

Summative evaluation of a pilot aquatic exercise program for children with disabilities

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Abstract

Background: Children with disabilities have lower physical activity levels and participate less in community-based sport and exercise programs than do children without disabilities. This in part is due to environmental barriers and lack of appropriate resources in these programs. Adaptive programs encouraging increased physical activity for children with disabilities are needed, and as these programs are developed, they should be critically evaluated.

Purpose: The purposes of this article are to describe a pilot aquatic exercise program for children with disabilities, to evaluate the program, and to determine areas of strength and areas needing modifications.

Methods: A summative program evaluation design was used to assess this twice per week aquatic exercise program lasting 14 weeks. Sixteen children, ages 6–12 years, with developmental disabilities participated in the program. Children swam laps, participated in relay races and water basketball games, and performed arm and leg strengthening exercises using aquatic noodles, foam barbells, and water for resistance. Swimming skills, program evaluation questionnaires, physical activity questionnaires, and interviews of pool site directors were used to determine program outcomes.

Results: Findings suggest that children made improvements in their swimming skills, parents were satisfied with the program, and children increased their physical activity levels during the program and maintained the increased physical activity levels six months after the program ended. The program continued in some form after the 14-week intervention ended.

Conclusions: The program was successful in achieving its objectives and recommendations for application of this program are provided. © 2010 Elsevier Inc. All rights reserved.

Keywords: Aquatic exercise; Children with disabilities; Physical activity; Program evaluation

The benefits of regular physical activity for children include increased muscle strength and bone density, improved cardiorespiratory endurance and self-esteem, and decreased stress and anxiety [1]. Physical activity recommendations for health promotion in children indicate that they should participate in at least 60 minutes of moderate to vigorous physical activity (which can occur in intervals of 10–20 minutes) on most days of the week but preferably on a daily basis [1–3]. Additionally, recommendations state that physical activity for children and adolescents should be interesting, fun, and motivating to encourage and establish healthy, active lifestyles at an early

age and to promote maintenance of healthy activity levels into adulthood. In general, children tend to select physical activities that can be done with peers such as participating in team sports or group recreational activities.

Children with disabilities are less physically active than children without disabilities [4]. They also participate less in community-based sports or active recreational programs than do children without disabilities [5,6]. Limited participation in sports and recreation programs may be due to the multiple environmental, attitudinal, and societal barriers that exist for children with disabilities and their families [7,8]. Some barriers can be overcome by selecting community sites that are conveniently located and accessible to children with disabilities and their families. Program modifications or physical assistance to accommodate the individual needs of each child should also be considered; however, few fitness centers or organizations provide such modifications. Team and individual sports programs often are very competitive,

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limiting participation to only top athletes and excluding children who are not sports oriented and those with disabilities. Given the prevalence of these barriers, children with disabilities may not have the ability to participate in physical activities, exercise, or sports with peer groups and therefore spend more time in sedentary behaviors. Physical inactivity may be even more detrimental to children with disabilities because they often have decreased strength, endurance, and flexibility due to their disability and inactivity contributes to further deconditioning and decreased health and fitness [9]. Although preliminary evidence on physical activity interventions for children with disabilities is limited, it suggests that physical activity is important for these children [10,11]. Therefore, there is a need for more community-based adapted sports and exercise programs, which provide opportunities for increased physical activity for children with disabilities [12].

Swimming and aquatic exercise programs can provide vigorous physical activity in a fun and motivating environment. The potential benefits of an adapted aquatics program include increased cardiorespiratory endurance, strength, and coordination and improved swimming and water safety skills. An adapted aquatic exercise program completed in a group setting may also encourage increased socialization and self-confidence for children with autism and other disabilities [13–15]. The properties of water including buoyancy and hydrostatic pressure make it easier for children of all abilities to participate [16].

Very little information; however, is available on the effectiveness of aquatic programs on fitness and swimming skills in children with disabilities [17]. Summative evaluations of aquatic programs for children with disabilities have not been published. Summative evaluations are especially informative for newly developed programs and assist program developers in revising and improving program quality. As specialized activity-based programs in community settings are designed for children with disabilities, it is important to evaluate the programs to determine whether they are implemented as planned and whether program objectives were achieved. The purposes of this article are to describe a pilot aquatic exercise program for children with disabilities, to evaluate the program, and to determine areas of strength and areas in need of improvement.

Methods

Design

This summative evaluation of a pilot aquatic exercise program was part of a one-group nonrandomized AB design study that was approved by the Institutional Review Board at Franciscan Hospital for Children and their parents provided written assent or consent to participate in this study. A summative program evaluation design was chosen because it can provide information about a new program, including whether it should be continued, modified, or abandoned

[18]. The summative evaluation process determines if the program is successful and has been implemented as planned and according to program objectives.

Program Participants

Twenty children enrolled in this study. Three children dropped out of the study because of the time commitment or due to transportation issues. One child with cerebral palsy received botulinum toxin and phenol injections for spasticity management toward the end of the study and no longer met inclusion criteria, and her data were removed from the analysis. Therefore, 16 children met the following inclusion criteria and participated in this study: (a) children with disabilities who had decreased fitness according to parent report, (b) ages 6 to 12 years, (c) children were able to walk independently with or without an assistive device, (d) children were medically able to participate, (e) children did not require constant individualized attention for monitoring medical or behavioral status, (f) children were able to follow directions and attend during a 45-minute session, and (g) children had any level of swimming ability as long as they were not fearful of being in a pool. Children were recruited through flyers sent via e-mail to local special education parent advisory committees and physical and occupational therapists at local schools and pediatric hospitals.

All of the participants were white and non-Hispanic and their primary language was English. Because of the pilot nature of the program and the importance of program attendance, we recruited children within the communities from which the swimming facilities were available. The participants had a variety of diagnoses including autism spectrum disorders (6 children), cerebral palsy—spastic diplegia (1 child) and hemiplegia (1 child), Down syndrome (2 children), myelomeningocele with the lesion at the lumbar spine level (L4–5) (1 child) and the sacral level (S1–2) (1 child), developmental delay (2 children), nonverbal learning disorder (1 child), and oto-palatal-digital syndrome (1 child). Sixty-five percent of the children were male. Their ages ranged from 6½ to 11 years with a mean age of 9 years 7 months. Eight children (50%) had a body mass index (BMI) at the 85th percentile or higher putting them in the at-risk or overweight category. All participants were able to walk independently and were medically stable to participate in an exercise program. One child with L4–5 myelomeningocele walked with a forearm crutch and bilateral ankle foot orthoses (AFOs) and 3 other children, 2 with cerebral palsy and 1 with S1–2 myelomeningocele, also used AFOs for ambulation.

Program Description

The development of this program was initiated in response to feedback from parents of children with disabilities that community-based adapted aquatics programs were needed. Using information gathered through literature

review and experience from previous land-based fitness programs and hospital-based aquatic programs, we developed a 14-week aquatic exercise program. Specific program objectives were that (a) children will demonstrate increased swimming skills, (b) parents of participants will report high program satisfaction ratings, (c) physical activity levels of the participants will increase during the program and these higher physical activity levels will be maintained after the program ends, and (d) the program will be sustainable beyond the 14-week program.

This aquatic program was funded through grants from two private foundations so parents did not have to pay program fees but they were responsible for transporting children to and from the aquatic classes. The grant covered costs for program development, training of aquatic staff, recruitment of participants, pool fees, staffing of a pediatric physical therapist and four or five swimming coaches for each class, masked testers who completed fitness testing pre- and postintervention, and program evaluation.

The aquatic exercise program was held 2 times per week for 14 weeks. The pool sessions were 45 minutes long and consisted of four components: warm-up (3–5 minutes), aerobic conditioning (20–30 minutes), strengthening exercises (5–10 minutes), and a cool-down (3–5 minutes). For the aerobic conditioning component, children swam laps and participated in relay races, obstacle courses, and water basketball games. For the strengthening component, children performed arm and leg exercises using barbells, aquatic noodles, and water resistance. The cool-down consisted of slow movement activities and shoulder, leg, and trunk stretching exercises. Polar heart rate (HR) monitors (Polar Electro Oy, Kempele, Finland) were used to track HR during pool exercise sessions. The amount of time children exercised in their target HR zone during at least one session per week was recorded. See [Table 1](#) for details on specific activities, exercise intensity, and duration.

The aquatic exercise program was held at two community-based pool sites in suburban locations. At one site, a YMCA, the teaching pool was used, which had a water temperature of 87° F and pool depth ranging from 3½ to 4½ feet. The other pool was located at a private girl's school. It had a pool depth ranging from 3 to 10 feet and the water temperature was 82° F. Nine children participated at the YMCA site and seven used the school site, and this was determined by where the child lived.

A certified lifeguard was present at each site during all of the sessions in accordance with public health regulations. A pediatric physical therapist supervised the pool sessions and directed the activities. There was additional staffing for a 1:2 coach-to-child ratio. The coaches were physical therapy students or aquatic staff from the facility and they were trained prior to the start of the program. The following information was covered in the training session: working with children with special needs including providing structure and positive feedback; teaching movement activities using demonstration, clear verbal instructions, and

assistance; specific ideas for modifying aquatic activities for children; safety procedures; and how to monitor exercise intensity using Polar HR monitors and student observation.

A schedule of aquatic activities was posted at the start of each class to provide added structure. To motivate children, the number of laps they swam during each session was recorded on a chart displayed on a large poster board. Coaches also recorded the amount of time it took children to swim laps. The children were encouraged to achieve their “personal best” in the number of consecutive laps they could swim and the amount of time they exercised in their training HR. Children were encouraged to work toward improving their own records. Emphasis was placed on children working together with other children and not on competing against each other. Positive reinforcement and encouragement from aquatic coaches and other participants were provided to increase activity, participation, and higher exercise intensity. A variety of activities and games were used to make the program fun. All of the children received participation certificates at the end of the program to acknowledge their accomplishments.

Several minor modifications were made to increase participation and facilitate optimal performance during the program. For several of the children who initially would not put their face in the water, goggles were provided. For one child who did not want to participate after the first session because the water was too cold, a wet suit was recommended and the problem was resolved when he started wearing the lightweight neoprene suit on the second session. At one pool site, a resting platform was used for children who were not able to reach the pool floor in the shallow end so that they could participate in strengthening exercises. Children were also encouraged to climb in and out of the pool without using the pool ladders so that they could work on functional strengthening during that activity. Children were allowed to wear their orthoses and regular shoes into the pool area for safety and they removed shoes and orthoses while sitting on the pool deck, just before entering the water.

Outcomes

Four outcomes were used to evaluate the four program objectives. In addition to these program objectives, cardiorespiratory endurance, strength, functional mobility, and safety were also measured and reported in another article [19]. For objective one, swimming skills were measured using the Swimming Classification Scale, which was developed specifically for this adapted aquatic program [19]. The scale has five levels and one level is selected to represent a child's swimming ability ([Table 2](#)). The Swimming Classification Scale was scored during the first week of the program and then again on the last week of the program by the pediatric physical therapist supervising the aquatic sessions. Concurrent validity of the Swimming Classification Scale and the

Table 1
Aquatic Program Activities and Intensity

Exercise Category	Activities	Duration	Intensity
Aerobic conditioning	<ul style="list-style-type: none"> Swimming laps—freestyle, backstroke, elementary backstroke, breast stroke, and legs only kicking while using a kickboard Movement activities while standing in the shallow end—running in place, jumping jacks, reciprocal arm and leg movements, hopping on one foot, jumping in place, and jumping forwards, backwards and sideways Relay races in the shallow end—running from one side of the pool to the other: 1) filling buckets with balls or other pool toys; 2) shooting a basketball into a hoop; or 3) running in teams while holding onto the aquatic noodles Obstacle courses—running in the water or swimming while going under, over, and around obstacles or retrieving dive rings Games—Playing ball by rapidly catching, throwing and shooting baskets into a basketball net; playing keep the ball away from the coaches; straddle sitting on the aquatic noodle and “racing the horse” the length of the pool 	20-30 minutes	Training intensity: 50-70% of maximum heart rate (HR) using Karvonen equation: [(Maximum HR – Resting HR) × (50%-70%)] + Resting HR. This was then adjusted for water by subtracting 17 heartbeats so that target HR ranged from 135 to 160 beats per minute.
Strength training	<ul style="list-style-type: none"> Upper and lower extremity exercises using bar bells or aquatic noodles and water resistance including latissimus pull down, tricep press, bicep curl, chest press, one-legged heel raises, front leg press, wall squats, straight leg kicks to the front, side and back 	5-10 minutes	1-2 sets of 10 repetitions Intensity variable and according to speed of movement and equipment used.
Cool-down and flexibility	<ul style="list-style-type: none"> Movement activities in the water—marching in place, arm circles, and leg circles. Done at slow pace to bring HR down to lower than target range. Gently stretching of pectorals, latissimus, triceps, hamstring, quadriceps, plantarflexors; lateral flexion trunk stretch. Done in the shallow end of the pool using the pool wall for balance as needed. 	3-5 minutes	Stretches held for 20-30 seconds and repeated 2 times for each side.

YMCA swimming skills checklist has been established ($r = 0.908$, $p = .005$) on a small sample ($n = 7$) of children with developmental disabilities [20].

For objective two, the Program Evaluation Questionnaire was used to gather information on whether parents were satisfied with the overall program, the program activities, instructors, facility, and child's accomplishments. The Program Evaluation Questionnaire has 27 closed-ended items and 4 open-ended items including one that asks parents to provide suggestions on what to change to improve future programs (Tables 3 and 4). The questionnaire has been used to evaluate other group fitness interventions [21,22] and was modified for this study to include items applicable to an aquatic program. Content validity was established by four physical therapists, one occupational therapist, and two parents of children with disabilities who reviewed the questionnaire for content and clarity. The Program Evaluation Questionnaire was completed by parents during the last program session while their children were participating in the session. The questionnaire did not contain any identifying information.

The third program objective about physical activity levels of the children was evaluated using a Physical Activity Questionnaire. Participants' parents completed the Physical Activity Questionnaire 1 month before the program started, at the end of the 14-week aquatic program,

and 6 months after the program ended. For the first two times, the parents completed the questionnaire while their child was participating in fitness testing and the 6-month follow-up questionnaire was completed by mail (Table 5 provides a copy of the Physical Activity Questionnaire). Question one on the questionnaire was adapted from the Patient-Centered Assessment and Counseling for Exercise Physical Activity Measure [23].

To evaluate the sustainability of the aquatic exercise program, objective four, the two pool site directors were

Table 2
Swimming Classification Scale and Program Results

Swimming Classification Scale	Pre-test (n)	Post-test (n)
Level 1: Unable to swim a lap even with a floatation device	3	0
Level 2 : Able to swim one or more laps with 2 or more foam pieces on the floatation belt	4	3
Level 3: Able to swim one or more laps with one foam piece on the floatation belt	3	1
Level 4: Able to swim one lap without a floatation device and without stopping	6	6
Level 5: Able to swim several laps without stopping and without a floatation device; working on swim stroke techniques for several strokes including backstroke, front crawl, breast stroke	0	6

Table 3
Program Evaluation Questionnaire

OVERALL PROGRAM SATISFACTION	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
1. Overall, how would you rate your satisfaction with the aquatic exercise program?	93.8%	6.3%			
PROGRAM ACTIVITIES	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
2. The exercises and activities in the pool were at an appropriate level for my child (not too easy and not too hard).	75%	25%			
3. The aquatic exercise classes were interesting and held my child's attention most of the time.	75%	18.8%	6.3%		
4. The class size (number of children who attended the aquatic exercise program) was appropriate.	75%	25%			
5. The classes provided opportunities for social interaction with other children.	68.8%	25%	6.3%		
6. Two times per week was the right amount of time for the aquatic exercise classes.	68.8%	31.3%			
7. The 45-minute aquatic exercise class was a good length of time for my child.	75%	6.3%	12.5%	6.3%	
If you answered Neutral, Disagree, or Strongly Disagree, was the class: Too long 0% Too short 100%					
PROGRAM INSTRUCTORS	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
8. The class instructors created a fun atmosphere where my child felt welcomed and motivated to participate.	87.5%	12.5%			
9. The class instructors provided my child with sufficient instructions and assistance.	81.3%	12.5%	6.3%		
10. The class instructors had the appropriate knowledge and expertise to work with my child.	81.3%	18.8%			
11. The class instructors were responsive to my suggestions.	81.3%	6.3%	6.3%*		
12. There were enough instructors to assist and supervise my child to ensure safety during the aquatic exercise program.	87.5%	12.5%			
FACILITY	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
13. There was enough exercise equipment for my child to use during the aquatic exercise classes.	75%	18.8%*			
14. The pool was an appropriate size for the aquatic exercise classes.	87.5%	12.5%			
15. The pool was accessible for my child.	81.3%	18.8%			
16. The changing rooms were accessible.	68.8%	12.5%	18.8%		
17. Adequate parking was available.	81.3%	12.5%	6.3%		
CHILD'S ACCOMPLISHMENTS	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
18. After participating in the aquatic program, my child's <i>strength</i> (ability to lift heavier objects/toys, kick a ball harder, etc.) improved.	43.8%	37.5%	18.8%		
19. After participating in the aquatic exercise program, my child's <i>endurance</i> (ability to participate in movement activities for longer periods) improved.	68.8%	12.5%	18.8%		
20. After participating in the aquatic exercise program, my child's <i>self-esteem/confidence</i> improved.	62.5%	25%	6.3%	6.3%	
21. After participating in the aquatic exercise program, my child's <i>balance</i> (ability to move around without tripping and falling) improved.	25%	31.3%	43.8%		
22. After participating in the aquatic exercise program, my child's <i>gross motor skills</i> (ability to run/walk, catch a ball, jump etc) improved.	31.3%	31.3%	37.5%		
23. After participating in the aquatic exercise program, my child's <i>ability to participate with a group of children</i> improved.	25%	43.8%	18.8%	12.5%	
24. After participating in the aquatic exercise program, my child's <i>swimming skills</i> improved.	56.3%	25%	12.5%*		
25. After participating in the aquatic exercise program, my child is more physically active at home.	18.8%	37.5%	43.8%		
FUTURE PLANS	Yes	Unsure	No		
26. I would enroll my child in the aquatic exercise program again if it is offered in the future.	93.8%	6.3%			
27. I would recommend this aquatic exercise program to other parents.	100%				

* 1 missing response.

Table 4
Themes from Responses to Open-Ended Questions on the Parent Satisfaction Questionnaire

Questions	Theme	Sample Quote
Child's favorite activity	Social interaction with staff and children Games/play activities Doing laps	Interacting with instructors, playing with other children. Throwing the ball around the pool and doing the obstacle/relay races. Laps! He took it very seriously.
Child's least favorite activity	No dislikes Getting out of the pool	My child loved being in the water; there was nothing she wouldn't try. Getting out of the pool.
What to change for future aquatic exercise programs	Maintain same structure Longer class session and program duration Alternate laps with play activities	Nothing—it was a well-balanced program of swimming/exercise. Make the class and program longer. Maybe alternate the laps with the more “fun” activity—more throwing balls or chasing each other—like tag to make him move in the water.
Additional comments	Overall high satisfaction with program—organization, instructors, social component Child improvements in swimming and social interactions	Program was so organized and well run. Parents always communicated to, instructors were great with kids, and accommodated specific needs. It was a wonderful program. My child learned a lot, met some great kids and improved his swimming skills. We hope it can continue.

contacted at the end of the 14-week program and 6 months after the program ended. They were informally interviewed about the status of the adapted aquatic exercise program. The following questions were asked: Do you have an adapted aquatic program at your pool? If yes, what is the program frequency, how is the program structured and who runs the program? If no, what are the reasons that you do not have a program?

Data Analysis

Changes in the child's swimming skills (Swimming Classification Scale) were examined using the Wilcoxon ranked sign test. Descriptive statistics (frequencies) were reported on items from the Program Evaluation Questionnaire. Qualitative methods were used to identify themes and code parent responses to the open-ended questions on the Program Evaluation Questionnaire. Changes in the child's physical activity and community level participation over time was evaluated by comparing parent responses on the Physical Activity Questionnaire administered at program baseline, endpoint, and 6-month follow-up. A series of one-way repeated-measures ANOVAs were used to compare physical activity levels over time. We used information from interviews from the two pool administrators to determine if the program was sustainable over time.

Results

Significant improvements in swimming skill levels were found ($Z = 3.58$, $p < .0001$). All but one child demonstrated an increase of at least one level on the Swimming Classification Scale (see Table 2).

All of the participants' parents completed the Program Evaluation Questionnaire. Parents were generally satisfied with the aquatic program including program curriculum, staffing, and facility accessibility (see Tables 3 and 4). Parents reported overwhelmingly that they would enroll their child if the program was offered again and would recommend the program to other families. The majority of parents

reported improvements in their child's endurance ($n = 13$), strength ($n = 13$), self-esteem or confidence ($n = 14$), group participation ($n = 11$), gross motor skills ($n = 10$), balance ($n = 9$), and swimming skills ($n = 12$) after participating in the aquatic exercise program (Table 3, Questions 18–25).

By parent report, the participants increased the number of days they engaged in physical activity before the program started to the end of the intervention period and they maintained their increased physical activity levels based on parents' responses to the 6-month follow-up questionnaire. For the 16 children, parents reported on average that children completed 5 days or more of at least 60 minutes of moderate to vigorous activity after participating in the program compared to an average of only 3 days prior to the intervention ($t = 4.23$, $df = 15$, $p = .001$). For those children ($n = 10$) for whom Physical Activity Questionnaire data were available at 6 months after the intervention was completed, six continued to sustain higher average levels of physical activity over baseline values. At the 6-month follow-up, swimming was listed on 80% of questionnaires ($n = 8$) as an activity that children participated in to get moderate to vigorous physical activity. On the baseline questionnaire, only one child participated in swimming. There were no significant differences in demographic data and physical performance outcomes between the children whose parent completed the follow-up questionnaire and for the six children whose parents did not return the questionnaire. Half of the participants received adapted physical education or physical therapy before the program started and the amount and type of service did not change during the intervention period.

At the completion of this initial 14-week program, the YMCA site continued the program for two more 14-week sessions and all but two children participated in the program. The costs were \$11 per class for each child who was not a member of the YMCA and \$4 per class (\$64 for one 8-week session with two classes per week) for children with a family membership.

The physical therapist continued to provide consultation to the program on a weekly basis. At the YMCA, the staff

Table 5
Physical Activity Questionnaire

We are interested in how much moderate to vigorous physical activity **your child** has been doing this week.

- **Moderate to vigorous** physical activity is any activity that increases your heart rate and makes you get out of breathe some of the time.
- **Moderate to vigorous** physical activity includes things like bike riding, swimming, running, walking fast, and playing playground games and sports.

1. Over the **past 7 days**, how many days did your child do **moderate to vigorous** physical activity for **60 minutes or more**? Circle your answer.

0 1 2 3 4 5 6 7

2. Please list the physical activities that your child has done over the **past 7 days** :

3. Over the **past 7 days**, how many days did your child have physical therapy or adapted physical education? Circle your answer.

0 1 2 3 4 5 6 7

4. What kind of activities did your child do in physical therapy or adapted physical education? (if your child does not receive these services please check N/A)

<input type="checkbox"/> N/A	<input type="checkbox"/> strengthening
<input type="checkbox"/> balance activities	<input type="checkbox"/> stretching
<input type="checkbox"/> walking	<input type="checkbox"/> other: please list _____

was comfortable with continuing to work with children enrolled in the program; however, the aquatic director was hesitant to offer the program to new participants and requested further assistance to increase their knowledge in carrying out another adapted aquatics program. A few of the participants successfully participated in inclusive programming at that YMCA after completing the second 14-week program.

The pool at the private school was not able to continue the twice-weekly group program due to lack of staffing; however, they did offer a lap swimming program where children swam on their own or with a parent and then recorded the number of laps each session. Three of the seven participants enrolled in that program. The pool site also offered private adapted swimming lessons and two other children participated in private lessons.

Discussion

This pilot aquatic program was successful on several levels as demonstrated by the achievement of three of the objectives (improvements in swimming skills, physical activity levels, and high levels of parent satisfaction) and partial achievement of the fourth objective (program sustainability). As this was part of a larger study, additional evidence suggests that the program was safe since no injuries or adverse effects were observed and the program was effective in promoting cardiopulmonary endurance (see Fragala-Pinkham et al. for details [19]).

Our program design with a high staff-to-child ratio, life-guard at all sessions, and structured exercise parameters may have contributed to the program safety. The highly structured program, high staff-to-child ratio, and use of HR monitors to determine exercise intensity are likely factors contributing to the achievement of program objectives. Another important component of the program was the use of motivational strategies to increase or maintain participation during the aquatic classes [9]. We used a variety of activities to make the program fun, provided positive reinforcement throughout the sessions, and

modified activities to minimize competition and to promote participant success.

Information learned from this summative program evaluation can be used to plan future adapted aquatic programs. For example, increasing class time to 1 hour should be considered. Extra time could be used to assist children with transitioning out of the pool and for children to informally socialize with other program participants. We found that recording lap times was an effective motivator; therefore, we will start recording fast lap times earlier in the program and will alternate the laps with games and other fun activities. We also found that the use of written prompts for the activity schedule and grouping children according to their swimming abilities were effective strategies. Parents were not happy about the lack of family changing areas at one pool facility, and in the future changing room accessibility should be considered when developing an adaptive aquatic program.

Program sustainability was only partially achieved due to barriers related to program staffing and knowledge barriers. At the YMCA, staff were comfortable with continuing to work with children enrolled in the program; however, the aquatic director was hesitant to offer the program to new participants and requested further assistance to increase their knowledge in carrying out another adapted aquatics program. This adapted aquatic exercise program is an example of how the collaboration of pediatric therapists and community recreation and fitness staff resulted in a successful adapted aquatic exercise program for children with a variety of abilities. Other authors have suggested that therapists should collaborate with community health and fitness programs to decrease participation barriers for children and adults with disabilities and to promote increased physical activity participation [24,25]. Pediatric physical therapist consultants and other health promotion specialists can serve an important role in educating the community staff on the nature of health conditions for children with special needs and how to handle specific medical precautions. They also can assist with providing information on ways to modify and adapt existing programs so that all children participate safely and successfully.

Program cost can also be a barrier to participation in active recreation programs [26]. For some families of children with disabilities, costs from medical bills, adapted equipment, prescriptions, and specialized transportation expenses may make it difficult for them to afford additional costs for recreational programs. This was not a factor in our program because it was funded by a grant; however, this was a concern for program sustainability and that is why we selected the YMCA as a site. Facilities like the YMCA and other nonprofit organizations provide financial assistance to families who cannot afford program fees.

This aquatic exercise program was specifically designed for children who did not need one-to-one supervision. For children with severe limitations due to physical, behavioral, or cognitive challenges, additional supervision, assistance, program modification, and adaptive equipment may be necessary to ensure safety and optimal participation.

One study limitation was that the Physical Activity Questionnaire that we used was not validated. One question was adapted from another measure that has been validated for self-report of physical activity in adolescents. In pilot testing of the questionnaire for younger children, we observed that 6- to 12-year-old children were not able to provide self-report so it was adapted to gather information from parents. Although self-report measures are commonly used, they can be problematic due to recall bias. In the future, quantitative measures of physical activity such as pedometers and accelerometers may help assess if the intervention is associated with changes in physical activity in the child's home or community environments. These measures also have drawbacks as they do not record some activity such as swimming or cycling.

Considerations for Future Program Development

When developing a community-based adapted aquatic program, several challenges or barriers should be considered. One important consideration is staffing because more staff may be necessary to ensure safety, modify activities, and promote optimal participation of each child. Since higher staffing levels increase the cost of a program, one option is to recruit college student volunteers who are enrolled in special education, physical therapy, or other allied health professions. This service-learning opportunity provides students with experiences to integrate information learned in the classroom into community settings and allows them to provide a valuable service to a community facility. Staffing changes at community facilities are also very common and can be challenging. This requires additional staff training and putting together a plan on what to include in training. Use of a program procedure manual containing information on specific exercises and group activities, how to modify activities, and how to evaluate the program may assist in making training sessions more efficient. Parent

participation as staff is another option to consider if a less expensive mode of staffing is required.

Accessibility to the facility pool, locker rooms, changing rooms, facility entrance and exits, and parking is another important consideration. This is difficult to change with existing buildings. However, using other space for family changing rooms or adding ramps and lift-equipment to improve access may be feasible if community facilities commit to providing these adaptive sports and aquatic programs for children with disabilities.

The requirement for specialized equipment should also be considered. Our program was designed to use some standard aquatic equipment including aquatic noodles, kickboards, and floats, which are commonly available at community pools. Other equipment such as buckets and foam dumbbells were supplied by the grant; therefore, some community facilities may need start-up funding for equipment. Most equipment is reusable and can be used for other standard programs.

Program evaluation should be conducted whenever a new program is initiated. For an aquatic program, the evaluation could consist of testing swimming abilities at the beginning and end of each program. A child and/or parent satisfaction survey may also be helpful with guiding changes and program development. Additional evaluations by aquatic coaches and the facility staff also would help inform the effectiveness of a program. The aquatic coaches could critique their training sessions and provided suggestions to make training more effective. For community-based programs, consultants could interview facility staff to determine their satisfaction with the program and their perspective on program costs to assist with program development and sustainability of the program.

In the future, we would like to develop guidelines on how to progress children from a specialized program to an inclusive program. We would also like to develop an aquatic exercise program manual with program development guidelines and aquatic activities. Specific program procedures and guidelines may assist community fitness staff with successfully including children with disabilities into sports and fitness programming and thereby providing more opportunities and decreasing participation barriers.

Conclusions

Adapted land- and water-based exercise programs encouraging increased physical activity for children with disabilities are needed. It is important that more programs become available to individuals with disabilities to reduce the risk of secondary conditions that have negative impact on morbidity and mortality. As these programs are developed and implemented, they should be critically evaluated on several dimensions. This pilot adapted aquatic program

was successful overall. The program evaluation provided information on what elements of the program should be maintained and other elements that could be modified to improve outcomes. Further, it is important for therapists and researchers to partner with community facilities to design, implement, evaluate, and promote health promotion programs for this vulnerable population of children with disabilities. This pilot adapted aquatic exercise program is a successful illustration of such a partnership.

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