

# Aquatic Physical Therapy in Musculoskeletal Diseases: Current Evidence

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  - Osteoarthritis
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# Other Authors

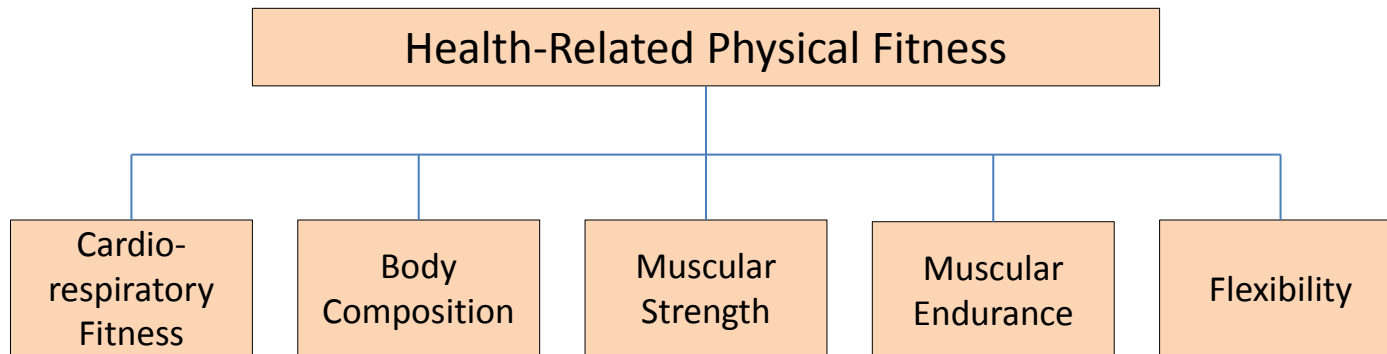
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# Components of Health-Related Physical Fitness (ACSM 2010)

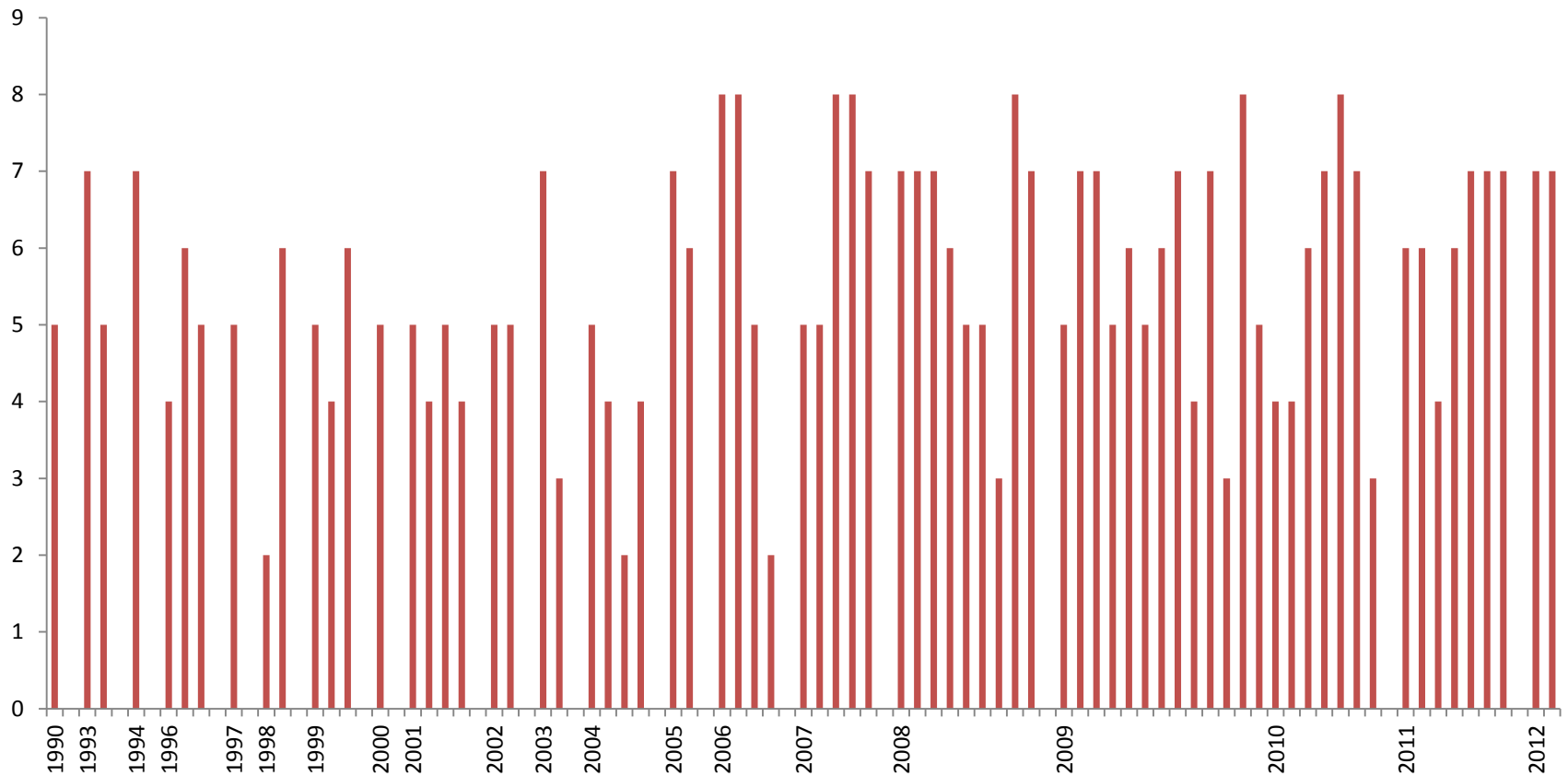


# Therapeutic Aquatic Exercise

TAE can be defined as an intervention utilizing the mechanical and thermal characteristics of water during immersion , in combination with the effects of movement with a systematic approach to treat a health problem. TAE evokes short-term and long-term adaptation mechanisms of a person with a deranged biological system (World Confederation of Physical Therapy – Aquatic Physical Therapy International network; WCPT-APTI).

# Quality of evidence for Therapeutic Aquatic Exercise in the management of musculoskeletal problems (n= 73)

**PEDro score /10**

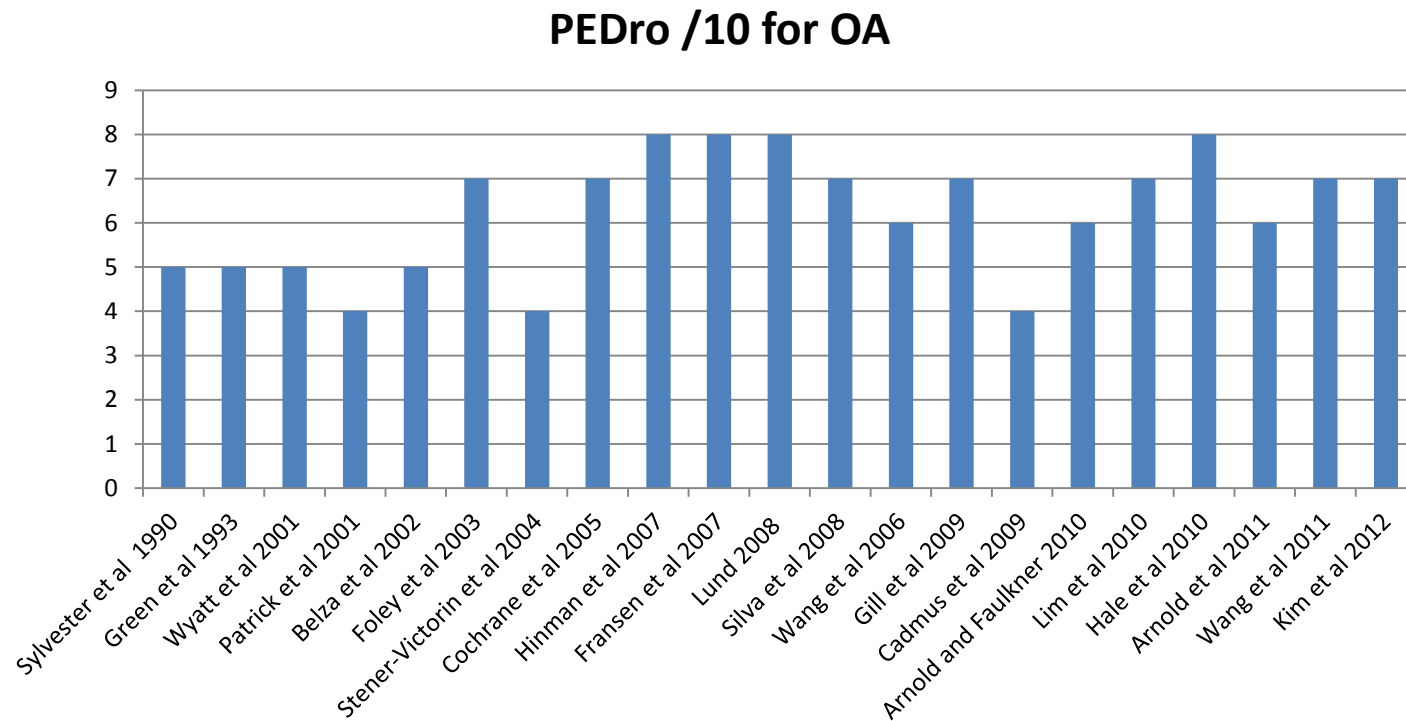


# PICOT

- Patient/Population
- Intervention
- Comparision
- Outcome
- Time

# Osteoarthritis (OA)

- Based on
  - 2 SR (Bartels et al 2008, Batterham et al 2011)
  - 21 RCT (4 lower limb OA, 7 hip and/or knee, 5 knee alone, 5 hip alone)





# PICOT for OA

- Patients/population
  - N = 2244 Ave 106 (14-326)
  - Diagnosed OA of LL, different criteria used throughout, mixtures of locations and severity
  - Age Average range from 59-79 years old
- Interventions
  - 9/21 intensity not stated, 6/10 strength training described rep 10-40 per set
  - Duration of intervention 30-60 minutes
  - Number of sessions total 593 ave 28 sessions (range 10-84)
- Comparison
  - 12/21 normal care
  - 8/21 Land based exercises
  - 2/21 home exercises
  - 1/21 electro-acupuncture
- Outcome
  - 21/21 Self assessed function 11/21 Pain (VAS), 9/21 WOMAC, 2/21 KOOS,
  - 12/21 Physical Performance measures 8/21 Knee flexion/extension strength, 5/21 6MWT, 4/21 Timed up and go
  - 12/21 Quality of life questionnaires
  - 2/21 body weight
- Time
  - Duration of treatment 6 weeks- 1 year
  - 7/21 had follow-up measurements 6 weeks-8 months after intervention

# Summary of Findings for OA

- Pain (Level 1)
  - Small to moderate changes (similar to other NP interventions)
- Strength (Level 2)
  - Conflicting findings
- Aerobic fitness (Level 2)
  - Small to moderate improvements
- Self assessed function (Level 2)
  - Small to moderate improvements
- Balance (Level 2)
  - Improves balance and decreases falls risk
- Quality of life (Level 2)
  - Small to moderate improvements
- Body composition (level 3)
  - Decrease body weight (if intervention is of sufficient intensity)
- Long term effect
  - Most positive effects are lost at follow up.
- All findings similar to dry land interventions and TAE is not superior

# Take home message

Limited agreement on what an optimal TAE program should be composed of.

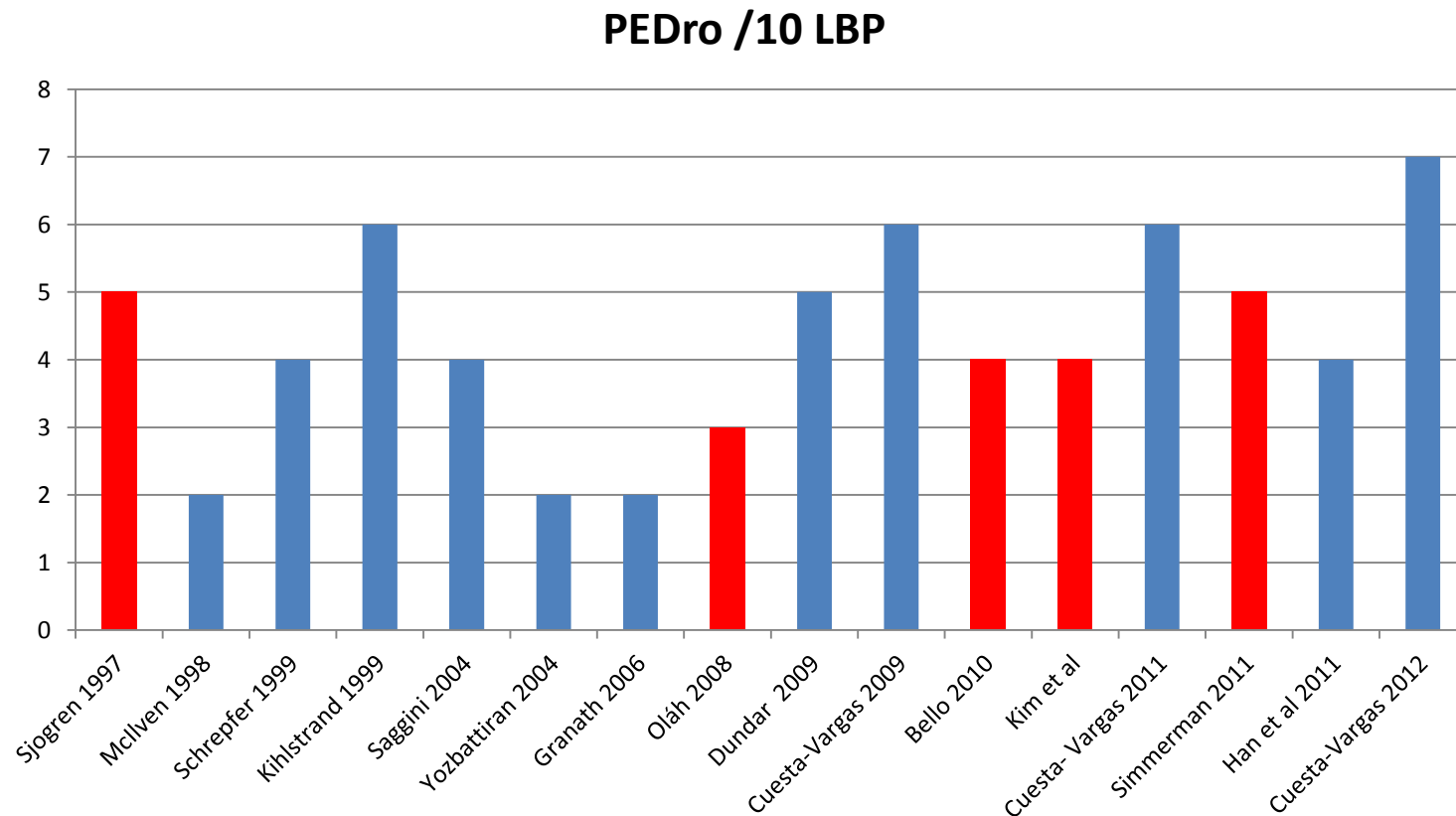
TAE for persons with OA of the lower limbs has to be intensive enough following current exercise guidelines to produce physiological and sustained improvements in function.

Booster sessions could maintain improvements in function.

Remember resistance equipment.

# Low Back Pain

- Based on
  - 2 SR (Waller et al 2009, Olson et al 2012)
  - 11 RCT
  - 5 CCT



# PICOT for LBP articles

- Patients/population
  - Non-specific, acute, chronic LBP, with/without, post discectomy, with/without radicular symptoms. Pregnancy and post-partum
  - Duration of symptoms 0 days to 8.9 years
  - N = 1418 (LBP 770 average 55 (range 16-109), pregnancy related 648 average 324 (range 258-390))
  - Average age range 28-60
- Interventions
  - 10 Group aquatic exercise (general or core specific), 2 traction, 4 DWR. Same intervention used only 2 times.
  - Number of treatment sessions for LBP total, 300 average 21.4 sessions(range 1-50)
- Comparison
  - 11 land treatment (all different interventions)
  - 3 control (no intervention)
  - 1 Non-treatment water intervention
  - GP information book
- Outcomes
  - All 16 used a pain measurement (VAS, NPRS,
  - Self assessed function Oswestry (5), Roland Morris Disability Questionnaire (3),
  - QoL Short form 36/12 (5)
  - PPM Lx ROM (8), isometric trunk strength (5) walking test (2),
- Time
  - Duration of treatment 1 day – 15 weeks
  - 6/16 had a follow-up measurement 3-12 months

# Summary of Finding for LBP

- Pain (Level 2)
  - Moderate sized improvements in pain
  - Not superior or inferior to land training options
- Self assessed function (Level 2)
  - Moderate sized improvements
- Trunk isometric strength (Level 3)
  - Small improvements
- Aerobic fitness
  - Limited evidence
  - Limited effect of treatment at any length of follow up measurements (level 2)
- Safe and effective at decreasing pain and sick leave days during pregnancy (Level 2)

# Take home message(s)

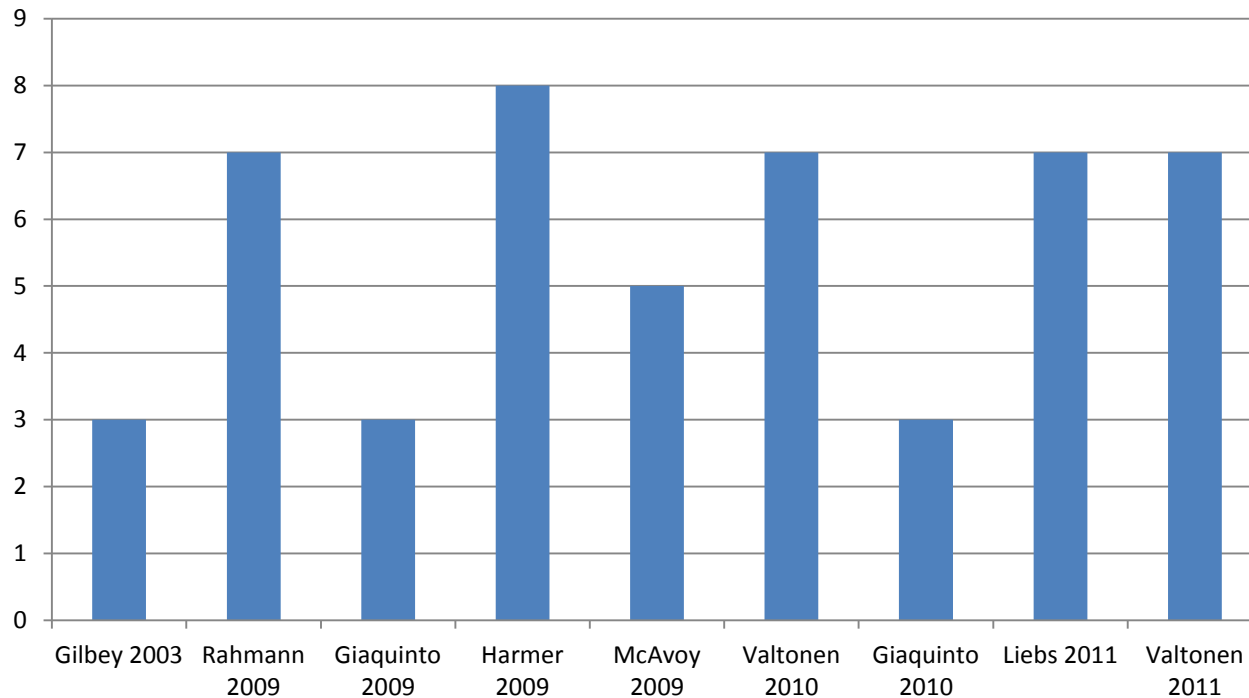
*Therapeutic aquatic exercises is effective at treating symptoms resulting from LBP. However, due to heterogeneous populations and interventions used prevents creation of specific exercise recommendations.*

*Individualized programs and group training are likely to be most effective and will be multimodal.*

# Arthroplasty

- Based on
  - 1 SR Villata et al 2012 (post operate side effects in AT)
  - 9 RCT (2 hip alone, 5 knee alone, 1 hip or knee, 1 hip and knee)

## PEDro /10 Athroplasty





# PICOT for Arthroplasty

- Patients/population
  - N = 974 Ave 108 (30-465)
  - Post arthroplasty (4 days – 10 months)
  - Knee, Hip and Knee/Hip
- Interventions
  - Passive movements – high intensity resistance training content on the whole poorly described,
  - only two articles described intensity of training, only 2 documented the use of resistance equipment
  - Number of sessions per treatment Ave 19, (range 10 – 36)
- Comparison
  - Normal post op interventions
  - Late aquatic therapy
  - Low intensity TAE (compared to high)
- Outcome
  - Self assessed function and pain 8/9 WOMAC, 1/9 KOOS
  - 5/9 used a physical performance measure, 4/9 lower limb strength, 2/9 6MWT
- Time
  - Duration of treatments 10 days – 12 weeks
  - 8/9 had longer follow-up ranging from 3-24 months

# Summary of Findings for Arthroplasty

- Pre-operative TAE
  - There is no evidence to suggest TAE pre-operatively improves outcome after surgery (Level 2).
- Early post operatively (0-3 months)
  - TAE is not superior at increasing ROM and decreasing oedema compared to land interventions (Level 2).
  - TAE produces small improvement in lower limb muscle strength over conventional treatment (Level 2).
  - There is evidence to suggest early (day 4 post-op) TAE is more beneficial following TKA and late TAE (2 weeks post op) is more beneficial following THR (Level 3).
- Late post operatively
  - TAE can increase quadriceps and hamstring strength and function but requires additional training to maintain improvements in functions (Level 2).
- Long term effect
  - No long term difference at follow-up between interventions (Level 2)

# Take home messages

TAE maybe effective at improving outcome during early rehabilitation and high intensity training is needed to produce function changes.

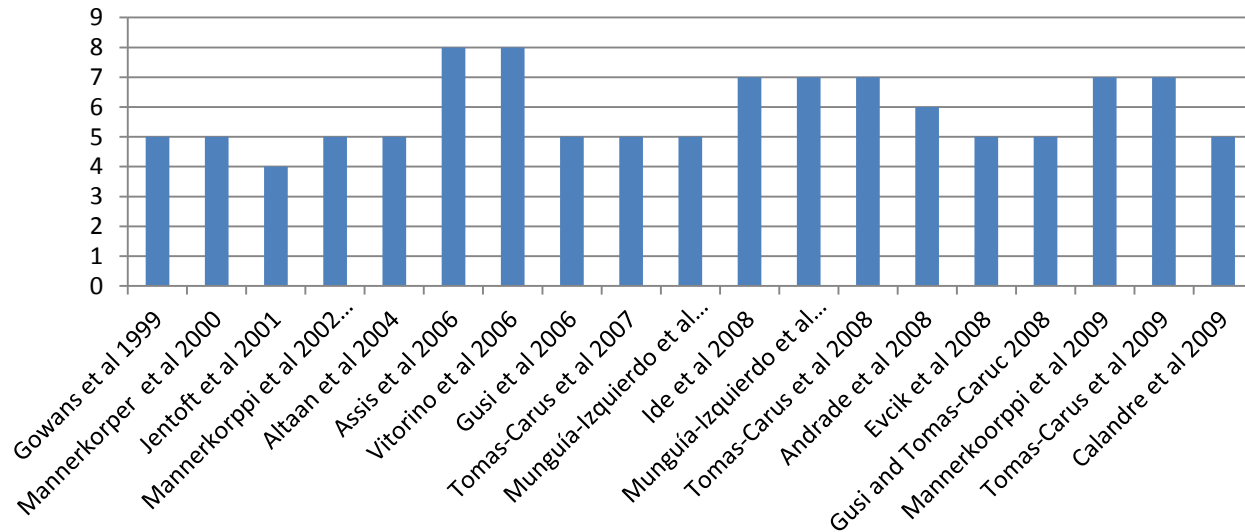
Results of post-operation studies using only self assessed function need to be carefully interpreted. Use of physical performance measures are likely to give more accurate results.

There does not appear to be an increased risk of post operative infection with aquatic exercise interventions.

# Fibromyalgia

- Based on
  - 2 SR McVeigh et al (2008), Perraton et al (2009)
  - 19 RCT

Pedro /10 fro FMS articles



# PICOT for FM articles

- Patients/population
  - N = 1062 (30-166)
  - ACR guideline diagnosed fibromyalgia
  - Mainly females
  - Average age range 39.4-51 years
- Interventions
  - Endurance training (16/19 indicate intensity 4 mention ACSM), stretching, relaxation and strength
  - Number of sessions 675 (Av 35.3, range 9-96)
- Comparison
  - 12 Control
  - 4 Dry land training
  - 2 Balneotherapy
  - 1 passive pool intervention
- Outcomes (primarily self assessed)
  - 18/19 measured pain (VAS, SF-bodily pain, tender points)
  - 14/19 used fibromyalgia impact questionnaire (FIQ),
  - QoL 9/19 used short form 36 (SF-36)
  - Beck depressions index (BDI)
  - 8/19 measure aerobic performance (6MWT, ergometer)
  - 6/19 isometric muscle strength (knee flexion/extension, grip strength, shoulder abduction adduction)
- Time
  - Duration of treatment 3 weeks -8 months
  - 9/19 had longer follow up period

# Summary of Findings for FM

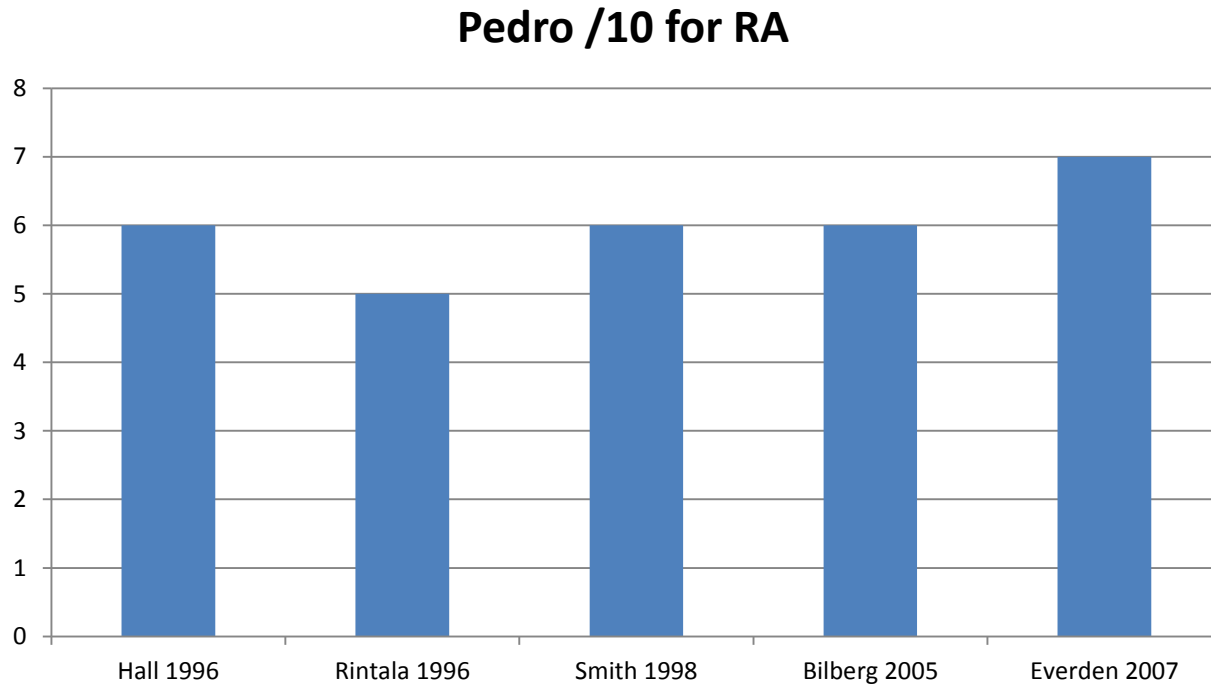
- Pain (Level 1)
  - moderate sized effect Equal to land training
  - TAE is superior to no treatment
  - Only partially maintained at follow-up
- Self reported function and quality of life
  - small to moderate sized improvements (Level 1)
  - Maintained at short term (3-6 months) follow up (level 2).
- Aerobic fitness (Level 1)
  - small to moderate effect,
  - similar to land training,
  - Maintained only at short (3-6 months) follow-up (level 2)
- Depression and sleep patterns
  - moderate improvements (Level 2)
- Muscle strength
  - Conflicting evidence
- No major harms reported in 19 RCT articles from TAE

# Take Home Message

*Aquatic aerobic training with an intensity of 60-80% of maximum heart rate (as per ACSM guidelines) is effective and safe for persons with fibromyalgia.*

# Rheumatoid Arthritis

- Based on
  - 1 SR (Verhagen et al 2012)
  - 5 RCT





# PICOT for RA

- Patients/population
  - ACR diagnosed stable RA with classifications I-III (2/5 I-II and 3/5 x I-III)
  - N = 361 Ave 72,2 (range 24-139)
  - Age 29-63 years
- Interventions
  - Mainly aerobic training with intensity measured using 70% MHR or RPE 13-15, some indicate strength training but type not described
  - Duration of intervention 30-60 minutes
  - Number of sessions total 92, average 18.4 range 6-30
- Comparison
  - 2/5 land training of similar intensity, 2/5 maintain normal ADL's and 1/5 passive water immersion
- Outcome
  - Self assessed function pain only pain (VAS) was used in more than one study.
  - 3/5 Aerobic fitness (2/5 VO<sub>2</sub> MAX)
  - 4/5 grip strength, 2/5 lower and upper limb strength (Isometric)
- Time
  - Duration of treatment 4-12 weeks
  - 3/5 had follow-up, all at 3 months post intervention

# Summary of Findings for RA

- Pain (Level 2)
  - Small to moderate improvements
  - Not maintained at follow up
- Self assessed function (Level 2)
  - Small to moderate improvements
  - Maintained at 3 month follow up
- Aerobic fitness
  - Conflicting
- Grip Strength (Level 2)
  - Small to moderate improvement
- Lower limb Strength
  - Limited
- Only improvement in self assessed function is maintained at even 3 month follow up.
- No Harms reported

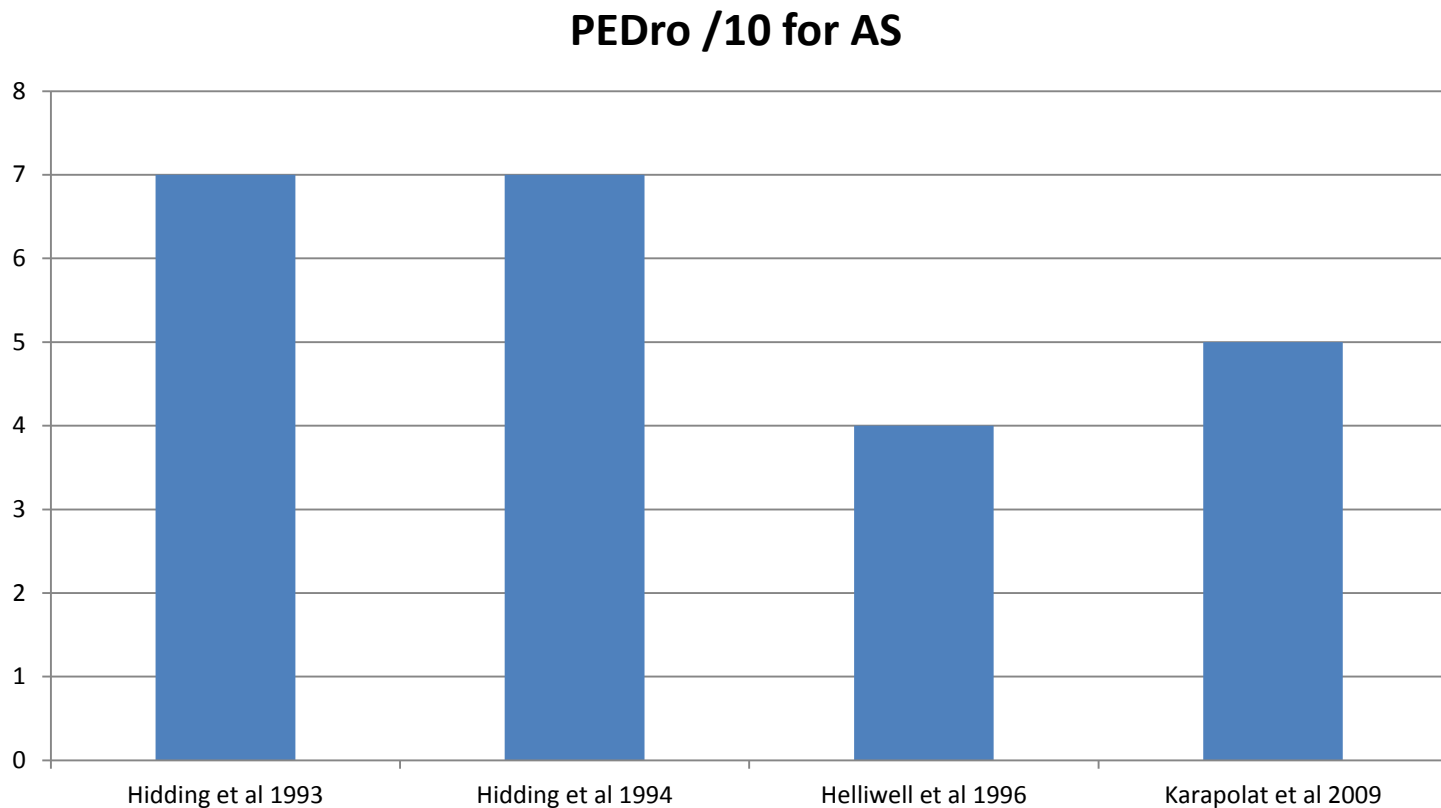
# Take home message

Patients with RA can benefit from TAE however improvements are not maintained possibly due to nature of the disease.

Treatments should be provided over a longer period of time or with booster periods of intervention (further research needed).

# Ankylosing Spondylitis

- Based on
  - 2 SR (Roos 2009 narrative, Cairns and McVeigh 2009 not TAE specific)
  - 4 RCT



# PICOT for AS

- Patients/population
  - N = 301 Ave 75 (44-144)
  - 4/4 diagnosed for AS using Modified New York Criteria
  - Age range of averages 38.9-50 years old
- Interventions
  - 1/4 swimming intensity 60-70% MHR
  - 3/4 group TAE no intensity or exercise described
  - 2/4 as part of a multimodal intervention
  - Number of treatment sessions 12 to 26 session
- Comparison
  - 3/4 home exercises
  - Walking at same intensity
- Outcome
  - 3/4 chest expansion, 1/4 pulmonary function (FVC, FEV1 etc)
  - AS specific self assessment questionnaires ¾
  - 3/4ROM
- Time
  - Duration of treatment, 6 weeks to 9 months
  - 1/4 follow up post intervention

# Summary of Findings for AS

- Aerobic capacity
  - TAE and swimming can produce moderate to large improvements in aerobic fitness (Level 2)
- Respiratory function
  - TAE and swimming can improve respiratory function and chest wall expansion (level 2)
- Pain
  - TAE in combination with home exercise can decrease pain further than home exercises alone

# Take home message

Persons with AS can improve aerobic capacity and respiratory function with water based exercise of moderate to high intensity.

Improvements are not maintained at follow up

Further research is needed to support these findings

# Summary

- Current evidence supports the use of TAE in the management of musculoskeletal diseases
- TAE in most cases produces similar effect sizes to other non-pharmaceutical interventions
- There is a desperate need for researchers to produce studies that will direct clinicians to know when, how and to whom therapeutic aquatic exercises should be prescribed.
- In order to facilitate the evidence based practice researchers must also focus on PICOT and as well as research methods
- Appropriate outcome measures have to be selected to demonstrate treatment effect. Take into account the patient and intervention (what are you expecting to happen)



THANK YOU