

Aquatic Interventions Compared with Conventional Land-Based Interventions to Improve Balance and Mobility in Persons with Parkinson's Disease: A Systematic Review

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Parkinson's Disease (PD)

- ~1 million Americans have PD¹
- ~60,000 Americans diagnosed with PD each year¹
- Men are one and a half times more likely to have PD than women¹
- Persons with PD are three times more likely to sustain a fall²
 - Prevalence: 13% weekly, 70% annually²



Parkinson's Disease (PD)

Cardinal Features³:

- Rigidity
- Bradykinesia
- Tremor
- Postural instability

Clinical Manifestations³:

- Motor performance
- Motor planning
- Gait
- Posture



Aquatic Therapy

Definition⁴:

- Practice of physical therapy in an aquatic environment by a physical therapist
- Includes: treatment, rehabilitation, prevention, health, wellness, and fitness of patient with or without the use of assistive, adaptive, orthotic, protective, or supportive devices



Aquatic Therapy

Designed to improve or maintain⁴:

- Function, aerobic capacity, balance, coordination, postural stabilization, flexibility, gait/locomotion, muscle strength/power/endurance



Aquatic Therapy vs. Aquatic Exercise

- **Aquatic Therapy = Hydrotherapy** - Practice of physical therapy in an aquatic environment by a physical therapist⁴
- **Aquatic Exercise = Water-Based Exercise = Ai Chi** - the utilization of water for the improvement of quality of life and achievement of fitness-related or general health-related goals⁴

Purpose

To determine the impact of aquatic interventions compared with conventional land-based interventions on balance and mobility for persons with Parkinson's Disease



Methods

Databases

- CINAHL
- ProQuest
- Pubmed/MEDLINE
- Science Direct

Search limits

- English language
- Published within past 10 years
- Peer-reviewed
- Human subjects



Search Terms

(aquatic therapy OR aquatic exercise OR aquatherapy OR water based exercise) and (Parkinson* disease)



Selection Criteria

Selection criteria

- Must fit sample population
- Must include both aquatic intervention and land-based exercise intervention

Interventions and comparators

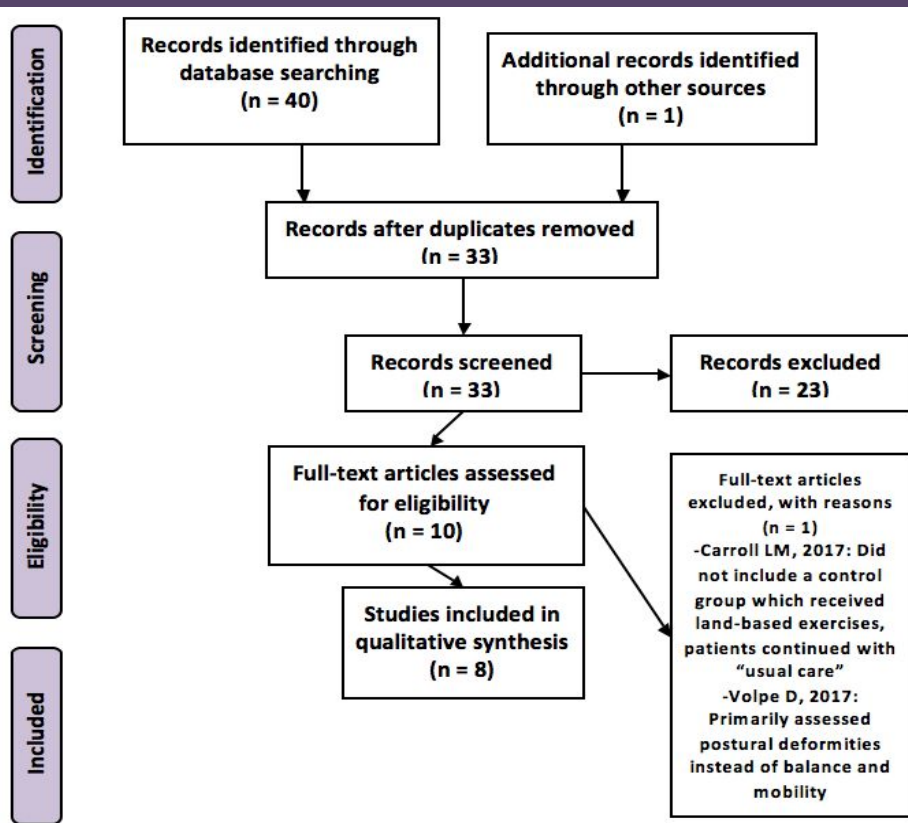
- Comparison of aquatic intervention to a land-based exercise intervention
- Outcome measure of balance and/or mobility

Sample population

- Adults \geq 18 years
- Confirmed diagnosis of PD (acute or chronic)
- Must be ambulatory (with or without device)



PRISMA



PEDro

Study	1	2	3	4	5	6	7	8	9	10	11	Score/10
Vivas J et al ('11)	Y	Y	N	Y	N	N	N	Y	N	Y	Y	5
Cancela J et al ('15)	Y	N	N	Y	N	N	N	Y	Y	Y	Y	5
Ayan C et al ('14)	Y	N	Y	Y	N	N	N	Y	Y	Y	Y	6
Sage M et al ('11)	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	6
Kurt EE et al ('17)	Y	Y	Y	Y	N	N	N	Y	Y	Y	Y	7
Palamara G et al ('17)	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Volpe D et al ('14)	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
Perez-de la Cruz S ('17)	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	8
												Mean = 6.6

Study Characteristics

Characteristics of the samples

- Sample sizes ranged from 12-89 subjects (289 total)
- Both males & females were included
- Average age range: 62.41-70.62 years
- H&Y stages: 1-3



Study Characteristics Continued

Programs varied widely

- Length of programs: 4-16 weeks
- Duration of sessions: 45-60 minutes
- Frequency: 1-6 sessions per week
- Pool temperature: 28-34° Celsius
- Pool depth: 0.75-1.5 meters
 - Average of 1.22 meters



Study Characteristics Continued

Various outcomes measures used by the studies

- **5MWT:** 5 Meter Walk Test
- **ABC Scale:** The Activities- specific Balance Confidence Scale
- **BBS:** Berg Balance Scale
- **FES:** Falls Efficacy Scale
- **FOG:** freezing of gait
- **FR:** Functional Reach
- **FTSTS:** Five Times Sit to Stand
- **PDQ-39:** Parkinson's Disease Questionnaire
- **SPPB:** Short Physical Performance Battery
- **Tinetti POMA:** Tinetti Performance Oriented Mobility Assessment
- **TUG:** Timed Up and Go
- **UPDRS:** Unified Parkinson's Disease Rating Scale



Aquatic Interventions

- All included warm up and cool down
- Variety of aerobic, balance, motor skills, coordination, joint mobility exercises



Aquatic Therapy Program Example

General Exercises (35 minutes)

- Lower limb (coordination, balance, strength)
 - Jogging with rowing movements: toward/forward
 - Displacements raising knees
 - Stepping movements (rising & lowering on an aquatic step)
 - Vertical position push-up against the wall
 - Half-squat & split-squat
- Upper limb (the swim board)
 - Arm flex/ext & abd/add
 - Bring arms together in front of chest
 - Opening & closing hands
 - Lateral trunk flex
 - Holding onto a swim board with two hands, water is pushed from the chest outwards
- Perceptual (5 minutes)
 - Throwing balls into hoops



Results

	<i>With respect to the aquatic intervention groups</i>			
Outcome measure	Statistically significant improvements within groups	Statistically significant improvements between groups	Nonsignificant improvements within groups	Nonsignificant improvements between groups
BBS	4 out of 5 studies	4 out of 5 studies	1 out of 5 studies	1 out of 5 studies
TUG	3 out of 5 studies	1 out of 5 studies	2 out of 5 studies	-----
UPDRS	3 out of 7 studies	2 out of 7 studies	2 out of 7 studies	1 out of 7 studies
PDQ-39	1 out of 2 studies	1 out of 2 studies	1 out of 2 studies	1 out of 2 studies
Gait speed	1 out of 2 studies	-----	-----	-----



Conclusions

Study	Accepted aquatic intervention as “as good or better than” land-based intervention
Vivas J et al ('11)	As good
Cancela J et al ('15)	As good
Ayan C et al ('14)	As good
Sage M et al ('11)	NOT as good
Kurt EE et al ('17)	Better
Palamara G et al ('17)	Better
Volpe D et al ('14)	Better
Perez-de la Cruz S ('17)	Better



Conclusions

There is moderate to high evidence for aquatic-based interventions as an adjunct treatment to improve balance and mobility for persons with Parkinson's Disease



Clinical Relevance

- Aquatic therapy is another beneficial physical therapy intervention for persons with PD
 - Aquatic exercise may be utilized as a maintenance program
- Feasibility
- Safety
- Reduction in pain



Limitations of the Study

- Varied protocols/measures
- Interventions impossible to blind to participants/providers
- Databases searched
- Small sample sizes
- Lack of long-term follow-up



Future Research

With regards to persons with PD

- Explore effects of aquatic intervention for those who are not taking medications for PD
- Determine optimal training parameters for aquatic intervention
- Determine effects of aquatic intervention on quality of life
- Explore specific effects of aquatic intervention on gait
- Include long-term follow-up with larger sample sizes



Take Home Message

- Introducing a treatment option that is both enjoyable and feasible for long-term care is important due to the progressive nature of PD
- Aquatic interventions can be performed individually, under the supervision of a PT, or in a group exercise class, which can have social benefits
- Clinicians should consider implementation or referral, as aquatic intervention is a safe and effective option to improve balance and mobility in persons with PD



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Appendix



Hoehn-Yahr Classification of Disability

Stage ³	Character of Disability ³
I	Minimal or absent; unilateral if present.
II	Minimal bilateral or midline involvement. Balance not impaired.
III	Impaired righting reflexes Unsteadiness when turning or rising from chair. Some activities are restricted, but patient can live independently & continue some forms of employment
IV	All symptoms present & severe. Standing & walking possible only with assistance.
V	Confined to bed or wheelchair.



Questions?

