

 Amsterdam UMC
University Medical Centers

Physical activity and lifestyle programs for children and adults with CP

Results of the Learn2Move studies

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Learn 2 Move program





- L2M 0-2 yrs UMC Groningen (Mijna Hadders-Algra et al)
- L2M 3-4 yrs Hoogstraat Utrecht (Marjolijn Ketelaar et al)
- L2M 7-12 yrs VUmc Amsterdam
- L2M 16-24 yrs Erasmus MC Rotterdam

- 4x RCT
- (Physical) activity stimulation
- Context-child focused
- Intensive


























LEARN 2 MOVE (L2M)


L2M 7-12 years

Annet Dallmeijer, Leontien van Wely,
Astrid Balemans, Jules Becher
VU University Medical Center Amsterdam

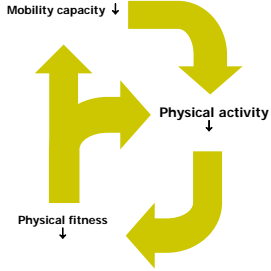
Effectiveness of a physical activity stimulation program for children
with spastic cerebral palsy: a randomized controlled trial



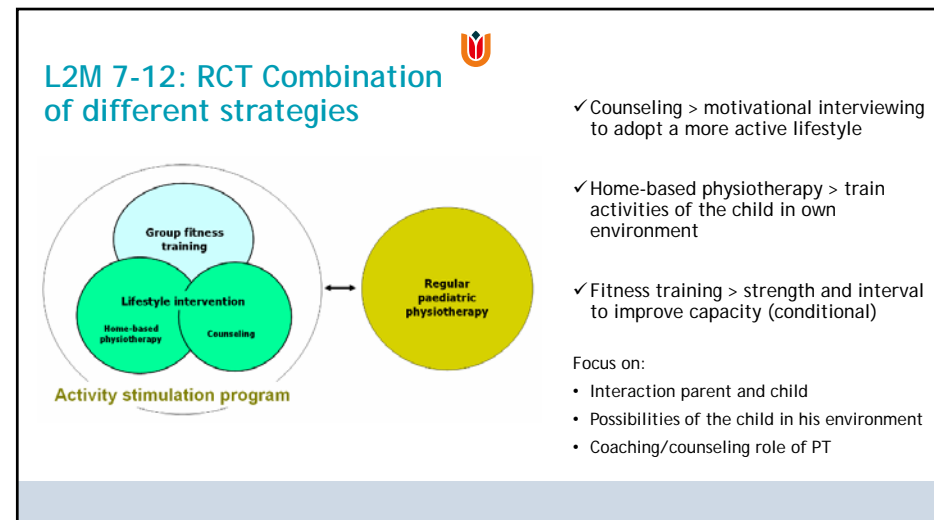
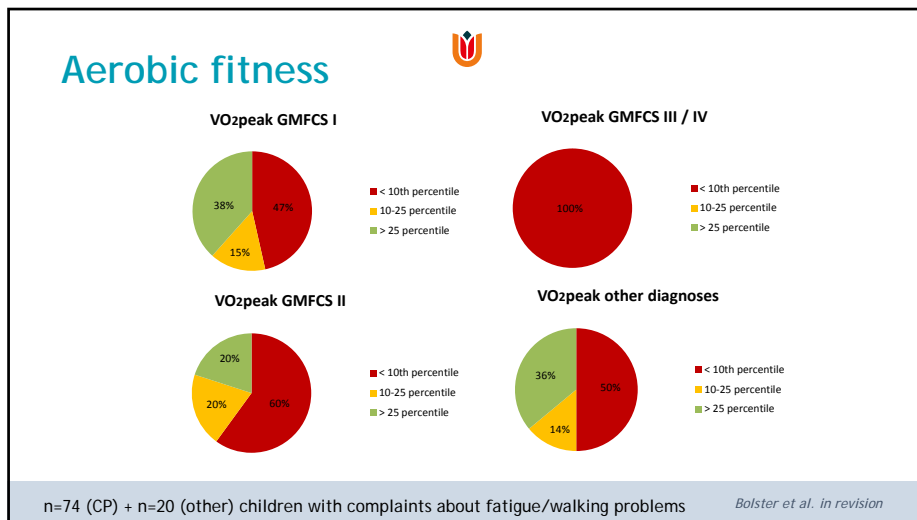
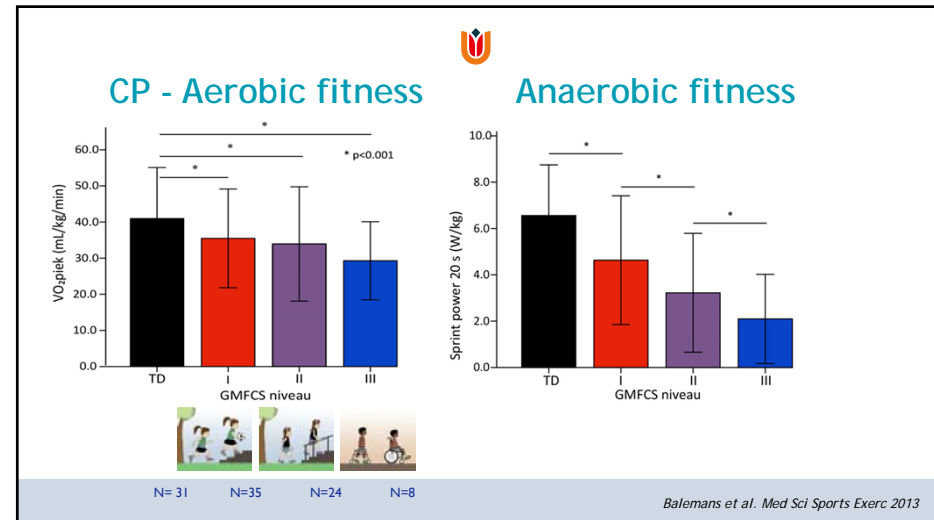
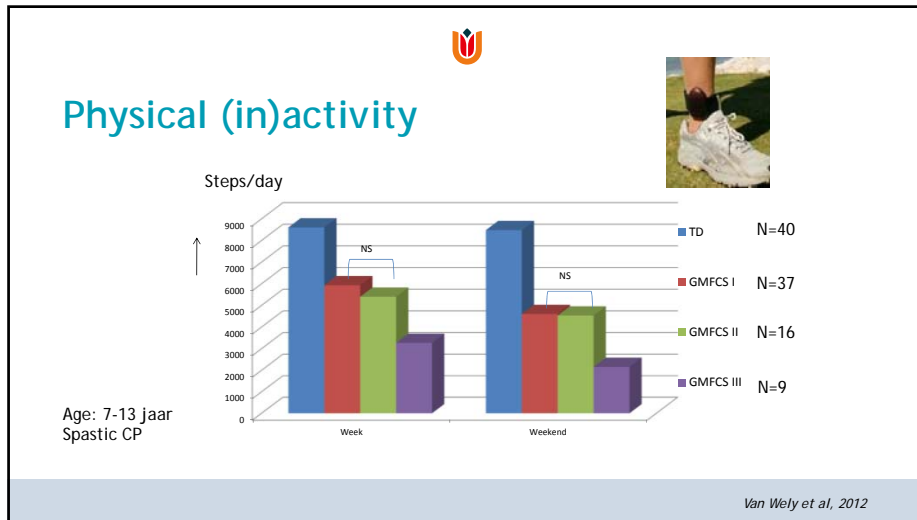
(In)activity?



- At risk for developing *inactive* lifestyle
- Fitness training > no sustained effects at follow-up
- Focus on daily life activities
- Lifestyle intervention needed?

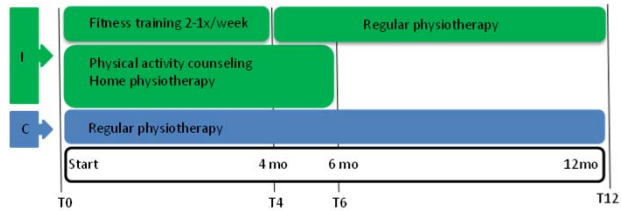
(Durstine, Sports Med 2000)

¹ Bjornson 2007, Van den Berg-Emons 1995





Design: 6-month program with 6-month follow-up



Participants

- Spastic CP 7 - 12 yr
 - GMFCS level I/II/III
 - Uni/bilateral
- 28/12/9
23/26
- One of the criteria:
 - Experienced problems with sport and/or mobility, or
 - Inactive lifestyle (< 60min/day moderately active), or
 - No regular sport participation (< 3 times a week)



- Random allocation to intervention or control group (stratified by GMFCS)
- n=49 (24/25)



Outcome measures

Physical activity (primary)

- Objectively measured walking activity > StepWatch Activity Monitor¹
- Parent-reported physical activity (AQUA)

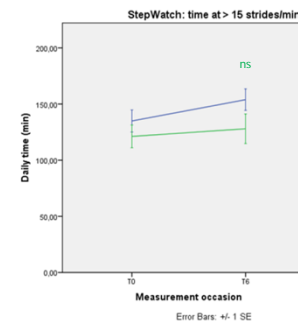


Secondary outcome measures

- Mobility capacity (*GMFM-66, 1-min walk test*)
- Physical fitness (*strength, aerobic, anaerobic*) and fatigue
- Social participation (*Life-Habits, CAPE*) Domestic life & Recreation and leisure
- Quality of life (CP-QoL)

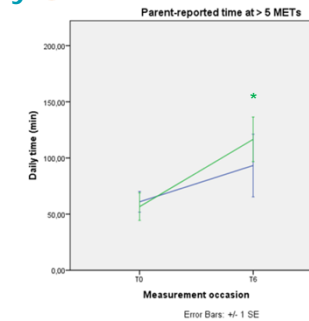
¹ Bjornson et al 2007

Results - Physical activity



T0-T6: Effect size: -.858
(95% CI: -1.819—1.04), NS

T0-T12: NS





T0-T6: OR= 2.2
(95%CI: 1.1 to 4.4), p=0.04

T0-T12: NS



— controle groep
— interventie groep

Van Wely, J Physiother, 2014



Effectiveness intervention



objective
Physical activity

parent report (t6)
Mobility capacity
GMFM (t6)


Mobility capacity
GMFM (t6)


Domestic activities
Life-H (t12)

Van Wely, J Physiother, 2014
Van Wely, Clin Rehabil 2013



No effects for..




Fitness



Fatigue

Sport participation



Quality of life


Van Wely, J Physiother, 2014
Van Wely, Clin Rehabil 2013

Discussion L2M 7-12


- Contrasting effect on physical activity
 - Positive effect on **self-reported** physical activity
 - Not supported by objective measurements
- Small positive effects on **mobility capacity** and **domestic life activities**
 - Home-based therapy/fitness training effects? not reflected in fitness outcomes?
 - Supported by 'off trial' shuttle run test improvements!
- The 'CP RCT issue' > bias and variability in response

1: Baemans et al submitted


Secondary analyses: Relation fitness - activity




Aerobic capacity




bilateral



Physical activity



Anaerobic capacity




Mobility (GMFM & 1MWT)

P<0.001

P<0.001

Baemans et al Phys Ther 2015





In summary L2M 7-12

- This six-month intervention program combining counselling, home physiotherapy and fitness training was not effective for increasing **objectively assessed walking activity**, but there was an increased **gross motor capacity** and **participation in domestic activities**
- Approach may be different for subgroups



Erasmus MC
Erasmus

LEARN 2 MOVE (L2M)

L2M 16-24 years

Rita van den Berg-Emons, Jorrit Slaman, Marij E. Roebroek, Henk Stam
Erasmus Medical Centre, Dept Rehabilitation Medicine

Effectiveness of a lifestyle program among adolescents and young adults with cerebral palsy; a randomized controlled trial




















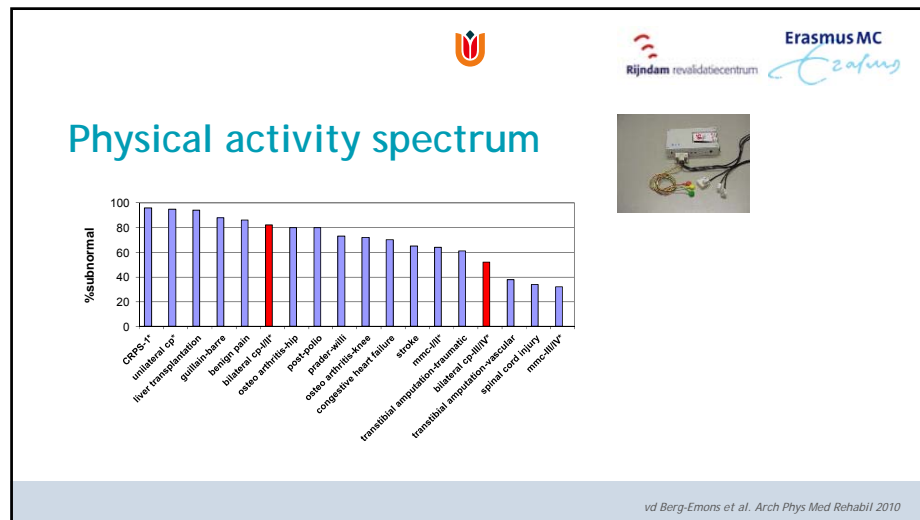






Adolescents and young adults with CP

Healthy lifestyle mediated by sufficient levels of

- physical activity (PA)
- physical fitness
- low sedentary time





Erasmus MC

Active Lifestyle and Sports Participation

Daily PA counseling

- Based on motivational interviewing
- Aimed to ↑ PA in daily life and ↓ sedentary time
- 6 sessions spread over a 6-month period

Sports counseling

- 2-4 sessions to find appropriate sports and sports facilities
- Possibility to practice sports with movement therapist

Fitness training

- Aimed at ↑ aerobic capacity & muscle strength
- Weekly group training at center & weekly individual training at home
- 24 sessions spread over first 3 months

Erasmus MC

Research questions

Effect of lifestyle module in adolescents and young adults with spastic CP on:

Primary

- Movement behaviour
- Fitness & health

Participants 16-24 yrs



	All	Control group	Intervention group	P-value
N	57	29	28	-
Gender (M / F)	27 / 30	15 / 14	12 / 16	0.50
Age (years)	20 ± 3	20 ± 3	20 ± 3	0.64
Body mass (kg)	67 ± 18	65 ± 18	70 ± 18	0.24
Height (cm)	170 ± 10	170 ± 9	169 ± 11	0.66
CP distribution (unilateral / bilateral)	29 / 27	14 / 14	15 / 13	0.79
GMFCS* distribution (I / II / III / IV)	33 / 18 / 5 / 1	16 / 9 / 3 / 1	17 / 9 / 2 / 0	0.75
Duration of PA (% / day)	8.52 ± 3.01	8.26 ± 2.94	8.80 ± 3.12	0.54
Sedentary time (% / day)	79.63 ± 7.06	81.10 ± 6.86	78.11 ± 7.08	0.16
Motility during PA (g)	44.00 ± 8.09	43.18 ± 8.74	44.91 ± 7.37	0.47

Physical activity



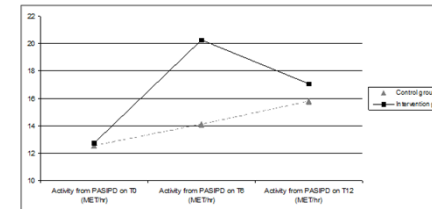
Self-reported PA (PASIPD)

- Effect of intervention during the intervention period ($p=0,05$)
- No longer present at follow-up



Objectively measured PA

- No effects at all
- Volume of daily PA / sedentary time
 - Intensity of daily PA
 - Number / duration periods of sitting, walking



Slaman et al 2015

Effects on Fitness



Intervention period

- VO₂peak ($p=0.01$)
- VO₂ on AT ($p=0.01$)
- Load on AT ($p=0.00$)
- Waist circumference ($p=0.01$)



No effects found for:

- Max Load
- Muscle strength
- 6 minute walk distance
- HDL cholesterol



Follow-up period

- Skinfolds ($p=0.01$)
- Systolic BP ($p=0.04$)
- Total cholesterol ($p=0.02$)



Slaman et al 2014

Secondary analyses



Effects on:

- Fatigue severity (CIS) (T0-T6; $p=0.03$)
- HR-QoL (SF-36) (T0-T6; $p=0.05$)

Outcome measure	Mediating effects			
	Peak oxygen uptake	Objectively measured level of physical activity	Objectively measured sedentary time	Self-reported level of physical activity
Fatigue: CIS-f (T0-T6)	16.0%	6.2%	5.9%	22.6%
HRQoL*: SF-36, domain mental health (T0-T6)	22.6%	26.8%	28.1%	25.3%

1

Slaman et al Clin Rehabil 2015



Discussion L2M 16-24

- Intervention effective in increasing self-reported PA during intervention period
> not supported by objective measurements
- Favourable effects of the intervention on different aspects of physical fitness and health → low intensive training program
> maintained at 6-month follow-up: attributable to counselling?
- Effects on fatigue and HR-QoL were mediated by effects on PA & Fitness



In summary L2M 16-24

The intervention was

- Not effective in reaching a behavioural change toward more **physical activity** or less sedentary time
- Effective in increasing several aspects of cardiopulmonary and metabolic **fitness and health**, which seem to endure longer than with regular exercise training programs in CP



LEARN 2 MOVE (L2M)

Lessons learned & current developments



Lessons learned

- **Movement behavior** difficult to change¹
 - Multifactorial, as in general population
- Physical activity **measurements**
 - Validity of self-report?
 - Objective vs self-report different constructs of PA?
- Inactivity and deconditioning serious problem in CP population





Fitness training

7-12 > functional strength and interval

- Not effective (low frequency)
- Positive effect on functional outcome (GMFM) and Shuttle Run test¹
- Intensive exercise
 - Children: 'Mijn hart klopt!'
 - Therapists: Hard work!

16-24 > aerobic training

- Effective at low training frequency
 - > Fitness and health outcomes
- Effects maintained at follow-up
 - > counselling effect?
- Fatigue improved, mediated by activity/fitness variables

1: Balemans et al submitted



Lessons learned L2M 7-12

Counseling child - parents @ home

Parents:

- Not always aware of what their child likes to do and can do
- Uncertain about PA for their child
- Indicate increased awareness of importance physical activity
- Appreciate individualized personal approach

Child:

- 'I CAN do it, but my mother does do it, since that is faster'
- 'I can cycle very good, but my mother is afraid that I will fall'
- 'We go to the shop by car (since my father is very lazy), cycling would be much more fun'

Van Wely et al submitted



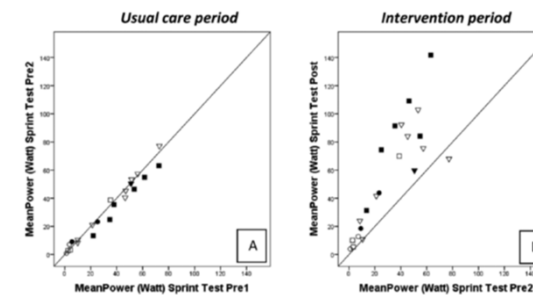
The next steps..

- ✓ Intensive **power training** young children > short periods intensive training
(Van Vulpes et al 2017, 2018)
- ✓ Exercise lab: assessment of **physical strain**¹ components in clinical setting
- ✓ Implementation of **life style module** for (young) adults (strain assessments)
- ✓ Start of treatment & follow-up **register** in NL

1: Dallmeijer et al 2010



MegaPower training - young children



Improvements in strength < functional improvements

- Double baseline design
- 14 weeks - 3x/wk
- 4-10 yrs
- ✓ Functional exercises
- ✓ High(er) velocity
- ✓ Loaded exercises
- ✓ Progressive
- ✓ Groups

Van Vulpes et al 2017, 2018

Physical strain of walking

GMFCS level	Physical strain (%)
I	~40
II	~55
III	~62
IV	~78

High in CP! > associated with PA

- Affects daily life activities, fatigue
- Contradiction: training or **overload**?
- Counseling: balance rest - activity/training

Physical strain: $(VO_{2walk} / VO_{2peak}) \times 100\%$

Balemans et al. Arch Phys Med Rehabil 2017

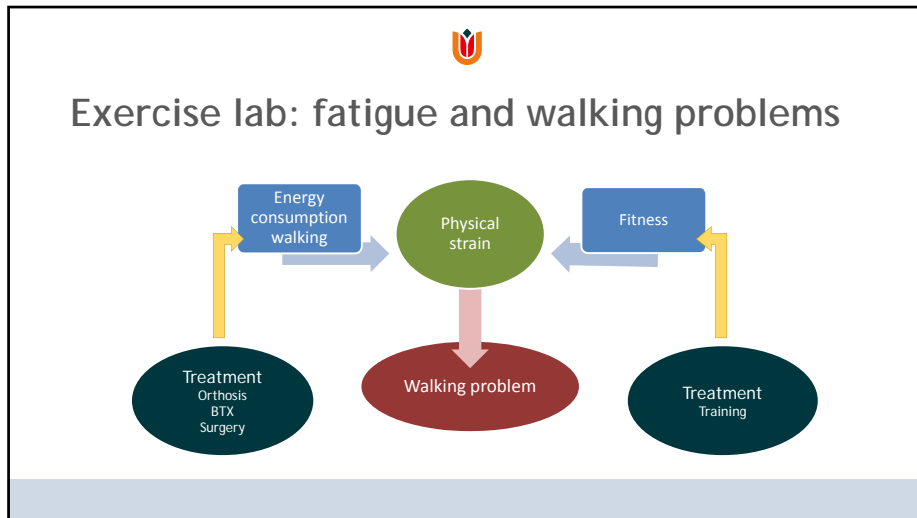
Energy cost - CP

GMFCS level	Energy cost (J/kg/m)
TD (n=51)	~5
GMFCS I (n=41)	~6
GMFCS II (n=35)	~7.5
GMFCS III (n=26)	~12

Energy cost = $EE \text{ walking} / \text{speed} \text{ (J/kg/m)}$

- Measure for 'efficiency' of walking

Bolster et al. 2018



VO2peak and VO2walk

Group	VO2peak (ml/kg/min)	VO2walk (ml/kg/min)
HC Normal (N=7)	~48	~20
HC Normal (N=6)	~42	~18
HC High (N=4)	~45	~22
HC High (N=12)	~40	~20

Physical strain

Group	Physical strain (%)
HC Normal (N=7)	~45
HC Normal (N=9)	~60
HC High (N=9)	~58
HC High (N=12)	~75

Energy cost

Group	Energy cost (J/kg/m)
HC Normal (N=7)	~5.5
HC Normal (N=9)	~5.8
HC High (N=9)	~6.5
HC High (N=12)	~7.5

Walking speed

Group	Walking speed (m/min)
HC Normal (N=7)	~75
HC Normal (N=9)	~65
HC High (N=9)	~62
HC High (N=12)	~55

VO2peak < 10th percentile, EC > 3SD

Implications for

- Treatment
- Counseling

Children & youth with complaints about:

- Fatigue in daily life/walking
- Reduced distance/speed

Balemans et al. Arch Phys Med Rehabil 2017



Nederlands CP-register

- Treatment & Follow-up (CPOP)
- Patient reported outcomes
- In collaboration with CP-Nederland (patient organization)



Take Home!

- Inactivity and deconditioning common > add to activity limitations
- Difficult to change movement behaviour
- Counseling (MI) and lifestyle intervention seem promising
- Relative strain in daily life does matter!
- Alternatives for RCTs (comparative effectiveness, evaluation of care)

Thank you for your attention!

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