Fitness

Mean ± 1 standard deviation pre-and post-program fitness data are summarized in Table 2. It can be seen that the curl-ups element of the Presidential Fitness Test (PFT) was found to have statistically changed following the 8-week program (Z = -2.953, P = .003). All other measures of fitness were not found to change significantly as a result of the fitness program. An unexpected finding was that many of the participants were unable to complete the one-mile endurance walk/run component of the PFT pre-programming (n = 10), making analysis of timed performance results as planned a priori problematic. While fewer participants were unable to complete the task post-programming (n = 6), Chi-square goodness of fit revealed that this change was not statistically significant (χ^2 = 1.47, P = .225).

Self-Concept

Table 3 summarizes pre- and post-program participation mean T-scores for all sub-domains and the total score ± 1 standard deviation across all parameters measured by the Piers-Harris 2 Self-ConceptScale.

Additionally, total score data were analyzed via Wilcoxon signed ranks test procedures. No statistically significant difference in selfconcept was found at post-testing (Z = -.378, P = .706). Two subjects were not included in this sample due to their young age and their inability or unwillingness to respond to the test items.

Social Skills

Figure 1 displays a comparison of the number of positive social interactions by social group recorded daily over the 8-week program. Repeated measures

TABLE 2 FITNESS RESULTS

	BMI	EEI	3Min (Feet)	Curl-ups	Shuttle (Secs)	Sit and Reach
Pre-program (X ± s.d.)	23.2 ± 7.5	0.3 ± 0.2	225.2 ± 89.2	14.6 ± 5.3	24.5 ± 9.9	3.1 ± 3.8
Post-program (X ± s.d.)	22.7 ± 7.3	0.2 ± 0.2	219.6 ± 67.7	19.5 ± 7.0	24.4 ± 11.1	1.7 ± 3.8
Test Statistics	*Z* = -2.323 *P* = .020	*Z* = -2.198 *P* =.028	*Z* = -.158 *P* =.875	***Z* = -2.953 *P* =.003**	*Z* = -.497 *P* =.619	*Z* = -1.708 *P* =.088

ANOVA revealed that there was no statistically significant change in social interaction found to occur on an individual basis over time $F(1,7) = 2.02$, $P = .19$ or related to whether subjects participated in the fitness center or station group exercise settings $F(1,7) = .47$, $P = .62$. There were a limited number of negative behaviors observed over the course of the 8-week period. The average number of inappropriate social interactions weekly was 2.875, with a range of 0-6. While positive programmatically, the limited number of negative behaviors did not make detailed statistical analysis possible.

Individual Participants with Physical Disabilities

Table 4 displays illustrative results for three specific participants who have physical disabilities only, one with retinopathy of prematurity as his only diagnosis, and two with spina bifida, one male and one female. Even at the individual level, results appear representative of the larger group analysis in that these participants demonstrated a fair degree of inconsistency in performance across the various subtests of the PFT. Additionally, they demonstrated limited changes in self-concept as meas-ured by the Piers-Harris 2 or in the amount of social interactions that were observed over time. Subject 13, who was observed to be a very verbal and social child, had a marked decrease in his average number of daily interactions over the last 3 weeks of the program (he was not present for weeks 4 & 5). It was noted that this participant's level of social interaction varied dependent on whom he was paired with for activities. In contrast, Subject 12's decrease in social interaction was sometimes attributed to the specific activity. For example, Subject 12 had fewer social interactions during step aerobics, an activity which does not lend itself to social interaction. In addition, Subject 12 was observed to ask peers many questions about themselves in the initial weeks of the program. Once she became familiar with her peers, she asked them fewer questions.

TABLE 3 PIERS-HARRIS 2 SELF-CONCEPT SCALE RESULTS

	Total	BEH	INT	PHY	FRE	POP	HAP
Pre-program (X ± s.d.)	**46.4 ± 8.4**	46.5 ± 10.0	49.4 ± 7.2	54.0 ± 5.6	44.5 ± 9.6	42.1 ± 7.0	47.6 ± 5.7
Post-program (X ± s.d.)	**48.0 ± 9.5**	46.9 ± 8.0	48.4 ± 6.9	53.1 ± 7.4	43.8 ± 10.9	43.4 ± 10.5	48.9 ± 7.1

BEH = Behavioral adjustment, INT = Intellectual & school status, PHY = Physical appearance & attributes, FRE = Freedom from anxiety, POP = Popularity, HAP = Happiness & satisfaction.
Sub-domain categories by T-score: Above average (≥ 56), Average (55 to 40), and Low (≤ 39).
Total score categories by T-score: High (≥ 60), Average (59 to 40), and Low (≤ 39).

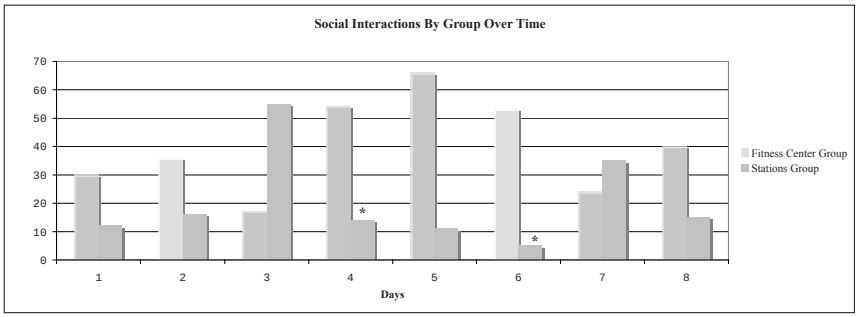

Figure 1 illustrates the total frequency of social interactions for subjects comparing those who participated in the fitness center activities (n = 11) to those who participated in the stations activities (n = 7). The "*" represent days for the Stations Group that > 50% of subjects were absent (Stations Group Day 4, n = 3; Day 6, n = 2).

DISCUSSION

Fitness

We found that when comparing changes in fitness level over time that there appeared to be a minimal impact of the 8-week program at a group level in the heterogeneous sample of children with physical and/or cognitive disabilities. There are multiple possible explanations for a lack of significant change in levels of fitness, including: inadequate power of participants, the program length and intensity, the specificity of the training activities, and varying degrees of active engagement among the participants. Additionally, the challenges of planning activities across the full spectrum of ages, skills, pre-existing fitness levels, and cognitive abilities of the participants and the effect this had on outcomes cannot be minimized. Further, on an individual basis there appeared to be substantial and meaningful changes in fitness and in health behaviors related to fitness that were difficult to substantiate based on the data but were qualitatively present. Anecdotally, as a result of participation in the program, parents reported that their children were more actively engaged in community-based recreational activities, lost weight, were eating better, wanted to be more involved in exercise, and appreciated the benefits of an active lifestyle.

It is interesting to note that the sit and reach scores were worse following participation in the program. The researchers question the reliability of the sit and reach test and further research will be necessary to determine if this is a valid and reliable measure of flexibility in children with disabilities. Currently there is no literature to support its use in this population and the PCPFS guidelines do not provide specific adaptations for children with disabilities. Modification of the study design in future research efforts including the

TABLE 4 ILLUSTRATIVE PARTICIPANTS RESULTS

Participant Number	BMI	EEI	3Min	Curl-ups	Shuttle Run	Sit and Reach	Endurance Run/Walk	PH-TOT	Social Interaction
6	18.4	0.10	251.5 feet	13	18.5 sec	0	15.33 min	66	2.25
	17.5	0.27	201.2 feet	20	17.5 sec	0	14.57 min	72	4
12	16.5	0.64	150.9 feet	25	30.8 sec	8	16.48 min (4 laps)*	44	8.5
	16.3	0.14	175.0 feet	25	30.8 sec	8	35.10 min	44	7.3
13	16.7	0.48	201.2 feet	5	32.3 sec	6.5	8.44 min (2 laps)*	35	7
	17.2	0.16	150.9 feet	8	33.6 sec	5.5	16.55 min (4 laps)*	47	2.67

The top value in each cell represents the pre-testing score for each variable while the bottom number represents the post-testing value except for the variable "Social Interaction," which represent the average number of positive social interactions per day for the first 4-weeks versus the last 4-weeks. Subject 6 attend all 8 weeks of the program. Subject 12, missed one day of the last 4 weeks (week 6), Subject 13 missed one day in each of the first and last 4-week blocks (weeks 4 and 5). * the subject was unable to complete a full mile. One lap is equivalent to approximately 200 meters (8 laps = 1609 meters = 1 mile).

addition of increased exercise frequency to multiple days per week and intensity (e.g. by setting endurance or weight-training goals), a non-exercise control group, as well as more in-depth exploration of qualitative aspects of health behaviors should clarify these issues.

Self-Concept

Although our subjects did not significantly improve in self-concept as measured by the Piers-Harris 2, many scored in the low range in the domains of behavioral adjustment, freedom from anxiety, and popularity during both pre- and post-testing. Those participants who scored in the low range in behavioral adjustment were acknowledging that they have difficulty following the rules at school and at home. Participants who scored in the low range in freedom from anxiety were acknowledging feeling anxious in general or in relation to school. Scoring in the low range in popularity indicates that subjects are unhappy with their social relationships or feel they do not have any close friends. They may feel left out socially or may be teased by peers. Forty-four percent of the participants at pre-test and 50% of them at post-test scored in the low range in the domain of popularity. Low self-concept scores in children with disabilities are consistent with previous research, emphasizing the need for additional research addressing this issue (Schreiber, Marchetti, & Crytzer, 2004).

Social Skills

Although no statistically significant difference in social skills was found, positive social interactions did increase for participants during some

fitness sessions. These increases could be attributed to the way participants were paired on a given night or to the activities planned for that night. Individual variables could also impact results (e.g., health of the individual, fatigue, sensitivity to noise and the noise level on the indoor track or in the fitness center).

While improvements in social skills were not statistically found, the college students assisting with the fitness program and the parents of many of the participants anecdotally reported improvements in social skills during this 8-week experience. Qualitative data regarding the richness of the participant's experiences will be necessary for future exploration with respect to avenues for enhancement and gains in social skills.

CONCLUSIONS

The results of this study indicated that children and adolescents with disabilities could make minimal improvements in measures of fitness as a result of participation in an 8-week exercise program administered once weekly for one hour sessions. While improvements in self-concept and social skills were not statistically observed, many parents of the children participating reported perceived improvements in both areas. Further research is necessary to determine how better to design and implement activities for heterogeneous groups of children with disabilities that promote both fitness and social interaction in non-threatening and fun environments.

LIMITATIONS OF THE STUDY

Two limitations existed in this study that restrict the generalizability of the results. First, the participants in this study consisted of a heterogeneous group of children and adolescents with disabilities, in terms of age range, types of disabilities, and severity of disabilities. While the participants were intended to represent children and adolescents with disabilities in community-based programs, the variability among participants in the study may have made it difficult to detect quantifiable changes in the skills being examined. Second, the intensity of the program (once weekly) was not enough to result in more than minimal changes in measures of fitness. While our intent was to replicate similar community-based programs, many of which take place weekly, our results suggest that this may not be enough.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future research is needed to determine the appropriate frequency, intensity, and duration of community-based programs that will result in meaningful improvements in the fitness, self-concept, and social skills of children and adolescents with disabilities. It is recommended that community-based fitness programs for children and adolescents with disabilities explore the option of offering such programs 2-3 times per week (Fragala-Pinkham, Haley, Rabin, & Kharasch, 2005). If this is not a feasible option for researchers and/or clinicians, the addition of a home program component should be considered (Fragala-Pinkham, Haley, Rabin, & Kharasch, 2005; Lewis & Fragala-Pinkham, 2005). A home program may assist in transferring fitness activities to the home environment.

Future research is also needed to explore outcome measures that can best be used to assess the overall impact of community-based fitness programs. The impact that these programs have on functional activities and overall quality of life were not examined in this study, but may be better constructs to explore.

PRACTICAL APPLICATION

Given the many benefits of physical activity and the minimal impact of the after school fitness program described in this study, it is essential that exercise be integrated into the school day for children and adolescents with disabilities. Our results suggest that teachers cannot rely exclusively on after school programming to meet the fitness needs of these children and adolescents. Activities such as walking, running, and stretching can and should be integrated into the daily school routines. Other aerobic exercises to consider, in addition to walking and running, are obstacle courses, scooter activities, dancing, step aerobics, and ball games. Depending upon the comfort level of the children and youth with disabilities, these activities could be performed with peer buddies who do not have disabilities in a general education physical education class or through extracurricular school activities. For students who are self-conscious to participate in fitness activities with peers without disabilities, performing the suggested activities during adapted physical education instruction would be advised. In addition, consult with a physical therapist to establish strength training exercises that are safe and appropriate for each child.

Through the collaborative efforts of school-based fitness programming,

after-school fitness programs, and home exercise programs, children and youth with disabilities can increase their fitness levels and reduce their risks of obesity. Simultaneously, these participants can learn new recreation and leisure activities, gain friendships, and experience social interactions with others.

REFERENCES

Ayyangar, R. (2002). Health maintenance and management in childhood disability. *Physical Medicine and Rehabilitation Clinics of North America, 13*(4), 793-821.

Beck, M. A., Roblee, K., & Hanson, J. (1982). Special education/regular education: A comparison of self-concept. *Education, 102,* 277-279.

Brown, M., & Gordon, W. A. (1987). Impact of impairment on activity patterns of children. *Archives of Physical Medicine and Rehabilitation, 68,* 828-832.

Darrah, J., Wessel, J., Nearingburg, P., & O'Connor, M. (1999). Evaluation of a community fitness program for adolescents with cerebral palsy. *Pediatric Physical Therapy, 11*(1), 18-23.

Fernhall, B. (1993). Physical fitness and exercise training of individuals with mental retardation. *Medicine & Science in Sports & Exercise, 25*(4), 442-450.

Fernell, E., Gillberg, C., & von Wendt, L. (1992). Self-esteem in children with infantile hydrocephalus and in their siblings: Use of Piers-Harris Self-Concept Scale. *European Child and Adolescent Psychiatry, 1*(4), 227-232.

Fragala-Pinkham, M.A., Haley, S. M., Rabin, J., & Kharasch, V. S. (2005). A fitness program for children with disabilities. *Physical Therapy, 85*(11), 1182-1200.

Freedman, D. S., Dietz, W. H., Srinivasan, S. R., & Berenson, G. S. (1999). The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. *Pediatr*ics, *103*(6), 1175-1182.

Hills, R. G., & Lutkenhoff, M. L. (1993). Social skills group for physically challenged school-age children. *Pediatric Nursing, 19*, 573-577.

Howard, L. (1996). A comparison of leisure-time activities between able-bodied children and children with physical disabilities. *The British Journal of Occupational Therapy, 59*(12), 570-574.

Kleinert, H. L., Miracle, S. A., & Sheppard-Jones, K. (2007). Including students with moderate and severe disabilities in extracurricular and community recreation activities: Steps to success. *TEACHING Exceptional Children, 39*(6), 33-38.

Lewis, C. L., & Fragala-Pinkham, M. A. (2005). Effects of aerobic conditioning and strength training on a child with Down syndrome: A case study. *Pediatric Physical Therapy, 17*(1), 30-36.

McCauley, E., Ross, J. L., Kushner, H., & Cutler, G. (1995). Self-esteem and behavior in girls with Turner syndrome. *Journal of Developmental and Behavioral Pediatrics, 16*, 82-88.

Piers, E. V., & Herzberg, D. S. (2002). *Piers-Harris 2: Piers-Harris children's self-concept scale* (2nd ed.). Los Angeles, CA: Western Psychological Services.

President's Council on Physical Education and Sport. Does your weight put your health at risk? Available at: http://www.presidentschallenge.org/tools_to_help/bmi.aspx. Accessed April 17, 2006.

President's Council on Physical Fitness and Sports. *Youth Physical Fitness in 1985.* Washington, DC: US Department of Health and Human Services; 1985.

Richardson, P. K., Florey, L., & Greene, S. (2001). Facilitating social interactions in children with disabilities. *Occupational Therapy Practice,* 6, CE1-CE8.

Rimmer, J. H. (1999). Health promotion for people with disabilities: The emerging paradigm shift from disability prevention to prevention of secondary conditions. *Physical Therapy, 79*(5), 495-502.

Rimmer, J. H., Riley, B., Wang, E., Rauworth, A., & Jurkowski, J. (2004). Physical activity participation among persons with disabilities: Barriers and facilitators. *American Journal of Preventative Medicine, 26*(5), 419-425.

Rose, J., Gamble, J. G., Lee, J. Lee, R., & Haskell, W. L. (1991). The energy expenditure index: A method to quantitate and compare energy expenditure for children and adolescents. *Journal of Pediatric Orthopedics, 11*, 571-578.

Rose, J., Gamble, J. G., Medeiros, J., Burgos, A., & Haskell, W.L. (1989). Energy cost in walking in normal children and in those with cerebral palsy: Comparison of heart rate and oxygen uptake. *Journal of Pediatric Orthopedics,* 9, 276-279.

Schreiber, J., Marchetti, G., & Crytzer, T. (2004). The implementation of a fitness program for children with disabilities: A clinical case report. *Pediatric Physical Therapy, 16*(3), 173-179.

Specht, J., King, G., Brown, E., & Foris, C. (2002). The importance of leisure in the lives of persons with congenital physical disabilities. *American Journal of Occupational Therapy, 56*(4), 436-445.

Troiano, R. P., Flegal, K. M., Kuczmarski, R. J., Campbell, S. M., & Johnson, C. L. (1995). Overweight prevalence and trends for children and adolescents. The national health and nutrition examination surveys, 1963 – 1991. *Archives of Pediatric and Adolescent Medicine,* 149, 1085-1091.