Case Comparison of Response to Aquatic Exercise: Acute Versus Chronic Conditions

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The purpose of this case report was to describe the effects of individualized aquatic exercise programs with two participants with knee impairments. The first participant was a 17-year-old high school soccer player with an acute knee injury (torn anterior cruciate ligament). She demonstrated significant improvement in functional abilities over the course of the nine week intervention. The second participant was a 33-year-old female with a chronic knee condition (rheumatoid arthritis) localized to the right knee. Although she demonstrated only marginal progress in functional outcomes over the course of six months of participation, improvement in swimming ability was remarkable. The cases were compared and contrasted relative to valid data collection methods and response to aquatic exercise. Results suggested that both quantitative and qualitative data may be useful in determining the effectiveness of aquatic exercise programs. In particular, qualitative data provided insight into the meaning of the activity for the second participant.

KEY WORDS: Arthritis, Aquatic Exercise, Functional Abilities, Anterior Cruciate Injury, Existential Outcomes, Symbolic Interactionism

Underlying assumptions motivating initiation of this aquatic exercise program were introduced by Beaudouin and Keller (1994). They observed that many individuals are dis-
charged from in-patient agencies with a need for indefinite continuation of rehabilitation and maintenance services. Often individuals discharged from in-patient rehabilitation experiences are assumed to be “cured.” Facts do not confirm this assumption. For example, people with spinal cord injuries require life-long exercise to avoid or delay the onset of significant secondary health problems. Some evidence suggests that persons with head injuries may be discontinued from rehabilitation programs too early (Dordel, 1989).

This report is the result of the implementation of a community-based intervention using aquatic exercise with two participants. It was designed to complement direct rehabilitative efforts aimed at functional problems related to the knee joint.

More specifically, the intent of the program was to use aquatic exercise to improve strength and endurance of muscles supporting the knee, to improve range of motion and flexibility about the knee, and to encourage regular participation in water-based recreation activities (e.g., swimming). Secondary expected outcomes were improved balance and kinesthesia, and pain control.

Water as a medium offers several advantages to exercise intervention programs for persons with joint impairments. Specifically, buoyancy, resistance, support, and hydrostatic pressure provided by an aquatic environment make movement easier and less painful than comparable land-based programs (Becker & Cole, 1997). Buoyancy makes body parts lighter and easier to move, while the position of hands, feet, or appliances can increase or decrease the resistance for strength training purposes. The density of the water slows movement and supports body positions (e.g., balancing on one foot) that would otherwise be unstable on land. Finally, the sheer weight of the water (hydrostatic pressure) provides a natural compression on joints and promotes reduction in swelling.

The community recreation department worked with the authors to identify times the city pool would be least crowded and available for individualized aquatic exercise programs. Aquatic exercise sessions typically occurred during less crowded, “lap swim” times, middle to late afternoons. Participants were charged $5.00 per session to cover expenses (the usual pool admission fee was $1.75).

Although most participants in the program described here are referred by physical therapists (PTs) and physicians, this was not the case for the two individuals described in this case report. The two participants learned of the program through “word of mouth” or through casual conversation with the first author.

The aquatic exercise program was directed by the first author, who is aquatic therapy and rehabilitation industry certified and a Certified Therapeutic Recreation Specialist. In consultation with each participant’s PT and considering pertinent aquatic exercise literature (Koury, 1996; Arthritis Foundation, 1996a, 1996b) initial programs were designed for each participant. With improvement, more advanced and challenging programs were planned and implemented. More detailed descriptions of how aquatic exercise programs were designed, and then modified in response to improvements by the participants, are provided below.

Two undergraduate therapeutic recreation students (third and fourth authors) worked individually with each participant under the direction and supervision of the first author. The first author was present at every session. All authors completed assessments throughout the intervention periods described below. The first author conferred with each participant’s PT throughout each intervention period. In general, the PTs were cooperative and enthusiastically supported the aquatic exercise program.

Biographical and Demographic Information

Case 1: Participant with an Acute Knee Injury

GG (pseudonym) was a 16-year-old, female, high school athlete who twisted her right knee playing soccer. She felt sudden pain and was unable to bear weight. Her knee swelled.
significantly overnight. Her examination revealed large right knee effusion and knee joint laxity. GG was upset and was familiar with reconstructive surgery because an older brother had his anterior cruciate ligament (ACL) re-constructed the previous July. She was scheduled for surgery on November 19, 1997.

On November 19, 1997, an ACL reconstruction of the right knee was performed using a hamstring tendon graft for the new ligament. GG’s rehabilitation went well and early on included isometrics, stationary bicycling, and hip strengthening. She soon progressed to leg press, hamstring curls, pool activities, and stair stepper exercises. GG began treadmill walking at six weeks post-injury and returned to a running program at 12–14 weeks post-injury. She continued to do well with strengthening and progression to agilities was without problems. GG returned to playing soccer between five and six months and played well.

Between seven and eight months after her first surgery, GG sustained a twisting injury to her left knee on June 2, 1998; the knee gave out and she experienced immediate onset of swelling. She stated that there was a minor collision, she felt a “pop” and tearing sensation in her left knee with acute pain. On June 18, 1998, GG underwent an arthroscopically assisted left knee ACL re-construction, again using the hamstring graft technique. The procedure also involved a partial lateral meniscectomy. In addition, an articular cartilage injury was detected on the lateral surface of the femoral condyle. Rehabilitation was initially similar to her first re-construction therapy regimen. Throughout both episodes, GG was very motivated to work in physical therapy and return to her previous level of function.

Case 2: Participant with a Chronic Knee Condition

FF (pseudonym) was a 33-year-old female with pronounced rheumatoid arthritis localized to the right knee. The condition was traced back to the age of 15, when she reported pain, swelling, and tenderness in her toes during ambulation. When FF was 15 years old she noticed that her feet were “totally in pain” after swimming practice. Because she thought there was something wrong with just her feet she went to a podiatrist. He reassured her that “nothing was wrong.” In a few weeks both knees began to swell and hurt when she walked. At this point she and her family realized that this was more than a simple foot problem. She went to the family doctor. After completing blood tests he diagnosed the problem as juvenile rheumatoid arthritis. The symptoms continued to get worse and the next joints to be affected were in the fingers of both hands. The doctor prescribed a large dose of aspirin, which had very little effect. The pain and swelling began to interfere with many of the activities she enjoyed. For example, she had participated on the high school golf team but could no longer hold a golf club, nor could she tolerate the demanding workout necessary to continue on the swim team.

Over the years the pain and swelling in her joints varied greatly. There were some weeks and months when symptoms seemed to go away. The medication that helped most was Voltaren, a non-steroid, anti-inflammatory drug. Eventually, the joint that was most affected was her right knee. Until about three years prior to beginning the aquatic exercise program, she retained full mobility in her right knee when symptoms were in remission. However, in the three years leading up to participation in this program, the pain and swelling had not subsided. This made walking and any type of physical activity very difficult.

FF was also diagnosed with schizophrenia. She resided at a county mental health facility and worked a few hours everyday as a secretary for a local landscaping company. She was able to negotiate transportation arrangements to the community pool for the aquatic exercise program (three times per week). Her schizophrenia was well managed throughout the course of the program and was not associated with any problems with her affect or behavior. The only symptom in evidence at times was occasional diffi-
culty with concentration. Sometimes questions or instructions had to be repeated. FF’s mental illness was not a central issue during this program. Initial and continued focus was directed toward her arthritis and functional abilities related to mobility. However, as FF progressed through the program, affective outcomes emerged as equally important. This matter is discussed further below.

Case Content

Case 1

Before beginning the program, the first author consulted with GG’s PT concerning areas to focus on and any precautions that were to be observed. The PT was enthusiastic about the prospects of GG beginning the program and thought it would be beneficial for her in conjunction with other out-patient activities she was advised to complete (e.g., easy jogging). GG also completed an information summary and consent document required by the university’s Human Subjects Review Committee. The document described the program, advised her that she could discontinue participation at any time without penalty, and that she had the right to ask questions. She also completed a screening questionnaire to determine whether any latent disorders were present and to obtain an initial impression of her current swimming ability. No latent conditions were detected that indicated participation was a risk to her health. Hence, the program was initiated in late September, a little more than three months after surgery on her left knee.

GG began the program on September 30, 1998 and was terminated when outcome measures reached asymptote on December 2, 1998. Generally, GG attended the aquatic exercise program three times per week for about 45 minutes per session. A total of 27 individual sessions were completed over the September 30 to December 2, 1998 time period.

Early programs were designed to work joints above (hip) and below (ankle) the knee, forcing GG to contract muscles necessary to hold the knee in a static position (i.e., knees in a “locked” position). Initial programs consisted of about 20 minutes of shallow water activities at neck to waist depth, including: various walking patterns (e.g., forward, backward, tandem, side step, etc.), non-resistance exercises at the knee, hip, and ankle (e.g., hip abduction and abduction, lunges, quarter squats, toe raises/heel rocks, ankle range of motion, etc.), and supported cycling movements in the corner of the pool. Short periods (two to four minute intervals working up to ten minutes) of swimming without leg kick, and with the aid of a flotation belt, were introduced within the first two weeks of the program, according to GG’s ability to tolerate activity. Early on, deep water exercises consisted of 10 to 15 minutes of stride walking and forward cycling with the aid of a flotation belt.

As GG improved, intermediate programs continued many of the exercises introduced in early programs, but added more challenging exercises in shallow water (e.g., half squats) and the use of resistance bands in some exercises. Movement at the knee was added to shallow water exercises; for instance, flutter kicking while using the edge of the pool for support was introduced at this point. Stride walking in deep water was continued as per early programs, but the intensity of effort was increased. Early programs included slow stride walking in deep water for five minutes; whereas, stride walking intensity was increased in intermediate phases by having GG complete five to seven sets of intervals of fast-slow walking (30 seconds fast, 30 seconds slow). Abduction and adduction movements of the lower extremities while suspended in the deep water were added as well.

Further improvement led to more advanced programs, which included exercises designed to improve proprioception (joint sense) about each knee, aggressive kicking in the water (e.g., punt kicking in chest deep water), different walking (e.g., braiding), and running patterns. Ballistic, plyometric exercises were also added cautiously and in consultation with the PT to determine GG’s readiness for incremental effort. In deep water, GG started 5 to 10
minute intervals of floatation-suspended running. She tolerated all of these increments in physical intensity well. As data below will show, strength about her knees was improved at a rapid rate.

In the final phase of the program, more plyometrics and sport simulated activities in knee deep water were added. For instance, GG walked and then later ran intervals in the “kiddy pool,” which contained knee-deep water. In deep water, the amount of time GG was asked to run was increased to 10 minutes; resistance was also added to her running efforts in deep water. By this point in the program, GG was running regularly outside, lifting weights, and beginning to practice indoor soccer skills. Hence, the progress observed in the pool was mirrored in her land-based sport and exercise activities.

Assessments and evaluation for Case 1. Selecting proper assessments proved to be a challenge. Even in the presence of a significant joint injury, because GG was fit, athletic, and young, she could easily perform many customary physical assessments used with middle-aged and older adults. For instance, she was able to balance on one foot for 60 seconds with no difficulty, on her very first attempt, using either lower extremity. Static balance is a typical assessment used with middle-aged and older adults who have degenerative joint disease or other chronic conditions that contribute to mobility impairment. Assessment of self-perceived pain using a visual analog scale (15 cm.) adapted from the Health Assessment Questionnaire (Ramey, Raynauld, & Fries, 1992) also proved to be unproductive insofar as her pain was well-managed and apparently under control from the onset of the program. Assessment of GG’s pain before and after sessions was continued on a routine basis to monitor for any spikes that might contraindicate participation in the program on a given day, or that might indicate too strenuous a workout on a particular day. Neither of these observations were apparent at any time over the course of the program. Using time for swimming four laps of 25 yards each was also a problematic assessment because GG’s upper extremity strength was above average. GG used her shoulder and arm strength to compensate for any weakness associated with her lower extremities as a result of her injuries and surgeries.

The assessment that was most sensitive to knee fitness focused performance on the knee joint—timing a single lap “swim” of 25 yards holding a kickboard. Using a kickboard required that GG propel herself the length of the pool using effort from only the lower extremities, specifically effort produced at the knee in forceful flexion and extension (i.e., “flutter kicking”). A second assessment that showed potential for improvement was range of motion at the knee. This measure was taken periodically for knee extension using a goniometer.

Results for Case 1. For both cases, most of the data are displayed visually for examination. Graphed data provide a visual history of each participant’s experience while in the program. Visual inspection of the figures reveals the amount and direction of change in outcomes over the course of the intervention. Although lines were plotted to the data to reveal trends more clearly, and statistical equations were presented to respond to “goodness of fit” concerns, neither are necessary to understand the results. Simply stated, the figures help the reader “see” changes associated with the interventions for each participant.

For Figure 1 and all subsequent data displayed visually, lines were plotted for the data to demonstrate trend in performance more clearly. Linear, second, and third order polynomial equations were used to identify trends in the data. Linear trends resulted when the performance improved consistently over time/trials. Second order polynomials were the most frequent trend anticipated because a line with a single curve will usually fit learning or treatment effect data well (i.e., improvements will taper off at the end of a program as participants near their best possible perfor-
FIGURE 1. GG'S RANGE OF MOTION: LEFT KNEE EXTENSION.

Figures 1 and 2 pertain to the outcomes of the aquatic exercise program for GG. Figure 1 represents the trend in improvement in extension\(^1\) (range of motion) in the most recently repaired (left) knee. The data plotted in Figure 1 revealed clear and consistent improvement in extension at the knee, with terminal trials of normal or near-normal values. The best fit for the data in Figure 1 was a second order polynomial ($R^2 = 0.81$), which indicates asymptote in performance near and at the end of the program.

\[ y = 28.771 - 2.8039x + 8.5318e^{-2x^2} \quad R^2 = 0.809 \]

\(^1\) The normal range for extension at the knee is between zero and ten degrees, with zero representing the neutral starting position for the knee in complete extension (i.e., "knees locked").
Figure 2 displays data for the 25 yard kickboard performance for GG. A trend similar to that observed in Figure 1 was evident. A second order polynomial ($R^2 = 0.97$) proved to be the best fit to the data and again indicated an asymptote of the treatment effect. In fact, the asymptote in performance, and consultation with GG to determine her readiness to move on to normal activity, were used to signal the appropriate time to terminate the program. Data in Figures 1 and 2 led the authors to conclude that the intervention was successful in bringing about improvements in GG's knee function necessary to resume participation in an active lifestyle.

**Case 2**

FF began the program February 22, 1999. As with GG, FF completed a screening questionnaire to determine if latent disorders were present and to assess swimming skills. She also completed the university's Human Subjects consent form. Like GG, she was made aware of her rights as a research participant. After securing informed consent and reviewing the screening questionnaire for secondary
disorders or health problems, FF began participation in the program.

Consultation with her PT occurred later than for GG, primarily because the researchers were not immediately made aware that FF was involved in an active physical therapy program. Shortly after beginning the aquatic exercise program, FF decided to change PTs. At this time FF’s new PT was contacted and asked for advice concerning contra-indicated exercises and activities in the water. In addition, the PT was contacted for advice periodically throughout the time-period covered by this report, and to share information pertaining to the participant’s progress.

FF’s progress was slow compared to that of GG, owing primarily to the fact that rheumatoid arthritis is a chronic condition rather than an acute problem that may be repaired by surgical intervention. Beginning on February 22, 1999, FF attended three times per week for about 45 minutes per session. FF’s participation in the program continues as of this writing, but the information contained within this paper presents data secured from the period between February 22 and August 20, 1999. A total of 62 sessions were completed by FF, with very few absences. Periodic breaks were taken during university recesses, a total of four weeks were skipped as a result. FF was very compliant and seemed to look forward to the program. Her mood was usually “up-beat” and enthusiastic when participating in the program.

Arthritis Foundation sources (1996a, 1996b) were consulted in designing FF’s initial program. The initial program time was about equally divided between shallow and deep water exercises, at 20 and 25 minutes respectively. FF began each session with forward, backward, and side-step walking. This was followed by hip abduction/adduction and leg lunges. FF was asked to complete an ankle range of motion series. Stretching exercises and “bicycling” movements in the corner of the pool completed the shallow water portion of the program. Most shallow water exercises were performed in neck to chest deep water.

Deep water exercises were completed using a floatation device that allowed FF’s lower extremities to be suspended directly under the torso. FF typically did strides, hip circles, ankle circles, deep water stretches, ankle alphabet, and relaxation while suspended from the floatation device. Without exception, deep water activities were of an open-chain variety (i.e., the extremity is free of weight bearing or resistance other than that of the water).

Shortly after beginning the program, one of the co-authors challenged FF to a one lap swimming race. FF won the race and seemed pleasantly surprised by her accomplishment and by her ability to swim. This event represented a breakthrough because FF was asked if she would like to swim some laps on a regular basis. Usually FF consented to swim and progression was noted over the course of the study. In fact, time to swim laps became one of the most useful assessments of FF’s progress. As the number of laps FF was asked to complete increased, she was encouraged to walk all or a portion of a lap if she tired. Walking time was included in her timed performance. Hence, an outcome measure emerged from FF’s interest in swimming and her satisfaction with her performance.

Because FF did not progress at a rate comparable to that of GG (see results of the program intervention below), the program did not change significantly throughout the time period covered in this report. One of the few significant changes apparent in FF’s program was the distance she swam and time set aside for swimming; by the end of the study FF was swimming (and walking) 12 laps of a 25 yard pool. At the end of the data collection period, FF’s program was as follows: walking patterns to warm-up (similar to those above), calisthenics and stretching in neck to chest depth water, and swimming 12 laps before moving to deep water for a routine almost identical to the one described above. Because of FF’s slower progress, the first author consulted with her PT again. They decided that promoting overall fitness would be a program focus, added to the goal of improving integrity and mobility of
FIGURE 3. FF’S TIME FOR 25 YARD SWIM.

FF’s right knee. Accordingly, exercises to improve abdominal strength were added and resistance bands were used with some exercises to improve lower extremity strength. FF was also encouraged to continue to challenge herself by adding length to her swim during each session. If her overall fitness improved, FF would likely be able to handle her affected knee better. Swimming, of course, figured prominently in this modified focus for FF’s program.

Assessments and evaluation for Case 2. The authors were also challenged to find appropriate assessment methodologies for FF. Unlike GG, however, measures of FF’s improvements were more difficult to judge because of the chronic nature of rheumatoid arthritis. The immobility of FF’s right knee in particular affected her performance on a host of assessments. Hence, data displayed in Figures 3–5 did not show dramatic improvements. However, verbal reports from FF indicated that she looked forward to the program, believed that her knee felt better, and her mood improved following each participation.

Because of the small improvements in physical performance measures (see below), and the observation that the program may have
produced serendipitous affective benefits, alternative methods to assess FF’s affective response to participation were explored.

On June 7, FF was asked to complete the Leisure Diagnostic Battery—Version B (LDB-B) to gain insight into the affective aspects of her participation (i.e., perceived freedom in leisure). FF’s responses to the items on the LDB-B were uniformly positive. A second administration of the LDB-B on August 4 revealed a similar response pattern. FF may have responded favorably because she liked the authors working with her, reflecting social desirability (e.g., halo effect, Hawthorne effect) and not her genuine feeling about leisure.

To gain greater insight into FF’s feelings, a variety of qualitative assessment techniques were used. First, FF’s responses to the LDB-B were used as a point of departure for an interview on June 14. The items on the LDB-B were used as points of discussion; FF was asked to explain how she felt about each item relative to her leisure and to explain her responses to each item. Although her responses offered only a little insight into how she felt about her leisure experiences and the program in particular, some of her more relevant comments were included in
FIGURE 5. **FF’S BALANCE ON HER RIGHT FOOT.**

the next section. FF’s responses revealed that she enjoyed other recreational pursuits, including shopping, meeting friends, reading, and swimming in her family’s pool (something she did occasionally before beginning the aquatic exercise program).

In addition, the third author kept a journal of her interactions with FF during most of the program. Some entries provided insight into the affective nature of FF’s participation and are included below. In a final attempt to identify the affective benefits of her participation in the program, FF was asked to write a response to the following query in her own words: “What do you like about the aquatics program and swimming?” Her response is described below.

**Results for Case 2.** Quantitative data revealed three distinct patterns of performance, an oscillating pattern, an asymptote pattern, and a linear pattern. Each pattern of performance suggested different conclusions about the effectiveness of the intervention. In addition, data for self-perceived pain before and after daily sessions were gathered through the use of a 15 cm. visual analog scale (Ramey et al., 1992) and are reported below as means and standard deviations.
Third order polynomials provided the best fit line to the range of motion data for right knee (extension and flexion), although the explained variances for extension ($R^2 = 0.55$) and flexion ($R^2 = 0.18$) were not remarkable. Figures for the range of motion data were not included because no clear pattern of improvement was evident. Neither extension nor flexion of the affected knee approached normal values.

The range of motion data may have reflected normal variability attributable to daily, weekly, or seasonal fluctuations in joint mobility among persons with arthritis. In addition, more aggressive physical therapy may have resulted in increased soreness periodically.

Figures 3 and 4 revealed a trend that was consistent with those expected if improvements were associated with participation in the intervention program. Both time for a single lap, 25 yard swim, and time for a 12 lap swim (FF was encouraged to walk when she was too fatigued to swim) showed a clear “learning”/treatment effect. Improvement was linear in both cases until near the end of the intervention. Once performance leveled off in the 25 yard swim (around sessions 25–35), the authors searched for another measure more sensitive to endurance rather than short-term, ballistic swimming performance. They selected a longer (12 lap) swim for this reason, and because they wanted to encourage FF to “re-discover” swimming as a lifetime leisure activity.

However, as the data clearly showed, the 25 yard swim ($R^2 = 0.84$) proved to be more sensitive to detecting performance improvements than the 12 lap swim ($R^2 = 0.37$). In fact, performance in the 12 lap swim varied little; this is reflected in the poor fit of the second order polynomial to the 12 lap swim data. A linear solution to the data probably would have accounted for more variance had it not been for the single outlier performance evident in Figure 4.

The best explanation for the 25 yard swim measure’s superiority as an indicator is related to fatigue. Because FF had been a competitive swimmer, she was able to use her upper body to propel herself more efficiently than the average recreational swimmer. Hence, she could perform well over a short distance by relying largely on her upper body strength and conditioning, which she seemed to re-acquire quickly once she started swimming every session. The virtual absence of change in FF’s 12 lap swim performance (discounting the outlier) also supports this explanation. Likewise, observation of FF’s mechanics during the 12 lap swims indicated minimal use of the right lower extremity for propulsion (i.e., very little “kicking”).

Figure 5 provided a view of perhaps the most encouraging data related to physical performance—balance on the right foot. A linear solution fit the data best, although it did not account for as much variance as hoped for ($R^2 = 0.43$). By the end of the program reported here, FF was able to balance for about 20 seconds on her affected extremity. This represented a considerable improvement compared to measures taken earlier in the program.

Balance is a function of both strength and proprioceptive mechanisms. Both of these mechanisms likely accounted for FF’s improved balance, although only the former may be attributed to the present intervention. Improved strength in the lower extremity allows for stability during static balance, and for the moment to moment corrections necessary to save balance when it is disrupted. Proprioceptive learning probably also came into play because when clients perform repeated balance trials, they likely “educate” proprioceptive mechanisms and “learn” how to balance better. Unfortunately, the present data do not

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2 Normal value for flexion at the knee is about 135 degrees.

3 Typically, FF would have to walk one and one-half laps of the total 12 lap swim.

4 Proprioceptive mechanisms include joint receptors, vision, and the semi-circular canals of the inner ear.
allow for partitioning of these explanations according to strength improvement versus proprioceptive learning.

The final quantitative measure was perceived pain "before" and "after" daily participation in about one-third of the 62 sessions FF completed. No figure was used to support the narrative report here because the data varied considerably (perceived pain before entering the water M = 6.71 ± 1.93, perceived pain after emerging from the water M = 3.67 ± 1.78), and because none of the linear or polynomial solutions accounted for a satisfactory amount of score variance. In general, FF's pain "before" scores of five to nine early in the program declined to scores of four to six several months subsequent to program initiation. Little change was observed in FF's estimates of her pain "after" each session, ranging from scores of two to five early in the program to a range of two to four several months after beginning the program.

Hence, the data for self-perceived pain were inconclusive. The data were consistent with FF's verbal reports of "feeling better" after each session. However, several competing explanations urge cautious interpretation of the self-perceived pain data. First, FF could see her "before" response to the visual analog scale at the time she indicated her self-perceived pain after sessions, providing good reason to believe responses may not have been made independent of one another. Second, as with responses to the LDB-B (detailed below) FF may have been subject to social desirability effect (e.g., halo effect, Hawthorne effect).

Qualitative data were gathered by debriefing FF after she completed the LDB-B by asking her to explain her responses. Her responses to the queries followed along several themes. First, she was very complimentary of those who worked with her. Second, the social group she mentioned most in her qualitative responses were the authors. Third, she stated several times that she enjoyed the interactions and experiences that were part of the aquatic sessions, and that she liked to "joke around" with the authors. Otherwise, she echoed the theme of each item without elaborating on the substance of the item.

Another qualitative data source was a journal maintained by the third author. It also revealed how much FF valued the social interaction and atmosphere that surrounded aquatic program participation. She especially valued co-participation on the part of the third author, evident in the following journal entries by the third author:

(4/21/99) "The client seemed happy that I was going to swim with her today. It appeared to play a large role in her motivational level and her enthusiasm."

(4/28/99) "As promised, I swim with the client again today. She improved her timed swim... from the previous assessment on 4/14."

(6/23/99) "The client was happy to see I was swimming with her. This motivated her to swim her laps very well. She completed 12 laps without stopping to walk once. The client becomes very talkative, more so when I am swimming with her. She enjoys the interactions that we share during the session and is more interested in the exercises."

FF also responded well to attention, as journal entries again bear out:

(5/10/99) "She displayed good high knee [during bicycling exercises] when we gave her verbal praise. It appeared that she enjoyed being rewarded for her hard work."

(6/16/99) "Today was my first day back in awhile. The client seemed excited to see me... By her performance in the water, you could see she was trying to show me how much she had improved during the time I was away. She asked many times if I thought she looked better in the water."

In an effort to gather FF's self-report regarding the quality of her experience in the program, she was asked to write an answer to the following: "What do you like about the aquatics program and swimming?" She responded as follows:

As I jump into the cool pool I ponder the exercises I will be doing. My knee is
slightly sore from the rheumatoid arthritis I have had since I was 17 years old. I am now 33. The water is refreshing and I look forward to swimming laps and doing range of motion exercises. The first exercise I do to warm up is walking across the pool. I walk two laps forward, two laps backward, and two laps side-stepping. I feel a little warmed up after these exercises and am ready to move on to the range of motion exercises. I then do exercises where I bring my leg forward then back, stretch, and do tracing. My knee is beginning to feel better. I then swim 12 laps which leaves me slightly tired, but in a good way. The swimming seems to help my mood as well as my arthritis. [Author’s name] times me on my lap swimming and I usually stay around the same time. I then go to the deep end of the pool. I use what [author’s name] calls the “noodle” to help me float. I also own a noodle which [author’s name] gave me for my birthday. I then go to the middle of the deep end and do flutter kicks and strides. I then work on stomach muscles where I bring my legs up, out, together, and then down. My knee is feeling better. I then hold on to the side of the pool and do bicycling, which stretches out my knee. By the time I have completed my exercises I feel refreshed and have a lot less pain.

I have always loved to swim. Ever since I was a kid in the [city name] Swim Club, going to the university swim camp, to high school swim camp, to high school swim team, I never got tired of being in the water. I raced against a total of 50 people once and got second place. Oh well!! I have a box of medals and ribbons and a couple of trophies. When I heard that [author name] was going to teach a class for people with arthritis in the water I knew it was the perfect thing for me. The water makes my joints feel a lot better. I can go in the pool and be in a substantial amount of pain and come out feeling much better. The water is soothing. It is easier to move in the water than on dry land. There is something about being in the water that seems to take stress away and lets me move in ways I can’t on land. Swimming laps in the pool is good for my cardiovascular system, helps loosen up joints and leaves me with a good feeling when I am done. The range of motion exercises help loosen up my affected knee and helps me get used to being in the pool. Ever since I was a kid swimming has been for me. I am thankful that I found someone who can help me get better doing something I love.

Taken separately, the qualitative data revealed only fragments of the nature of FF’s experience in the aquatics program. But taken collectively, they provided considerable insight into the experiences that FF seemed to value in the program. These included casual conversation and banter with the authors, acceptance by the authors (and pool staff) as a person one could “joke around with,” and occasionally sharing participation with the authors. These environmental and interpersonal features were associated with FF’s frequent expressions of enjoyment and satisfaction with the program, despite her minimal improvement in functional performance indicators (see above).

Authors’ Comments and Implications

Based on the outcomes for the two clients described here, the authors concluded that the aquatic exercise program was both feasible and effective. The program was delivered at a municipal recreation center pool during normal operating hours, with no special provisions or accommodations for persons with disabilities. Assessment of the physical infrastructure needed to deliver the program would likely change if the
number of clients served at one time grew to more than three.

Compliance for both GG and FF was very high. Both were very motivated to participate and improve. Although each young woman aspired to different program goals, the program seemed to be responsive to both a relatively acute knee problem, in the case of GG, and a more chronic knee problem, in the case of FF.

Likewise, in both cases, finding the appropriate assessment measures was a struggle. Even with the advice of the co-operating PTs, searching for practical and valid field measures for functional abilities related to the program continued throughout most of the program for each participant. Many of the measures used were not sensitive enough to detect changes in FF’s performance, or not challenging enough to be valid for a more fit individual, such as GG. Fortunately, experimentation with assessments did reveal several useful measures.

The program was effective for both individuals served, but in different ways. For GG, the determination of the program’s effectiveness was a straightforward matter of inspection of functional improvements, with cross-validation through self-reported improvement in other activities (e.g., jogging) and consultation with the attending PT. By December, 1998, GG and the authors came to the same conclusion—she had improved significantly and was ready to move on to more rigorous, land-based training. GG was advised to continue to work in the water on her own after cessation of the formal program.

Determining whether the program was effective for FF was not a straightforward matter at all. In fact, if the same criteria used for GG were applied to FF, the authors might have concluded that the program was not very effective at all. Like the case of GG, FF presented some measurement challenges, not because of her fitness, but because of the chronic nature of her arthritis. Functional improvements were not dramatic, and sometimes improvements were equivocal.

However, other qualitative data sources were considered as the meaning of FF’s participation revealed itself. The qualitative data were slow in emerging and often revealed only small “windows” of access into the psychology of participation-related rewards that FF might be experiencing. Several attempts at subjective data collection were partially successful and provided reason to persist. A breakthrough came when FF was asked to complete a short essay about the aquatics program and swimming. Her description of her feelings verified that activities in the water represented a meaningful and personally satisfying experience. This was not the original intent of the program, but this is where the participant’s responses pointed as she slowly revealed her impressions of her experience. The present results suggested that, in some cases, more qualitative outcomes deserve attention when employing aquatic techniques.

FF’s case drew attention to Richter and Kaschalk’s (1996) remark that therapeutic recreation specialists may function as “existential therapists,” helping their clients to find meaning and to make sense out of their lives. Richter and Kaschalk’s interpretation of therapeutic recreation has relevance to the case of FF. Clearly, swimming and the other activities in the water represented meaningful experiences for her.

Two perspectives seemed pertinent to interpreting the meaning ascribed to aquatic activities by FF. The first is symbolic interactionism. The [personal] meaning that an activity holds for the participant is a function of the person’s own interpretation of the experience (context, action, and events) as well as the person’s interpretation of how others see them (Samdahl, 1988; Shaw, 1985). Samdahl further maintained that the participant’s interpretation of those contexts and events may serve as a source of freedom or constraint on subsequent actions.

Samdahl’s (1988) data suggested that when a person was excessively influenced by perceived interactive role modifications (i.e., what the subject thought others expected) the
result was that the individual increased “self-objectification” (i.e., portraying the self in anticipation of other’s judgments). When Samdahl’s participants evaluated situations as “leisure” they characteristically reported that interactive role modifications were low and they were less influenced by the expectations of others. Samdahl further concluded that “(w)ith the combined effect of reduced role constraint and reduced self-objectification, leisure should offer an increased opportunity for true self-expression” (p. 30).

The conclusions of Samdahl (1988) within the context of symbolic interactionism helped with the interpretation of FF’s self-expression through her aquatic experience. Several environmental manipulations were consistent with a symbolic interactionist interpretation of FF’s case. Throughout the course of the sessions, FF was usually given a choice of how many laps she wanted to swim, minimizing the constraint of others’ performance expectations. Supplemental feedback was also provided across sessions as her swims became longer, assuring her that if she walked some of the time it was “OK” because the idea was to complete the number of laps and not to worry about the time. In a sense, the therapeutic recreation specialist helped her define “success” through the use of augmented feedback. Lastly, FF articulated her self-defined (meaningful) role as a ‘good swimmer’ (see FF’s short essay above), and the aquatic experience allowed FF to validate this perception of herself.

FF’s self-perceived role as a “good swimmer” may also be interpreted as a method of seeking continuity, similar to research on the post-injury adjustment of patients with spinal cord injuries (SCI; Lee, Dattilo, Kleiber, & Caldwell, 1996). Lee and his colleagues maintained that one of the primary adaptive tasks of their participants with SCI was represented by varied attempts to transcend impairment by seeking continuity with their previous leisure lifestyles. Lee et al.’s participant observer methodology identified different adaptive styles prevalent among 20 participants with recent SCIs. Three styles emerged of negotiating the meaning of activities to establish continuity with a previous leisure lifestyle: (a) seeking continuity, an emerging awareness of possibility; (b) establishing a sense of continuity, experiences of a “near likeness” to a pre-injury leisure pursuit; and (c) accommodating for continuity, modification of activities to attain continuity.

Much of the qualitative data surrounding FF’s aquatic experiences implied a type of “continuity.” Because she actually participated in the activity with only a few adaptations (e.g., walking when she became tired while swimming laps), the meaning of continuity for FF represented Lee et al.’s (1996) second typology of ascribing meaning to continuity—“establishing a sense of continuity.”

If an illness disrupts a person’s life to the extent that they must alter their “life story” (Lee et al., 1996), then a crisis of meaning ensues. Past, present, and future lives are disrupted. Social-psychological healing, from this perspective, requires that the affected person re-establish continuity between the past, present, and future. “The sense of being able to participate in previous activities appeared to connect participants’ past, present, and future lives” (Lee et al., 1996, p. 219).

Swimming during the aquatic exercise program probably felt very similar to FF’s swimming before diagnosis of her impairment. Hence, leisure (aquatic exercise and swimming in this case) may have served as a bridge over time to transcend impairment-related limitations for FF. That is, swimming felt like it had always felt, it felt familiar, practically the same as before. People interacted with “me” in a way that they had before the impairment.

While these explanations are very tentative and certainly in need of replication, the results provide good reason to look past one-dimensional results in delivering aquatic exercise programs to persons with disabilities. Aquatic exercise programs hold the promise to lead to other improvements, besides those seen in physical function markers. Researchers and practitioners should look to psychological di-
dimensions and qualitative measures for improvement as well.

**Post-script**

GG showed greater (physical) functional improvement of the two participants reported here. Subsequent to ceasing the program, GG returned to play high school soccer, but sustained a third knee injury. GG did not swim or participate in aquatic activities again after her program’s completion in December of 1998. FF did not demonstrate nearly the functional improvement of GG; but FF continues to swim (sometimes on her own) and participates three times per week in the aquatic exercise program as of this writing.

** References**


