

RIMS REHABILITATION IN
MULTIPLE SCLEROSIS
European network for best practice and research

KLINIKEN VALENS



Preceptorship on rehabilitation in multiple sclerosis

19-21 September 2013 - Valens, Switzerland



Improving the patient's life through medical education
www.seronosymposia.org

Sports Therapy during Rehabilitation in MS



J. Bansi
21.09.2013

Aims of this talk 22.09.2012:

Identification of the main triggers for
quantifying exercise intensities during
training in PwMS

Definition „Sports therapy“

„Sports therapy is a therapeutic option that regenerates impaired motor, cognitive and social functions, prevents secondary injuries and promotes health orientated behaviours through the resources of sporting activities .“ (Schüle, Huber, 2004)



Differences to Physiotherapy?

- No sports therapy in the acute phase
- Clients/patients must be able to stand or walk
- Predominantly group therapy

Introduction

- PwMS develops impaired functional capacity and deficits in cardiovascular function
(Mostert and Kesselring 2002; NG Kent Braun 1997)
- MS is associated with reduced physical inactivity
(Motl 2005)
- Inactivation often results in comorbidities which further decrease health status
(White & Dressendorfer 2004)

Why exercise PwMS during rehabilitation?

Comparison of the influence of different rehabilitation programmes on clinical, spirometric and spiroergometric parameters in patients with multiple sclerosis

K Rasova¹, E Havrdova², P Brandejsky³, M Zálišová⁴, B Foubikova⁴ and P Martinkova⁵

- Moderate exercise intensities influences respiratory functions

Why exercise PwMS?

J Neurol (2005) 252:839–845
DOI 10.1007/s00415-005-0759-2

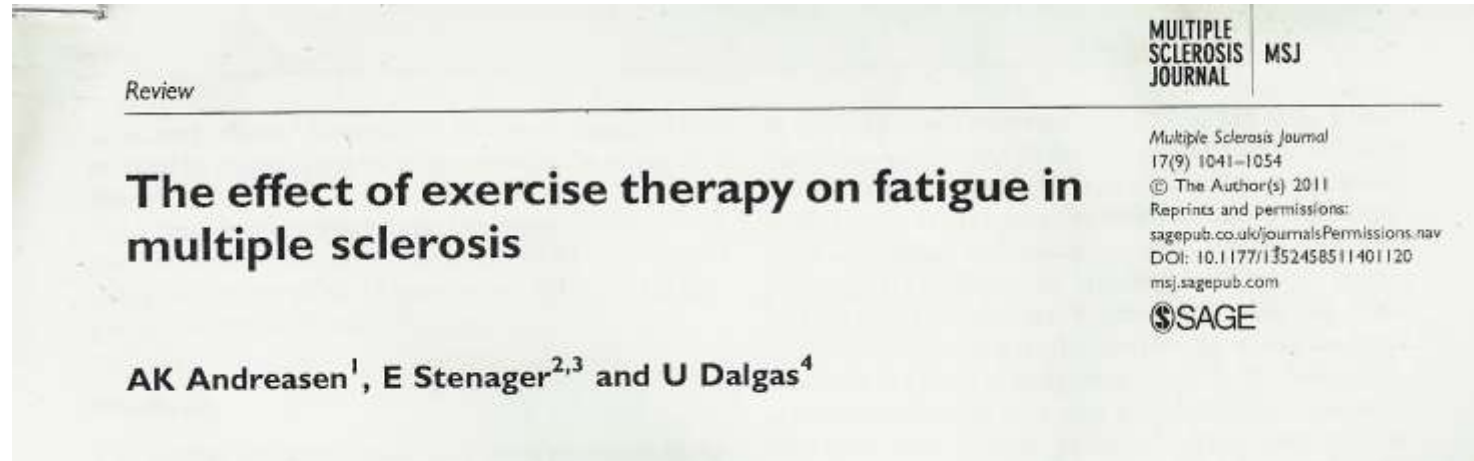
ORIGINAL COMMUNICATION

Anders Romberg
Arja Virtanen
Juhani Ruutiainen

Long-term exercise improves functional impairment but not quality of life in multiple sclerosis

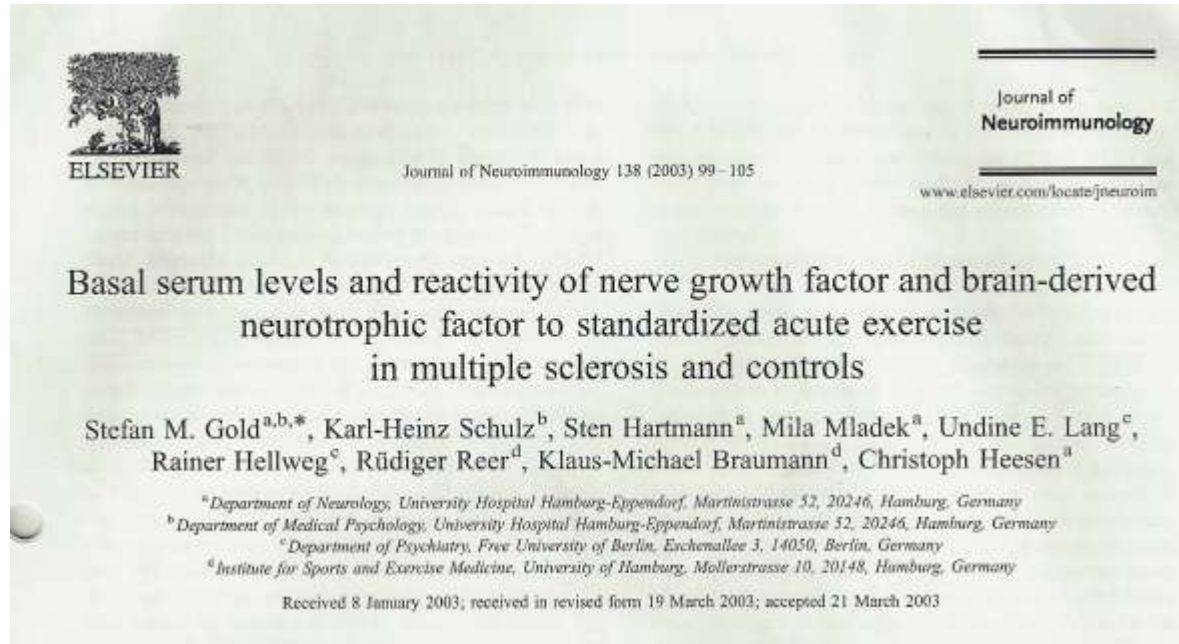
- Long-term progressive strength and endurance training intervention over six months
- Significant improvement of walking speed (500m walking test)

Why exercise PwMS?



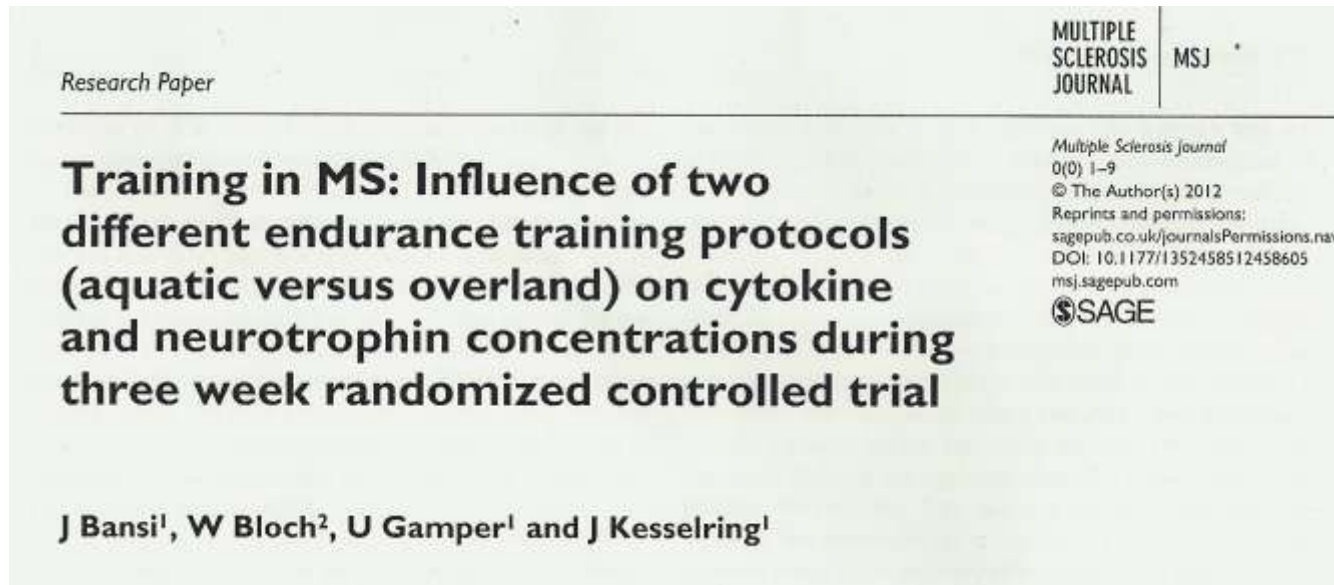
- Endurance exercise and resistance training influences fatigue and quality of life
- Endurance 11 (1 RCT) , Resistance 4 (1 RCT), Combined 5 (1 RCT)

Why exercise PwMS?



- Neuroregenerative functions through increased neurotrophin production

Why exercise PwMS?



- Endurance exercise under immersion enhances BDNF regulation
- Moderate exercise intensities were well tolerated although PwMS were severely fatigued and impaired

Introduction

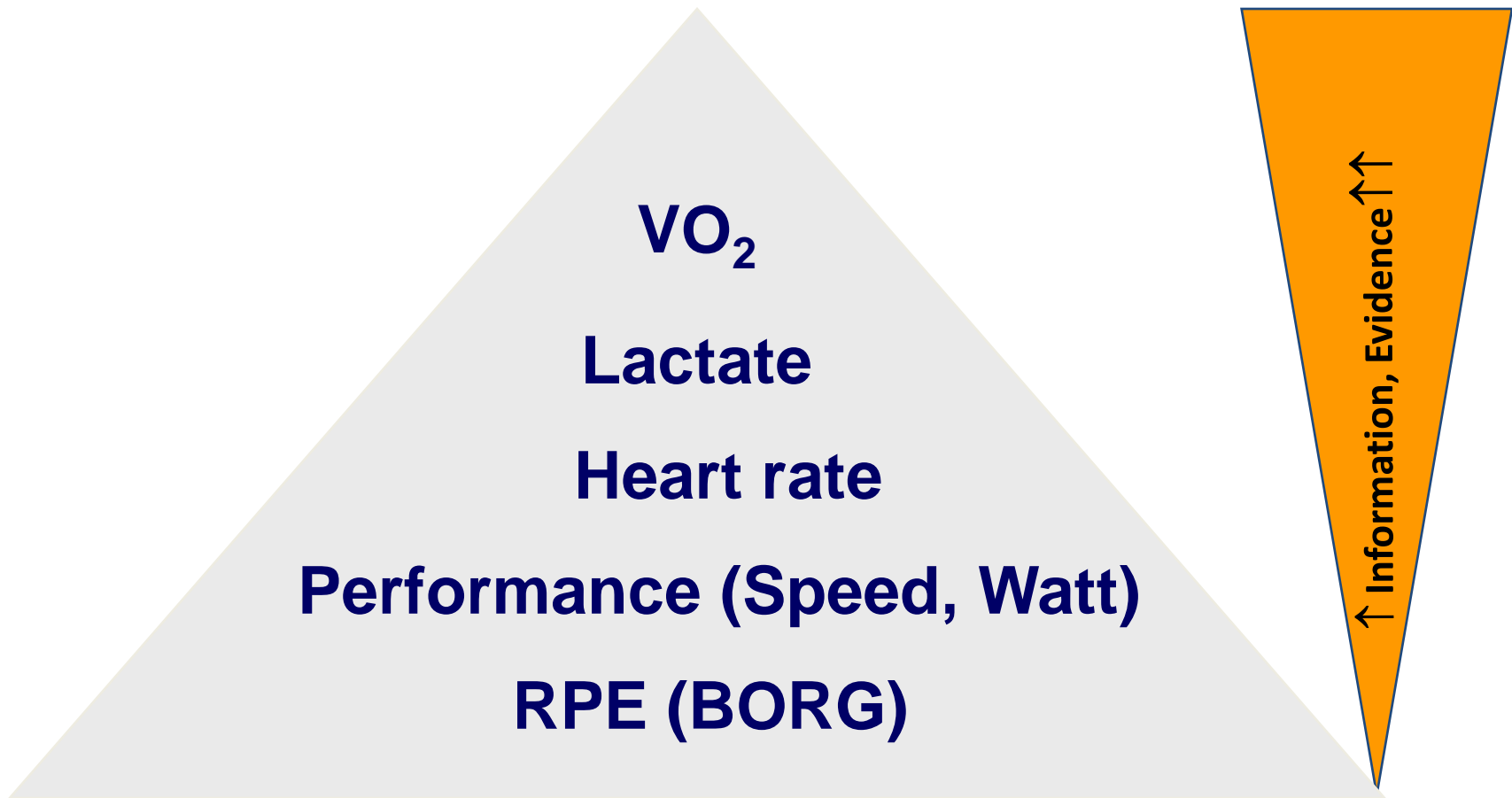
To sum it up:

- The beneficial effects of are well studied
- Effects on cytokine response, fatigue and cardiorespiratory values
- Important aspect of rehabilitation in PwMS

3. Quantification of training intensities

Endurance training

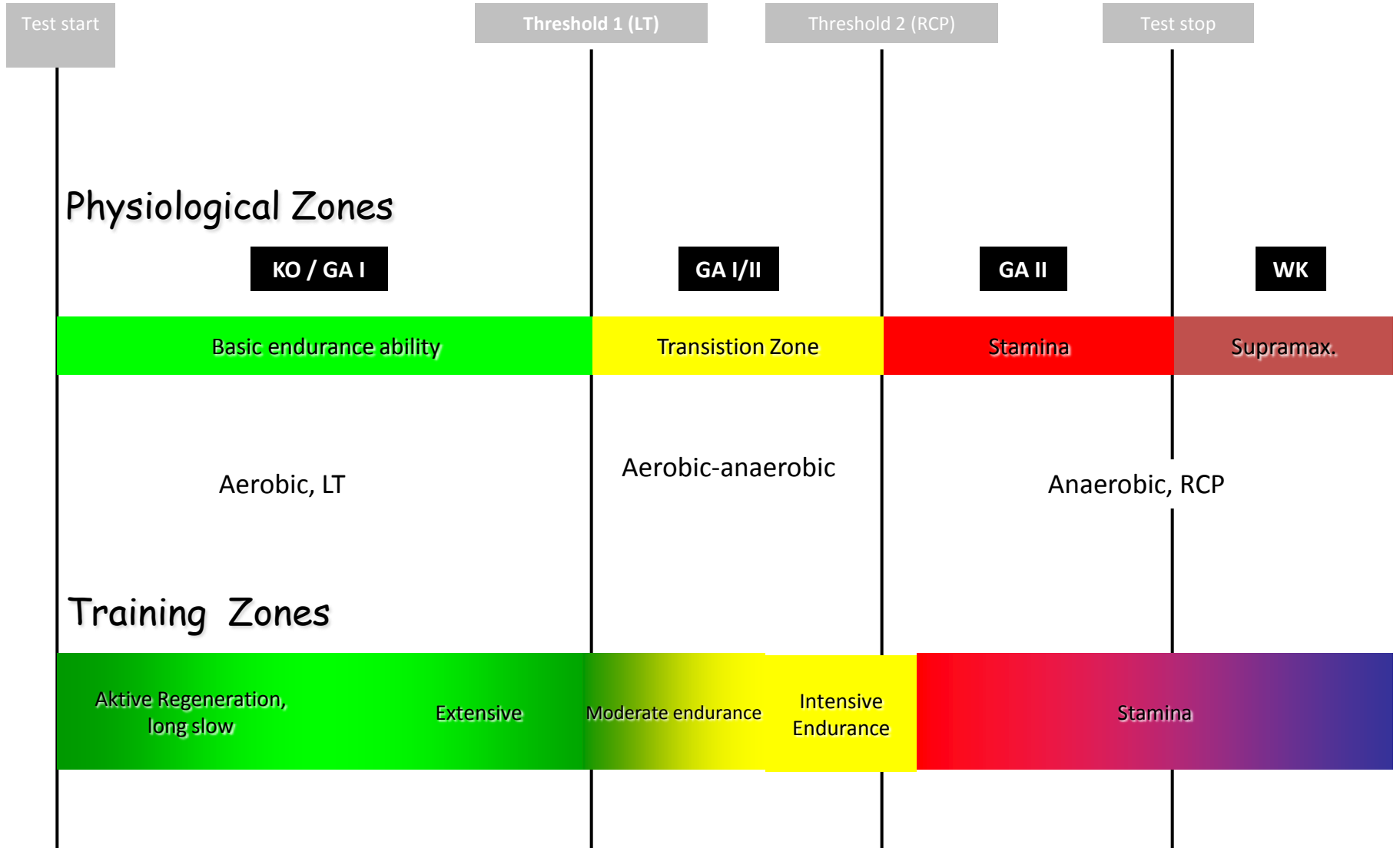
3.1 Cardiopulmonary parameters



Diagnostical Drawbacks

- Borg scales are subjective measurements
- Interactions with fatigue
- Do the verbal anchors mean the same for clinical groups?

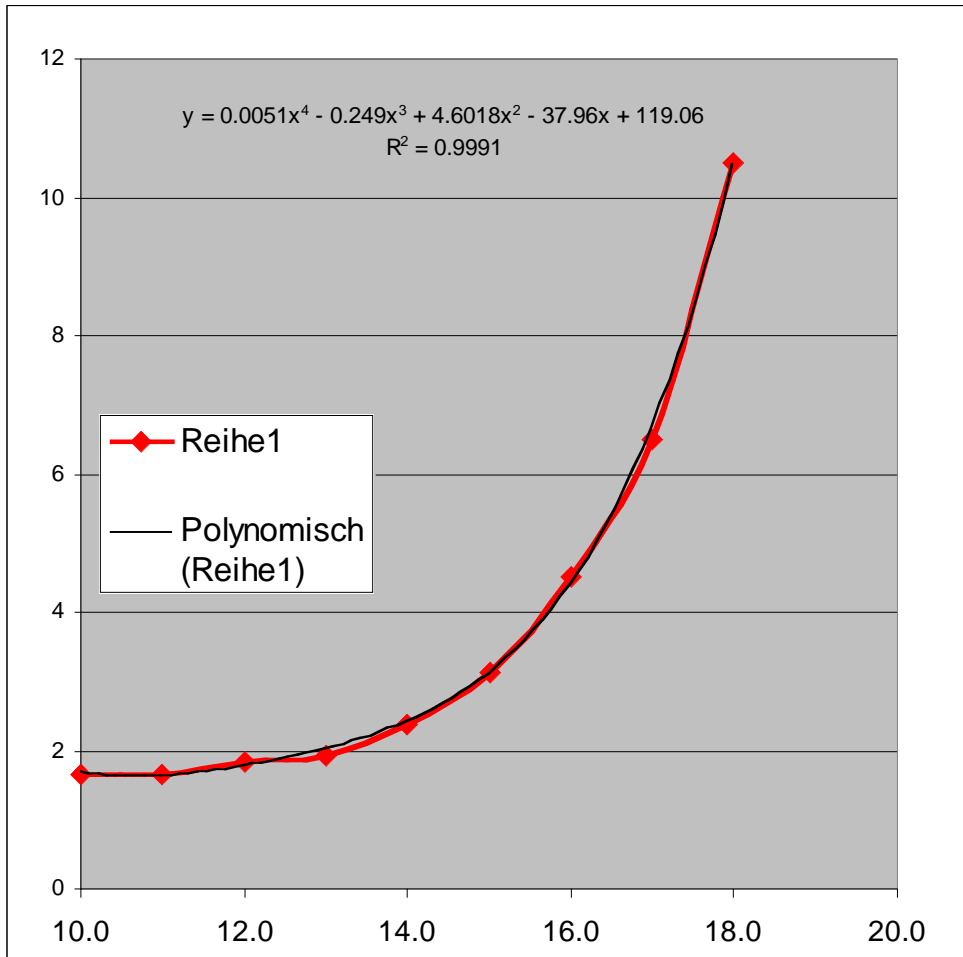
Training zones



3.3 Laktate

- Detection of lactate levels in the capillary blood
- High lactate levels indicate:
insufficient clearing of lactate from the blood (lack of oxygen)

Example of the calculated lactate curb



a_4	a_3	a_2	a_1	a_0
0,005	-	4,601	-	119,0
105	0,24	807	37,9	563
	901		601	

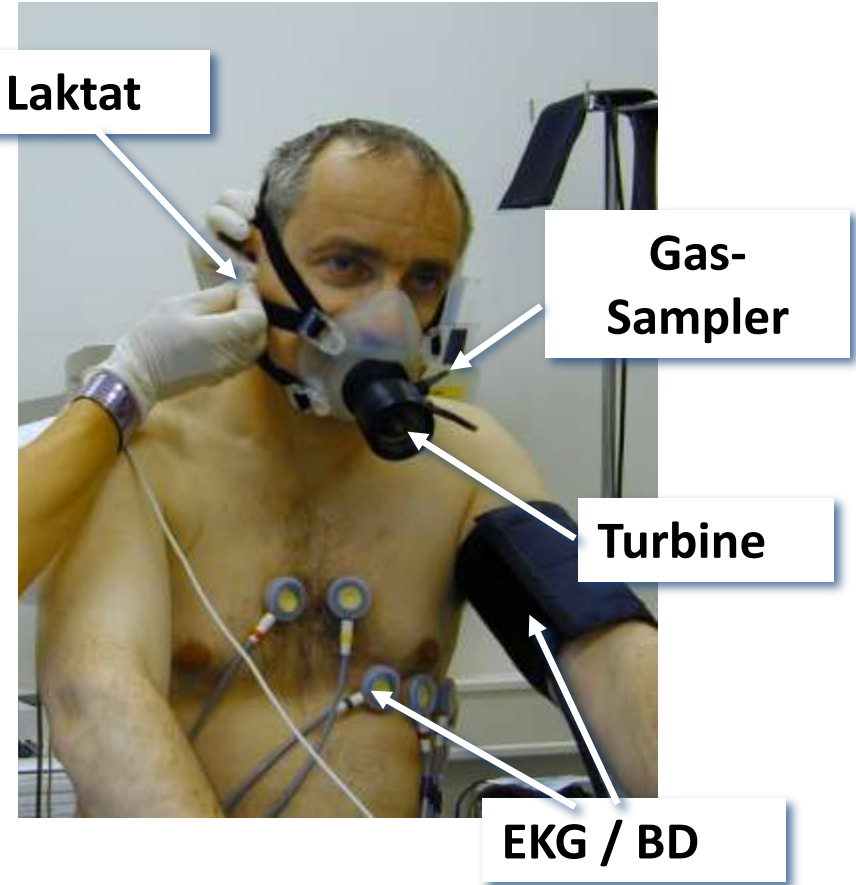
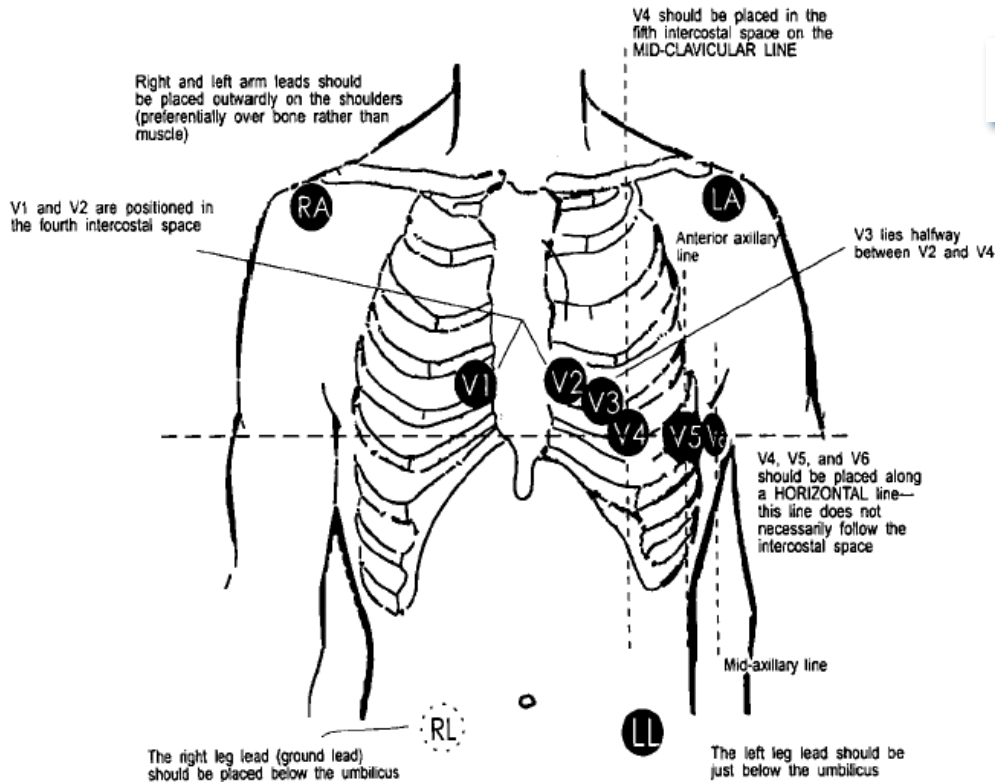
x	y
17	6,65
	90

Winkel	x	y
45,0°	15,11	3,214
	48	1

Diagnostical Drawbacks

- No physiological concept (mathematical models)
- High variations 0.9 – 8.4 mmol/l (Rest – Respiratory Compensation Point)

3.3 Cardiopulmonary exercise testing (CPET)



3.5 Recommendations for Endurance training

Extensive Intervalltraining...

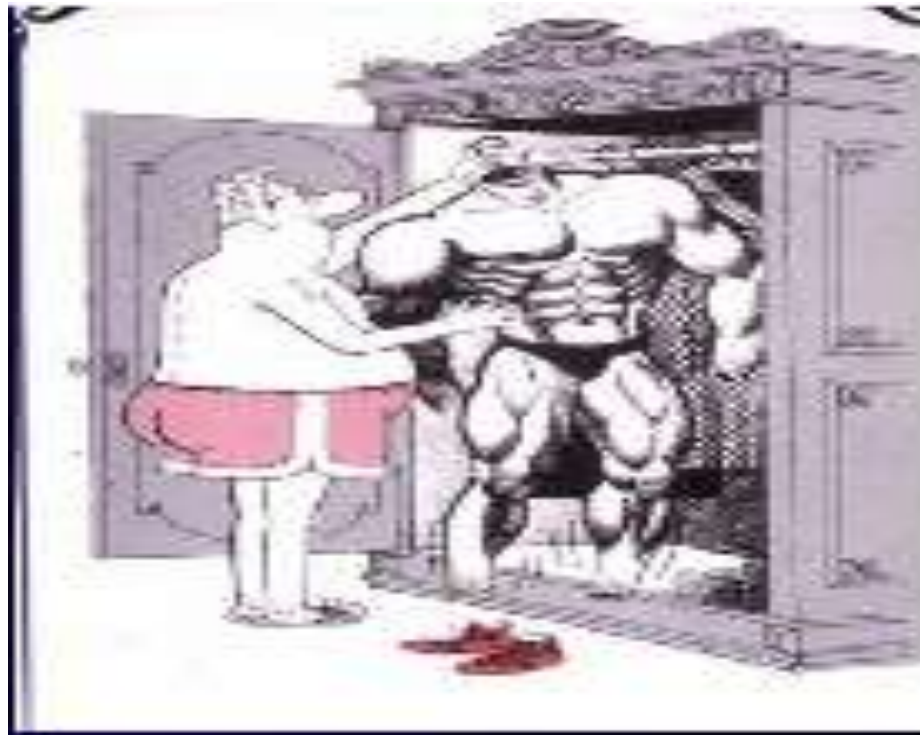
“.. implements intensive exercise bouts on the peripheral muscles which are lower and less intense for the cardiopulmonal system.”

Meyer et al, Z. Kardiol 87:8-14 (1998)

“..leads to significant training effects that are equal to those performed with continuous intensities but use double the amount of time.” *Vogiatzis et al, Eur Respir J. 2002;20(1):9-12*

4. Quantification of training intensity

Resistance training



Why resistance training?

Dalgas et al. 2010:

- 12 weeks of PRT improved strength of knee flexors and extensors
- Significant effects compared to control group on MVC

Why Resistance Training

Florida Group: White et al 2004, Guiterrez et al. 2004

- Significant within group effects of resistance training on MVC
- Fatigue Reduction (MFIS)

Conclusions

- Literature gives very precise specifications which are not always feasible in training practice (laboratory conditions, cost intensive instruments)
- Training should be individually suited so that specified goals can be maintained!
- For resistance training: PwMS should exhausted be at the end of the series!

Combined training for PwMS

- Endurance training twice per week over 30-60 Min with 70% of HR_{peak}
- Progressive resistance training twice per week with 65-70% of 1-RPM
- Further activation in form of ADL or leisurely sporting activities using moderate intensities (50% of HR_{peak})

Take home message

- Quantification of exercise intensities should be an essential aspect of rehabilitation
- Moderate training intensities are then well tolerated by PwMS

**Thank you for your
attention!**

www.kliniken-valens.ch

References

- 1. Brück W. Inflammatory demyelination is not central to the pathogenesis of multiple sclerosis. *J Neurol* 2005; 252 (5): 10-15.
- 2. Lucchinetti C, Brück W, Parisi J, Scheithauer B, Rodriguez M, Lassmann H. Heterogeneity of multiple sclerosis lesions: implications for the pathogenesis of demyelination. *Ann Neurol* 2000; 47: 707-717
- 3. Heesen, C. Endocrine and cytokine responses to standardized physical stress in multiple sclerosis. *Brain Behav Immun* 2003; 17 (6): 473–481.
- 4. Von Boxel-Dezaire AH, Hoff SC, van Oosten BW, Verweij C, Drager A, Asder H et al. Decreased Interleukin 10 and increased interleukin 12p40 mRNA are associated with decreased activity and characterize different disease stage in multiple sclerosis. *Ann Neurol* 1999; 45: 695-703.
- 5. Hohlfeld R, Kerschensteiner M, Stadelmann C, Lassmann H, Wekerle H. The neuroprotective effect of inflammation: implications for the therapy of multiple sclerosis. *J Neuroimmunol* 2000; 107: 161–166.
- 6. Keegan BM, Noseworthy JH. Multiple Sclerosis. *Annu Rev Med* 2002; 53: 285-302.

References

- 7. Pedersen AM, Petersen BK. The anti-inflammatory effects of exercise. *J Appl Phys* 2005; 98: 1154-1162.
- 8. Kohut M, McCann D, Russell D, Konopka D, Cunnick J, Franke W, et al. Aerobic exercise, but not flexibility/resistance exercise, reduces serum IL-18, CRP, and IL-6 independent of [beta]-blockers, BMI, and psychosocial factors in older adults. *Brain Behav Immun* 2006; 20: 201-209.
- 9. Castellano V, White L. Serum brain-derived neurotrophic factor response to aerobic exercise in multiple sclerosis. *J Neurol Sci* 2008; 269: 85–91.
- 10 Prakash RS, Snook EM, Motl RW, Kramer A. Aerobic fitness is associated with gray matter volume and white matter integrity in multiple sclerosis. *Brain Research* 2010; 1341: 41–51.
- 11. Andreasen AK, Stanager E, Dalgas U. The effect of exercise on fatigue in multiple sclerosis. *Mult Scler* 2011; 17(9): 1041-1054.
- 12. Mostert S, Kesselring J. Effects of a short term exercise training program on aerobic fitness, fatigue, health perception and activity level of subjects with multiple sclerosis. *Mult Scler* 2002; 8: 161–168.

References

- 13. Kamioka H, Tsutani K, Okuizumi H, Mutoh Y, Ohta M, Handa S, et al. Effectiveness of Aquatic Exercise and Balneotherapy: A Summary of Systematic Reviews Based on Randomized Controlled Trials of Water Immersion Therapies. *J Epidemiol* 2010; 20 (1): 2-12.
- 14. Wiesner S, Birkenfeld AL, Engeli S, Haufe S, Brechtel L, Wein J et al. Neurohumoral and Metabolic Response to Exercise in Water. *Horm Metab Res* 2010; 42: 334-339.
- 15. Roehrs TG, Karst GM. Effects of an aquatics exercise program on quality of life measures for individuals with progressive multiple sclerosis. *J Neurol Phys Ther* 2004; 28: 63-71.
- 16. Gehlsen GM, Grigsby SA, Winant DM. Effects of an aquatic fitness program on the muscle strength and endurance of patients with multiple sclerosis. *Phys Ther* 1984; 31: 653-657.
- 17. Polman CH, Reingold SC, Ednan G, Filippi M, Hartung HP, Kappos L et al. Diagnostic criteria for multiple sclerosis: 2005 Revisions to the “McDonald criteria”. *Ann Neurol* 2005; 58 (6): 840-846.
- 18. Penner IK, Raseli C, Stocklin M, Opwis K, Kappos L, Calabrese P. The Fatigue Scale for Motor and Cognitive functions (FSMC): validation of a new instrument to assess multiple sclerosis-related fatigue. *Mult Scler* 2009; 15: 1509-1517.

References

- 19. Wassermann K, Hansen JE, Sue DY, Stringer WW, Whipp BJ. *Principles of exercise testing and prescription*. 4th ed. Philadelphia: Lippincott Williams & Wilkins; 2005.
- 20. Wilcock IM, Cronin JB, Hing WA. Physiological response to water immersion: a method for sport recovery? *Sports Med* 2006; 36: 747-765.
- 21. Park KS, Choi JK, Park YS. Cardiovascular regulation during water immersion. *Appl Human Sci* 1999; 18: 233-241.
- 22. Schnitzer W, Fenzl M, Knüsel O, Hartmann B. Concerning a Question About the Correction of the training Heart Rate in the Water. Significance of the water Temperature? *Phys Med Rehab Kuror* 2006; 16: 330-336.
- 23. Vignali DA. Multiplexed particle-based flow cytometric assays. *J Immunol Methods* 2000; 243:243-255.
- 24. Krishna G, Danovitch GM & Sowers JR. Catecholamine responses to central volume expansion produced by head-out water immersion and saline infusion. *J Clin Endocrinol Metab* 1983; 56: 998-1002.
- 25. Grossman E, Goldstein DS, Hoffman A, Wacks IR, Epstein M. Effects of water immersion on sympathoadrenal and dopa-dopamine systems in humans. *Am J Physiol* 1992; 262 (6): 2.

References

- 33. Cakt BD, Nacir B, Genc H, Sracoglu M, Karagoz A, Erdem HR, et al. Cycling progressive resistance training for people with multiple sclerosis: a randomized controlled study. *Am J Phys Med Rehabil* 2010; 89: 446-457.
- 34. Romberg A, Virtanen A, Ruutiainen J et al. Effects of a 6-month exercise program on patients with multiple sclerosis: a randomized study. *Neurol* 2004; 63: 2034–2038.
- 35. Beenakker EA, Oparina TI, Hartgring A, Teelken A, Arutjunyan AV, De Keyser. Cooling garment treatment in MS: clinical improvement and decrease in leukocyte NO production. *Neurol* 2001; 57: 892–894

Quantification of intensity for resistance training

- Normatives:
 - Intensity (% of maximum force)
 - Change of series and repetitions
 - Pause length
 - Performance

