‘Wetenschap rond actieve leefstijl, sport en handicap’

Een inkijk in actueel bewegingswetenschappelijk revalidatieonderzoek
***28 oktober** 2011*

rijksuniversiteit groningen

umcg

Noordelijk Expertise centrum Sport, bewegen & Handicap (NESH)

Physical strain, work capacity and mechanisms of restoration of mobility in the rehabilitation of individuals with spinal cord injury (SCI)?

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Jan van der Scheer, Sonja de Groot ea

www.scionn.nl

Spinal cord injury?

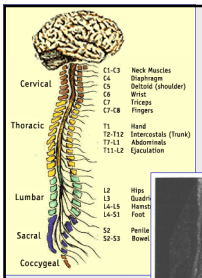


FIGURE 2. Midline sagittal T2 weighted MRI image of the cervical spine revealing a disc herniation at the C5–C6 level with thecal sac compression. (From Chapman JR, et al: Spine: State Art Rev 1999;13:431-447, with permission.)

- •Primary impairments: motor, sensory & autonomic
- •150-300 pat/yr; male, young
- •Netherlands: 12.000
- •+/- Life expectancy
- •Specialized Units
- •80% wheelchair dependent
- •Leg >> arm work
- •Inactive lifestyle?!
- •Secondary impairments

=> Infections; decubitus, osteoporosis

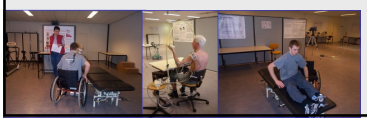
=> CVD & Overuse MSS

=>Restoration of mobility in rehab?

SCI Restoration of Mobility: key-problems?

- *Upper body/Arm work*
  - Loss of Function: Small muscle mass, not well trained
  - Complex & vulnerable upper body musculoskeletal system
- *SCI*
  - Incomplete motor system & autonomic disturbances
- *(Highly) repetitive mechanical & cardio-resp stress* ***wheelchair use & ADL*** => inactivity….overuse?
  - Inefficient hand rim propulsion mechanism
  - Stress ⇔ **Strain ⇔ Work Capacity** !

⇒Rehabilitation
⇒Prevention
⇒secondary impairments
⇒vicious circle



The (In)Activity paradigm: adaptations to (dis/non-)use

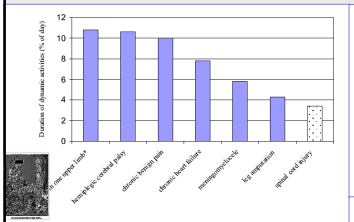


Fig 4. The mean duration of dynamic activities, as a percentage of a 24-hour period, as measured with the activity monitor in able-bodied persons and in persons with different chronic diseases. *CRPS-1: complex regional pain syndrome type 1. Healthy subjects,[28-31,45-49] CRPS-1,[28] hemiplegic cerebral palsy,[49] chronic benign pain,[31] chronic heart failure,[29] meningomyelocele,[29] leg amputation,[30] SCI: current study.

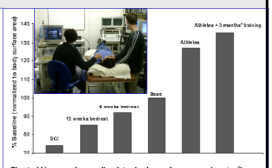
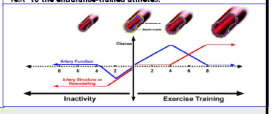


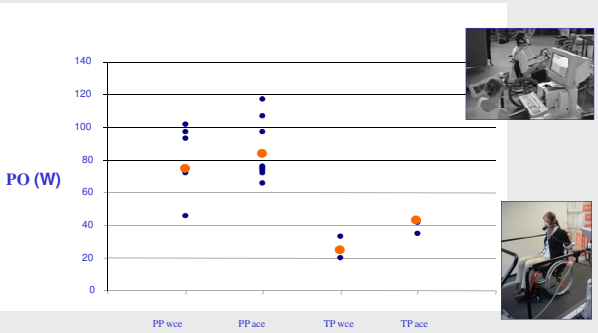
Fig 1. LV mass (normalized to body surface area, in g/m²) as a percentage of baseline or control across the total spectrum of physical activity from extreme deconditioning (SCI, present study), bedrest[4] to the endurance-trained athletes.[21]



Van den Berg-Emons et al, 08

P de Groot et al, 2006a,b

Low fitness in SCI?!

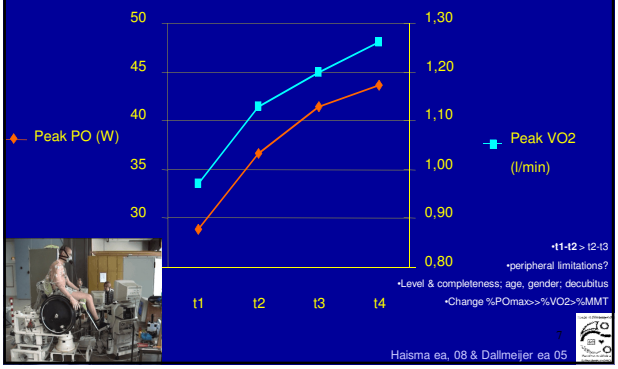


Mean peak power output (W) for included studies Haisma ea 06; PP: paraplegia; TP: tetraplegia; wce: wheelchair exercise; ace: arm-crank or handcycle exercise.
● = weighted mean peak power output for all included studies.

(systematic review: Haisma ea, 06)

Fitness: Peak wheelchair exercise test

Mlwin outcome (n=125)



•t1-t2 > t2-t3
•peripheral limitations?
•Level & completeness; age, gender; decubitus
•Change %POmax>>%VO2>%MMT

Haisma ea, 08 & Dallmeijer ea 05

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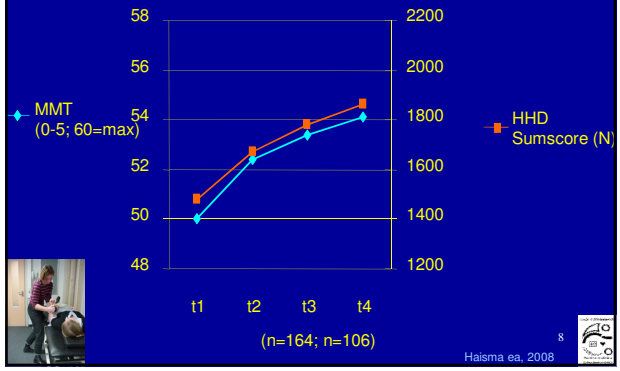
Fitness: Upper body muscle strength

Mlwin outcome



(n=164; n=106)

Haisma ea, 2008

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Person and lesion related factors

	age	gender	level	completeness
peak power output	↓	♀ ↓	TP ↓	=
change in PO	↓	♀ ↓	=	=
peak oxygen uptake	=	♀ ↓	TP ↓	=
change in VO2	=	♀ ↓	TP ↓	=

Haisma ea, 2008

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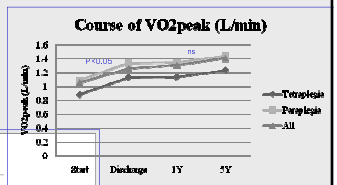
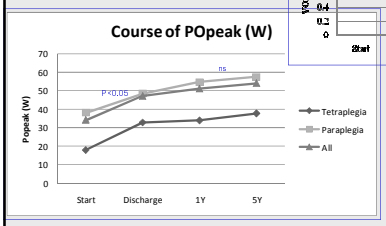
5 yrs after discharge SCI rehab?

[redacted]





Similar trends:
•FIM
•Wheelchair efficiency & skill

Van Koppenhagen et al, in preparation (N=128)

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SCI-rehab

How much therapy do we give?

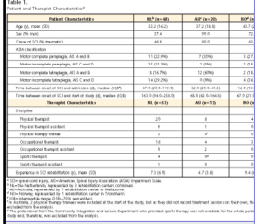


Table 2.
General Characteristics of the Interventions by Country

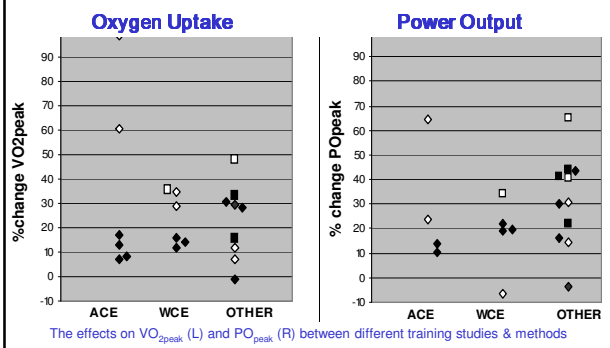
Variable	NL[a]	AU[b]	NO[c]
Total no. of recorded treatments	1,640	628	258
Total no. of recorded interventions[d]	2,712	1,752	680
For mobility and self-care (%)	95.7	95.4	95.3
For other domains of the ICF (%)	4.3	4.6	4.7
No. of interventions per treatment			
1 intervention (%)	56.6	30.9	25.6
2 interventions (%)	28.5	16.7	23.3
3 interventions (%)	11.7	21.2	28.3
4 interventions (%)	2.4	15.8	14.1
>4 interventions (%)	0.8	15.4	8.7
Total therapy time (min)[e]	48,970	29,705	11,830
For mobility and self-care (%)	93.8	89.1	90.3
For other domains of the ICF (%)	6.2	10.9	9.7
Proportion of therapy time for mobility and self-care by discipline (%)			
Physical therapy	67.8	71.9	67.6
Occupational therapy	22.7	28.1	32.3
Sports therapy	9.5	0	0
Proportion of therapy time given as individual therapy (%)	61.0	93.7	84.5
Physical therapy (%)	61.9	91.2	77.8
Occupational therapy (%)	65.9	100	98.8
Sports therapy (%)	42.9	0	0

[a] NL=the Netherlands, represented by 3 rehabilitation centers combined.
[b] AU=Australia, represented by 1 rehabilitation center in Melbourne.
[c] NO=Norway, represented by 1 rehabilitation center in Trondheim.
[d] Total number of recorded interventions in individual and group treatment sessions.
[e] Percentage of time spent on mobility and self-care and on other domains of the *International Classification of Functioning, Disability and Health* (ICF) (not included in the Spinal Cord Injury—Intervention Classification System) was calculated for each country.

Optimal intensity,freq,duration,form? Guideline?

Van Langeveld et al 2011

Training effects in chronic SCI ?



The effects on VO_{2peak} (L) and PO_{peak} (R) between different training studies & methods

Square symbols are studies including subjects with TSI<1yr and diamond symbols are studies with TSI>1yr. Filled symbols are studies of an acceptable quality and open symbols are studies of a lower quality. Results in studies of Taylor et al, Davis et al and Dallmeijer et al. are corrected for changes in a control group.

Systematic review: Valent ea 2008, also see: Devillard ea 2007, Hicks et al 2011

Martin Ginnis et al 2011: evidence-informed PA guidelines

PHYSICAL ACTIVITY GUIDELINES
for Adults with Spinal Cord Injury

Rick Hansen Institute / Institut Rick Hansen — SCI Action Canada

www.sciactioncanada.ca/guidelines

PREAMBLE

These guidelines are appropriate for all healthy adults with chronic spinal cord injury, traumatic or non-traumatic, including tetraplegia and paraplegia, irrespective of gender, race, ethnicity or socio-economic status. Adults are encouraged to participate in a variety of physical activities that are enjoyable and safe.

You should try to be active throughout the day, and in a variety of ways, in addition to your usual activities of daily living.

If you are newly injured, are pregnant, prone to autonomic dysreflexia, or have other medical conditions, you should talk to your health professional to find out what types and amount of physical activity are right for you. A health professional might include a doctor, a physiotherapist, or a qualified exercise professional.

As a safe progression towards meeting the guidelines it is appropriate to start with smaller amounts of physical activity and gradually increase how long, how often, and how hard you engage in physical activity.

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For important fitness benefits, adults with a spinal cord injury should engage in:
At least 20 minutes of moderate to vigorous intensity aerobic activity 2 times per week,
AND
Strength training exercises 2 times per week, consisting of 3 sets of 8-10 repetitions of each exercise for each major muscle group.

How…?	Aerobic Activity	Strength Training Activity
How often?	Two times per week	Two times per week
How much?	Gradually increase your activity so that you are doing at least 20 minutes of aerobic activity during each workout session.	Repetitions are the number of times you lift and lower a weight. Try to do 8-10 repetitions of each exercise. This counts as 1 set. Gradually work up to doing 3 sets of 8-10 repetitions of each exercise.
How hard?	These activities should be performed at a moderate to vigorous intensity. Moderate intensity: activities that feel somewhat hard, but you can keep doing them for a while without getting tired. Vigorous intensity: activities that make you feel like you are working really hard, almost at your maximum, and you cannot do these activities for very long without getting tired.	Pick a resistance (free weights, cable pulleys, bands, etc.) heavy enough that you can barely, but safely, finish 8-10 repetitions of the last set. Be sure to rest for 1-2 minutes between each set and exercise.
How to?	There are many ways to reach this goal, including: *Upper Body Exercises:* wheeling, arm cycling, sports *Lower Body Exercises:* Body weight supported treadmill walking, cycling *Whole Body Exercise:* recumbent stepper, water exercise	There are many ways to reach this goal, including: ■ Free weights ■ Elastic resistance bands ■ Cable pulleys ■ Weight machines ■ Functional electrical stimulation

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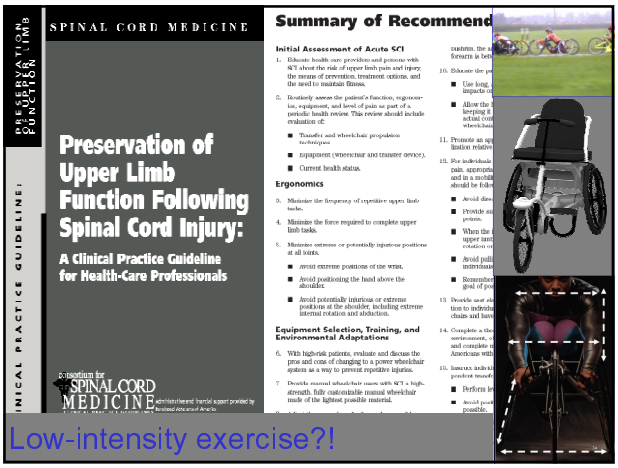
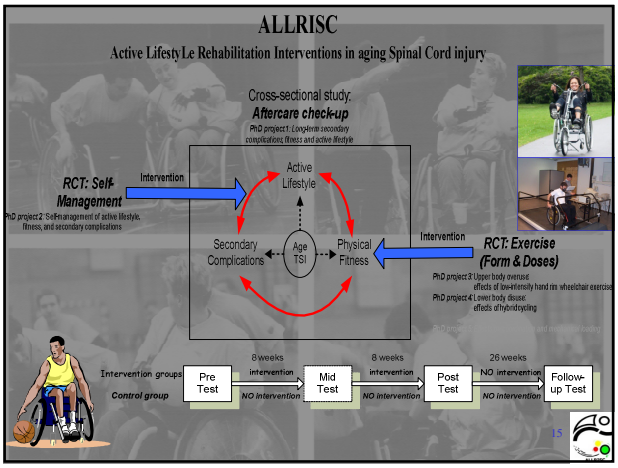


Low-intensity exercise?!



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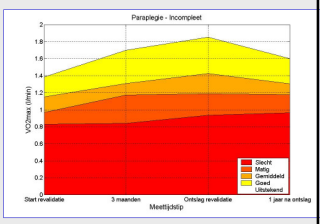
From Research to Rehab: patient monitoring?

- Implementation limited # of measurements in rehab
- Pre-/post tests & form, intensity, freq, duration
- Individual treatment process
- Reference database
- Treatment strategy
- Develop guidelines

- *Continuous Support of professionals + Multidisciplinary discussion Multicenter collaboration*



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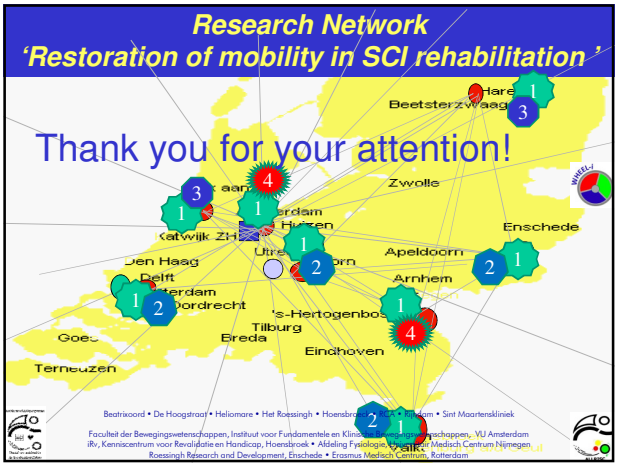

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