Abstract

Purpose. The purpose of this study was to determine the feasibility of providing a community-based aquatic exercise programme and to examine the effects of a group aquatic exercise programme in individuals with multiple sclerosis. This study illustrates the implementation of a multidisciplinary community-based programme in a university community wellness centre coordinated with a local advocacy group.

Method. Eleven subjects with multiple sclerosis participated in a 5-week community-based aquatic exercise programme. Aquatic exercises were held twice weekly for 60 minutes and included aerobic exercises, strength training, flexibility exercises, balance training and walking activities. The 10-Metre Walk test, the Berg Balance Scale (BBS), the ‘Timed Up and Go’ (TUG) test, grip strength and the Modified Fatigue Impact Scale were used to assess motor function.

Results. Analysis of the scores demonstrated improved gait speed, BBS, TUG test and grip strength. The average attendance of the training sessions was good (88%), and no incidence of injuries, no incidence of falls and no adverse effects related to the exercise programme were reported. All participants reported that they enjoyed the programme, and they had improved after the training.

Conclusions. A community-based aquatic exercise programme is feasible and resulted in improvement in motor functions of individuals with multiple sclerosis. These findings indicate that an aquatic training programme is appropriate and beneficial for individuals with multiple sclerosis and should be considered to augment the rehabilitation of those individuals. This programme may provide a viable model for a community-based wellness programme for people with disability including individuals with multiple sclerosis.

Keywords: Multiple sclerosis, aquatic therapy, community programmes, exercises

Introduction

Multiple sclerosis is a chronic progressive inflammatory-demyelinating disease of the central nervous system. It is the most common cause of neurological disability in young- and middle-aged adults [1,2], affecting an estimated 400,000 people in the United States [3]. Associated limitations in mobility including walking and balance are frequently responsible for limited community participation, long-term disability and handicap [4–6]. Improvement in motor function including strength, walking and balance is one of the most common goals in the rehabilitation of individuals with multiple sclerosis [7].

For many years, individuals with multiple sclerosis have been advised to avoid exercise because of excessive fatigue and the fear of increased disability.
[8–11]. During the last decade, several studies of individuals with multiple sclerosis provide evidence in support of exercise for this population. As a result, physical exercise is now recommended for individuals with multiple sclerosis [8–13].

An aquatic exercise programme is a well-tolerated form of integrated exercise for individuals with multiple sclerosis [12] that provides an appropriate therapeutic environment that can be used to augment rehabilitation of those individuals. The National Multiple Sclerosis Society advocates for aquatic exercise programmes for individuals with multiple sclerosis, and clinicians recommend aquatic exercise on an increasing basis as a valuable adjunct to traditional treatment [14,15]. Research on the effects of aquatic therapy for individuals with multiple sclerosis provides evidence in support of an aquatic training approach. Investigations of the effect of aquatic exercises in individuals with multiple sclerosis indicated positive effects reporting improvements in strength [16,17], cardiovascular endurance [14], fatigue [15], quality of life [15,18,19] and psychological wellbeing [18].

The effect of temperature and fatigue on some individuals with multiple sclerosis provides one rationale for recommending aquatic exercise [15]. The impact of fatigue and sensitivity to heat constrain some individuals from exercising. Aquatic exercise is one method of cooling that allows dissipating body heat generated during exercise [15,16], thus allowing individuals with multiple sclerosis to exercise without fear of fatigue or experiencing heat sensitivity.

The physical properties of the water allow individuals to participate in intensified strength, balance, and functional skill training in an antigravity posture in a safe and motivating environment. The buoyancy effect of the water reduces the influence of gravity and provides postural support that may allow individuals with weakness and spasticity to exercise and move easier in the water than on land [14]. The properties of the water including buoyancy, relative density, viscosity and resistance provide multiple sensory stimuli and may contribute to proprioception and balance efficiency [20], and allow a variety of activities that can be easily modified to accommodate the wide range of motor abilities [21].

The efficacy of aquatic exercise for improving functions in individuals with multiple sclerosis has received attention in recent years. Although there is a limited number of studies evaluating the effectiveness of aquatic exercise for multiple sclerosis, those that have been conducted consistently demonstrate positive outcomes. Gehlsen et al. [17] investigated the effects of an aquatic exercise programme in a cohort of 10 ambulatory subjects with multiple sclerosis. The study reported increased work capacity and fatigue resistance of the knee flexor and extensor muscles, and improved upper extremity work, force and power measures after 10 weeks of the aquatic training. In another study, Gehlsen et al. [22] reported no changes in gait parameters in 11 individuals with multiple sclerosis following a 10-week aquatic exercise programme. The aquatic programme consisted of free-style swimming and shallow water aerobics. The author did not provide information about the training programme used in this study. In a case report, Peterson [16] described the use of an aquatic programme for a 33-year-old female patient with multiple sclerosis during an exacerbation, who underwent a 6-week aquatic exercise programme. The patient demonstrated improvements in mobility and muscle strength and did not experience fatigue or any adverse change in neurologic status throughout the programme. Pariser et al. [14] reported that an 8-week aquatic training programme resulted in improvements in cardiovascular fitness in two individuals with multiple sclerosis; however, changes in fatigue were equivocal for participants. Although the fact that the potential for the effectiveness of aquatic training appears strong, the effects of aquatic exercise on motor functions including strength, gait and balance have not been reported for individuals with multiple sclerosis.

Community-based exercise programmes play an important role in the health of individuals with disabilities [23]. Considering the role of these programmes in preventing physical inactivity that can lead to devastating secondary health complications such as weakness, fatigue, deconditioning and cardiovascular dysfunction, community-based exercise programmes are urgently warranted. Typically, exercise research studies in multiple sclerosis have been conducted in otherwise well-controlled conditions. Although these studies provide useful information regarding exercise response in multiple sclerosis, they have limited focus on promoting skills transfer and community integration. Moreover, there is little evidence attesting to its effects on motor functions in this population.

This research study illustrates the implementation of a multidisciplinary multiple sclerosis aquatic programme with faculty and students in occupational therapy, physical therapy and sports science programmes, in a university community wellness centre coordinated with a local advocacy group. The purpose of this study was to determine the feasibility of providing a community-based aquatic exercise programme and to examine the effects of aquatic group exercise training on motor functions in regard to strength, gait and balance in individuals with multiple sclerosis. We hypothesised that a group-based aquatic exercise programme is feasible and
would improve motor functions in individuals with multiple sclerosis.

Methods

Participants

Eleven subjects with multiple sclerosis were recruited through the New York City Chapter of the National Multiple Sclerosis Society (NMSS). Subjects were recruited based on the following criteria: (1) medical diagnosis of multiple sclerosis; (2) a medical clearance for exercise participation; (3) limited physical activity prior to participation in the study; (4) capable of giving informed consent. Subjects were excluded if they had debilitating illness before or during the study or if they had cognitive limitations that precluded them from participation in the training programme. All subjects signed an informed consent approved by the Long Island University Institutional Review Board.

Intervention

The aquatic programme was designed by the NMSS [24] and validated by a panel of faculty from physical therapy, occupational therapy and sports science programmes and a certified aquatic instructor with 15 years of experience conducting aquatic exercise programmes for individuals with multiple sclerosis. This exercise protocol was originally implemented in several local community settings sponsored by the New York City chapter of the National Multiple Sclerosis Society.

Participants received a 60-min session of group aquatic training twice weekly for 5 weeks during the summer of 2008. The aquatic programme was held in an accessible swimming pool (31°C), which meets the Americans with Disabilities Act (ADA) requirements, at the Wellness, Recreational and Athletic Centre located at Long Island University. The majority of the participants used Acess-A-Ride transportation to attend the training sessions.

The aquatic training was led by a certified aquatic instructor who had experience in conducting aquatic exercise programmes for persons with multiple sclerosis. Faculty and graduate students from occupational therapy, physical therapy and sports science programmes provided assistance during the sessions to maximise participation and safety. All students had received two training sessions from a physical therapist who is a Neurology Certified Clinical Specialist, an occupational therapist and the aquatic instructor. A manual with description of class activities was provided to all students. Lifeguards and pool safety equipment were available during the training sessions, as well as assistive equipment to facilitate participation and maximise the function of the participants. Equipment included flotation devices, ankle weights, water barbells, kickboards, hydrosneakers and therapy bars. The training programme was supervised by three faculty from physical therapy, occupational therapy and sports science programmes. Attendance and adverse effects of the training were recorded and if a participant did not attend a training session, the research team attempted to contact them to determine the reason for the absence.

Each session consisted of a warm-up period, aquatic exercises, followed by a cool-down period. The warm-up and cool-down periods were performed in the pool and included low-intensity aerobic exercises such as breathing exercises, flexibility and neck, arm and leg movements such as arm circles. The aquatic exercises included activities focussed on joint mobility, muscle strength, balance, posture and functional activities as well as to address the underlying impairments and functional limitations, specifically during walking. Throughout the training session, quality of movement was emphasised and neutral spinal position was encouraged. The sessions typically concluded with a group activity that encouraged the use of physical, in addition to cognitive and social skills. Aquatic activities are summarised in Table I.

Assessment

Participants were evaluated pre- and post-aquatic training utilising the following assessment tools to measure the effects of the aquatic programme: The 10-Meter Walk test, Berg Balance Scale (BBS), the Timed ‘Up and Go’ (TUG) test, hand dynamometre and the Modified Fatigue Impact Scale (MFIS). These measures are commonly used in both clinical and research settings for individuals with multiple sclerosis.

The 10-metre walk test. The 10-Metre Walk test is a measure of gait speed. The test has good psychometric properties [25], with good interrater reliability (ICC = 0.88) for individuals with multiple sclerosis [26]. Subjects were allowed to use their usual walking aid during the test. Subjects started walking at a point 1 meter in front of the walkway and stopped at a point 1 meter behind the walkway to allow for acceleration and deceleration. The time it took to walk 10 m at the subject's usual speed was recorded. Two trials were averaged to determine gait velocity.
Table I. Aquatic exercise activities.

| Warm-up | Walking slowly holding barbells for support  
|         | Back roll-use pool wall for support  
|         | Walking heel toe pattern holding barbells  
| Flexibility | Neck, arm, shoulder stretches  
| Aerobics | Walking forward, backwards and sideways rolling barbells  
|         | Punching the water using barbells  
|         | Jumping jacks  
|         | Jumping forward and upward  
| Strengthening activities | Floating resisted exercise such as push/pull kickboard while walking forward  
|         | Marching in place to strengthen hip flexors  
|         | Heel and toe raises  
|         | Moving the body or body part(s) against water turbulence  
| Balance activities | Weight shifting activities  
|         | Unilateral stance  
|         | Reaching in different directions to catch a ball, throwing a ball  
|         | Stepping activities such as stepping forward, backward and sideways  
| Walking activities | Marching activities that focussed on maintaining an upright trunk posture  
|         | Stepping activities such as stepping forward, backward and sideways  
|         | Walking activities at various speeds and water depth including walking forward, backward, sideways and changing directions  
| Transitions | Sit-to-stand and controlled stand-to-sit  
| Cool-down | Squat to stand activities  
|         | Stretching exercise  
|         | Shoulder rolls forward and backward  
|         | Back roll-use pool wall for support

The Berg balance scale. The Berg Balance Scale was used to measure balance function. The Berg Balance Scale is a 14-item task-oriented performance-based test that has been used to assess balance function and evaluate response to treatment [27]. The scale consists of 14 functional tasks frequently performed in everyday life. The total score range is 0–56, with the higher scores indicating better balance. The Scale has been shown to be a valid test with excellent interrater (ICC = 0.96) and intrarater reliability (ICC = 0.97) [28,29]. The BBS has been reported to have excellent interrater reliability (ICC = 0.99) and test–retest reliability (ICC = 0.85) for ambulatory individuals with multiple sclerosis [26].

The timed ‘up and go’ test. This test is a performance-based test designed to assess functional mobility [30]. The TUG is a valid and reliable measure of balance with an excellent intrarater (ICC = 0.99) and interrater (ICC = 0.99) reliability [30]. Each participant was asked to rise from a seated position off a standard chair with arm rests, walk to a line on the floor 3 meters away, cross the line, turn and return to the seated position. Participants performed the test at their own pace and subjects who were using walking aids were allowed to use their usual walking aid. The test was performed twice, and the total time for each trial was recorded.

Dynamometer grip strength. Grip strength was measured using a handheld dynamometer. The handheld dynamometer has high reliability (ICC = 0.98–0.99) for individuals with multiple sclerosis [26]. All participants completed the handheld dynamometer testing from a sitting position. The handheld dynamometer was adjusted to fit the hand of the participant. The participant was then instructed to squeeze the handle of the dynamometer as hard as possible. Three trials were completed on both sides of the body.

The modified fatigue impact scale. Fatigue was assessed using the Modified Fatigue Impact Scale (MFIS). The scale consists of 21 items to determine the effects of fatigue on physical, cognitive and psychological functioning [31]. Each item is scored on a 5-point scale (0 = ‘never’ to 4 = ‘almost always’). The total score range is 0–84 with the lower score indicating less fatigue. The validity and reliability of the scale is well supported [31,32].

Satisfaction survey. Attendance was recorded for all participants at the beginning of each session. Percentage of programme attendance was calculated by dividing the total number of sessions attended by the total number of exercise sessions and multiplied by 100. Participants completed a satisfaction survey for the aquatic programme. The satisfaction survey was based on the New York City chapter of the Multiple Sclerosis Society’s exit survey used to assess recreational and exercise programmes for the membership. It also addressed specific elements of the research process. The areas queried included: satisfaction with overall programme (10 point scale). Other items used a five-point continuum scale with a neutral mid point for evaluating satisfaction with: the aquatic exercise programme, knowledge and expertise of staff, experience with 1:1 coaching, timing, scheduling and coordination, the timing of pre- and post-assessment for the research component, accessibility of the facility and interest in future participation. In addition, each participant’s perceived benefits of the programme were recorded on a visual analogue scale (0–10) with the anchors ‘not at all beneficial’ and ‘extremely beneficial’.
Data analysis

Descriptive statistics (mean and SD) was generated for each dependent variable. The difference between the pre-test and post-test for 10-m walk test, TUG and handheld dynamometers scores was analysed with a paired-t test. The Wilcoxon signed rank was used to analyse the difference between the pre-test and post-test scores for BBS and MFIS. All statistical tests used a significance level of $p < 0.05$.

Results

Of the 11 participants, 10 completed the training programme, with one woman dropping out after pretest and another five training sessions, secondary to receiving a tattoo on her arm, which could have potentially been affected by the water. The remaining 10 participants completed the training sessions and all pre- and post-assessments. The average attendance of the training sessions was (88%). The demographic details of the participants are presented in Table II.

Analysis of the scores indicated that the participants performed significantly better at post-test as compared to pre-test with respect to walking speed ($p < 0.049$). Following training, the participants exhibited statistically significant ($p < 0.001$) decrease in TUG scores compared with the baseline. The BBS scores showed significant improvements following the training programme ($p < 0.008$). The grip strength scores were significantly (right: $p < 0.03$, and left: $p < 0.03$) improved after the training programme. The MFIS scale revealed no significant ($p < 0.85$) difference. Table III presents the mean and standard deviation of the outcome measures pre- and post-aquatic training programme. Figure 1 presents the mean values of the outcome measures pre- and post-aquatic training programme.

All participants reported no incidence of falls, no increase in fatigue level and no adverse effects related to the exercise programme. The appreciative responses of the participants in the satisfaction survey about the programme support the feasibility. The participants expressed high levels of satisfaction with ratings of predominantly 100% for the overall experience, expertise of pool and aquatics staff, timing, scheduling and coordination, level of assistance and hospitality and coordination between Long Island University and the local Multiple Sclerosis chapter. Areas of accessibility, scheduling for pre- and post-evaluations and expertise of the research team received the highest ratings from 85% of the participants. All participants enjoyed the programme and indicated an interest in continuing in future programmes. In addition, 9 of the 10 participants reported improvements after the training.

Discussion

The purpose of this study was to examine the feasibility and effectiveness of a 5-week community-based group aquatic exercise programme for individuals with multiple sclerosis. The findings demon-

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age (year)</th>
<th>Time since diagnosis (year)</th>
<th>Gender</th>
<th>Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>3</td>
<td>Female</td>
<td>Walker/wheelchair</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>10</td>
<td>Female</td>
<td>Independent</td>
</tr>
<tr>
<td>3</td>
<td>45</td>
<td>7</td>
<td>Female</td>
<td>Independent</td>
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<tr>
<td>4</td>
<td>57</td>
<td>15</td>
<td>Male</td>
<td>Wheelchair</td>
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<td>5</td>
<td>69</td>
<td>20</td>
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<td>12</td>
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<td>Walker</td>
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<tr>
<td>8</td>
<td>44</td>
<td>6</td>
<td>Male</td>
<td>Walker</td>
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<td>9</td>
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<td>21</td>
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<td>10</td>
<td>58</td>
<td>11</td>
<td>Female</td>
<td>Walker/wheelchair</td>
</tr>
</tbody>
</table>

Table III. Pre-test, post-test means and standard deviations.

<table>
<thead>
<tr>
<th></th>
<th>Pre (mean ± SD)</th>
<th>Post (mean ± SD)</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gait speed (cm/s)</td>
<td>33.06 ± 21</td>
<td>40.27 ± 8</td>
<td>0.049</td>
</tr>
<tr>
<td>TUG (s)</td>
<td>44.21 ± 20.6</td>
<td>36.71 ± 17</td>
<td>0.001</td>
</tr>
<tr>
<td>BBS</td>
<td>24 ± 15</td>
<td>27 ± 14</td>
<td>0.008</td>
</tr>
<tr>
<td>Grip strength-right (kg)</td>
<td>14.55 ± 11</td>
<td>18.77 ± 9</td>
<td>0.03</td>
</tr>
<tr>
<td>Grip strength-left (kg)</td>
<td>16.34 ± 10</td>
<td>19.96 ± 11</td>
<td>0.02</td>
</tr>
<tr>
<td>MFIS</td>
<td>27.7 ± 4.1</td>
<td>28.5 ± 5.5</td>
<td>0.85</td>
</tr>
</tbody>
</table>

TUG, Timed ‘Up and Go’ test; BBS, Berg Balance Scale; MFIS, Modified Fatigue Impact Scale.
Note: Significant difference $p < 0.05$.

Table II. Demographic details of participants.
strate that a community-based group aquatic programme for individuals with multiple sclerosis is feasible, beneficial and safe to implement and may serve as a good model for community-based wellness programmes for people with disabilities. The results of this study support the clinical recommendation to include aquatic exercise for individuals with multiple sclerosis.

The feasibility of the aquatic programme was supported by adequate recruitment and compliance (10 individuals recruited with one drop out). The programme was safe, and the sessions were tolerated well with no negative effects reported and all participants wished to continue in future programmes. Effective recruitment was accomplished through affiliation with the local advocacy group to identify individuals with a moderate level of involvement and good motivation.

The findings of this study, in conjunction with previous reports demonstrating the beneficial effects of aquatic exercise programmes in individuals with multiple sclerosis, show that people with multiple sclerosis may benefit from participation in an aquatic exercise programme. Differences in the study designs, the community nature of our programme, the training activities and the outcome measures between this study and other studies may contribute to difficulty in comparing results.

Our findings of improved strength after the aquatic programme concur with the findings of Gehlsen et al. [17], who reported improved muscle strength after 10 weeks of aquatic training consisted of freestyle swimming and shallow water aerobics. The primary difference is that improvements occurred with less intervention (5 weeks) as compared to the programme of Gehlsen et al. (10 weeks). In contrast to the programme of Gehlsen et al., our aquatic programme focussed on exercises in functional positions, and incorporated strength components.

Our participants demonstrated improvements in walking speed on the 10-Meter Walk test after the 5-week aquatic programme. Gehlsen et al. [22] reported no change in walking speed as measured by video camera after a 10-week aquatic programme. The aquatic programme of Gehlsen et al. consisted of free-style swimming and shallow water aerobics. In contrast to the intervention programmes used in the Gehlsen et al. study, the aquatic programme in this study involved practicing balance and walking activities, the specificity of training used in this study may explain our findings of significant improvements in walking speed and may account for the difference between our study and Gehlsen et al. study.

Improvements observed in this study may be attributed to the combination of training activities and physical properties of the water (buoyancy, viscosity, pressure, absence of gravitational stress on joints) [20,33,34] and facilitating ability to engage in exercises that would not be possible on land with enhanced balance, mobility and less fatigue [35]. The exercise programme used in this study was a generalised exercise programme included activities that were task driven and were selected to enhance performance in functional skills. The programme focussed primarily on exercise in functional positions and incorporated strength, balance and walking components, features that may explain the improvements in strength, balance and gait.

Our results demonstrated that aquatic training led to no significant changes in subjects’ MFIS scores. In contrast to our data, Roehrs and Karst [15] found significant reduction in fatigue in 10 subjects with multiple sclerosis who participated in a 12-week aquatic exercise classes. The difference between the duration of the aquatic programme in this study and their aquatic programme may account for this discrepancy. It is possible that the duration of the programme was too short, or the training intensity used in this study was not high enough to result in statistically significant changes in the MFIS. It is possible that the training programme did not provide participants with sufficient endurance and aerobic training or the strength, balance and walking activities used in this study were not critical to improve fatigue. The small sample size has probably contributed to the decrease in the significance of this measure. It is possible that the MFIS may not sensitive enough to detect changes in fatigue over time [36]. Furthermore, it is possible that increased activity level as a result of participation in the programme may limit the changes in fatigue. In addition, the pre-assessment was conducted in June and the post-assessment was conducted in August, the timing of the assessment may affect the level of fatigue.

Some of the advantages of the programme were its location in a community setting providing exercise in a recreational and group social context. These two elements contributed to a cohesive group structure with strong adherence to participation and attendance. The therapeutic/physical properties of an aquatic environment and skilled leadership lent a playful tone to working on improved physical functioning and wellness with participants displaying great vigour and enthusiasm.

Although individual training sessions are beneficial to ensure proper supervision, intensity and difficulty level, the group model used in this study used staff and students as ‘one-to-one’ water coaches. This unique feature of the programme allowed us to ensure proper supervision and tailor activities, intensity and difficulty level and at the same time ensure the social engagement and adherence benefits of the group interaction.
Recreational exercise programmes often do not address the unique needs of individuals with disabilities. Therapeutic group exercise programmes may not be optimal for promoting skill transfer and community integration. Our programme was a generalised aquatic exercise programme designed to address the unique needs of individuals with disabilities and community integration.

Another feature contributing to the success of this programme was the integration and collaboration between the interdisciplinary research team, the local support agency and community center staff, as well as involvement of students in health professions.

Limitations and future research

There are several limitations of this study. First, the sample size included in this study was small and was a sample of convenience. The small sample size suggests that the findings concerning fatigue should be interpreted with caution. Another limitation is the use of a one-group, pretest/posttest design that lacked a control group. Inclusion of a control group would have provided stronger evidence that the training programme was responsible for the improvements seen in the study variables. The aquatic exercise protocol was based on the programme designed by the NMMS [24]; however, the experienced aquatic instructor also introduced other exercises. It is difficult to determine which specific components of the exercises were instrumental to the improvements observed in this study. Community-based aquatic programmes frequently have limited staffing and may not accommodate participants with higher levels of disability or may require those participants to attend with their personal care assistant. In this programme, which was located in a university setting, health professions students in training extended the ability to support individuals with higher levels of disability both in the pool and in the changing facility. Access to this model of one to one ‘water coaching’ is a unique feature, which would be difficult to provide in a typical community-based programme. To prepare them for this role, students had specific training related to the characteristics of multiple sclerosis and to working with participants with aquatic exercises. Furthermore, in this programme, funding was available to purchase additional equipment such as aqua steps, weights, a waterproof wheelchair and rash shirts. Other community programmes may have limited resources to obtain specialised aquatic equipment. Future study with a larger sample size is needed to support or negate the findings of this study. A well-designed randomised, controlled clinical trial is warranted to confirm the benefits of an aquatic exercise programme. Future studies should include a long-term training programme and long-term follow-up to determine the long-term benefits and adherence to an ongoing aquatic exercise programme. Such studies should include quality of life measures, as well as physical performance measures to determine training effectiveness. Furthermore, it would be interesting to undertake a controlled study to demonstrate the efficacy of an aquatic exercise programme in comparison to a land-based exercise programme.

Nevertheless, the positive outcomes from this study justify a multi-centered study to further examine the efficacy and cost-effectiveness of the aquatic programme and to determine the cost of running intensive short-term group-based aquatic exercise programme compared to long-term individual aquatic sessions.

Clinical implications

This study has a number of important implications for clinical practice. Objective evidence of the potential benefits of community-based aquatic exercise programmes is essential. The findings of this study demonstrate the feasibility and the potential benefits of a community-based exercise programme to improve motor functions in individuals with multiple sclerosis and to augment the rehabilitation of those individuals. This programme serves as a good model of a community-based programme for individuals with disabilities.

Individuals with disability typically demonstrate a decline in physical activity. Limited participation in physical activity may result in limited mobility function, reduced quality of life and restricted interaction within society. Given the adverse effect of physical inactivity and the cost associated with the long-term care of individuals with disability, developing community-based exercise programmes that ensure adherence of the participants is critical to promote physical functioning, quality of life, health and well-being and to augment the rehabilitation of individuals with disabilities.

A major responsibility of health care professionals is to influence community resources and to advocate for the development and implementation of community-based exercise programmes. These programmes can serve as adjuncts to and complement traditional therapy services [37]. Health care professionals including physical and occupational therapists, particularly those in a university setting can consult with the community centre and educate the staff on the exercises and nature of health conditions and specific precautions related to the health condition or disability.
Structuring meaningful, effective and enjoyable activities for individuals with wide disease severity and range of capabilities is challenging. However, the small number of participants and the additional support from the programme staff and students promoted each participant’s involvement in the activities at an appropriate level. Several factors should be considered when designing and implementing community-based exercise programmes for individuals with disabilities: identifying appropriate participants, structuring meaningful training activities, the ratio of participants to support staff, intensity, frequency, duration, group versus individual training and suitability and safety of the training environment.

Critical to the successful development and implementation of a community-based programme is the collaboration of the programme team. The successful collaboration in this programme may serve as a model for other community-based programmes to expand service delivery for individuals with disabilities.

Conclusion

This study demonstrated that a community-based group aquatic exercise programme using support from health care professionals and students is feasible and resulted in improvement in motor function of individuals with multiple sclerosis. These findings indicate that the aquatic training programme was appropriate and beneficial for this group of individuals with multiple sclerosis and should be considered to augment the rehabilitation of those individuals. This study provides baseline data for future research examining the effects of community-based group aquatic exercise programmes in individuals with multiple sclerosis and provides useful clinical information for those health professionals using aquatic training as an intervention in this patient population. If the results of this study can be replicated, it would add further support to the clinical recommendation to include aquatic exercise for individuals with multiple sclerosis.

Health professionals are encouraged to adopt and support the development of wellness programmes for people with disability. This programme may provide a viable model for a community-based wellness programme for people with disability including individuals with multiple sclerosis. Further research should investigate additional aspects of community programmes such as the long-term effects and its ability to improve function and quality of life in individuals with disabilities.

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