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# Can aquatic exercise improve function in elderly persons with and without chronic disability? : A systematic review

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# The Problem



- Balneotherapy and spa therapy are common treatments for low back pain.
  - The costs are sometimes reimbursed.
- A systematic review found only 5 RCTs. Judged by self reported pain on a visual analogue scale, the treatments were modestly effective (*Rheumatology* 2006;45: 880-4).

# The Problem



A more important finding is the mismatch between the popularity of these interventions and the paucity of evaluations of their efficacy.  
*(BMJ, 2006)*



# Purpose



Exercise is beneficial for elderly and water is an appropriate environment to exercise, nevertheless no recent review has concentrated on this population and the evidence remains unclear.

Systematically review the literature on the effect of aquatic exercise on function, activity and participation in elderly with and without chronic diseases.

# Methods



Studies: randomised controlled trials.

Population: mean age 55 yrs or older, independent in ADL-and with or without chronic disability.

Interventions: active aquatic therapy (exercise not SPA).

Outcomes: Cardiovascular fitness, flexibility, balance, strength and body composition.

# Search: PUBMED, PEDRO, CINAHL, Sports Discus and the Cochrane controlled trials register



**Search Terms:** Aquatic therapy **and** Fitness **and** Elderly  
**or** Aquatic exercise Balance/Fall prevention  
Water therapy Quality of life  
Hydrotherapy  
Aquatic Physiotherapy  
Water exercise  
Aquatic Rehabilitation  
Pool exercise  
Water rehab

## Limits:

Human  
Adult (age $\geq$ 55)  
Published 1980-01/2008  
RCT's, Reviews

# Search results: 2 Reviewers



Potential relevant studies (N=114)

N=84 excluded after reading abstract

- passive intervention in water
- average age  $\leq$  55 years
- review/no RCT

N=30

N=11 excluded after reading article

- written in Japanese
- not yet published
- did not meet inclusion criteria
- no control group

N=19

# Results

9 studies = Healthy population

1 study = Stroke

4 studies = Arthritis

2 studies = Rheumatism

1 study = Osteoporosis

1 study = Heart Disease

1 study = COPD





study	N		Body Function / Structure
Takeshima & al. 2000	30	healthy	VO2 peak, FEV1, trunkROM, muscleF, skinfold
Cider & al. 2003	25	chronic heart failure	VO2max/peak
Chu & al. 2004	12	chronic stroke (mild - moderate)	VO2max, max workload, paretic muscle F
Devereux & al. 2005	50	osteopenia - osteoporosis	∅
Wang & al. 2006	38	osteoarthritis hip or knee	ROM lower limb(exept knee flexion), Muscle F lowerlimb
Eversden & al. 2007	115	rheumatoid arthritis	∅
Hinman & al 2007	71	hip/knee osteoarthritis	Visual Analogue Scale, WOMAC pain & function
Sato & al. 2007	30	frail elderly persons	∅
Foley & al. 2008	105	hip/knee osteoarthritis	QuadricepsF: GYM > HYDRO
Silva & al. 2008	64	knee osteoarthritis	Visual Analogue Scale: Decrease PAIN GYM<HYDRO after 50 feet Walk test

study	N		Activity / Participation
Takeshima & al. 2000	30	healthy	Vertical jump, Side step test
Cider & al. 2003	25	chronic heart failure	6 min walk test
Chu & al. 2004	12	chronic stroke (mild - moderate)	Gait speed
Devereux & al. 2005	50	osteopenia - osteoporosis	Step test, SF36
Wang & al. 2006	38	osteoarthritis hip or knee	6 min walk test
Eversden & al. 2007	115	rheumatoid arthritis	10 m walk time
Hinman & al 2007	71	hip/knee osteoarthritis	6 min walk test
Sato & al. 2007	30	frail elderly persons	SF36 physical & mental component, HQRoL, FIM for both group after 6 months
Foley & al. 2008	105	hip/knee osteoarthritis	6 min walk test: HYDRO > CONTROL GYM = CONTROL
Silva & al. 2008	64	knee osteoarthritis	∅

# Delphi score: Methodological quality of selected studies



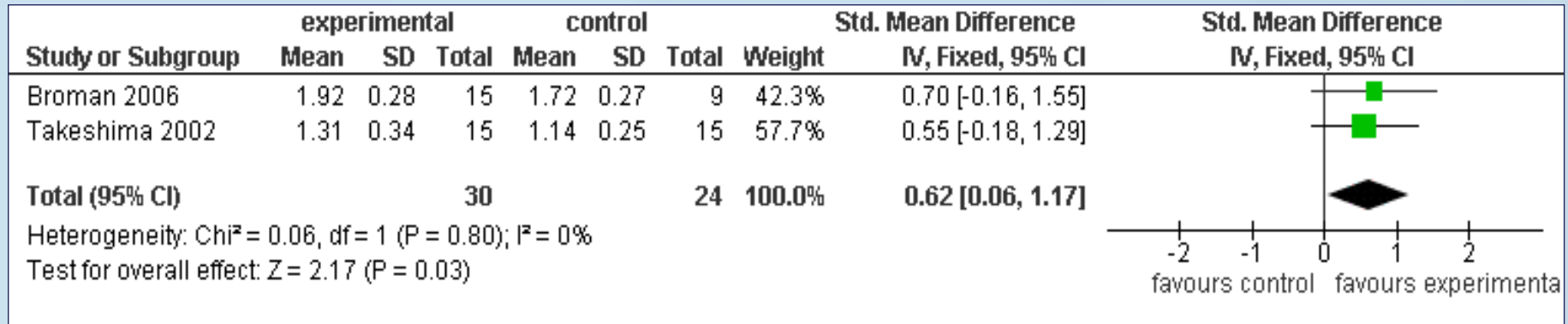
	Chu 2004	Eversden 2007	Foley 2003	Hinman 2007	Silva 2008	Devereux 2005	Hall 1996	Ide 2005	Tsourlou 2006	Sato 2007	Takeshima 2002	Taunton 1996	Simmons 1996	Wang 2006	Broman 2006	Lord 2006	Wadell 2004	Cider 2003	Douris 2003	
Randomisation?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	?	O	O	
Concealed allocation?	X	X	X	X	X	X	X	X	?	?	?	?	?	?	?	?	O	?	O	
Equal at baseline?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	O	O	
Eligibility specified?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Blind assessors?	X	X	X	X	X	O	X	?	X	O	X	X	O	O	?	O	?	O	O	
Blind care providers?	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	?	O	O
Blinded participants?	X	O	O	O	?	O	O	O	O	X	O	O	O	O	O	O	O	?	X	O
Point estimates and variability?	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Intention-to-treat?	?	X	X	X	X	X	?	?	?	?	?	?	?	X	X	?	X	X	O	O
Delphi score	7	7	7	7	7	6	6	5	5	5	5	5	5	5	4	4	4	4	3	2

# Results

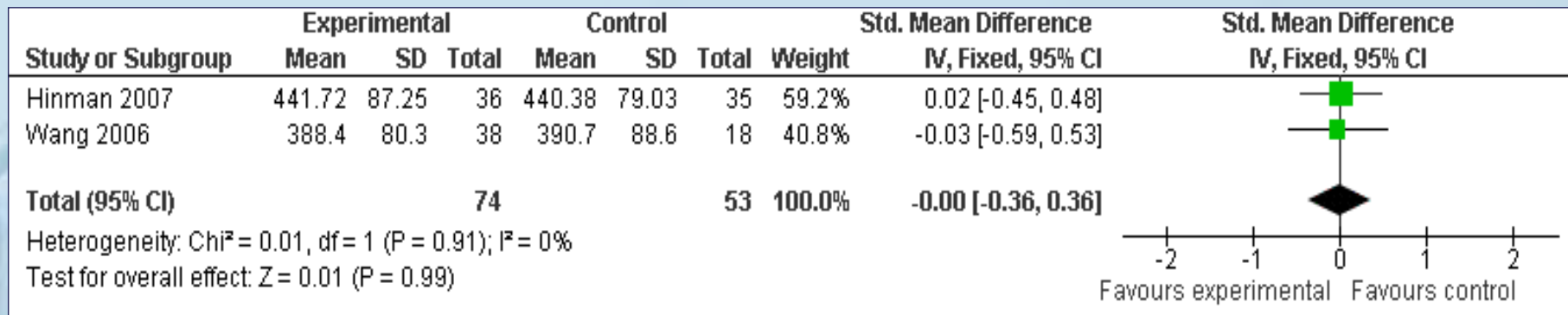


- Samples = 12 to 139 persons ( $M = 106.5$ , groups = 7-35)
- $M$  age from 58 to 78 years.
- Intervention = 4 to 24 weeks
- 1 to 3 sessions a week
- Total treatment = 240 to 4320 min, ( $M=1460$  min).
- Water level from waist to chest level.
- Water temperature between  $25^{\circ}$  and  $35^{\circ}$  C.
- Less than 50% did a follow-up study

# Results: Meta analysis



## Aerobic Capacity



## 6 min. Walk

# Discussion



- Aerobic Capacity: improves (does not decrease) if exercise is specific and intervention long enough (12% - 22%)
- For ROM the evidence less consistent (+11%)
- Balance: Only with specific exercises
- Strength: (5% to 30%)
- Body composition: (3.4% increase in lean body mass and 8% decrease in skin-fold thickness).
- **Only 1 study reported an adverse effect of aquatic therapy.**

# Clinical Message



- An aquatic exercise program is moderately to highly effective in elderly for improvement of: body functions and structures, activities and participation.
- There is a need for more high quality trials with sufficient sample size, blinded outcome assessment and follow-up assessment
- Aquatic exercise guidelines need to be developed



Thank You for Your attention!



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study	N	population	aquatic intervention	control group activity	follow-up
Takeshima & al. 2000	30	healthy	intervention clearly explained 70 min, 3x/week, 12 weeks	normal daily activity <i>We get you moving</i> Changes	N
Cider & al. 2003	25	chronic heart failure	intervention clearly explained 45 min, 3x/week, 8 weeks	normal daily activity, no PA changes	N
Chu & al. 2004	12	chronic stroke (mild - moderate)	intervention clearly explained 60 min, 3x/week, 8 weeks	arm function program	N
Devereux & al. 2005	50	osteopenia - osteoporosis	intervention moderately explained 60 min, 2x/week, 10 weeks	no instructions not encouraged to change daily living	N
Wang & al. 2006	38	osteoarthritis hip or knee	intervention clearly explained 50 min, 3x/week, 12 weeks	normal daily activity, hydrotherapy end of the trail	N
Eversden & al. 2007	115	rheumatoid arthritis	intervention moderately explained 30min, 1x/week, 6 weeks	same program on land	Y (after 12 weeks)
Fransen & al. 2007	152	hip/knee osteoarthritis	interventions clearly explained 60 min, 2x/week, 12 weeks	T'ai Chi: 24 form control: waiting list	Y (after 12 weeks)
Hinman & al. 2007	71	hip/knee osteoarthritis	intervention clearly explained 45 - 60 min, 2x/week, 6 weeks	normal daily activity, no medication changes	Y (after 6 weeks)
Sato & al. 2007	30	frail elderly persons	60 min, 1x/week, 24 weeks intervention clearly explained	normal daily activity	N
Foley & al. 2008	105	hip/knee osteoarthritis	intervention poorly explained 30 min, 3x/week, 6 weeks	control: normal daily activity gym: program with fitness equipment	Y (not clear)
Silva & al. 2008	64	knee osteoarthritis	intervention moderately explained 50 min, 3x/week, 18 weeks	similar land-based exercises	Y (after 18 weeks)