EWAC workshop

Aquatic Therapy State-of-the-Art

Johan Lambeck, IATF

Djeddah, 11-10-2012

Network in which EWAC participates

- Ecebat: 1st European Conference on Evidence Based Aquatic Therapy

  www.aquatherapy2013.org

- Aquaoutcome: Erasmus IP
- Ewac library: free articles, thesises, aquatic PP
  - http://www.ewac.nl/html/index.php?page_id=133
- Indirect connections:
- Aquatic Health Benefits group of the WHO
- APTI: Aquatic Physical Therapy International of the WCPT www.wcpt.org/apti
- Association IATF www.halliwicktherapy.org

The importance of the right depth.
Th11 is an adequate depth for e.g. gait training.
The level of Th11 depends on the length of the patient.

Aquatic (Physical) Therapy (APT)

- APTis a programme, using mechanical and thermal characteristics of water during partial or complete immersion, in combination with the effects of movement. It evokes short-term and long-term adaptational mechanisms of a person with a deranged biological system, using specific stimuli to create biological and thus therapeutic effects (NPI, 2005)
- A therapy programme utilising the properties of water, designed by a suitably qualified physiotherapist specifically for an individual to improve function, carried out by appropriately trained personnel, ideally in a purpose built, and suitably heated hydrotherapy pool (ATACP, 2008)

Evidence Based Practice

- Based on Sackett DL, et al. Evidence Based Medicine: how to practice and teach EBM, 2000.

1. Clinical Questions: is AT legitimated?

2. Search for Evidence: published research

3. Critical Judgement: expertise and patient values

4. Implementation: include an adequate environment

5. Evaluation: Outcome measurements

Best research evidence

- Clinically relevant research, often from the basis of medicine, but especially from patient-centered clinical research into the efficacy and safety of therapeutic, rehabilitative, and preventive regimes.

- EWAC library
- Aqualit: 1700 references and pdf's about AT (KU Leuven)

Aquatic exercise for treatment of knee and hip osteoarthritis

Bartels EM et al: Chochrane Library; 2009

Aquatic exercise appears to have some beneficial short-term effects for patients with hip and/or knee OA while no long-term effects have been documented.

No evidence was found for pain, walking ability or stiffness after end of treatment. No radiographic evaluation was performed

Pain	**4**	**638**	**0.19 (0.04 – 0.35)**
Function	**4**	**648**	**0.26 (0.11 – 0.42)**
Walking ability	**2**	**355**	**0.18 (-0.03 – 0.39)**
Stiffness	**2**	**380**	**0.14 (-0.06 – 0.34)**
Quality of life	**3**	**599**	**0.32 (0.03 – 0.61)**

Effects of aquatic interventions in children with neuromotor impairments

Getz M et al: Clin Rehabil; 2006

11 articles, no RCT, 5 case reports

Investigated population	Number of trials	Number of participants	Mean age (years)
Rett syndrome	1	1	11
Neurological dysfunction	1	1	0.8
High-risk infants	1	3	0.3
Triplegia		2	
Quadriplegia		21	
Ataxia/athetosis		8	
Muscular dystrophy	3	54	7
SMA type II		31	
SMA type III		20	
PMD		3	

SMA, spinal muscular atrophy; PMD, progressive muscular dystrophy.

There is evidence to suggest that hydrotherapy might improve respiratory function in children with cerebral palsy

In other aspects of activity and participation, further research of good design is needed

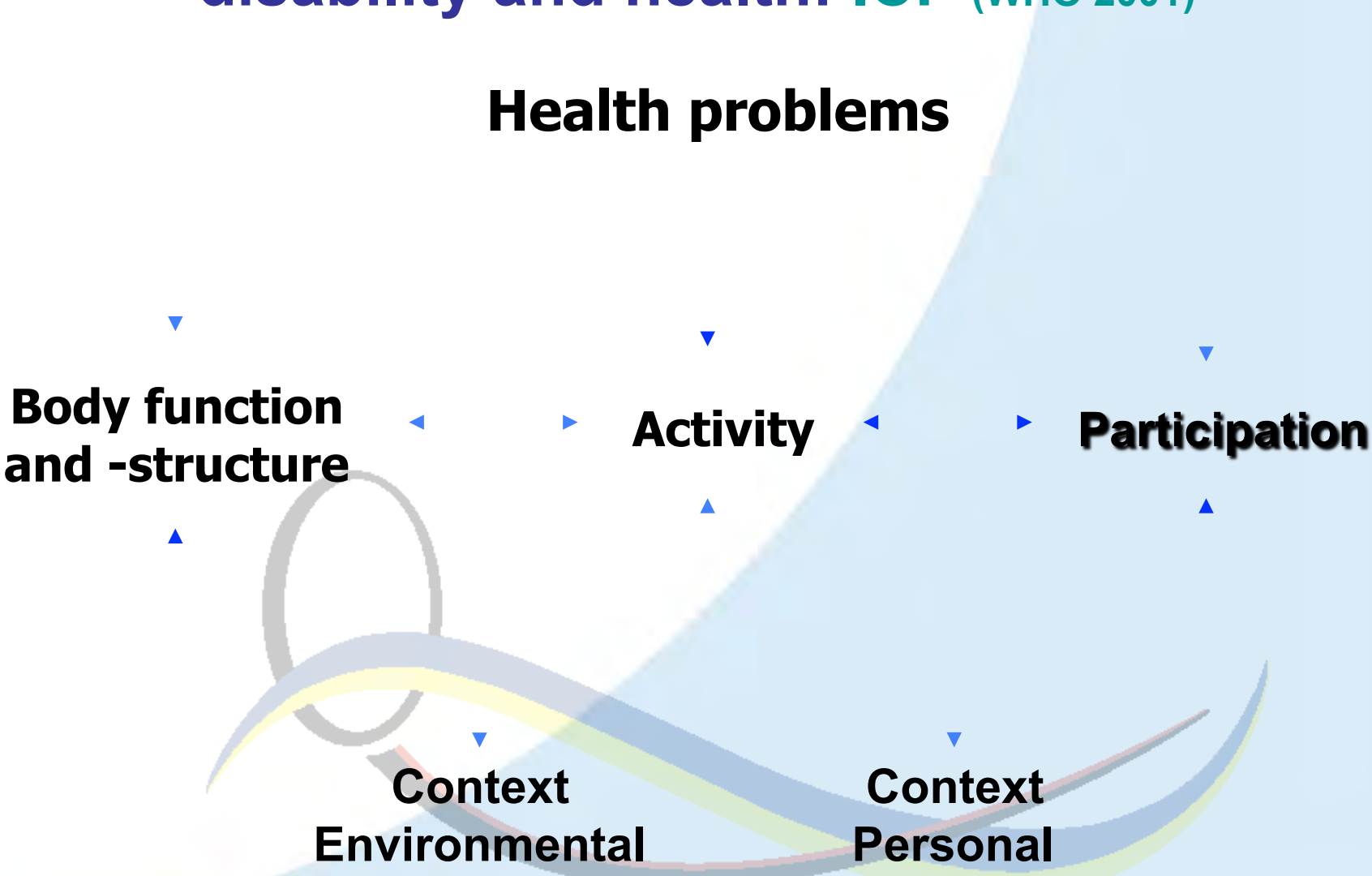
Evidence for effective AT

- Hydrotherapy in neurology, e.g. MS, TBI, stroke, paediatric neurology have received little attention from researchers to date.
- Hands-on techniques were generally not included in the trials, thus no interactive practice of constantly reassessing the patient's responsive movements and adjustment of the technique.
- J. Geytenbeek, Physiotherapy (2002)

Patient values

- The unique preferences, concerns and expectations each patient brings to a clinical encounter and which must be integrated into clinical decisions if they are to serve the patient.
- >> patient is a swimmer

International classification of function, disability and health: ICF (WHO 2001)



AT: level of body function, 1

- ROM
  - Single/multiple joints: spine and peripheral joints
  - Bones: scapula and pelvis
- Stability : see ROM
- Muscle strength
  - Isolated groups, trunk, one side of the body, one limb, all muscles etc

AT: level of body function, 2

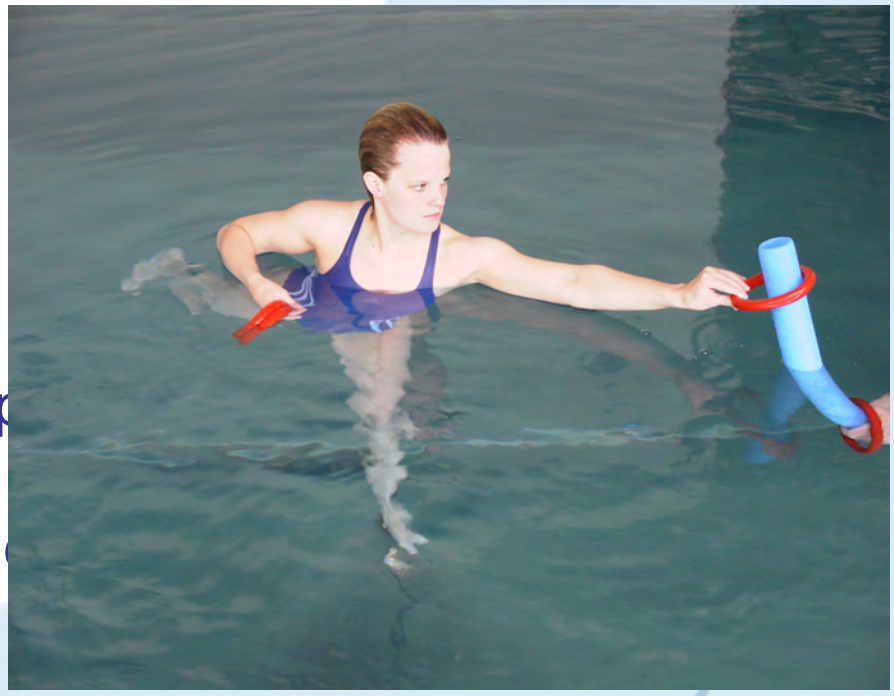
- Muscle tonus, see strength
- Endurance
  - Isolated muscle groups, all muscles
- Involuntary movements
  - Righting, equilibrium, supporting
- Control voluntary movement functions
  - Complex voluntary movements
  - Supportive functions of arm or leg

AT: level of activity, 1

- Change position
  - Lying down
  - Squatting
  - Kneeling
  - Sitting
  - Standing
  - Bending
  - Shifting COG
  - Rolling LRC
  - Rolling CRC
- Maintain position
  - Lying
  - Squatting
  - Kneeling
  - Sitting
  - Standing
  - gliding

AT: level of activity, 2

- Moving objects with the legs
  - Pushing and kicking
- Hand and arm use
  - Pulling and pushing
  - Reaching and grasping
- Walking and moving
  - Walking short distances, stop and turn
  - Different surfaces and aroun obstacles



AT: level of activity, 3

- Moving around
  - Entry and exit of the pool
  - Running and jumping
  - Swimming
- Moving with equipment
  - Scuba, mask and snorkel
  - Fins
  - Wetvest
- Respiratory functions
  - Breathing and blowing

ICF and AT

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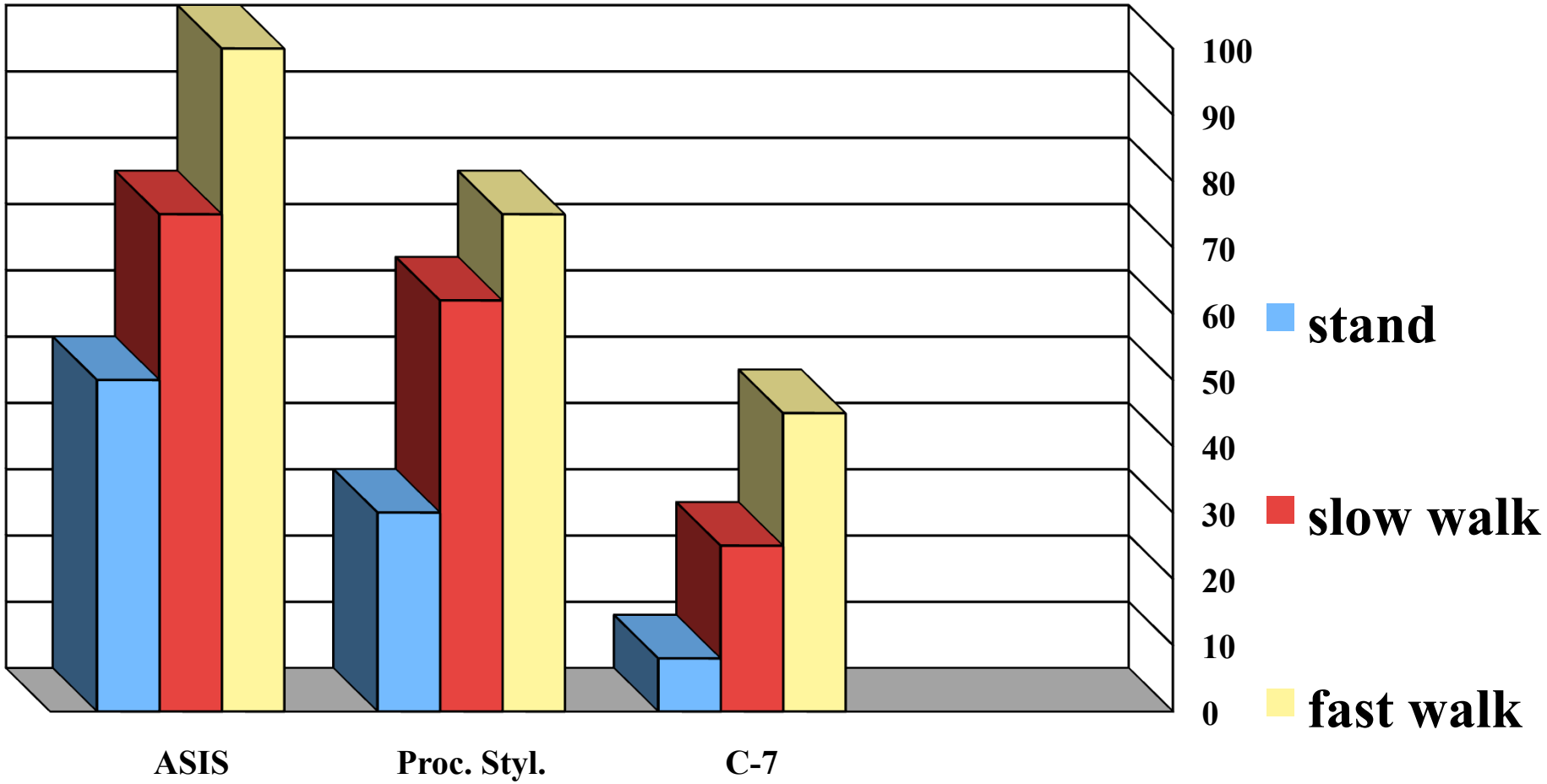
	Body function	Activity	Participation
Halliwick	√	√	√
ATrelax	√		
BRRM	√		
Obstacles	√	√	
Fitness	√		√
Clinical Ai Chi	√	√	√

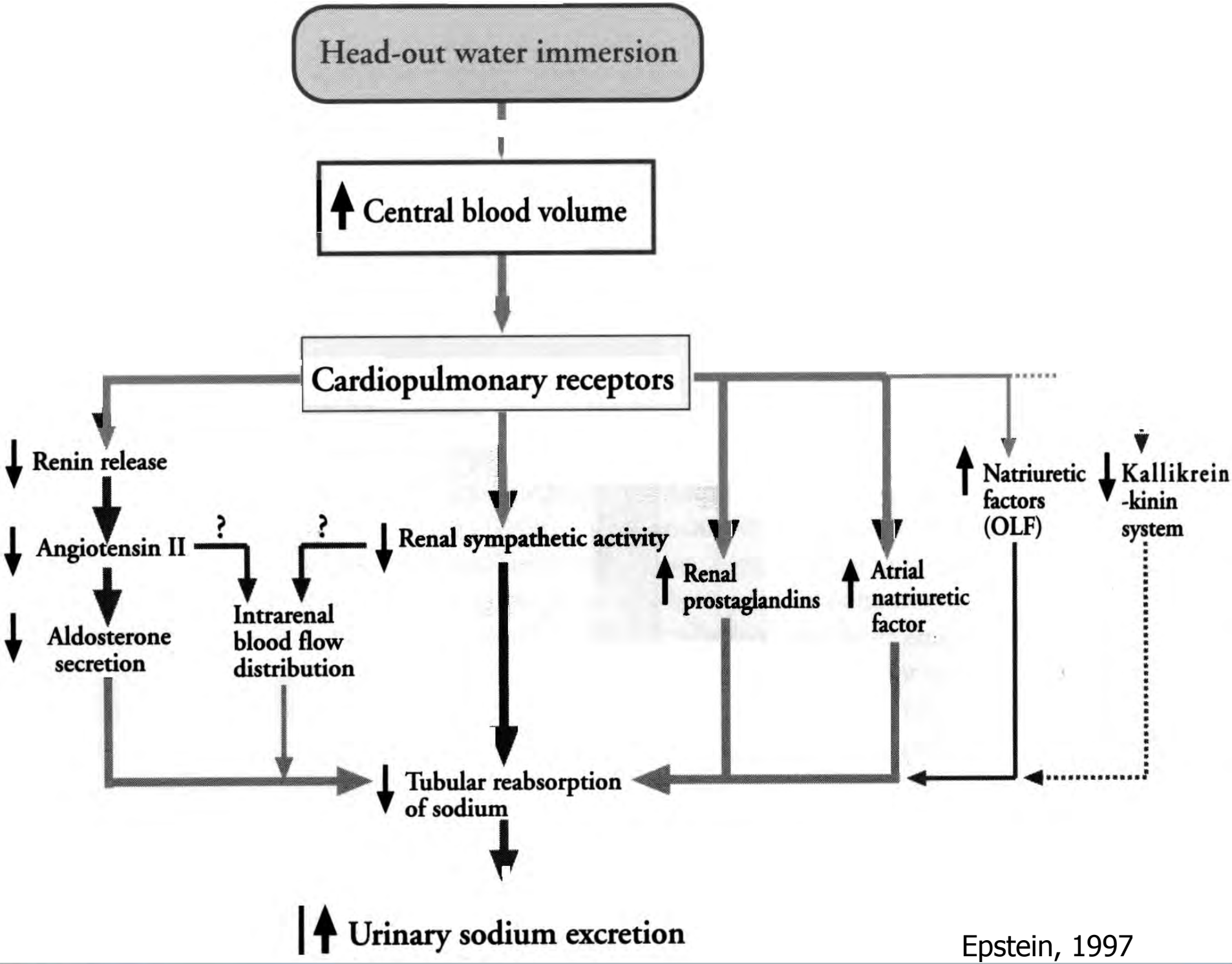
AT is a stimulus therapy

- Mechanical
  - Flow: turbulence
  - Buoyancy (pressure)
  - Waves
- Thermal
- Chemical

Unloading and resistance

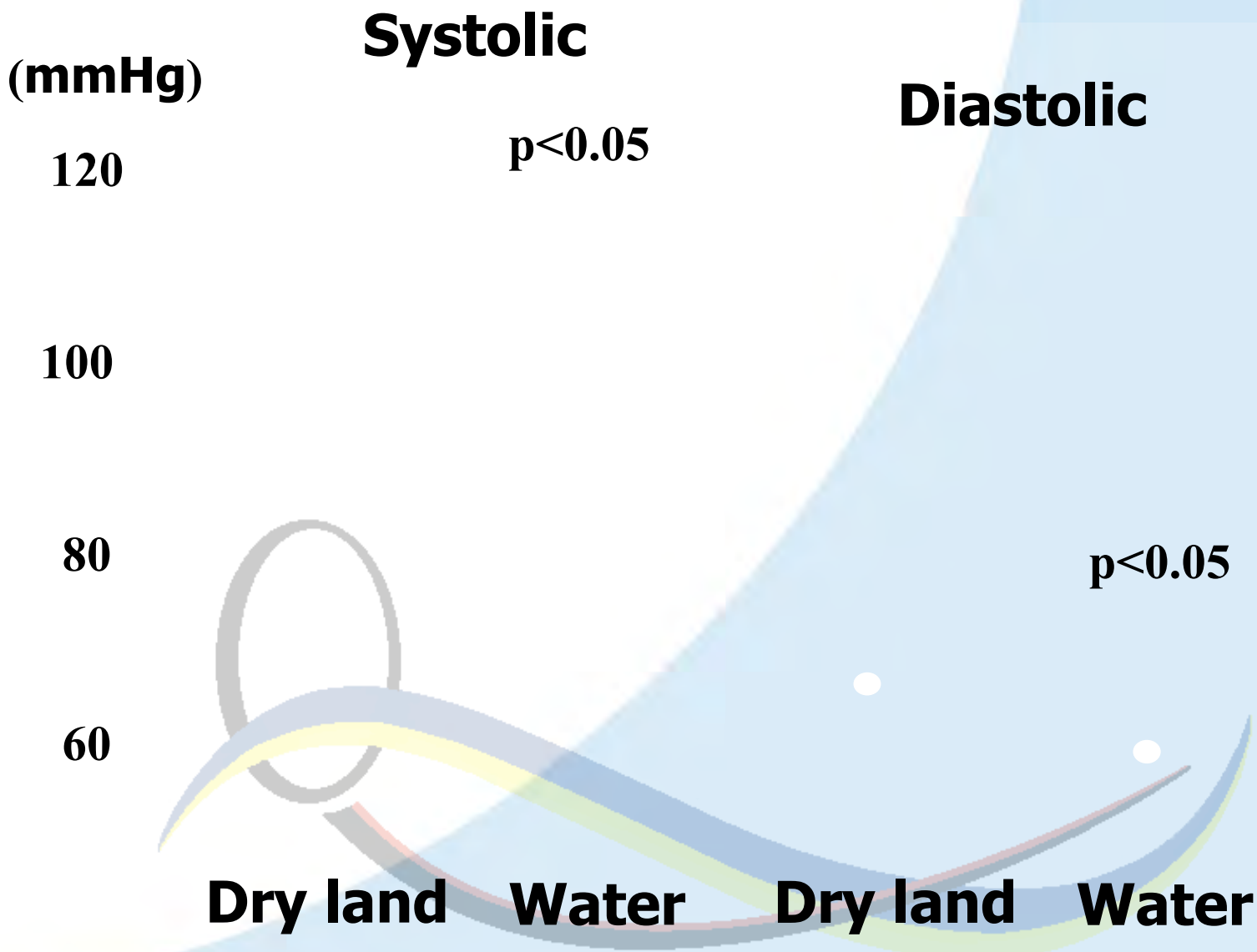
Harrison R, J of Physiotherapy 1987





Epstein, 1997

Blood pressure

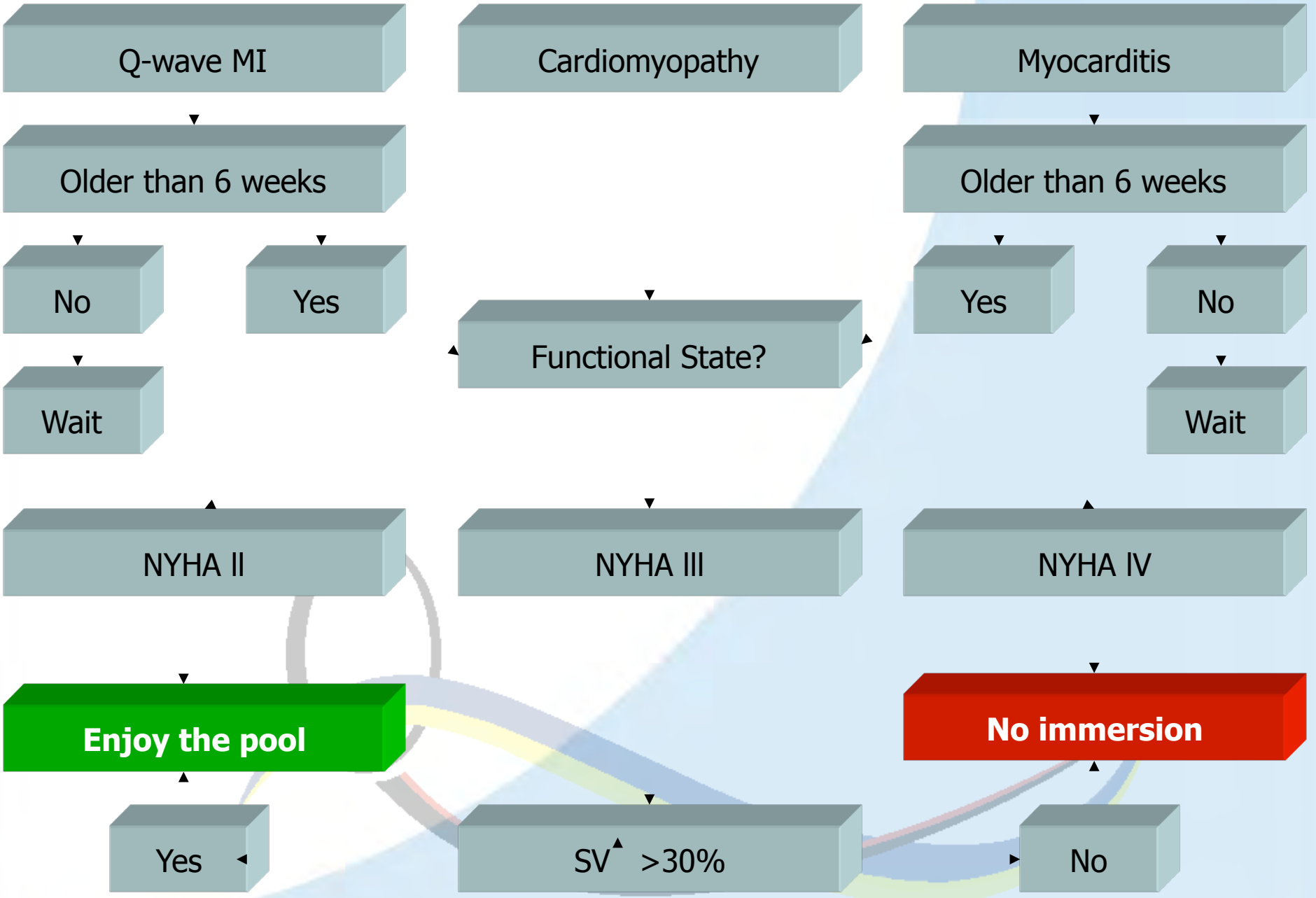


Head-out Water Immersion

- ↑ Central blood volume
- ↑ Chest wall pressure
- ↑ Abdom. compression
- ↑ Pulmonary Vessel fill
- ↓ Chest circumference
- ↑ Diaphragm height
- ↓ Diffusion capacity
- ↑ Airway resistance
- ↓ Lung volume & VC
- ↓ Efficiency
- ↓ Po_2
- ↓ Expiratory flow rate
- ↓ Pulmonary compliance

Work of breathing increases by 60%

Clinical Algorithm for Aquatic Activity by Heart failure

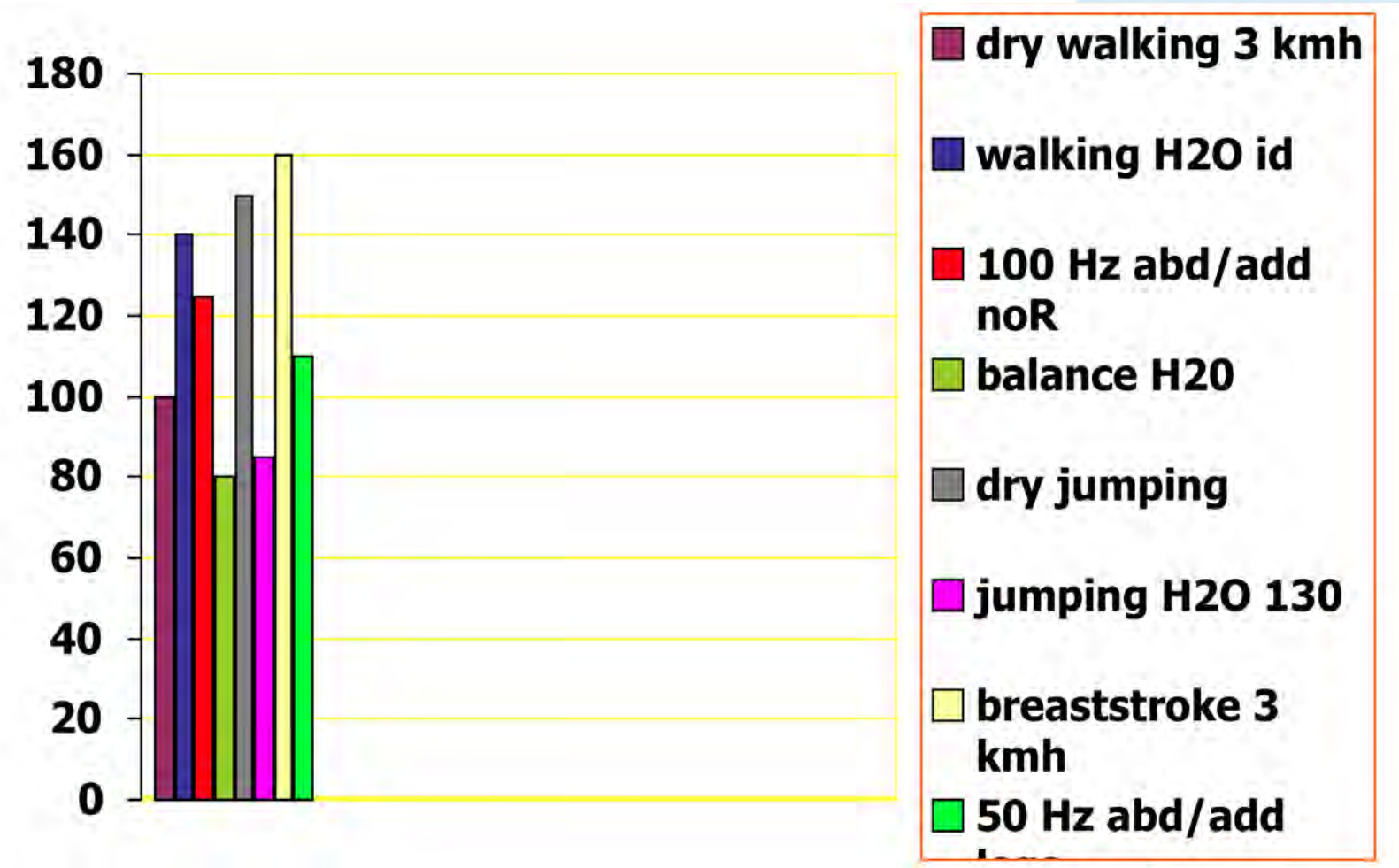


Becker BE: 2010 adapted from Meyer K et al: 2008

Physiologically high impact

Whitley & Schoene, 1987

Heart rate differences



Shoulder muscle activation during aquatic and dry land exercises in nonimpaired subjects

Kelly B et al: J Orthop Sports Phys Ther; 2000

Muscle	Test	30°/S	60°/S	90°/S
Supraspinatus	Land	16.68	17.46	22.79
	Water	3.93	5.71	27.32
		P=.015	P=0.15	P=0.73
Infraspinatus	Land	11.10	10.76	15.03
	Water	2.28	2.89	21.06
		P=.0325	P=.0524	P=.5566
Subscapularis	Water	5.96	6.83	7.45
	Land	1.49	2.26	10.73
		P=.0072	P=.0346	P=.2421
Anterior deltoideus	Water	15.88	18.82	22.09
	Land	3.61	4.49	32.83
		P=.0047	P=.0273	P=.3273

Percentage of maximal voluntary contraction

So: what does water do?

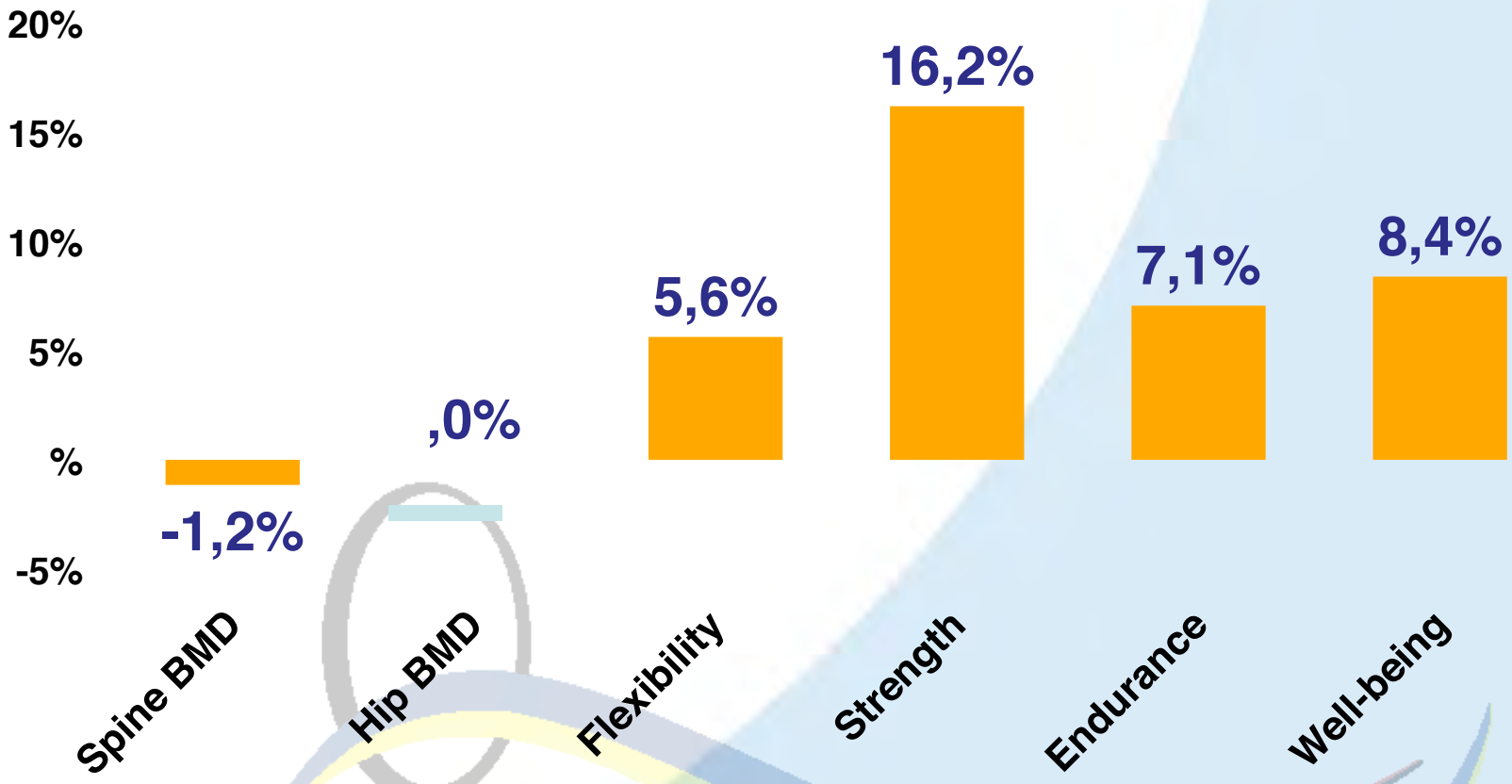
- **Water:**
- Provides proprio- en exterosensory input
- Provides an equilibrium problem
- Offers variation
- Stimulates activity
- Motivates (often)
- Has physiological effects

Advantages

- Water is a pain reducing environment
- Stiffness of connective tissue decreases
- No crutches have to be used
- Water gives variable resistance
- Water is safe and gives thinking time
- Water provides rhythm and directs motion
- Impact: mechanically low / physiol. high

Aquarobic Effect on BMD, Fitness & Well-being @1 year

77 females, ages 50-70, 1 hour/day, 3 days per week, 12 months



Bravo, Gauthier et al, Arch PMR, 78, 1375-80,1997

Osteoporosis

N = 97 healthy menopausal Japanese women

Veterans: 35 months exercising 2-3/w

Newcomer: 3.5 w start 2-3/w

Control: no exercise

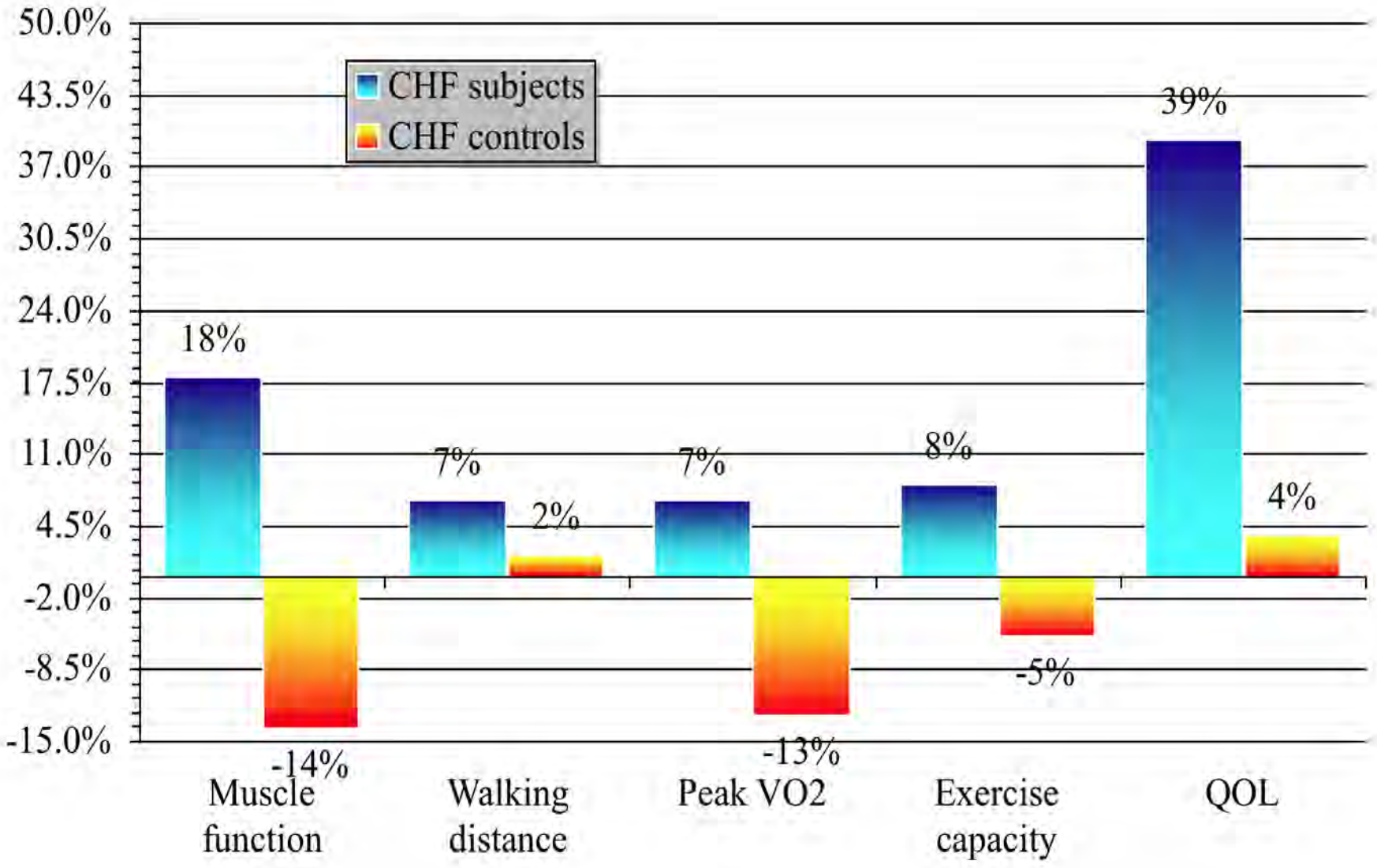
Results:

BMD	Veterans	Newcomer	Control
Start	**0.832 g/cm²**	**0.766 g/cm²**	**0.783 g/cm²**
1 Year	**+0.27%**	**+0.75%**	**-2.72%**

Tsukahara N et al: J Nutr Sci Vitaminol (Tokyo) 1994

Aquatic Exercise in CHF

25 pts with CHF, 8 weeks training at 3 times per week



Cider A, Schaufelberger M, Sunnerhagen KS, Andersson B, Eu J Heart Failure 5 (2003) 527-535

Case: adult CP diplegia

- 3/wk, 10 weeks vigorous AT
- Resistive ex. LE, waterwalking, stretch
- Unconditioned, short distance walking with calipers
  pretest: 20m Posttest: 140m
- Endurance increased with 450%
- Walking: farther and faster
- Strength increased with 100%
- Independent stance/walk without calipers
- Functional reach
  - Pretest 0 inch, no independent stance
  - Posttest direct: 7 inch
  - Posttest 11 weeks: 6 inch

– Thorpe & Reilly, JAPT 2000

KATHOLIEKE UNIVERSITEIT
LEUVEN

The influence of Ai Chi on balance and fear of falling among older adults

Rita Teixeira[1], Laura Pérez[2], Johan Lambeck[3], Francisco Neto[4]

	Intragroup p-values		Intergroup p-values	Intergroup ES (d)
	Ai Chi	Controls		
FES	0.306	0.011*	0.001*	1.5
POMA total	0.001*	0.254	0.002*	1.3
POMA balance	0.001*	0.230	0.001*	1.4
POMA gait	0.001*	0.202	0.004*	1.1

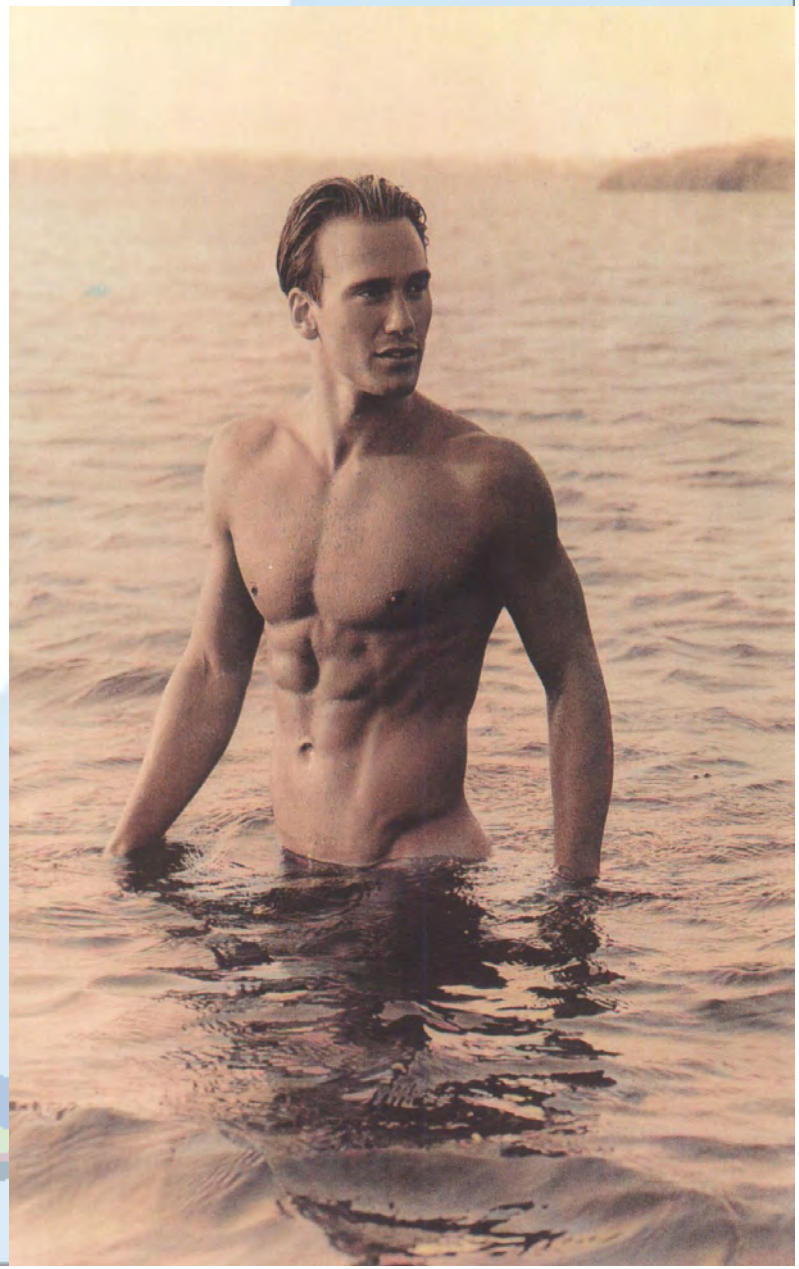
* = significant, $\alpha = 0.05$

Inclusioncriteria for hydrotherapy

- There is a generalised problem with multi-local involvement
- No possibility to enhance physical fitness on dry land
- There is a lower extremity problem, weight reduction is needed
- The autonomous system needs tuning in a stress inhibiting environment

Exclusioncriteria

- The contract ends
- The normvalues have been reached
- The goals have been met
- There are new contra-indications



Methods

- Halliwick
- Bad Ragaz Ringmethod
- ATrelax
- Conventional hydrotherapy
- Clinical Ai Chi, obstacles
- Manipulative therapy in water
- Underwater elongation of the spine
- Fitness in water, incl swimming
- Feldenkrais
- Hubbardtanks etc
- ……

Halliwick
Mental
Adjustment

▼

Balance
Control

▲

▼

▼

Movement

Water
Specific
Therapy

▲

Obstacle course
Ai Chi

▼

(Adapted) Aquatics
for
Sports and Leisure

Bad Ragaz Ring M
AquaTrelax

Halliwick: Ten Points

- Mental Adjustment
- Sagittal Rotation Control
- Transversal Rot. Control
- Longitudinal Rot. Contr.
- Combined Rot. Contr
- Upthrust
- Balance in Stillness
- Turbulent Gliding
- Simple Progression
- Basic Movement

- M A and Disengagement
- Balance Control and dis

- Movement and dis.

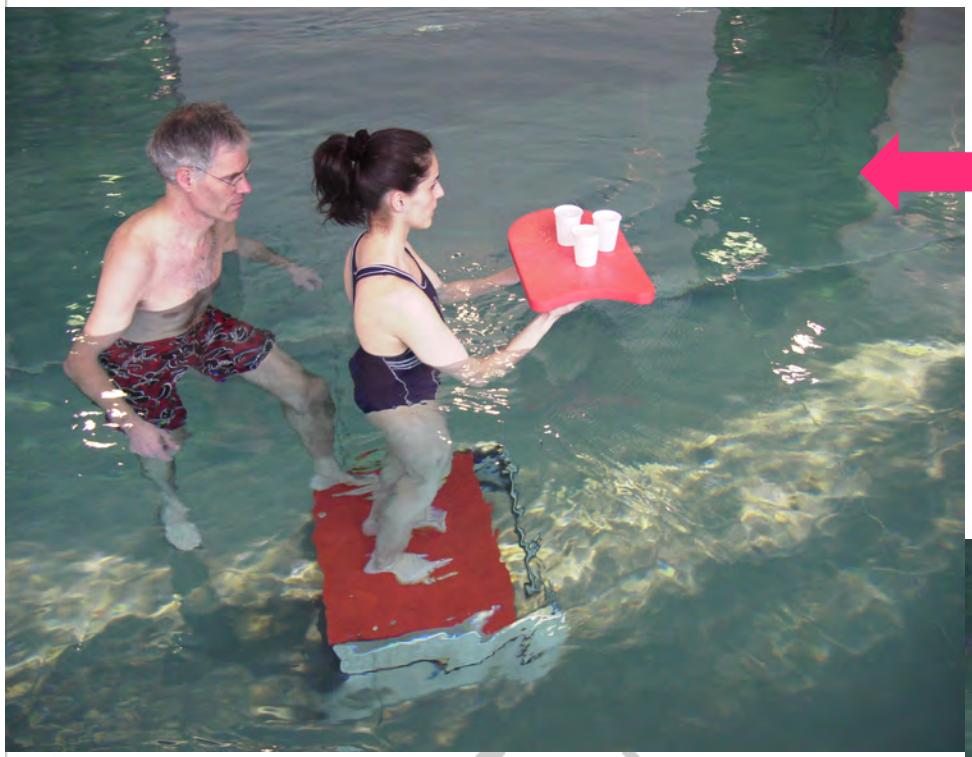
Sagittal Rotation Control

Can be used to:

- facilitate righting reactions
- facilitate equilibrium reactions
- automatic movements in general
- lengthening of the trunk or
- stabilization of joints

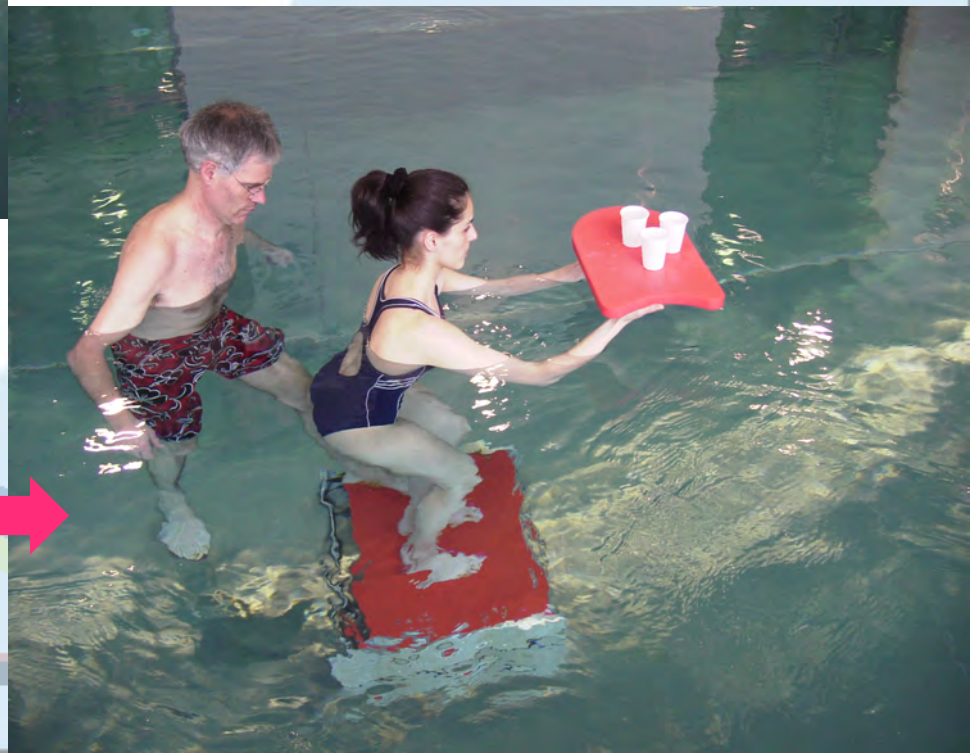
BIS: oblique abdominal activation

Voluntary and involuntary movements



Hold the kickboard:
Active movement, pre setting, double task

Hold the kickboard:
Active movement, reactive adaptation to disturbed balance, double task



Close chain and open chain

Close chain situation:
Five fix points, relative stable position, little body control

Open chain situation:
No fix point, free movement, full body control, instable


CEFA

The Bad Ragaz Ring Method

EWAC MEDICAL

We get you moving

Aqua-T-Relax

Thank you very much for your attention