Aquatic Therapy: A Viable Therapeutic Recreation Intervention

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This paper presents a review of the literature concerning the effects of aquatic therapy utilizing swimming and exercise activity to improve function. Based on the literature, aquatic therapy appears to have numerous psychological and physical benefits. Research studies support the belief that participation in an aquatic therapy program can provide individuals with a realistic solution for maintaining physical fitness and continuing to achieve rehabilitation goals while engaging in enjoyable leisure pursuits. Implications of aquatic therapy to leisure generally and therapeutic recreation more specifically are highlighted.

KEY WORDS: Aquatic Therapy, Swimming, Water Exercise, Therapeutic Recreation

Aquatic therapy, utilizing swimming and exercise activity to improve function, is believed to have beneficial consequences for physiological and psychological well-being (Campion, 1990; Davis & Harrison, 1988; Hurley & Turner, 1991; Skinner & Thomson, 1989). Hurley and Turner (1991) suggested that for many individuals with disabilities the buoyancy as well as the increased resistance and warmth of water creates an environment for exercise which is more conducive to achieving treatment goals than exercise conducted on land. In addition, exercise achieved through aquatic therapy may improve functioning of all major muscle groups without the impact that is unavoidable in land based physical exercise (Campion, 1985).

Physiological improvements achieved through involvement with aquatic therapy have been documented in studies of individuals who have multiple sclerosis (Gehlsen, Grigsby, & Winant, 1984), cystic fibrosis (Edlund, 1980), arthritis (Danneskiold-Samsoe, Lyngberg, Risum, & Telling, 1987), orthopedic impairments (Skinner & Thomson, 1989), cerebral palsy (Harris, 1978; Smith, 1985) and asthma (Haung, Veiga,
Sila, Reed, & Hines, 1989). Furthermore, psychological benefits of participants in aquatic therapy have been identified to include improved mood (Berger & Owen, 1992; Berger, Owen, & Man, 1993), enhanced self-esteem and body image (Benedict & Freeman, 1993; Wright & Cowden, 1986), and decreased anxiety and depression (Stein & Motta, 1992; Weiss & Jamieson, 1989). In addition to physiological and psychological benefits, aquatic therapy may promote the development of swimming as a lifetime leisure skill which helps maintain health and contributes to happiness (Beaudouin & Keller, 1994; Johnson, 1988; Peganoff, 1984; Smith, 1992; Tsukahara, Toda, Goto, & Ezawa, 1994).

Although various issues abound in the general area of aquatics, from concerns regarding water temperature (Campion, 1990; Franchimont, Juchmes, & Leccomte, 1983) to qualifications of practitioners using the aquatic medium in therapy (Campion, 1990; Smith, 1992), the general consensus reported in the literature is that aquatics is a viable medium that has potential to enhance quality of life for people with disabilities. Based on the findings reported in the literature, aquatic therapy appears to be an intervention that can be used by therapeutic recreation specialists to promote psychological and physiological improvement while facilitating independence in swimming and water exercise.

This paper begins with a definition of "aquatic therapy" and the issue of swimming as therapy as discussed in the literature. Subsequently, physiological, psychological, and leisure activity implications are addressed. Implications for aquatic therapy delivered in community settings by therapeutic recreation specialists are presented as well. The paper concludes with recommendations for the practice of therapeutic recreation.

**Description of Aquatic Therapy**

Aquatic therapy has a long-established and documented history. People have sought the restorative properties of spas, warm baths and the sea since the 5th century BC. Greeks and Romans recognized the value of the warm water as an adjunct to their sporting activities and aquatic activity for rehabilitation of individuals with paralysis (Campion, 1990). More recently, aquatic therapy has been provided in the United States in swimming pools and therapeutic pools since World War I (Reynolds, 1976). Aquatic therapy has been described as activity in the water based on hydrodynamic principles for therapeutic purposes (Campion, 1990). The literature concerning use of water as a medium for therapy has been written by various individuals practicing in aquatics, including therapeutic recreation specialists, physical therapists, occupational therapists, massage therapists, physiotherapists, medical doctors, sport psychologists and exercise physiologists.

Aquatic therapy (Johnson, 1988), hydrotherapy (Campion, 1990), water therapy (Smith, 1992), swimming therapy (Campion, 1990), water exercise (Danneskiold-Samsøe, Lyngberg, Risum, & Telling, 1987) and water physiotherapy (Smith, 1992) are some of the phrases used in the literature describing the use of the water for therapeutic benefits. The term "hydrotherapy" is presented primarily in literature published in Great Britain and "aquatic therapy" seems to be the dominant phrase used in the United States. For the purpose of this paper, the phrase "aquatic therapy" is used to include water exercise and swimming as modes of prescribed activity used as rehabilitation/habitation to achieve goals of improved physiological, psychological, psychosocial and/or life activity function under the supervision of individuals qualified and competent in its techniques and utilization. Therapeutic recreation specialists should be familiar with intervention strategies and benefits of aquatic therapy. An understanding of the potential of aquatic therapy to enhance an individual’s leisure lifestyle may be useful in justifying treatment programs.
The techniques of aquatic therapy vary. Some popular interventions include Bad Ragaz (Boyle, 1981) (employing the principles of proprioceptive neuromuscular facilitation using active and passive techniques for strengthening, muscle re-education and trunk elongation); Watsu (Dull, 1993) (applying the moves of Zen Schiatsu to facilitate decreased tension and improved psychological well being); deep and shallow water ambulatory exercise and therapeutic swimming commonly implemented using the Halliwick Method (Campion, 1985) or Sequential Swim Techniques (Carter, LeConey, & Dolan, 1994) which inherently facilitates normal patterns of movement and posture (Neurodevelopmental Treatment). The use of passive or active water exercise and swimming as therapeutic media are technical processes that require the ability to teach swimming as well as understand the hydrodynamics of the water and the implications and contraindications associated with use of the water for therapy (Association of Swimming Therapy, 1992).

Although swimming is considered to be a component of aquatic therapy in this paper, for some individuals it is seen as a recreation activity not in the realm of aquatic therapy (Davis & Harrison, 1988). Some practitioners consider aquatic therapy as limited to passive or active exercise techniques in the water, while Campion (1985) and others believe that swimming is an integral part of aquatic therapy, and is essential to the overall rehabilitation of some individuals. Numerous examples of the benefits of swimming when used in aquatic therapy are presented in the literature (Bar-Or & Inbar, 1992; Benedict & Freeman, 1993; Edlund, 1980; Haung et al., 1989; Johnson, 1988; Langridge & Phillips, 1988; Peganoff, 1984). Thus, as suggested by Campion (1990), swimming is a critical aspect of aquatic therapy because of its potential to be adopted as a life-long leisure and fitness activity.

Physiological Implications

Although techniques such as Watsu, and Bad Ragaz are discussed in the literature, swimming and non-swimming water exercise were the only mediums found to be examined in the research literature. The physical benefits of activity performed in the water may include relief of pain (Guillemin, Constant, Collin & Boulangre, 1994; Langridge & Phillips, 1988; Woods, 1989), decreased spasticity and increased relaxation (Davis & Harrison, 1988), improved bone density (Benedict & Freeman, 1993; Tsukahara et al., 1994), improved pulmonary function (Haung et al., 1989; Whiteley & Schoene, 1987), strengthened muscles (Gehlsen, Grigsby, & Winant, 1984), improved endurance (Burke & Kennan, 1984; Danneskiold-Samsoe, Lyngberg, Risum, & Telling, 1987; Edlund, 1980; Edlund et al., 1986; Routi, Troup, & Berger, 1994; Wright & Cowden, 1986), and improved range of motion and increased circulation (Peganoff, 1984). The following is a review of articles describing the physical benefits of aquatic therapy.

Decrease Pain

Although water exercise and swimming are commonly mentioned as recommended forms of treatment for lower back pain (Campion, 1990; Johnson, 1989; Levin, 1991; Meyer, 1990; Siracusano, 1984; Skinner & Thomson, 1989), it is a treatment modality which has limited scientific research basis and reports in the back pain literature. One study conducted by Guillemin, Constant, Collin, and Boulangre (1994), assessed the effects of spring water treatment on chronic low-back pain by comparing a randomly selected group of 50 people undergoing an aquatic therapy program to 52 randomly selected people not receiving aquatic therapy. After three weeks (6 X week), the people in the aquatic therapy group reported a reduction in their daily duration of pain, pain intensity and drug consumption, and showed significant improvement over the
control group in their spine mobility and functional score on the Waddell index (Waddell & Main, 1984). The Waddell index is a self report questionnaire designed to assess an individual’s ability in nine daily life activities including lifting, sitting, traveling, standing, walking, sleeping, social activities, sexual activity, and foot wear. The long term effect assessed after nine months showed that, although participants in the aquatic therapy group maintained reduced levels of pain and drug consumption and an increase in spine mobility over the control group, the functional score reported on the Waddell index returned to the original level. The authors concluded that aquatic therapy, if used as a therapeutic medium for people with chronic pain, may have positive short term and moderate long term effects on chronic lower back pain. The authors suggested various factors that may contribute to the effectiveness of the aquatic therapy. First, warm spring water is thought to have therapeutic effect in hydrotherapy. Second, the authors suggested the positive effects of the program could have been because of the change in lifestyle during the program. Finally, the authors concluded that aquatic therapy is beneficial because it occurs in an environment that is physically nonthreatening, thus leading to participants’ relaxation and less guarded movement.

An earlier study by Woods (1989) investigated the use of aquatic therapy using prescribed exercise and modified swimming strokes to improve strength, range of motion and in the reduction of pain. Eighteen people who sustained a lumbar/sacral strain or had received lumbar laminectomies for ruptured discs participated in the study (3 × week at no greater than 1 hour each session) for six weeks. The mean age was 39 years with two of the participants being female. Statistical analysis to determine whether any change occurred in either functional ability or pain reports over the course of the treatment was performed using a two-by-two chi-square test. Each participant was assessed pre- and post-treatment with participants serving as their own controls. The Functional Ability Assessment Checklist indicated an improvement in functional ability (p <.01). The Functional Ability Assessment Checklist was developed for this study to test flexibility and strength of the trunk extensors, trunk flexors and lower extremities. Pain was assessed using a portion of the McGill Pain Questionnaire that denotes the intensity of perceived pain (Melzack, 1983). No change was noted in the self report pain levels. Thus, no statistical relationship existed between self-reports of pain and functional capacity for the participants. The author stated that the findings support a contention that reliance upon pain reports alone to determine readiness for the resumption of occupational or leisure activities is not judicious. Nevertheless, the non-experimental design of this study prevents generalization of results.

To further assess group hydrotherapy for participants with chronic back pain Langridge and Phillips (1988) monitored subjective pain levels and quality of life of 27 participants in a group aquatic therapy program. Ages were clustered around 41 to 60 years. Attendance ranged from 4 to 33 sessions in a six month period. Prior to and after each session, each participant completed a visual analog pain scale expressing pain level. Pre-post questionnaires included information on physician visits, quality of life, medication use, ease of work and general pain level. Overall results of the subjective visual analog scores showed a diminution of pain for the participants (p <.001) while 11% expressed an increase in pain. Eighty one percent reported an improvement in pain before and after each aquatic therapy session, while 15% found that pain increased immediately after each aquatic therapy session. Ninety-six percent showed improvement in their quality of life (p <.001) and sixty-seven percent showed a decrease in private medical cost. None of the participants showed an increase in the number of drugs taken for back pain and 44% showed a decrease in the amount of drugs taken. Caution in interpret-
ing these results is advised since only a few participants were used and methodological rigor was not employed. However, implications of the study are useful to consider in aquatic therapy interventions for individuals with chronic pain. The authors emphasized that the participants derived much enjoyment from the sessions, they perceived themselves to be having positive benefits regarding levels of pain and expressed a general feeling of improved well being which influenced their quality of life and eased their work capacity. The authors hypothesized that the positive results were due perhaps to the (a) peer support found in the group approach and (b) participants ability to take control in helping themselves through water exercise rather than depending on skilled practitioners in a clinic.

**Prevent Bone Loss**

Bone loss has become a recent topic in aquatic literature because of its relation to osteoporosis. To examine the impact of water exercise in a warm pool in preventing bone loss, Tsukahara, Toda, Goto, & Ezawa (1994) conducted a cross-sectional study of Japanese post menopausal women to determine improvement in bone mineral densities (BMD). In a nonexperimental control group post-test only design, the researchers measured the bone density of the lumbar spine of 27 volunteers who had been exercising in a sports club for two or more times a week for 35.2 months (veterans), 40 participants who had been exercising two or more times a week for three to four weeks (newcomers), and 30 non-exercisers using BD Z-scores. Length of sessions were not disclosed in the article. There were no significant differences in participant’s age, height, body weight, body mass index, and body fat percentage. Comparisons were performed by simple linear regression and stepwise multiple regression. Student’s t-test found that for the veteran group, the BMD scores were significantly higher than the scores of the newcomers (p < .05) and the non-exercisers (p < .001). The results of the non-exercisers group in this study supported previous research (e.g., Nilas & Christiansen, 1987) indicating a decrease in BMD by 1-2% in postmenopausal women. Although the ongoing water exercise provided in this study appeared to have a suppressive effect on participants’ bone loss, caution is advised when interpreting the results due to major limitations associated with the study design.

Benedict and Freeman (1993) found similar results to Tsukahara et al. (1994) regarding bone densities and swimming. This nonrandomized control group study included tests recorded on 73 volunteer participants (32 men and 42 women) who were regular participants in a swimming and aquatic aerobics program that had met for 6 hours a week for 10 years, and two volunteer control groups; a group of 73 (15 men and 58 women) who attended senior centers for activity but not swimming and 12 individuals (10 women and 2 men) who neither attended a senior center nor swam. The bone densities of people who exercised in the swimming and aquatic aerobics program for more than three years were compared to those who had exercised for a shorter period of time and to older people who had not exercised on a regular basis. Sixty-two of the nonswimming center attendees reported that they exercised regularly (mostly walking). Bone densities of the femoral neck and spine were measured by dual-energy X-ray absorptiometry. Two-way analysis of variance and chi square were used to compare the bone densities of people who exercised in the swimming group for more than three years to those in the other two groups. The swimmers’ bone densities of the hip (p <.01) and spine (p <.04) were higher than the senior center attendees who did not participate in water exercise or swimming. Length of participation in the program was not significant.

**Increase Strength**

Although there is limited empirical evidence on strength benefits for individuals with disabilities, improved strength is often
identified as a benefit of aquatic therapy (Campion; 1990; Davis & Harrison, 1988; Skinner & Thomson, 1989). In an attempt to substantiate this contention, Gehlsen, Griggsby, and Winant (1984) examined the effects of a 10-week aquatic program (3 × week, 60 min sessions) on 10 people (M age = 40) with multiple sclerosis (MS). Selection criteria required participants to be ambulatory and in remission. Testing occurred prior to participation, midway into the program and in the week following completion of the program. A Cybex II dynamometer was used to measure components of strength (peak torque and work) and fatigue in the knee flexor and extensor muscles, and a swim bench was used to measure components of muscular strength (force, work, and power) and fatigue in the upper extremities. There was a significant difference of peak torque for knee extensor muscles for pre-trial to mid-trial (p < .05) with no significant improvement after mid-trial. For the upper extremities, a significant increase was seen from pre-trial to mid-trial to post-tests in all force measurements accompanied by significant improvement in power and total work (ps < .05). The authors warned that the greater improvement in the components of the swim bench data for the upper extremities may be related to discrepancies in the testing protocols for the different instruments. Gehlsen and colleagues (1984) suggested that the lack of improvement in some areas may be attributed to the general muscular weakness and contraction experienced by people with MS, as well as the inability of training to change previous central nervous system damage that occurs with MS. Although the results were mixed, Gehlsen and colleagues indicated that strength was improved for the individuals in this study. Thus, according to the authors, a positive change in strength can be expected through aquatic exercise. The mixed results and non-experimental design associated with this study and the absence of other investigation assessing the effects of aquatic therapy on strength indicate a need for further research in this area.

Increase Endurance

Although the efficacy of aquatic therapy on cardio-vascular endurance has received more attention in the literature than other physical implications, there are few studies examining benefits specific to individuals with disabilities. For example, Edlund (1980) and Edlund et al. (1986) examined the effects of a 12-week swimming therapy program (3 × week, 60 min sessions) on the strength, endurance and pulmonary function of 12 children with cystic fibrosis to 11 children who did not receive swimming therapy. Volunteers residing in a children's hospital were randomly assigned to an experimental group that consisted of 9 boys and 3 girls and the control group that consisted of 5 boys and 6 girls between the ages of 7 and 14. Participants in the swimming therapy group were required to attain a minimum level of their maximum heart rate during each swim session set at 60% for the first five weeks, building up to 70% in the final four weeks of the program. The pre-tests and post-tests for pulmonary function included forced expiration volume, forced vital capacity, residual volume, residual volume over total lung capacity, and diffusion capacity. The pre-test and post-test exercise tolerance was evaluated by testing the participants' maximum oxygen consumption, time on a treadmill, heart rate blood pressure and minute ventilation. The clinical state of the disease was evaluated according to a Shwachman score (Shwachman & Kulezycki, 1958). The Shwachman scoring technique scores history, physical evaluation, nutrition, and chest roentgenogram. A single blind technique was used for score determination. An experimental design of pre and post-test exposure, with one control group with an ANCOVA to determine significance, was used. Although a significant improvement was found in their clinical state of disease as determined by the Shwachman score (p
<.05) for both studies, the children in both the 1980 and 1986 swimming therapy program did not significantly improve their pulmonary function. They did, however, show a statistically significant improvement over the control group in endurance (p <.01).

Burke and Keenan (1984) examined 5 women (M age 36.6) and 5 men (M age 32.8) volunteers using the elementary backstroke to examine energy cost and to determine if heart rate and perceived exertion are useful for monitoring intensity. The volunteers swam at four different intensities, while velocity, VO2, heart rate and perceived exertion were monitored. Each dependent variable significantly increased with increasing intensity. In addition, Burke and Keenan found that the average energy cost was acceptably high. The American College of Sports Medicine recommended that healthy individuals work at 60% to 90% of their maximal heart rate reserve and a recommendation of 12 to 14 on the Borg perceived exertion scale (Borg, 1970). Both of these criteria were met during the medium and fast intensities. The authors concluded that the elementary backstroke is suitable for an aquatic therapy program. The elementary backstroke is often and comfortably used in instruction with most individuals with disabilities because it allows easier breathing due to the face being out of the water (Farrell, 1976; Garvey, 1991; Hurley & Turner, 1991; Johnson, 1988). Therefore, although this non-experimental study consisted of individuals without disabilities, this information may be beneficial for the therapeutic recreation specialist using swimming in aquatic therapy.

Endurance was also examined by Wright and Cowden (1986) who examined the effect of swim training on individuals with mental retardation in a non-randomized pre-test post-test control group study with one group of 25 (M age = 15.5) who participated in a 1 hour 10 week (2 × week) training program and a control group of 25 (M age = 15) who adhered to normal daily living activities. The participants in the two groups were equated in ages and IQs and were all classified as mildly or moderately mentally retarded in school evaluations. The researchers used the 9-minute Run/Walk test (Governor’s Commission on Physical Fitness, n. d.) to measure endurance and the Piers and Harris Children’s Self Concept Scale (Piers & Harris, 1964). Using a two way ANOVA with the Scheffe’ test as a subsequent test for mean comparison, significant F ratios were identified. Results showed that this program contributed to a significant increase in cardiovascular endurance (p <.05) and self concept (p <.05) for participants in the experimental group when compared to the control group. A variety of methodological concerns including the use of ANOVA rather than multivariate procedures for analysis should be considered when interpreting the results of this study.

In another study, Routi, Troup, and Berger (1994) examined the impact of a water exercise program on the muscular endurance and aerobic work capacity of older adults (age >50 years) by comparing the performance of 12 participants in a water exercise group and 10 participants in a control group. The authors concluded that the elementary backstroke is suitable for an aquatic therapy program. The elementary backstroke is often and comfortably used in instruction with most individuals with disabilities because it allows easier breathing due to the face being out of the water (Farrell, 1976; Garvey, 1991; Hurley & Turner, 1991; Johnson, 1988). Therefore, although this non-experimental study consisted of individuals without disabilities, this information may be beneficial for the therapeutic recreation specialist using swimming in aquatic therapy.

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tem reflected in the reduction of resting HR and increase in VO2 and work capacity. Although results of increased VO2 were the same as findings reported by Pollock (1973), who documented the training effects of older adults in 8 to 42 weeks of running, Routi and colleagues noted that an advantage of water exercise was that it resulted in less joint stress. The authors contended that individuals recovering from physical injury or muscular disease may employ water exercises with expectations of a training effect in aerobic work capacity and in muscular endurance.

**Improve Pulmonary Functioning**

The impact of aquatic therapy on pulmonary functioning has been studied primarily as it relates to children with asthma. For example, Haung et al. (1989) examined the effects of swimming training on asthma morbidity. Participants included 45 children (ages 6-12) with asthma who were matched by age, sex and severity of illness and randomly assigned to swimming training (3 × week, 1 hour sessions) for 12 months or a control group. Pulmonary function with a peak flow meter every three months, school absenteeism, emergency room visits, hospitalizations, days requiring daily medications, and days of wheezing both during the swimming sessions and for a period of 12 months after the final swimming session were recorded. These data were compared to data collected 12 months prior to the swim class and to the control group. The Student’s t-test or the chi square test was used for the analysis. Between group differences were statistically significant on each of the dependent variables when compared to the control group (p <.01) and when compared to the 12 months prior to the swimming program (p <.01). Although Haung et al. concluded that swimming may have therapeutic benefits for children with chronic lung disease (including children with asthma or cystic fibrosis) and that the beneficial effects may last longer than previously anticipated, the use of a Student’s t-test rather than a multivariate analysis raises concern when interpreting these results.

To further examine the effects of swimming on children with asthma, Bar-Or and Inbar (1992) conducted a comprehensive literature review to explore the benefits and deleterious effects of swimming on children with asthma. The review of the evidence suggested that swimming induces less severe bronchoconstriction than other active leisure related activities (e.g., Fitch & Morton, 1971; Holmer, Stein, Saltin, Ekblom & Astrand, 1974). Although reasons for this protective effect of swimming are not clear, the authors cited experimental evidence (e.g., Inbar, Dohan, Dlin, Neuman, & Bar-Or, 1980) implying that positive effects may result, in part, from the high humidity of inspired air at water level, which reduces respiratory heat loss and possible absorption of airway mucus.

Deleterious effects of swimming on individuals with asthma, according to Bar-Or and Inbar, include the “diving reflex” which is a parasympathetic response to immersion of the face in water, especially colder water. After examining studies by Sturani, Sturani, and Tosi (1983) and Mukhtar and Patrick (1984), Bar Or and Inbar speculated that asthmatic response of individuals may be enhanced in cold water and water containing chlorine and its derivatives, especially when air recirculating occurs. Recirculating the concentration of chemicals may irritate the airways, as observed by Penny (1983), when he reported increased complaints of coughing when such a system was in use. Because participants in Penny’s study did not have asthma, more research is needed to determine if this airway irritation response induced asthma response of swimmers with asthma.

Bar-Or and Inbar also described seven studies documenting how aquatic therapy resulted in improved fitness effects, most importantly, increased pulmonary function and the reduction of the incidence and severity of exercise induced asthma (Fitch & Morton, 1971; Haung et al., 1989; Mitsubayashi,
1984; Schnall, Ford, Gillam, & Landau, 1982; Svenonius, Kautoo, & Arborelius, 1983; Szentagothal, Gyene, Szocska, & Osvath, 1987; Tanizaki, Komagoe, Sudo, & Morinaga, 1984). Bar-Or and Inbar concluded from their review of the literature that swimming was less asthma inducing than other physically active leisure activities and found swimming as the most suitable exercise therapy for children with asthma.

In their assessment of the physiologic and clinical effects of exercise in children with cystic fibrosis, Edlund et al. (1986) (detailed in the section of this paper on endurance), found no change in pulmonary function but did report that the sputum production during chest physical-therapy decreased when participants were involved in the program. The authors concluded that the exercise associated with the swimming apparently helped to clear the lungs of sputum, and that a swimming program (at least 3 sessions per week) is an excellent way to improve the clinical status and quality of life of a person with cystic fibrosis.

Zach, Purrer, and Oberwaldner (1981) examined the effect of swimming therapy on forced expiration and sputum clearance of 11 participants with cystic fibrosis (mean age = 10 years 7 months) who participated in swimming therapy for seven weeks (17 sessions of 1 hour each). The t-test and analysis of variance were used for statistical analysis. Ventilatory status, assessed by spirometry one day before the first session and one day after the last session showed significant improvement in forced vital capacity, forced expiratory volume and peak expiratory flow rate. The sputum, collected by the children who registered daily volumes in milliliters, was higher on swimming days than on non-swimming days. Ten weeks after the end of the training most of the measurements returned to their pre-swimming levels. Although the authors contended that swimming as therapy can assist in mucus clearance and improve ventilatory function in children with cystic fibrosis, the lack of a control group limits interpretation of the results.

Another population that has been examined in relation to pulmonary function is muscular dystrophy. Adams and Chandler (1974) investigated the effects of swimming and breathing exercise of three participants (11 years old) for 11 months (30 min × 2 wk). Vital capacity measurements were taken on a wet spirometer three times weekly. After four months, each participant improved in vital capacity. During a three-week vacation, two of three participants showed marked losses in vital capacity. Continuing the swimming therapy resulted, once again, in improvement. When the program was, again, canceled for two weeks during vacation, the participants showed a slight loss which was regained after continuing the program. The authors stated that a regular program of therapy can result in increased vital capacity with supervised treatment. Further investigation of methods of maintaining vital capacity is needed for children with muscular dystrophy due to the lack of studies in general, and more specifically, due to the non-experimental design and small number of participants used in this study.

Psychological Implications
Although some psychological benefits of aquatics are reported in the literature, there is a lack of literature documenting the psychological benefits of aquatic therapy or aquatic activity, in general, for individuals with disabilities. The majority of studies have been conducted with people without noted disabilities, mostly college students and older adults. Information about psychological improvements such as improved body image, self concept, mood and decreased depression can be useful to the therapeutic recreation specialist and will be described in the following section.

Improve Body Image
The impact of aquatic therapy on body image was noted by Benedict and Freeman
(1993) who observed older adults swimming. In this study (detailed in the section of this paper on preventing bone loss), the researchers assessed body image by projective drawings and the use of a semantic differential survey. Although there was no significant differences in the projective drawings, an improved body image of swimmers was observed when compared to the control group who did not participate in water exercise (p < .05) as measured by the semantic differential.

Decrease Depression

Reduction in depression, noted as a benefit in the literature of aquatic therapy (Skinner & Thomson, 1989), has mixed support. For example, in the aforementioned nonexperimental study by Benedict and Freeman (1993), morale and depression scales were administered. Although results showed that swimmers reported higher morale than the control group (p <.01), there was no significant difference in the level of depression between swimmers and the control group.

In a related study, Stein and Motta (1992) compared the effects of anaerobic weight training to aerobic swimming on depression and self-concept. This study was conducted to examine the effects of resistive exercise in the water or through an aerobic regimen such as swimming on chemical changes influencing depression. Participants could not have had previous training in aerobic or non-aerobic exercise for at least three months prior to the initiation of this experiment. The 98 volunteers (M age = 20) were assigned randomly to a 14-week structured swimming for fitness aerobic class (2 X week, 50 min sessions), a structured progressive resistance weight training (2 X week, 50 min sessions), or a control group that did not exercise. Dependent measures were assessed using the Beck Depression Inventory, Depression Adductive Check Lists, Tennessee Self-concept Scale and Cooper's 12-minute swim. After the ANCOVA indicated a significant interaction, the post hoc analysis showed that significant improvement occurred in both experimental groups in self concept and depression, when compared to the control (p <.001). Stein and Motta concluded that, in the case of individuals with disabilities who are unable to withstand land-based weight training, water exercise may be a valuable option for enhancing self esteem and decreasing depression.

Weiss and Jamieson (1989) conducted a retrospective study to evaluate the effect of an aquatic exercise on subjective depression of participants. The length of time in the program for the participants was 8 weeks to 5 years. The ages of the 88 women ranged from 21 to 75 years with the majority clustered between 45 and 64. All 21 participants who reported symptoms of depression when beginning the class reported less depressed feelings with 90.5 percent of these individuals attributing the aquatic therapy class as a contributing factor to their improved emotional state. According to the authors, the findings suggest that this particular program was an effective intervention in the dissipation of depression related symptoms of subjectively depressed women. The authors claimed that the findings add to a growing body of literature affirming links of exercise and psychological well-being including the treatment of mild depression and prevention of major depression. In addition, the authors stated the study agreed with other research suggesting that the positive effects may occur in conjunction with social concomitants because the women (a) viewed the program as a support group, (b) made new friends in the classes, and (c) found it helpful to converse with the others in the group about health, humor and feeling. The subjectivity, lack of information on interview methods, and the retrospective nature of this study raises concern in interpreting the findings and suggest a need for further study.

Enhance Mood

Berger and Owen (1992) examined swimming classes and yoga to determine if
aerobic exercise improved mood by employing a pre-post control group design with 87 college student volunteers who enrolled in two swimming classes (2 × week, 40 min sessions), a yoga course (1 × week, 80 min sessions) and a lecture control group course (3 × week, 50 min sessions). The initial pre-class mood and anxiety scores of the three groups were compared to examine variability of students selecting physical activity as compared to the more sedentary lecture class. The three groups were not different significantly in social desirability, gender, state anxiety, tension, depression, fatigue and confusion on the initial pre-class scores, except for differences in age, with the yoga group being older (M age = 28.4) than the swimming (M age = 20.3) and control group (M age = 21.1). Participants completed the Profile of Mood States (POMS) inventory immediately before and after class on the second session, midway through the study and on the last day of instruction. A significant reduction in anger, confusion, tension and depression was reported for the swimming and yoga groups when compared to the control group (p < .0002), indicating that aerobic exercise and exercise below one’s target heart rate may enhance mood. Berger and Owen suggested that since swimming and Hatha yoga can facilitate deep, rhythmical diaphragmatic breathing, which is a common element in many stress reductions techniques, the rhythmical breathing may facilitate mood alteration. In addition, Berger and Owen suggested that lap swimming and Hatha yoga may influence mood by “stretching and relaxing large muscle groups in the body, an internal awareness, finding time for oneself and a focus on the present . . .” (p. 1340). This study has implications for individuals with disabilities because some individuals have difficulty performing land based aerobic activity and the water environment may be one of the few environments that a person could do aerobic activity independently (Campion, 1985). Because this study was not specific to (re)habilitation, these speculations call for further examination of the psychological effects of swimming in aquatic therapy.

To examine further the complex relationship between exercise and mental health across cultures, Berger and Owen (1993) studied 15 swimmers and 15 controls from Czechoslovakia (Czech) for 12 weeks (1 × week, 90 min sessions); and 20 swimmers and 28 controls from a large metropolitan college in the United States (US) for 14 weeks (2 × week, 50 min sessions). Participants were involved in either a beginning swimming course or a lecture control course. Although the duration of the swimming sessions in the two countries differed, the total time participants swam each week was the same. The POMS was utilized to measure tension, depression, anger, and confusion and an increase in vigor. The POMS was administered to all groups before and after class on the second session, mid semester, and at the end of the courses. The resulting pre-post and activity interactions were significant for the Czech (p <.00) and US (p <.00) swimmers. The US. and Czech swimmers showed a significant mood shift (p <.00) on every scale except fatigue. All scores were similar except for tension where Czech swimmers reported a larger reduction than the US swimmers. Results indicated that the students felt better after enrolling in the swimming course than before they began the course. This study provides additional support for the belief that swimming positively influences mood.

Although the aforementioned studies do not include individuals with disabilities, the results have implications for people with disabilities, individuals receiving psychiatric services, and individuals without a clinical mental health diagnosis. An acquired physical disability often results in decreased self-esteem, self-determination and consequential mood alterations (Krause & Crew, 1987). Since many individuals with physical disabilities are unable to participate actively in land based aerobic activity (Campion, 1985),
it may be useful for therapists to consider additional benefits from aquatic therapy beyond physiological ones and examine psychological benefits such as improved mood.

**Leisure Implications**

A major advantage of aquatic therapy is that it may enhance functional ability that encompasses all areas of life and helps to develop a life-long leisure activity that can be enjoyed with other people (Campion, 1985; Peganoff, 1984). Specifically, Campion emphasized that once a person is independent in the water, opportunities for socialization are increased. There is, however, limited research on the benefits of aquatic therapy to a person’s leisure lifestyle. Nevertheless, many authors have emphasized the importance of transitioning the person with a disability from the clinical environment into recreational programs in the community to achieve psychosocial and functional benefits (e.g., Duley, 1983; Martin, 1983; Slade & Simmons-Grab, 1987). Although not data-based, there are numerous reports of the benefits of using recreational activity, community re-entry or family training in aquatic therapy to meet goals and to facilitate continued participation (e.g., Duley, 1983; Martin, 1983; McNamara, 1994; Melvin, 1976; Priest, 1976; Smith, 1985; Smith, 1992). The following are examples of two case studies that include information relative to the leisure experience.

Peganoff (1984) presented a case study to exemplify the use of swimming as a leisure activity that incorporates therapeutic goals for individuals with disabilities. The participant was a 12-year-old girl with spastic right hemiparesis who participated in an 8-week swimming program (2 X week, 45 min sessions). The treatment goals included improving (a) range of motion, (b) functional use and coordination of the right upper extremity, (c) bilateral integration, (d) balance and equilibrium skills, and (e) self image. The participant showed a 15° increase in shoulder flexion and a 10° increase in shoulder abduction of the right upper extremity. She began using her right upper extremity during activities of daily living at home. Although the participant refused to swim with others initially, after learning how to swim at the beginner level, she continued the activity in her free time in the presence of family and peers. According to Peganoff, this skill acquisition also resulted in an increase in incidence of satisfaction and compliance with the program as compared to her traditional therapy. Thus, for this participant, treatment goals achieved through instruction in the basic swim strokes were enhanced by incorporating a new leisure skill of interest.

In another case study, Johnson (1988) described a 62-year old man (Charlie) who was diagnosed with amyotrophic lateral sclerosis (ALS) three years prior to this aquatic therapy intervention. Upon entering the program, Charlie had respiratory weakness, trace to poor lower extremity muscle strength and fair to good upper extremity strength. Aquatic therapy was prescribed for Charlie for 10 weeks (2 X week, 45 min sessions) to facilitate an increase in strength, flexibility, and conditioning, as well as promote recreation and socialization. Charlie improved from not being able to swim to swimming 26 lengths of a 20-yard pool with an adapted vest and minimal assistance. Johnson concluded that aquatic therapy for Charlie achieved, not only increased endurance and strength, but improved reported energy level and happiness in daily activity as a result of utilizing a challenging leisure activity. According to Johnson, an aquatic therapy program may provide a person who has ALS with a realistic alternative for maintaining physical fitness or continuing with rehabilitation goals while participating in an affordable leisure activity.

In further support of aquatic therapy as a means to independent leisure involvement, Beaudouin and Keller (1994) described a program developed by a therapeutic recreation practitioner that was designed to improve functional abilities, facilitate psy-
chosocial adjustment and ultimately lead one to independent participation in other community recreation programs. Assessments were conducted on participants’ psychosocial and physical skills (endurance, strength and flexibility) as well as their personal interests and functional needs. The program used water exercises and swimming to meet the treatment goals, which, generally, included moving from individual to group sessions. Although no data were reported on the effectiveness of the program, the relevance of this article is its focus on transitioning participants to community programs and the information presented on the reimbursement rate. Beaudouin and Keller reported that insurance companies provided 85% reimbursement for treatment which was attributed to organized and continuous communication with physicians and case managers. The authors stated that successful intervention and documentation strengthened the reputation of the program with physicians and third party payers. Beaudouin and Keller’s description, in conjunction with information from the previous articles described in this section, provide information on how aquatic therapy has been used as a means to promote individuals’ functioning and leisure participation.

Although a benefit of aquatic therapy could be the potential for independence in the aquatic activity after functional goals have been met, there has been little discussion concerning the leisure implications of the interventions. Therapeutic recreation specialists can address leisure implications by including leisure related dependent variables in aquatic therapy research such as satisfaction, enjoyment, intrinsic motivation and self-determination.

Implications of Aquatic Therapy for Therapeutic Recreation

Aquatic therapy is a viable intervention which can be employed by therapeutic recreation specialists. The number of physician referrals for aquatic therapy are increasing (Meyer, 1990; Smith, 1992). In addition, aquatic therapy is being viewed by third party payers as a viable treatment (Beaudouin & Keller, 1994). Therapeutic recreation specialists who have the educational training may use aquatic therapy to encourage participants to achieve independent leisure participation while realizing functional benefits (Beaudouin & Keller, 1994, Campion, 1988; Johnson, 1988; Peganoff, 1984) and enhancing their life satisfaction and longevity (Krause & Crew, 1987).

To address the demand and the educational training needs in aquatic therapy for therapeutic recreation specialists, systematic instructional sessions on aquatic therapy are being developed by various organizations and individuals as seen by a recent increase in aquatic therapy workshops sponsored by the National Therapeutic Recreation Society (NTRS) and the American Therapeutic Recreation Association (ATRA). Both organizations have recognized the importance of training for therapeutic recreation specialists in aquatic therapy and expressed a commitment to address this need. Based on sentiments expressed by Broach (1995a) and LaTourette (1995) that therapists, at a minimum, have an understanding and be proficient in the use of properties of the water, safety and rescue, swimming methodology, equipment use, patient indications and contraindications, handling and therapy techniques, NTRS and ATRA have formed aquatic therapy committees to address issues and increase networking. The NTRS aquatic committee conducted a survey to assess the status of aquatic therapy use and needs (Broach, 1995b). In response to the survey, the committee has developed yearly aquatic therapy institutes at the national conference. To address further practitioner concerns, a NTRS aquatic therapy network has been established. The network disseminates aquatic therapy information through bi-yearly correspondence, including an updated list of network participants. ATRA has a committee
of experts to serve as resources, advocate for reimbursement and research aquatic therapy. In addition, ATRA sponsors aquatic therapy workshops throughout the year. These efforts demonstrate an increased interest in providing instruction and disseminating information on aquatic therapy and, thus, increase the ability of practitioners to incorporate aquatic therapy into their repertoire of services.

Aquatic therapy is delivered in various settings. In the past, therapeutic recreation has been provided most often in residential centers as a part of individual rehabilitation. A recent trend showing a reduction in hospital length of stay has resulted in many individuals not having the opportunity to take full advantage of therapeutic recreation services during hospitalization (Carter, 1991). Therefore, the range of therapeutic recreation services needed in the community is expanding to include services such as aquatic therapy that are designed to have participants achieve treatment goals (Beaudouin & Keller, 1994). Further, physicians and insurance companies are acknowledging the benefits of aquatic therapy and referrals to aquatic programs are increasing (Smith, 1992). In addition, some physicians and people in need of treatment are searching for alternatives to expensive outpatient care due to the decrease in insurance reimbursement and rising health care costs (Heyneman & Premo, 1993). Thus, as Johnson (1988), Heyneman and Premo (1993), McHugh (1995), and Slade and Simmons (1987) stated, much of the long term process of rehabilitation can occur in aquatic therapy programs within the community. Aquatic therapy provided by therapeutic recreation specialists in a community pool can facilitate participants achievement of treatment goals while simultaneously promoting inclusion in their communities (Beaudouin & Keller 1994).

Based on the review of the literature, there is some support for the use of aquatic therapy by therapeutic recreation specialists as a viable intervention to meet the needs of individuals with disabilities. However, there is limited documentation on the implications of aquatic therapy to therapeutic recreation. Therapeutic recreation specialists can address these shortcomings through efficacy-based research using various experimental and non-experimental designs. Areas of research could include examining the benefits of (a) similar exercises on land versus water and continuation of such programs after clinical intervention, (b) effects of combining a leisure education model of cognitive behavior therapy with aquatic therapy in relapse prevention after discharge, (c) cost effectiveness of aquatic therapy interventions by comparing lengths of stay of participants and non participants, (d) psychological effects of swimming on individuals with a variety of disabling conditions and (e) effects of aquatic therapy interventions on activities of daily living and activity level. Therapeutic recreation specialists are encouraged to conduct rigorous studies using efficacy-based research documenting the role therapeutic recreation practitioners play in improving individuals’ functional abilities as well as enhancing their enjoyment and life satisfaction through aquatic therapy interventions.

Conclusion

There is evidence to indicate that aquatic therapy has numerous psychological and physical benefits. Furthermore, aquatic therapy appears not only to improve physical and psychological functioning, but also maintain health and daily life functioning. In addition, aquatic therapy is valuable because it is conducted in water which often improves participants’ comfort and increases their confidence in achieving functional independence (Guillemin et al., 1994; Hurley & Turner, 1991). The health care trend of shorter hospital stays and an emphasis on outpatient care has resulted in a need for therapeutic recreation interventions to be applied across a myriad of environments. It may be useful for therapeutic recreation specialists to consider employing aquatic therapy as a facilitation
The facilitation technique of aquatic therapy can result in an increase in participants’ functional ability while they participate in an enjoyable leisure activity which encourages inclusion in their communities (Dattilo, 1994).

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