



AUSTRALIAN PHYSIOTHERAPY ASSOCIATION

National Aquatic Physiotherapy Group

AQUATIC PHYSIOTHERAPY EVIDENCE-BASED GUIDE

Prepared by Jenny Geytenbeek, 2008

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This Guide is an excerpt from the *Aquatic Physiotherapy Evidence-Based Practice Guide* and differs in its purpose to provide clinicians with a listing of the evidence for aquatic physiotherapy practice and indications to the outcomes researchers have measured in the evidence. Clinicians should refer to the *Practice Guide* for more detailed descriptions of the evidence and the aquatic physiotherapy interventions represented in the body of evidence.

ABSTRACT

In response to increasing physiotherapist and consumer demand, the Management Committee of the Aquatic Physiotherapy Group sought funding from the Australian Physiotherapy Association Special Purpose Fund in 2007 to develop the APEBPG. A substantial systematic review was undertaken using the phrases “aquatic physiotherapy”, “hydrotherapy”, “aquatic therapy” and “water exercise” over electronic databases including CINAHL, MEDLINE, EMBASE, PEDro, AMED, Ageline, Sports Discuss and The Cochrane Library. A personal bibliographic database was created to store and manage the 154 research papers retrieved that met the inclusion criteria of recency of publication (from 1997 to 2007), publication in English, availability in full-text-format, and not balneotherapy, whirl pool, passive immersion or spa. Evidence was catalogued into clinically useful areas of practice; musculoskeletal, neurological, paediatric, women’s health, cardiorespiratory and sports physiotherapy practice. Data extracted pertained particularly to answer three questions; (1) what evidence - relating to research-design and level of evidence, (2) what intervention - with particular emphasis on reporting in detail the aquatic therapies and exercise programs in order to guide clinicians in replicable practice, and (3) what effect – reporting on outcome domains including effect on function, ambulation, strength, range of movement, flexibility, pain, balance, well-being, depression, quality of life, health status, activity and participation, athletic performance, body composition, cardiac and respiratory function, fitness, spasticity, medication use and cost-effectiveness. Evidence was documented to support aquatic physiotherapy in the management of osteoarthritis, rheumatoid arthritis, joint arthroplasty, fibromyalgia, ankylosing spondylitis, back pain, upper- and lower- limb disorders, stroke, acquired brain injury, spinal cord injury, multiple sclerosis, Guillain Barré syndrome, post-polio syndrome, adult cerebral palsy, juvenile rheumatoid arthritis, muscular dystrophy, spinal muscular atrophy, cerebral palsy, autism, Rett syndrome, maternal peri-natal health, post-menopausal health, osteopenia, obesity, lymphodema, chronic obstructive pulmonary disease, heart failure, and sports-specific rehabilitation.

Table 1. Evidence and Outcomes

Diagnostic Group or Subject Heading	Papers	Levels of Evidence	Subjects	Outcome Domains
Musculoskeletal Aquatic Physiotherapy				
Osteoarthritis 14,42,65,92,160,185,210	11	II, III-1, V	1196	func, amb, strgth, pain, ROM, QoL, wellB, Hlth, depr, Actv, fitn, cost eff
Rheumatoid Arthritis 20, 60, 175	5	II, V	216	func, amb, Strgth, pain, ROM, HQoL, Hlth, Dis Act
Osteo- & Rheumatoid Arthritis 187, 188, 189	4	II, III-3	297	strgth, flex, ROM, bal, compliance
Arthroplasty 81	9	I, II, III-3, IV	176	func, amb, strgth, pain, ROM
Ankylosing Spondylitis 49	3	I, II	120	func, pain, QoL, WellB, dis act
Fibromyalgia 7, 87,103,137,204	9	I, II, III-3	236	func, amb, strgth, pain, QoL, WellB, Health, depr, fit
Back Pain 144, 176, 182	14	I, II, III-3, IV, V	252	func, amb, strgth, Pain, med, RTW
Lower Limb Conditions	4	III-1, III-3, IV	106	amb, strgth, ROM, bal
Upper Limb Conditions	10	III-2, III-3, IV, V	7	func, strgth, ROM
Aquatic Physiotherapy in Neurology				
Stroke 36	3	II, IV	18	func, amb, strgth, fit, UL movt
Spinal Cord Injury	4	III-2, IV	48	func, amb, strgth, resp Fx, spast
Acquired Brain Injury & Intellectual Disability 55	3	II, III-3, IV	20	strgth, ROM, fit, wellB, body comp
Adult Cerebral Palsy	4	III-3, IV	57	func, amb, strgth, ROM, self perception
Multiple Sclerosis	2	III-3, IV	20	func, strgth, QoL, fatigue
Guillain Barré Syndrome	1	V	1	
Post-Polio Syndrome	2	III-1, V	28	pain, fit

Diagnostic Group or Subject Heading	Papers	Levels of Evidence	Subjects	Outcome Domains
Pediatric Aquatic Physiotherapy				
Cerebral Palsy	4	III-1, IV, V	68	resp Fx, wat skill, Soc comp, soc acc
Chronic Regional Pain Syndrome	1	IV	103	func, pain
Juvenile Idiopathic Arthritis ⁵⁹	2	II, III-3	88	func, strgth, fit, dis act, ptt sat
Rett Syndrome	3	IV, V	1	amb, bal, anx, UL movt
Autism	1	V	0	strgth, bal, soc comp
Spinal Muscular Atrophy	3	IV	1	maintained weight
Aquatic Physiotherapy in Women's Health				
Pregnancy-related Wellbeing ¹⁶⁶	4	I, II, IV, V	208	stress, mood , discf, body img
Pregnancy-related Back Pain ¹¹⁶	2	I, II	258	pain, absnt
Post-menopausal Wellbeing ^{52, 199}	3	II, IV	88	bal, QoL, strgth, amb, flex, body comp
Labor-related Pain ¹⁷	3	I, II, V	18	pain, anx, med
Osteoporosis ^{8, 9}	3	II, IV	180	flex, co-ord, agility, strgth, endur, bone hrm, bone US
Breast cancer related lymphodema	1	IV	3	limb volume, strgth, endur, wellB
Obesity ^{70, 152}	2	II	82	body wt, body fat, fit, flex, strgth, HQoL
Cardiorespiratory Aquatic Physiotherapy				
Chronic Obstructive Pulmonary Disease ¹⁵⁷	6	I, III-1, III-2, III-3	109	amb, fit, activity, HQoL, resp Fx, card Fx
Heart Failure ^{38, 206}	7	II, III-3, V	138	resp Fx, card Fx, body comp, blood lipids, QoL, amb, strgth

Diagnostic Group or Subject Heading	Papers	Levels of Evidence	Subjects	Outcome Domains
Aquatic Physiotherapy in Sports and Training				
Deep Water Running ⁵¹	12	I, II, III-3, IV, V	155	fit, athl perf
Plyometric Training ^{141, 148, 174}	4	II, V	81	fit, athl perf, strngth, exs-induced pain
Sport-specific Training and Rehabilitation ¹⁴¹	4	II, V	23	athl perf, balance
Total	151		3227	

Reference Numbers

Randomised controlled trials supporting the efficacy of aquatic therapy in each diagnostic group are indicated by subscripted reference numbers and link to the reference list below.

Key to Outcome Domains

Outcome Domains in **bold type** indicate those supported by Level II evidence.

(Absnt) Absenteeism, (Actv) Activity, (Aglty) Agility, (Amb) Ambulation, (Anx) Anxiety, (Athl Perf) Athletic Performance, (Bal) Balance, (Body Comp) Body Composition, (Body Img) Body Image, (body wt) Body weight, (Body Fat) Body Fat, (Bone Hrm) Bone Hormones, (Bone US) Bone Ultrasound, (Card Fx) Cardiac Function, (Co-ord) Co-ordination, (Cost) Cost Effectiveness, (Depr) Depression, (Dis Act) Disease Activity, (Discf) Discomfort, (Endr) Endurance, (Fit) Fitness, (Flex) flexibility, (Func) Function, (Hlth) Health, (HQoL) Health Related Quality of Life, (Med) Medication Use, (Mood) Mood, (Pain) Pain, (Ptt Sat) patient satisfaction, (QoL) Quality of Life, (Resp Fx) Respiratory Function, (ROM) Range of Movement, (Soc Acc) Social Acceptance, (Soc Comp) Social Competence, (Spast) Spasticity, (Stress) Stress, (Strgth) Strength, (UL movt) Upper limb movement, (Wtr Skill) Water Skills, (WellB) Well Being.

Key to Levels of Evidence

- I Evidence obtained from a systematic review of all relevant randomized controlled trials
 - II Evidence obtained from at least one properly designed randomized controlled trial
 - III-1 Evidence obtained from well-designed pseudo randomized controlled trials (alternate allocation or some other method)
 - III-2 Evidence obtained from comparative studies (including systematic reviews of such studies) with concurrent controls and allocation not randomized (cohort studies), case control studies, or interrupted time series with a control group
 - III-3 Evidence obtained from comparative studies with historical control, two or more single arm studies, or interrupted time series without parallel control group
 - IV Evidence obtained from a case series, either post-test or pre-test and post-test
 - V Evidence obtained from clinical peers, as referenced literature reviews, or as clinical opinion
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Adapted from: National Health and Medical Research Council of Australia (1999). A Guide to the Development, Implementation and Evaluation of Clinical Practice Guidelines. NHMRC: Canberra

Subject Tally

The subjects tally excludes those cited in systematic reviews. Subject numbers from clinical trials include both intervention and control groups.

- 1) Ackerman IN, Bennell KL (2004) Does pre-operative physiotherapy improve outcomes from lower limb joint replacement surgery? A systematic review. *Australian Journal of Physiotherapy*. 50(1):25-30
- 2) Adams N, Sim J (2005) Rehabilitation approaches in fibromyalgia. *Disability & Rehabilitation*. 27(12): 711-723
- 3) Alberton CL, Olkoski MM, Pinto SS, Becker ME, Kruel LFM (2007) Cardiorespiratory responses of post-menopausal women to different water exercises. *International Journal of Aquatic Research and Education*. 1:363-372
- 4) Alencar KL, Carvelho LB, Prado LB, Vantini AL, Vieira VC, Cardoso AP, Alencar JP, Paes AT, Peres CA, Prado GF (2005) Older people involved in physical activity benefit from water exercise, showing longer total sleep time. *Journal of the American Geriatric Society*. 54(4):725-7
- 5) Alexander M (2003) Effect of a water exercise program on walking gait, flexibility, strength, self-reported disability and other psycho-social measures of older individuals with arthritis. *Physiotherapy Canada*. 53(3): 203-11
- 6) Anstey KH, Rosell C (2000) Hydrotherapy: detrimental or beneficial to the respiratory system? *Physiotherapy*. 86(1):5-13
- 7) Assis MR, Silva LE, Alves AMB, (2006) A Randomized Controlled Trial of Deep Water Running: Clinical Effectiveness of Aquatic Exercise to Treat Fibromyalgia. *Arthritis & Rheumatism*. 55(1):57-65
- 8) Ay A, Yurtkuran M (2003) Evaluation of hormonal response and ultrasonic changes in the heel bone by aquatic exercise in sedentary postmenopausal women. *American Journal of Physical Medicine and Rehabilitation*. 82(12): 942-9
- 9) Ay A (2005) Ay A, Yurtkuran M (2005) Influence of aquatic and weight-bearing exercises on quantitative ultrasound variables in postmenopausal women. *American Journal of Physical Medicine and Rehabilitation*. 84(1): 52-61
- 10) Balogova M, Germanova Z, Celko J, Chylova M (2003) Hydrokinesiotherapy research in the spastic form of infantile cerebral palsy. *Rehabilitacia*. 36(2): 90-95
- 11) Barben J, Hafen G, Schmid J. (2005) Pseudomonas aeruginosa in public swimming pools and bathroom water of patients with cystic fibrosis. *Journal of Cystic Fibrosis*. 4(4): 227-231
- 12) Barker KL, Dawes H, Hansford P, Shamley D (2003) Perceived and measured levels of exertion of patients with chronic back pain exercising in a hydrotherapy pool. *Archives of Physical Medicine and Rehabilitation*. 84(9):1319-23
- 13) Bartels EM, Lund H, Hagen KB, Dagfinrud H, Christensen R, Danneskoild-Samsøe B (2005) Aquatic exercise for the treatment of knee and hip osteoarthritis. *Cochrane Database of Systematic Reviews*. Issue 4, Art No.:CD005523. DOI:10.1002/14651858.CD005523.
- 14) Belza B, Topolski T, Kinne S, Patrick DL, Ramsey SD (2002) Does adherence make a difference? Results from a community-based aquatic exercise program. *Nursing Research* 51(5):285-91
- 15) Bender T, Karagulle Z, Balint GP, Gutenbrunner C, Balint PV, Sukenik S (2005) Hydrotherapy, balneotherapy, and spa treatment in pain management. *Rheumatology International*. 25(3): 220-224
- 16) Benelli P, Ditroilo M, De Vito G (2004) Physiological responses to fitness activities: a comparison between land-based and water aerobics exercise. *Journal of Strength and Conditioning Research*. 18(4): 719-22.
- 17) Benfield RD, Herman J, Katz VL, Wilson SP, Davis JM (2001) Hydrotherapy in Labor. *Research in Nursing and Health*. 24(1):57-67
- 18) Berlin B (2003) The effect of aquatic therapy interventions on patients with depression: a comparison study. *Annual in Therapeutic Recreation*. 12:7-13, 57-64.
- 19) Bermingham MA, Mahajan D, Neaverson MA (2004) Blood lipids of cardiac patients after acute exercise on land and in water. *Archives of Physical Medicine and Rehabilitation*. 85(3): 509-11 (13 ref)
- 20) Bilberg A, Ahlmen M, Mannerkorpi K. (2005) Moderately intensive exercise in a temperate pool for patients with rheumatoid arthritis: a randomized controlled study. *Rheumatology*. 44(4):502-508
- 21) Binkley H (2002) Effects of water exercise on cardiovascular responses of hypertensive elderly inner-city women. *Journal of Aquatic Physical Therapy*. 10(1): 28-33
- 22) Binkley H (2002) Aquatic therapy in the treatment of upper extremity injuries. *Athletic Therapy Today*. 7(1):49-54.
- 23) Booth CE (2004) Water exercise and its effect on balance and gait to reduce the risk of falling in older adults. *Activities, Adaptation & Aging*. 28(4): 45-57. (24 ref)
- 24) Bravo G (1997) A weight-bearing, water-based exercise program for osteopenic women: its impact on bone, functional fitness, and well-being. *Archives of Physical Medicine and Rehabilitation*. 78(12): 1375-80.
- 25) Broach E, Datillo J (2003) The effect of aquatic therapy on strength of adults with multiple sclerosis. *Therapeutic Recreation Journal* 37 (3): 224-239
- 26) Broman G, Quintana M, Engardt M, Gullstrand L, Jansson E, Kaijser L. (2006) Older women's cardiovascular responses to deep-water running. *Journal of Aging and Physical Activity*. 14(1): 29-40.
- 27) Brown S (1997) Deep water running physiologic responses: gender differences at treadmill-matched walking/running cadences. *Journal of Strength and Conditioning Research*. 11(2): 107-14.
- 28) Brown SP (1997) Predicting oxygen consumption during deep water running: gender differences. *Journal of Strength and Conditioning Research*. 11(3): 188-93.
- 29) Brosseau L, Mac Leay L, Robinson VA, Tugwell P, Wells G (2003) Intensity of exercise for the treatment of osteoarthritis. *Cochrane Database of Systematic Reviews*, Issue 2, Art No.:CD004259, DOI: 10/1002/14651858.CD4259

- 30) Bumin G, Uyanik M, Yilmaz I, Kayihan H, Topcu M (2003) Hydrotherapy for Rett syndrome. *Journal of Rehabilitation Medicine* 35(1):44-5.
- 31) Busch A (2007) Hydrotherapy improves pain, knee strength, and quality of life in women with fibromyalgia. *Australian Journal of Physiotherapy*, 53(1):64.
- 32) Burke D (2000) The effect of hot or cold water immersion on isometric strength training. *Journal of Strength and Conditioning Research*. 14(1): 21-5.
- 33) Bushman BA, Flynn MG, Andres FF, Lambert CP, Taylor MS, Braun WA (1997) Effect of 4 wk of deep water run training on running performance. *Medicine and Science in Sports and Exercise*. 29(5):694-699
- 34) Campbell J (2003) Metabolic and cardiovascular response to shallow water exercise in young and older women. *Medicine and Science in Sports and Exercise*. 35(4): 675-81.
- 35) Cardoso JR, Arthala AN, Cardoso APRG, Carvalho SMR, Garanhani MR, Lavado EL, Verhagen AP (2001) Aquatic therapy exercise for treating rheumatoid arthritis. *The Cochrane Database of Systematic Reviews*. Issue 4, Art No.:CD003684, DOI: 10/1002/14651858.CD003684
- 36) Chu KS, Eng JJ, Dawson AS, Harris JE, Ozkaplan A, Gylfadottir S (2004) Water-based exercise for cardiovascular fitness in people with chronic stroke: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*. 85(6): 870-874
- 37) Chu C (2001) Physiological and cardiovascular changes associated with deep water running in the young: possible implications for the elderly. *Sports Medicine*. 31(1): 33-46.
- 38) Cider A, Schaufelberger M, Sunnerhagen KS, Andersson B (2003) Hydrotherapy--a new approach to improve function in the older patient with chronic heart failure. *European Journal of Heart Failure*. 5(4):527-35
- 39) Cider A, Sunnerhagen KS, Schaufelberger M, Andersson B (2005) Cardiorespiratory effects of warm water immersion in elderly patients with chronic heart failure. *Clinical Physiology and Functional Imaging*. 25(6):313-317
- 40) Cider A, Svealv BG, Tang MS, Schaufelberger M, Andersson B (2006) Immersion in warm water induces improvement in cardiac function in patients with chronic heart failure. *European Journal of Heart Failure*. 8(3):308-313
- 41) Cochrane DJ (2004) Alternating hot and cold water immersion for athlete recovery: A review. *Physical Therapy in Sport*. 5(1):26-32
- 42) Cochrane T, Davey RC, Edwards SMM (2005) Randomised controlled trial of the cost-effectiveness of water-based therapy for lower limb osteoarthritis. *Health Technology Assessment* 3(31): iii-iv, ix-xi, 1-114
- 43) Coco M, Maugeri A, Perciavalle V (2006) Effects induced by swim on a patient with multiple sclerosis. Case report. *Acta Medica Mediterranea*. 22(2): 85-92
- 44) Crevenna R, Schneider B, Mittermaier C, Keilani M, Zoch C, Nuhr M, Wolzt M, Quittan M, Bigenzahn W, Fialka-Moser V (2003) Implementation of the Vienna Hydrotherapy Group for Laryngectomees - A pilot study. *Supportive Care in Cancer*. 11(11): 735-738
- 45) Cromie JE (2002) Occupational health in physiotherapy: General health and reproductive outcomes. *Australian Journal of Physiotherapy*. 48(4): 287-294
- 46) Cusack T (2003) A randomized controlled trial to evaluate the effects of short-wave diathermy and hydrotherapy on patients with osteoarthritis of their knees: a two year report. *Physiotherapy Ireland*, 24(2):19
- 47) Cusack, T, McAteer, MF, Daly LE, McCarthy, CJ (2005) Knee osteoarthritis: A randomized controlled trial comparing hydrotherapy and continuous short-wave diathermy. *Arthritis and Rheumatism* 52(9 Suppl. S): S506-S506
- 48) D'Acquisto L (2001) Metabolic and cardiovascular responses in older women during shallow-water exercise. *Journal of Strength and Conditioning Research*. 5(1): 12-9
- 49) Dagfinrud H, Hagen KB, Kvien TK (2007) Physiotherapy interventions for ankylosing spondylitis. *Cochrane Database of Systematic Reviews*. 2004, Issue 4 Art No.: CD002822. DOI: 10.1002/14651858.CD002822.pub.2 (reprinted 2007, Issue 3)
- 50) Darby LA, Yaekle BC (2000) Physiological responses during two types of exercise performed on land and in water. *Journal of Sports Medicine and Physical Fitness* 40:303-11
- 51) Davidson K (2000) Deep water running training and road running training improve VO2 max in untrained women. *Journal of Strength and Conditioning Research*. 14(2): 191-5. (32 ref)
- 52) Devereux, K, Robertson D and Briffa N. (2005) Effects of a water based program on women 65 years and over: a randomised controlled trail. *Australian Journal of Physiotherapy*. 51(2): 102-8
- 53) Douris P (2005) The effect of land and aquatic exercise on balance scores in older adults. *Journal of Geriatric Physical Therapy*. 26(1): 3-6.
- 54) Driver S (2003) Effect of an aquatics program on psycho/social experiences of individuals with brain injuries: a pilot study. *Journal of Cognitive Rehabilitation*. 21(1): 22-31.
- 55) Driver-S; O'Connor-J; Lox-C; Rees-K (2004) Evaluation of an aquatics programme on fitness parameters of individuals with a brain injury. *Brain-Injury*. 18(9): (847-859)
- 56) Dumas H, Francesconi S (2001) Aquatic therapy in pediatrics: annotated bibliography. *Physical & Occupational Therapy in Pediatrics*. 20(4): 63-78
- 57) Edlich RF, Winters KL, Buschbacher RM, Cox MJ, Long WB, Becker DG (2004) Strategies to reduce hyperthermia in ambulatory multiple sclerosis patients. *Journal of Long-Term Effects of Medical Implants*. 14(6):467-479
- 58) Eksioghi, E (2007) Effects of stanger bath therapy on fibromyalgia. *Clinical Rheumatology*. 26(5): 691-4
- 59) Epps H, Ginnelly L, Utley M, Southwood T, Gallivan S, Sculpher M, Woo P (2005) Is hydrotherapy cost-effective? A randomised controlled trial of combined hydrotherapy programmes compared with physiotherapy land techniques in children with

- juvenile idiopathic arthritis. *Health Technology Assessment*, 9(39):III
- 60) Eversden L, Maggs F, Nightingale P, Jobanpurtra P (2007) A pragmatic randomised controlled trial of hydrotherapy and land exercises on overall well being and quality of life in rheumatoid arthritis. *BMC Musculoskeletal Disorders*. Vol. 8, article 23. Published online 2007 March 1. doi: 10.1186/1471-2474-8-23
- 61) Faull K (2005) A pilot study of the comparative effectiveness of two water-based treatments for fibromyalgia syndrome: Watsu and Aix massage. *Journal of Bodywork & Movement Therapies*. 9(3):202-210
- 62) Figuers CC (2005) Aquatic therapy intervention for a child diagnosed with spinal muscular atrophy. *Journal of Aquatic Physical Therapy*. 13(1):6-12
- 63) Fiscus KA, Kaminski TW, Powers ME. (2005) Changes in lower-leg blood flow during warm-, cold-, and contrast-water therapy. *Archives of Physical Medicine & Rehabilitation*. 86(7): 1404-1410
- 64) Florence DJ, Palmer DG (2003) Therapeutic choices for the discomforts of labor. *Journal of Perinatal Neonatal Nursing*, 17(4):238-249
- 65) Foley A, Halbert J, Hewitt T, Crotty M (2003) Does hydrotherapy improve strength and physical function in patients with osteoarthritis--a randomised controlled trial comparing a gym based and a hydrotherapy based strengthening programme. *Annals of Rheumatic Diseases*. 62(12):1162-7
- 66) Fowler-Horne A (2000) Walking parameters when walking in water. *Journal of Aquatic Physical Therapy*. 8(1): 6-9.
- 67) Fransen M, Nairn L, Winstanley J, Lam P, Edmonds J (2007) Physical activity for osteoarthritis management: A randomized controlled clinical trial evaluating hydrotherapy or Tai Chi classes. *Arthritis Care & Research*. 57(3):407-414
- 68) Fuller R (1999) The activity levels of the vastus medialis oblique muscle during a single leg squat on the land and at varied water depths. *Journal of Aquatic Physical Therapy*. 7(1): 13-8
- 69) Gangaway JMK (2005) Evidence in practice: use of aquatic physical therapy for an adult following clavicle resection. *Journal of Aquatic Physical Therapy* 13(1):13-20
- 70) Gappmaier E, Lake W, Nelson A, Fisher A (2006) Aerobic exercise in water versus walking on and: effects on indices of fat reduction and weight loss of obese women. *Journal of Sports Medicine and Physical Fitness*. 46(5): 564-9
- 71) Gass EM, Gass GC, Pitetti K (2002) Thermoregulatory responses to exercise and warm water immersion in physically trained men with tetraplegia. *Spinal Cord* 40(9):474-80
- 72) Gaub MG, Prost E, Bomar M, Farid R, Langland G, Brown M (2004) Efficacy of balance and flexibility intervention in a frail female centenarian. *Journal of Geriatric Physical Therapy*, 27(1): 20-6
- 73) Gehring M (1997) Water running with and without a flotation vest in competitive and recreational runners. *Medicine and Science in Sports and Exercise*. 29(10): 1374-8.
- 74) Geigle PR, Cheek WL, Gould ML, Hunt HC, Shafiq B (1997) Aquatic physical therapy for balance : the interaction of somatosensory and hydrodynamic principles. *Journal of Aquatic Physical Therapy*. 5(1):4-10
- 75) Geigle P (2001) The effects of a supplemental aquatic physical therapy program on balance and girth for NCAA division III athletes with a grade I or II lateral ankle sprain. *Journal of Aquatic Physical Therapy* 9(1):13-20
- 76) Geigle PR (2000) Clinical decision making in aquatic physical therapy: the guide to physical therapy practice. *Journal of Aquatic Physical Therapy*. 8(2):29-32
- 77) Getz M, Hutzler Y, Vermeer A (2006) Effects of aquatic interventions in children with neuromotor impairments: a systematic review of the literature. *Clinical Rehabilitation* 20:927-936
- 78) Getz M, Hutzler Y, Vermeer A (2007) The effects of aquatic intervention on perceived physical competence and social acceptance in children with cerebral palsy. *European Journal of Special Needs Education*. 22(2):217-228
- 79) Geytenbeek J (2002) Evidence for Effective Hydrotherapy. *Physiotherapy*, 88 (9): 514-529
- 80) Giaquinto S, Margutti F, Romano F (2004) A special pool project for rehabilitation of hip and knee arthroprosthesis. *Disability & Rehabilitation*. 26(19):1158-1162
- 81) Gilbey HJ, Ackland TR, Tapper J, Wang AW (2003) Perioperative exercise improves function following total hip arthroplasty: A randomized controlled trial. *Journal of Musculoskeletal Research*. 7(2):111-123
- 82) Gowans SE, deHueck A, Voss S (1999) Six minute Walk test: a potential outcome measure for hydrotherapy. *Arthritis Care and Research*. 12(3):208-211
- 83) Gowans SE, deHueck A, Voss S, Richardson M (1999) A randomised controlled trial of exercise and education for individuals with fibromyalgia . *Arthritis Care and Research*. 12(2):120-128
- 84) Gowans S.E., DeHueck A. (2007) Pool exercise for individuals with fibromyalgia. *Current Opinion in Rheumatology*. 19(2):168-173
- 85) Griffiths H (2004) A 28-year-old kitchen hand with acute low back pain. *Medicine Today*. 5(12): 57
- 86) Gruber C, Riesberg A, Mansmann U, Knipschild P, Wahn U, Buhning M (2003) The effect of hydrotherapy on the incidence of common cold episodes in children: A randomised clinical trial. *European Journal of Pediatrics*. 162(3):168-176
- 87) Gusi N, Tomas-Carus T, Häkkinen A, Häkkinen K, Ortega-Alonso A (2006) Exercise in waist high water decreases pain and improves health-related quality of life and strength in the lower extremities in women with fibromyalgia. *Arthritis and Rheumatism*. 55(1):66-73
- 88) Guzmán J, Esmail R, Karjalainen K, Malmivaara A, Irvin E, Bombardier C (2001) Multidisciplinary rehabilitation for chronic low back pain: a systematic review. *British Medical Journal*. 332:1511-1516

- 89) Gyurcsik NC, Estabrooks PA, Frahm-Templar MJ (2003) Exercise-related goals and self-efficacy as correlates of aquatic exercise in individuals with arthritis. *Arthritis & Rheumatism*. 49(3):306-13.
- 90) Hall J, Skevington S, Maddison P, Chapman K (1996) A randomised and controlled trial of hydrotherapy and rheumatoid arthritis. *Arthritis Care and Research*. 9(3):206-215
- 91) Hamer P (1997) The psychophysical and heart rate relationship between treadmill and deep-water running. *Australian Journal of Physiotherapy*. 43(4): 265-71.
- 92) Hinman RS, Heywood SE, Day AR (2007) Aquatic physical therapy for hip and knee osteoarthritis: Results of a single-blind randomized controlled trial. *Physical Therapy*. 87 :32-43
- 93) Hirasawa Y, Yamaguchi Y, Okajima S (2002) Surgical approach to cubital tunnel syndrome in the symptomatic osteoarthritic elbow. *Orthopedics & Traumatology*. 10(2):130-137
- 94) Hettinga DM, Jackson A, Moffett JK, May S, Mercer C, Woby SR (2007) A systematic review and synthesis of higher quality evidence of the effectiveness of exercise interventions for non-specific low back pain of at least 6 weeks' duration. *Physical Therapy Reviews*, 12(3):221-232
- 95) Hodgson S (2006) Proximal humerus fracture rehabilitation. *Clinical Orthopaedics & Related Research*. 442:131-138
- 96) Housle B. (2006) One-on-one. Aquatic resistance training. *Strength and Conditioning Journal*. 28(2): 41-2.
- 97) Huber I (2003) An exploration of aquanatal exercise. *British Journal of Midwifery*. 11(4): 218-22.
- 98) Hulls DSV, Walker LK, Powell JM (2006) Clinicians' perceptions of the benefits of aquatic therapy for young children with autism: A preliminary study. *Physical & Occupational Therapy in Pediatrics*. 26(1-2):13-22
- 99) Hutzler Y, Chacham A, Bergman U, Seinberg A. (1998) Effects of a movement and swimming program on vital capacity and water orientation skills of children with cerebral palsy. *Developmental Medicine & Child Neurology*. 40(3): 176-81
- 100) Irvin J (2000) Aquatic dynamics: a sport specific supplemental physical conditioning program. *Journal of Aquatic Physical Therapy*. 8(1):10-2
- 101) Jamison LJ (2000) The therapeutic value of aquatic therapy in treating lymphodema: compressive decongestive physiotherapy. *Rehab Management: the Interdisciplinary Journal of Rehabilitation*. 13(6):29-31
- 102) Jensen MP, Engel JM, Hoffman AJ, Schwartz L (2004) Natural history of chronic pain and pain treatment in adults with cerebral palsy. *American Journal of Physical Medicine and Rehabilitation*. 83(6):439-45
- 103) Jentoft E, Kvalvik A, Mengshoel A (2001) Effects of pool based and land based aerobic exercise on women with fibromyalgia/chronic widespread muscle pain. *Arthritis Care & Research*, 45:42-47
- 104) Johnson BA, Li Y, Hartman AGC (1998) A case study of upper extremity stroke rehabilitation using aquatic exercise techniques: a motor control and learning perspective. *Journal of Aquatic Physical Therapy* 6(2):12-23
- 105) Jones MC, Walley RM, Leech A, Paterson M, Common S, Metcalf C (2006) Using goal attainment scaling to evaluate a needs-led exercise programme for people with severe and profound intellectual disabilities. *Journal of Intellectual Disabilities*. 10(4):317-335.
- 106) Jubelt B (2004) Post-polio syndrome. *Current Treatment Options in Neurology*. 6(2):87-93
- 107) Katrak P, O'Connor B, Woodgate I (2003) Rehabilitation after total femur replacement: A report of 2 cases. *Archives of Physical Medicine & Rehabilitation*. 84(7):1080-1084
- 108) Katz V (2003) Exercise in water during pregnancy. *Clinical Obstetrics and Gynecology* 46:432-441
- 109) Kelly BT, Roskin LA, Kirkendall DT, Speer KP (2003) Shoulder muscle activation during aquatic and dry land exercises in non-impaired subjects. *Journal of Orthopedic Sports Physical Therapy*. 30(4):204-210
- 110) Kelly M, Durrah J (2005) Aquatic exercise for children with cerebral palsy. *Developmental Medicine & Child Neurology*. 47(12): 838-42.
- 111) Kendrick (2002) Effects of water exercise on improving muscular strength and endurance in suburban and inner-city older adults. *Journal of Aquatic Physical Therapy*. 10(1): 21-7.
- 112) Kenkowitz SE, Hasson SM (2003) Aquatic physical therapy in the treatment of a patient with simultaneous bilateral total knee arthroplasties: a case report. *Journal of Aquatic Physical Therapy*. 11(1):6-13
- 113) Kent T, Gregor J, Deardorff L, Katz V (1999) Edema of pregnancy: a comparison of water aerobics and static immersion. *Obstetrics and Gynecology* 94:726-729
- 114) Keren O, Reznik J, Groswasser Z (2001) Combined motor disturbances following severe traumatic brain injury: an integrative long-term treatment approach. *Brain Injury*. 15(7):633-638
- 115) Kesiktaş N, Paker N, Erdogan N, Gulsen G, Bicki D, Yilmaz H. (2004) The use of hydrotherapy for the management of spasticity. *Neurorehabilitation & Neural Repair*. 18(4):268-273
- 116) Kihlstrand M, Stenman B, Nilsson S, Axelsson O (1999) Water-gymnastics reduced the intensity of back / low back pain in pregnant women. *Acta Obstetrica et Scandinavica*. 78(3):180-5
- 117) Konlian C (1999) Aquatic therapy: making waves in the treatment of low back injuries. *Orthopaedic Nursing* Jan/Feb:11-19
- 118) Kosonen T, Malkia E, Keskinen K, Keskinen O (2006) Cardiorespiratory responses to basic aquatic exercise - a pilot study. *Advances in Physiotherapy* 8(2):75-81
- 119) Kurabayashi H, Machida I, Kubota K (1998a) Improvement in ejection fraction by hydrotherapy as rehabilitation in patients with chronic pulmonary emphysema. *Physiotherapy Research International* 3(4): 284-291

- 120) Kurabayashi H, Machida I, Handa H, Akiba T, Kubota K (1998b) Comparison of three protocols for breathing exercises during immersion in 38°C water for chronic obstructive pulmonary disease. *American Journal of Physical Medicine and Rehabilitation*. 6:145-148
- 121) Kurabayashi H, Machida I, Tamura K, Iwai F, Tamura J, Kubota K (2000) Breathing out into water during subtotal immersion: A therapy for chronic pulmonary emphysema. *American Journal of Physical Medicine and Rehabilitation* 79(2):150-153
- 122) La Mantia K (1995) The Efficacy of aerobic exercises for treating osteoarthritis of the knee. *New Zealand Journal of Physiotherapy*. 23-29
- 123) Lauder T (2001) Deep water running: an effective non-weight bearing exercise for the maintenance of land-based running performance. *Military Medicine*. 166(3): 253-8.
- 124) Lavie E, Shapiro M, Julius M (2005) Hydrotherapy combined with Snoezelen multi-sensory therapy. *International Journal of Adolescent Medicine & Health*. 17(1):83-87
- 125) Lenkowitz S (2003) Aquatic physical therapy in the treatment of a patient with simultaneous bilateral total knee arthroplasties: a case report. *Journal of Aquatic Physical Therapy*. 11(1): 6-13.
- 126) Letizia GA, Cataldo P, Cusumano C, Sanfilippo A (2003) The role of water-kinetic therapy in osteomuscular disease in the athletes. *Acta Medica Mediterranea*. 19(3):165-168
- 127) Liddle SD, Baxter GD, Gracey JH (2004) Exercise and chronic low back pain: What works? *Pain*. 107(1-2):176-190
- 128) Lin SYC, Davey RC, Cochrane T (2004) Community rehabilitation for older adults with osteoarthritis of the limb: A controlled clinical trial. *Clinical Rehabilitation*. 18(1): 92-101
- 129) Lineker SC, Badley EM, Hawker G, Wilkins A (2000) Determining sensitivity to change in outcome measures used to evaluate hydrotherapy exercise programs for people with rheumatic diseases. *Arthritis Care and Research*. 13(1):62-66
- 130) Liotard J-P, Edwards TB, Padey A, Walch G, Boulahia A. (2003) Hydrotherapy Rehabilitation after Shoulder Surgery. *Techniques in Shoulder & Elbow Surgery*. 4(2): 44-49
- 131) Liquori A (2003) Effects of a 6-week prenatal water exercise program on physiological parameters and well-being in women with pregnancies in the 2nd-3rd trimesters: a pilot study. *Journal of the Section on Women's Health*. 27(3): 11-9.
- 132) Lorenzetti P (1999) Rehabilitation of a lumbar disc injury with concomitant spondylolisthesis and scoliosis: a case report. *Sports Chiropractic & Rehabilitation*, 13(3):107-110
- 133) Lotan M (2004) Aquatic physical therapy for Rett syndrome: a practice report. *Journal of Aquatic Physical Therapy*. 12(1): 6-16.
- 134) Lox CL, Treasure DC (2000) Changes in feeling states following aquatic exercise during pregnancy. *Journal of Applied Social Psychology* 30(3):518-527
- 135) Maginnis M (1999) Balance abilities of community dwelling older adults engaged in a water exercise program. *Journal of Aquatic Physical Therapy*. 7(1): 6-12.
- 136) Maher CG (2004) Effective physical treatment for chronic low back pain. *Orthopedic Clinics of North America*. 35(1):57-64
- 137) Mannerkorpi K, Nyberg B, Ahlmen M, Ekdahl C (2000) Pool exercise combined with an education program for patients with fibromyalgia syndrome: a prospective randomised study. *Journal of Rheumatology*. 27(10):2473-2481
- 138) Mannerkorpi K, Ahlmen M, Ekdahl C (2002) Six- and 24-month follow-up of pool exercise therapy and education for patients with fibromyalgia. *Scandinavian Journal of Rheumatology*. 31(5):306-310
- 139) Mannerkorpi K (2003) Physiotherapy group treatment for patients with fibromyalgia -- an embodied learning process. *Disability and Rehabilitation*. 25(24): 1372-80.
- 140) Marklund I, Klassbo M (2006) Effects of lower limb intensive mass practice in poststroke patients: Single-subject experimental design with long-term follow-up. *Clinical Rehabilitation*. 20(7): 568-576)
- 141) Martel GF, Harmer ML, Logan JM, Parker CB. (2005) Aquatic plyometric training increases vertical jump in female volleyball players. *Medicine and Science in Sports and Exercise*. 37(10): 1814-9.
- 142) Matsumoto I, Araki H, Tsuda K, Odajima H, Nishima S, Higaki Y, Tanaka H, Tanaka M, Shindo M (1999) Effects of swimming training on aerobic capacity and exercise induced bronchoconstriction in children with bronchial asthma. *Thorax* 54: 196-201
- 143) Maynard TL (2004) Evidence in practice: water walking and strengthening for improving gait function for an adult with cerebral palsy. *Journal of Aquatic Physical Therapy*. 12(1): 24-32
- 144) McIlveen B, Robertson VJ (1998) A randomised controlled study of the outcome of hydrotherapy for subjects with low back pain and leg pain. *Physiotherapy*. 84(1):17-26
- 145) McVeigh JG (2004) Physiotherapy management of fibromyalgia syndrome: a survey of practice in Northern Ireland. *International Journal of Therapy and Rehabilitation*. 11(2): 71-8
- 146) Meyer K (2006) Left ventricular dysfunction and chronic heart failure: Should aqua therapy and swimming be allowed? *British Journal of Sports Medicine*. 40(10): 817-818
- 147) Miller M (2001) Recommendations for implementing an aquatic plyometric program. *Strength and Conditioning Journal*. 23(6): 28-35.
- 148) Miller-MG; Berry-DC; Bullard-S; Gilders-R (2002) Comparisons of land-based and aquatic-based plyometric programs during an 8-week training period. *Journal of Sport Rehabilitation* 11(4): 268-83
- 149) Morris D (1996) Aquatic community-based exercise programs for stroke survivors. *Journal of Aquatic Physical Therapy*. 4(2): 15-20.
- 150) Miyoshi T, Shirota T, Yamamoto SI, Nakazawa K, Akai M (2004) Effect of the walking speed to the lower limb joint angular displacements, joint moments and ground reaction forces during walking in water. *Disability and Rehabilitation*. 26(12): 724-732

- 151) Municino A, Nicolino A, Milanese M, Gronda E, Andreuzzi B, Oliva F, Chiarella F (2006) Hydrotherapy in advanced heart failure: The cardio-HKT pilot study. *Monaldi Archives for Chest Disease*. 66(4):247-254
- 152) Nagle EF, Robertson RJ, Jakicic JJ, Otto AD, Ranalli JR, Chiapetta LB (2007) Effects of Aquatic Exercise and Walking in Sedentary Obese Women Undergoing a Behavioral Weight-Loss Intervention. *International Journal of Aquatic Research & Education* 1(1):43-56
- 153) Nelson RT, Bandy W (2004) Deep water running: an alternative to distance training on land. *Journal of Aquatic Physical Therapy*. 12(1):17-23
- 154) Nikodem VC (2002) Immersion in water in pregnancy, labor and birth. *Cochrane Database of Systematic Reviews*, 2002, Issue 2, Art No.:000111. DOI:10.1002/14651858.CD000111.pub2
- 155) Nijs J, Van Parijs M (2004) Long-term effectiveness of pool exercise therapy and education in patients with fibromyalgia. *Journal of the Chronic Fatigue Syndrome*. 12(3):73-79
- 156) Norton N (1997) Effectiveness of aquatic exercise in the treatment of women with osteoarthritis. *Journal of Aquatic Physical Therapy*. 5(3):8-15.
- 157) O'Brien M, Harris B, Williams M (2003) The effects of water versus land-based exercise for patients with chronic obstructive pulmonary disease – a pilot study. Proceedings of the 8th National Cardiothoracic Special Group Conference, Australian Physiotherapy Association, September 2003, Brisbane.
- 158) Palmer-SL (1998) Aquatic physical therapy case report: rehabilitation of a patient with a supraspinatus tear by aquatic therapeutic home exercises. *Journal of Aquatic Physical Therapy*. 6(2):24-7
- 159) Parker KM, Smith SA (2003) Aquatic-aerobic exercise as a means of stress reduction during pregnancy. *Journal of Perinatal Education*. 12(1):6-17
- 160) Patrick DL, Ramsey SD, Spencer AC, Kinne S, Belza B, Topolski TD (2001) Economic evaluation of aquatic exercise for persons with osteoarthritis. *Medical Care*. 39(5):413-24
- 161) Pechter U (2003) Beneficial effects of water-based exercise in patients with chronic kidney disease. *International Journal of Rehabilitation Research*. 26(2):153-6.
- 162) Pengel HM, Maher CG, Refshauge KM (2002) Systematic review of conservative interventions for subacute low back pain. *Clinical Rehabilitation*. 16(8): 811-82
- 163) Petrick M (2001) Comparison between quadriceps muscle strengthening on land and in water. *Physiotherapy*. 87(6):310-7.
- 164) Petrofsky J, Connel M, Parrish C, Lohman, Laymon M (2002) Muscle use during gait on land and in water. *British Journal of Therapy and Rehabilitation*. 9(1): 6-14
- 165) Pohl MB, McNaughton LR (2003) The physiological responses to running and walking in water at different depths. *Research in Sports Medicine*. 11(2):63-78
- 166) Polman R, Kaiseler M, Borkoles E (2007) Effect of a single bout of exercise on the mood of pregnant women. *Journal of Sports Medicine and Physical Fitness*. 47(1):103-111
- 167) Poteat AL, Bjerke MD, Johnston TD, Mairs JP (1997) Evidence-based aquatic therapy: building a case for use of aquatic physical therapy for fibromyalgia patient populations. *Journal of Aquatic Physical Therapy*. 5(2):8-16
- 168) Poyhonen T (2002) Effects of aquatic resistance training on neuromuscular performance in healthy women. *Medicine and Science in Sports and Exercise*. 34(12): 2103-9.
- 169) Poyhonen T, Keskinen KL, Kyrolainen H, Hautala A, Savolainen J, Malkia E (2001) Neuromuscular function during therapeutic knee exercise under water and on dry land. *Archives of Physical Medicine and Rehabilitation*. 82(10):1446-52.
- 170) Prins J, Cutner D (1999) Aquatic therapy in the rehabilitation of athletic injuries *Clinics in Sports Medicine*. 18(2):447-461
- 171) Reilly T (2003) The physiology of deep-water running. *Journal of Sports Sciences*. 21(12): 959-72.
- 172) Robertson JM, Brewster EA, Factora KI (2001) Comparison of heart rates during water running in deep and shallow water at the same rating of perceived exertion. *Journal of Aquatic Physical Therapy*. 9(1):21-6
- 173) Robinson (2004) The effects of land vs. aquatic plyometrics on power, torque, velocity, and muscle soreness in women. *Journal of Strength and Conditioning Research*. 18(1):84-91
- 174) Roehrs T (2004) Effects of an aquatics exercise program on quality of life measures for individuals with progressive multiple sclerosis. *Journal of Neurologic Physical Therapy*. 28(2):63-71
- 175) Sanford-Smith S, MacKay-Lyons M, Nunes-Clements S (1998) Therapeutic benefit of aqua-aerobics for individuals with rheumatoid arthritis. *Physiotherapy Canada*. 50(1): 40-46
- 176) Schrepfer RW, Fritz J (2000) A comparison of change in visual analogue pain rating of acute low back pain patients following deep water walking or deep water hanging. *Journal of Aquatic Physical Therapy*. 8(2): 25-8
- 177) Schrepfer RW, Babb RW (1998) Manual techniques of the shoulder in aquatic physical therapy. *Journal of Aquatic Physical Therapy*. 6(1):11-5
- 178) Sherman N (1997) VO2 max estimation in healthy adults using submaximal deep-water running. *Journal of Strength and Conditioning Research*. 11(2):73-6.
- 179) Sherry DD, Wallace CA, Kelley C, Kidder M, Sapp L (1999) Short and long term outcomes of children with complex regional pain syndrome type I treated with exercise therapy. *Clinical Journal of Pain*. 15:218-223
- 180) Simmonds M (2006) Exercise therapy in the management of hip osteoarthritis: a literature review. *New Zealand Journal of Physiotherapy*, 34(2):112
- 181) Simmons V, Hansen PD (1996) Effectiveness of water exercise on postural mobility in the well elderly: an experimental study on balance enhancement. *Journal of Gerontology*. 51(5):M233-8

- 182) Sjogren T, Long N, Storay I, Smith J (1997) Group hydrotherapy versus group land-based treatment for chronic low back pain. *Physiotherapy Research International*. 2(4):212-22
- 183) Smith SA, Michel Y (2006) A pilot study on the effects of aquatic exercises on discomforts of pregnancy. *Journal of Obstetric, Gynecological and Neonatal Nursing*. 35(3):315-23
- 184) Southard V, Douris P, Gennero C, Schauss W, Varga C, Reiss A. (2003) The effects of land and aquatic exercise on balance scores in older adults. *Journal of Geriatric Physical Therapy*. 26(3):49-50.
- 185) Stener-Victorin E, Kruse-Smidje C, Jung K (2004) Comparison between Electro-Acupuncture and Hydrotherapy, both in combination with patient education and patient education alone, on the symptomatic treatment of osteoarthritis of the hip. *Clinical Journal of Pain*. 20(3):179-185
- 186) Stowell T, Fuller R, Fulk G (2001) An aquatic and land-based physical therapy intervention to improve functional mobility for an individual after an incomplete C6 spinal cord lesion. *Journal of Aquatic Physical Therapy*. 9(1):27-32
- 187) Suomi R, Lindauer S (1997) Effectiveness of Arthritis Foundation Aquatic Program on strength and range of motion in women with arthritis. *Journal of Aging and Physical Activity*. 5(4):341-51
- 188) Suomi R, Kocejka DM (2000) Postural sway characteristics in women with lower extremity arthritis before and after an aquatic exercise intervention. *Archives of Physical Medicine and Rehabilitation*. 81(6):780-785
- 189) Suomi R (2003) Effects of arthritis exercise programs on functional fitness and perceived activities of daily living measures in older adults with arthritis. *Archives of Physical Medicine and Rehabilitation*. 84(11): 1589-94.
- 190) Takahashi T (2003) Responses of heart rate and vagus tone to treadmill walking on land and in water in healthy older adults. *Journal of Aging and Physical Activity*. 11(1):18-26.
- 191) Takeshima N, Nakata M, Kobayashi F, Tanaka K, Pollock ML. (1997) Oxygen uptake and heart rate differences between walking on land and in water in the elderly. *Journal of Aging and Physical Activity*. 5(2):126-34.
- 192) Takken T, van der Net J, Helders PJM (2001) Do juvenile idiopathic arthritis patients benefit from an exercise program? A pilot study. *Arthritis & Rheumatism (Arthritis Care & Research)*. 45(1):81-5.
- 193) Taylor S (2003) The ventilated patient undergoing hydrotherapy: a case study. *Australian Critical Care*. 6(3):111-5
- 194) Thein JM, Thein Brody L (2000) Aquatic-based rehabilitation and training for the shoulder. *Journal of Athletic Training*. 35(3):382-389
- 195) Thomaz S, Beraldo P, Mateus S, Horan T, Leal JC. (2005) Effects of partial isothermic immersion on the spirometry parameters of tetraplegic patients. *Chest*. 128(1):184-189
- 196) Thorpe DE (2000) The use of aquatic resistive exercise for a patient with anterior knee pain. *Physical Therapy Case Reports*. 3(3):114-9.
- 197) Thorpe DE, Reilly M (2000) The effect of an aquatic resistive exercise program on lower extremity strength, energy expenditure, functional mobility, balance and self-perception in an adult with cerebral palsy: a retrospective case report. *Journal of Aquatic Physical Therapy*. 8(2):18-24
- 198) Tidhar D, Shimony A, Drouin J (2004) Aqua lymphatic therapy for post-surgical breast cancer lymphedema. *Rehabilitation Oncology*. 22(3): 6-14.
- 199) Tsourloulou T, Benik, A, Dipla, K, Zafeiridis, A and Kellis, S (2006) The effects of a twenty four week aquatic training program on muscular strength performance in health elderly women. *Journal of Strength and Conditioning Research*. 20(4):811-8
- 200) van der Linden S, van Tubergen A, Hidding A (2002) Physiotherapy in ankylosing spondylitis: What is the evidence? *Clinical & Experimental Rheumatology*. 20(6 SUPPL. 28):S-60-S-64
- 201) van Tubergen A, Landewe R, van der Heijde D, Hidding A, Wolter N, Asscher M, Falkenbach A, Genth E, The HG, van der Linden S (2001) Combined spa-exercise therapy is effective in patients with ankylosing spondylitis: a randomized controlled trial. *Arthritis Rheum*. 45(5):430-8.
- 202) Vargas LG (1998) The effect of aquatic physical therapy on improving motor function and decreasing pain in a chronic low back pain patient: a retrospective case report. *Journal of Aquatic Physical Therapy*. 6(1):6-10
- 203) Verhagen AP, de Vet HCW, de Bie RA, Kessels AGH, Boers M, Knioschild PG (2000) Balneotherapy for rheumatoid arthritis and osteoarthritis. In: The Cochrane Library, Issue 3, 2000, Oxford: Update Software.
- 204) Vitorino DFdM, Carvalho LBCd, Prado GFd (2006) Hydrotherapy and conventional physiotherapy improve total sleep time and quality of life of fibromyalgia patients: Randomized clinical trial. *Sleep Medicine*. 7(3):293-296
- 205) Voglte L (1998) An aquatic program for adults with cerebral palsy living in group homes. *Physical Therapy Case Reports*. 1(5): 250-9.
- 206) Volakis KA, Tokmakidis SP (2007) Land versus water exercise in patients with coronary artery disease: effects on body composition, blood lipids and physical fitness. *American Heart Journal* 154:560.e1-560.e6
- 207) White T, Smith BS (1998) The efficacy of aquatic exercise in increasing strength. *Sports Medicine, Training and Rehabilitation*. 9(1):51-59
- 208) Von-Duvillard SP, Le Mura LM, Presper S, Plaud JJ, Rohrer A (2000) Submaximal exercise in young female subjects on land and in water with and without hand-held weights. *Sports Medicine, Training and Rehabilitation*. 9(3):153-168
- 209) Wadell K, Sundelin G, Henriksson-Larsen K, Lundgren R (2004) High intensity physical group training in water - An effective training modality for patients with COPD. *Respiratory Medicine*. 98(5):428-438
- 210) Wang TJ, Belza B, Thompson FE, Whitney JD, Bennett K (2007) Effects of aquatic exercise on flexibility, strength and

- aerobic fitness in adults with osteoarthritis of the hip or knee. *Journal of Advanced Nursing* 57(2):141–152
- 211) Ward EJ, Mc Intyre A, Van Kessel G, Hague WM (2005) Immediate blood pressure changes and aquatic physiotherapy. *Hypertension in Pregnancy*. 24(2):93-102
- 212) Watanabe E, Takeshima N, Okada A, Inomata K (2000) Comparison of water and land based exercise in the reduction of state anxiety among older adults. *Perceptual and Motor Skills*. 91:97-104
- 213) Watts KE, Gangaway JMK (2007) Evidence-based treatment of aquatic physical therapy in the rehabilitation of upper extremity orthopedic injuries. *Journal of Aquatic Physical Therapy*. 15(1):19-26
- 214) Wieczorek M, DeMore D, Tucker JM, Shea P, Broke M, Kauffman C, Marchese A, Row K (1996) Comparison of heart rate, blood pressure and rate of perceived exertion on land versus in water with aerobic stepping. *Journal of Aquatic Physical Therapy*. 4(1):4-10
- 215) Willen C, Sunnerhagn KS, Grimby G (2001) Dynamic water exercise in individuals with late poliomyelitis. *Archives of Physical Medicine and Rehabilitation*. 82(1):66-72.
- 216) Weigenfeld-Lahav I, Hutzler I, Roth D, Hadar-Frumer M (2007) Physical and psychological effects of aquatic therapy participants after hip-joint replacement: a pilot study. *International Journal of Aquatic Research and Education*. 1:311-321
- 217) Winter S (2000) Effects of preoperative water exercise on total knee replacement patients. *Journal of Aquatic Physical Therapy*. 8(2):12-7.
- 218) Winter SV (2000) Effects of aquatic lumbar stabilization and strengthening exercise protocol on chronic low back pain patients. *Journal of Aquatic Physical Therapy*. 10(1):11-20.
- 219) Wyatt FB, Milam S, Manske RC, Deere R (2001) The effects of aquatic and traditional exercise programs on persons with knee osteoarthritis. *Journal of Strength and Conditioning Research*. 15(3): 337-40.
- 220) Yurtkuran M (2006) Balneotherapy and tap water therapy in the treatment of knee osteoarthritis. *Rheumatology International*. 27(1):19-27