24 studies about the effectiveness of assistive MOTOmed movement therapy

MOTOmed
move differently

	Author	Therapy/Intervention	n	Age (Ø years)	Frequency (Week/Min.)	Duration (Weeks)	Results	Significance (α=5%)	Design LoE
1. Stroke:									
1.11	**Theme: Cyclic Movement training versus Conventional Physiotherapy for Rehabilitation of Hemiparetic Gait after Stroke** Specialized clinic for Neurology, Kipfenberg								
	Podubecka et al. 2011 Germany **713.3/W506**	MOTOmed viva2 + PT Gait training + PT	IG =10 CG =10	58.45±13.73	5 x for 30 min.	4 weeks	Balance (BBS)	p< .05	Ib RCT
1.10	**Theme: Current Approaches to Restoring Walking in Patients during the Acute Phase of Cerebral Stroke** Russian State Medical University, Moscow								
	Skvortsova et al. 2011 Russia **713.3/EB203**	MOTOmed viva2 (or GT) + PT Physiotherapy	IG = 53 CG = 25	59±10.4	5 x for 20 min.	2 weeks	Gait Balance Walking speed Daily activities Proprioception	p< .001 p< .001 p< .05 p< .001 p< .05	Ib RCT
1.9	**Theme: Effect of Repetitive Arm Cycling Following Botulinum Toxin Injection for Post stroke Spasticity: Evidence From fMRI** Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne								
	Diserens et al. 2010 Switzerland **716.1/W10**	MOTOmed viva2 + BOTOX BOTOX + card game	IG =4 CG =4	49.0±10.0	3 x for 30 min.	12 weeks	Muscle tone, GRMA	p< .05	IIb RCOS
1.8	**Theme: Functional electrical stimulated leg cycling (FES-LCE) in clinic rehabilitation of patients with post acute stroke** Institute for sports and sports science, Heidelberg								
	Eigler et al. 2010 Germany **713.3/W438**	MOTOmed viva2 + FES MOTOmed viva2	IG =18 CG =13	66.5±10.82 65.31±12.33	5 x for 15 min.	4 weeks	Maximal force (F_{max}) Ø Performance Ability for self-help Walking distance	p= .005 p= .022 p= .012 p< .00	Ib RCT

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Explanations: BBS = Berg Balance Scale; BOFU = Body functions; CG = Control group; CS = Case study (experiment); CT = Controlled trial; ER = External rotation; FES = Functional electrical stimulation; GRMA = Group with remaining muscular activity; GT = Gait Trainer; IG = Intervention group; IR = Internal rotation; LoE = Level of Evidence; n = number of participants; PS = Pilot study; PT = Physiotherapy; RCOS = Randomized Cross Over Study; RCT = Randomized controlled trial; SA = Scientific article; TUG = Timed Up & Go-Test

	Author	Therapy/Intervention	n	Age (Ø years)	Frequency (Week/Min.)	Duration (Weeks)	Results	Significance (α=5%)	Design LoE
1.7	**Theme: Use of an assistive movement training apparatus in the rehabilitation of stroke patients** German Sports University Cologne								
	Dobke et al. 2010 Germany **713.3/W2518**	MOTOmed viva2 home-based Conventional Therapy	IG =16 CG =15	63.1±8.1 65.8±10.7	2 x per day for 10 min.	16 weeks	2' Walking distance 6' Walking distance Comfortable walking speed Quality of life (BOFU) Ø Performance	p= .015 p= .003 p= .024 p= .0018 p= .009	Ib RCT
1.6	**Theme: Effects of MOTOmed leg training on hemiplegic stroke patients** Department of Rehabilitation of the Tongji Institute at the Huanzhong Technical University Kanton								
	Whan Xingu et al. 2009 **China** **716.1/W14**	MOTOmed viva2 + PT PT	IG =33 CG =32	51,8±10,7 50,6±12,7	1 x per day for 45 min.	8 weeks	Fugl-Meyer test FAC category Barthel index	p= .005 p= .005 p= .005	Ib RCT
1.5	**Theme: A pilot randomized controlled trial to evaluate the benefit of the cardiac rehabilitation paradigm for the non-acute ischemic stroke population** Stroke Rehabilitation Unit, University College Dublin								
	Lennon et al. 2008 Ireland **713.3/W374**	MOTOmed viva2 + PT + occupational therapy Physiotherapy + occupational therapy	IG =23 CG =23	59.0±10.3 60.5±10.0	2 x for 30 min.	10 weeks	Maximal oxygen uptake (VO_2) Cardiovascular risk factors (CRS) Depression (HADS)	p< .001 p< .05 p< .001	Ib RCT
1.4	**Theme: The effect of repetitive arm cycling on post stroke spasticity and motor control. Repetitive arm cycling and spasticity** Centre Hospitalier Universitaire Vaudois (CHUV) and University of Lausanne								
	Diserens et al. 2007 Switzerland **713/W2228-2229**	MOTOmed viva2 + PT	IG =9 CG =none	66.3±16.0	5 x for 30 min.	3 weeks	Muscular force of the upper extremities Mobility	p< .01 p< .05	III CS
1.3	**Theme: Repetitive training for training for ameliorating upper limbs spasm of hemiplegic patients** Department of Rehabilitation, Xuanwu Hospital of Capital Medical University, Beijing								
	Zhu et al. 2006 China **713.3/W389**	MOTOmed viva2	IG =7 CG =none	26-60	5 x for 30 min.	6 weeks	Muscle tone Motor function Range of motion	MAS↓ RMA↑ RMI↑	III CS

Explanations: BBS = Berg Balance Scale; BOFU = Body functions; CG = Control group; CS = Case study (experiment); CT = Controlled trial; ER = External rotation; FES = Functional electrical stimulation; GRMA = Group with remaining muscular activity; GT = Gait Trainer; IG = Intervention group; IR = Internal rotation; LoE = Level of Evidence; n = number of participants; PS = Pilot study; PT = Physiotherapy; RCOS = Randomized Cross Over Study; RCT = Randomized controlled trial; SA = Scientific article; TUG = Timed Up & Go-Test

	Author	Therapy/Intervention	n	Age (Ø years)	Frequency (Week/Min.)	Duration (Weeks)	Results	Significance (α=5%)	Design LoE
1.2	**Theme: Cyclic movement training of the lower limb in stroke rehabilitation** German Sports University Cologne								
	Kamps et al. 2005 Germany **713/W2278**	MOTOmed viva2 + physiotherapy Conventional therapy	IG =16 CG =15	63.1±8.1 65.8±10.7	2 x per day for 10 min.	16 weeks	2' Walking distance 6' Walking distance Comfortable walking speed Mobility (TUG test)	p< .015 p< .003 p< .024 p< .016	Ib CRT
1.1	**Theme: Examination of the effects of assisted training on the endurance capacity in stroke patients** German Sports University Cologne								
	Demmer et al. 2005 Germany **713.3/W509**	MOTOmed viva2 + therapy groups	IG =7 CG =none	62	daily for 15 min.	12 weeks	2' Walking distance Walking speed	p< .007 p< .007	III CS
	2. Geriatric medicine (active living):								
2.1	**Theme: Use of an assistive Movement Training Apparatus in the Rehabilitation of Geriatric Patients** German Sports University Cologne								
	Diehl et al. 2008 Germany **713/W2403**	MOTOmed viva2 + physiotherapy Gait training + physiotherapy	IG =21 CG =21	80.7±4.76 79.1±7.49	5 x for 15 min.	3 weeks	2' Walking distance 6' Walking distance Mobility (TUG test) Fast walking ability Ø Performance	p= .006 p= .000 p= .000 p= .012 p= .016	Ib RCT
	3. Multiple sclerosis:								
3.3	**Theme: Assistive training in multiple sclerosis patients** German Sports University Cologne								
	Corrales Mora et al. 2002 Germany **713.3/W469**	MOTOmed viva2 + basic therapy Basic therapy	IG =10 CG =12	44.7±11.0 50.5±9.3	5 x for 15 - 20 min.	8 weeks	Extension/Flexion of the hip joint IR/ER of the hip joint	131° ->140° 93° -> 100°	IIb RCOS
3.2	**Theme: The effects of therapy of spasticity utilizing a motorized exercise-cycle** Neurological clinic, University Ulm								
	Rösche et al. 1997 Germany **713/W1782**	MOTOmed pico	IG =35 CG =none	49±10.32	1 x for 30 min.	once	Muscle tone	p< .05	III CS

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	Author	Therapy/Intervention	n	Age (Ø years)	Frequency (Week/min.)	Duration (Weeks)	Results	Significance (α=5%)	Design LoE
3.1	**Theme: Immunosuppressive and symptomatic therapy of multiple sclerosis** Neurological clinic, University Ulm								
	Kornhuber et al.1995 Germany **713/W1286**	MOTOmed pico	IG =20 CG =none	x	1 x for 30 min.	once	Muscle tone	p< .05	III CS
4. Parkinson's:									
4.2	**Theme: Forced Exercise – effects of MOTOmed® therapy on typical motor dysfunction in Parkinson's disease** Institute for sports and sports science, Institute for technology, Karlsruhe								
	Laupheimer et al. 2011 Germany **716.4/W46**	MOTOmed viva2 Parkinson + pharma Standard therapy	IG =21 CG =23	67.5 ± 7.8 71.3 ± 4.0	5 x for 40 min.	10 weeks	Walking speed Step length Dysdiadochokinesia	p= .000 p= .000 p= .03	Ib RCT
4.1	**Theme: Effects of active-assisted cycling on upper extremity motor and executive function in Parkinson's disease.** Exercise Physiology, Cleveland Clinic, Kent State University								
	Ridgel et al. 2009 USA **716.4/W41**	MOTOmed viva2 with 85 rpm MOTOmed viva2 with 60 rpm	IG =10 CG =10	64.5±2.1 64.7±1.9	3 x for 60 min.	8 weeks	UPDRS Bimanual dexterity	p< .05 p< .05	IIb CT
5. Hypertension:									
5.1	**Theme: The Cardiovascular effects of Upper-Limb Aerobic Exercise in Hypertensive Patients** Department of Nephrology and Section of Sports Medicine, Charité Berlin								
	Westhoff et al. 2008 Germany **713/W2456**	MOTOmed viva2 No intervention	IG =12 CG =12	66.1±4.0 68.4±9.7	3 x for 30 min.	12 weeks	Systolic blood pressure Diastolic blood pressure Artery compliance Performance	p< .03 p< .02 p< .004 p< .005	Ib RCT

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	Author	Therapy/Intervention	n	Age (Ø years)	Frequency (Week/Min.)	Duration (Weeks)	Results	Significance (α=5%)	Design LoE
6. Cerebral Palsy:									
6.2	Theme: **Effectiveness of motor-assisted MOTOmed® movement therapy in the rehabilitation of children suffering from infantile cerebral palsy** Prof. Kurbanov Rehabilitation clinic, Tashkent								
	Nurmatova et al. 2012 Uzbekistan **713.6/W80**	MOTOmed gracile12 + physiotherapy	IG =120 CG =none	6.7	5 x for 10-25 min.	4 weeks	Range of motion of the ankle joint Muscle force Muscle tone	p< .05 p< .05 p< .001	III CS
6.1	**Theme: Effects of Motomed Gracile on Function of Lower Limbs in Children with Spastic Cerebral Palsy** Rehabilitation and Vocational Training Center for the Disabled, Shanghai								
	Shen et al. 2009 China **713.6/W67**	MOTOmed gracile12 + physiotherapy Physiotherapy	IG =24 CG =24	3.0 3.25	5 x for 20 min.	24 weeks	Muscle tone Muscle force	p< .05 p< .05	Ib RCT
7. Dialysis:									
7.2	**Theme: Effects of exercise training on ergocycle during haemodialysis in patients with end stage renal disease: Relevance of the anaerobic threshold intensity** Association "Help for Patients suffering from kidney failure in Brittany"								
	Besnier et al. 2012 France 713.4/W172	MOTOmed letto2 during haemodialysis	IG =6 CG =none	72.55±7.83	3 x for 45 min.	12 weeks	Oxygen uptake Blood pressure Hemoglobin Serumalbumin Balance 6' walking distance State of mind	VO_2max ↑ mmHg ↓ g/l ↑ g/l ↑ TUG test ↑ Distance ↑ SF-36 ↑	IIIb PS
7.1	**Theme: Uptake of and adherence to exercise during hospital haemodialysis** Renal Unit, Dumfries and Galloway Royal Infirmary, Dumfries								
	Torkington et al. 2006 Great Britain **713.4/W21**	Haemodialysis + Mm letto2 Haemodialysis	IG =22 CG =24	58±18 67±10	3 x for 20 - 60 min.	8 weeks	Walking distance Quality of life (VIT)	p< .001 p< .017	IIb CT

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	Author	Therapy/Intervention	n	Age (Ø years)	Frequency (Week/Min.)	Duration (Weeks)	Results	Significance (α=5%)	Design LoE
8. Intensive Care Unit (early rehabilitation):									
8.1	**Theme: Early exercise in critically ill patients enhances short-term functional recovery** Faculty of Kinesiology and Rehabilitation Sciences, Katholieke University Leuven								
	Burtin et al. 2009 Belgium **713.4/W102**	MOTOmed letto2 + physiotherapy Physiotherapy + mobilization	IG =26 CG =32	56.0±16.0 57.0±17.0	5 x for 20 min.	at least 1 week	Walking distance Quality of life (BOFU) Force of quadriceps	p= .05 p< .01 p< .01	Ib RCT
9. COPD (chronic obstructive pulmonary disease):									
9.1	**Theme: Spiroergometry in patients confined to bed with severe COPD** Ambrock clinic, clinic for Pulmonology, allergology, and somnology, Hagen								
	Galetke et al. 2002 Germany **713.4/W22**	MOTOmed letto MOTOmed letto	IG =9 CG =6	69.2±9.5 28±8.7	5' passive with 30 rev. 5' active with >30 rev. 2' active up to max.	Once	Oxygen uptake $(VO_2)_{passive}$ Oxygen uptake $(VO_2)_{active}$ Maximum oxygen uptake	p< .02 p< .005 p< .001	IIb CT

Explanations: BBS = Berg Balance Scale; BOFU = Body functions; CG = Control group; CS = Case study (experiment); CT = Controlled trial; ER = External rotation; FES = Functional electrical stimulation; GRMA = Group with remaining muscular activity; GT = Gait Trainer; IG = Intervention group; IR = Internal rotation; LoE = Level of Evidence; n = number of participants; PS = Pilot study; PT = Physiotherapy; RCOS = Randomized Cross Over Study; RCT = Randomized controlled trial; SA = Scientific article; TUG = Timed Up & Go-Test

	Author	Therapy/Intervention	Implementation	Objectives/Results	
1. Knee and hip replacement:					
1.2	**Theme: Standardized rehabilitation after hip replacement** Specialty hospitals Hohenurach, orthopedic department, Bad Urach				
	J. Heisel 2009 Germany **713/W2594**	MOTOmed viva 2	**Hip:** as of 2nd postoperative week if hip flexion > 70°	Active mobilization	IV SA
1.1	**Theme: Rehabilitation after endoprosthetic replacement of hip and knee** Specialty hospitals Hohenurach, orthopedic department, Bad Urach				
	J. Heisel 2008 Germany **713/W2593**	MOTOmed viva 2	**Hip:** as of 2nd postoperative week if hip flexion > 70° **Knee:** as of 2nd postoperative week if genuflection at least 70°	Reduction of rest pain, movement pain and/or pain caused by stress Re-establishment of functionality of the hip joint or knee joint Re-establishment of total mobility Independence of supporting walking aids Improvement of the physical capacity in daily life and business (quality of life)	IV SA
2. Dialysis:					
2.1	**Theme: Exercise Training in Dialysis Patients: Why, When, and How?** Department of Physical Education and Sports Science, Aristotle University of Thessaloniki				
	Kouidi et al. 2002 Greece **713.4/W105**	Haemodialysis + Mm letto	Evaluation of movement therapy during dialysis	Improved oxygen uptake (VO_2) Improved endurance Reduced lactate production	IV SA
3. Intensive Care Unit (early rehabilitation):					
3.1	**Theme: Technology to enhance physical rehabilitation of critically ill patients** Department of Physical Medicine and Rehabilitation, Johns Hopkins University, Baltimore				
	Needham et al. 2009 USA **713.4/W103**	MOTOmed letto2 + FES	5x for 20 min., at least for 1 week	Reduction of muscular atrophy Force ↑ Endurance ↑	IV SA

Explanations: BBS = Berg Balance Scale; BOFU = Body functions; CG = Control group; CS = Case study (experiment); CT = Controlled trial; ER = External rotation; FES = Functional electrical stimulation; GRMA = Group with remaining muscular activity; GT = Gait Trainer; IG = Intervention group; IR = Internal rotation; LoE = Level of Evidence; n = number of participants; PS = Pilot study; PT = Physiotherapy; RCOS = Randomized Cross Over Study; RCT = Randomized controlled trial; SA = Scientific article; TUG = Timed Up & Go-Test

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1. Stroke:

1.11 Podubecka J, Scheer S, Theilig S, Wiederer R, et al. Zyklisches apparatives Bewegungstraining versus konventionelles Gangtraining in der Rehabilitation des hemiparetischen Ganges nach Schlaganfall: Eine Pilotstudie. Forschr Neurol Psychiat 2011; 79: 411-418.

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1.6 Xinhu W, Chunhua G, Zhengmao Y, Qia H, Cuihuan. Effects of MOTOmed leg training on hemiplegic stroke patients. Chinese Journal of Physical Medicine and Rehabilitation 2009; 31(7): 503-504

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2. Geriatric medicine:

2.1 Diehl W, Schüle K, Kaiser T. Apparativ-assistives Bewegungstraining der unteren Extremitäten in der geriatrischen Rehabilitation. NeuroGeriatrie 2008; 5(1): 3-12.

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8. Intensive Care Unit (Early rehabilitation):

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9. COPD (Chronic obstructive pulmonary disease):

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Explanation about the statistical significance

In statistics, differences between measures or variables are **significant** when there only is a slight probability of achieving them by chance. If significance is given, a more than coincidental connection can be statistically assumed. Statistically significant differences can be coincidental, too. How often this happens depends on the selection of the measures to be examined: Between 0 % and 100 % of the statistically significant connections can be coincidences. Significance is verified by statistical tests in accordance with the data which allow for evaluating the probability of a mistake. The level of significance α (alpha) describes the quantile to be specified *a priori* of the maximally acceptable probability of a mistake. For instance, p-value = **0.05** means that the maximally acceptable probability is **5** % and that an actually right null hypothesis will be declined by mistake. On the other hand, the probability of a test confirming a right null hypothesis is at least $1-\alpha$, that is **95** % or more in this case ($1-\alpha = 0.95$).

☝ If a difference is statistically ***insignificant***, it does not necessarily mean it was only caused by coincidence.

Conclusion: If the results of a study are less (<) than p< 0.05, the probability of the positive result deriving from e. g. MOTOmed movement therapy applies with 95 % (= significant). Results of p< 0.001 are **highly significant**, meaning they are even better, exclusively caused by the intervention (therapy)! The statistical significance of an event is a measure for the level of "truth" of the result. The p-value represents a decreasing index for the result's reliability. Actually, the p-value measures the probability of an error while accepting the result observed as valid. For example, a p-value of 0.05 indicates there is a maximum probability of **5 %** that a random sample appears to be "seeming" or "inaccurate". ☝ In many researching areas, a **p-value of 0.05** is generally accepted as "limit value" for the level of mistakes.

Interpretation of the level of significance:

$p > 0.05$	insignificant
$p \leq 0.05$	significant
$p \leq 0.01$	very significant
$p \leq 0.001$	highly significant

i. e. results of more than p> 0.05 are insignificant, results between 0.02 and 0.05 are considered as significant, results between 0.002 and 0.01 are very significant and results between 0.001 and 0.000 eventually form the highest level of significance and are classified as highly significant (i. e. hit rate of 99 % to 100 %).

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Level of Evidence (LoE):

The scientific validity of clinical studies is evaluated by means of the level of evidence (synonym class of evidence). In doing so, the levels I to IV are differentiated according to the recommendations of the AHRQ (Agency for Healthcare Research and Quality). Studies of level Ia have the highest evidence, studies of level IV have the lowest. The higher the level of evidence the better the scientific justification of a therapy recommendation.

Level Ia:	Evidence due to meta analysis of several randomized controlled studies
Level Ib:	Evidence due to at least one randomized controlled study
Level IIa:	Evidence due to at least one well-invested, but not randomized controlled study
Level IIb:	Evidence due to at least one well-invested quasi-experimental study
Level III:	Evidence due to well-invested, not experimental descriptive studies like comparative studies, correlation studies, or case-control-studies
Level IV:	Evidence due to reports of expert committees or expert opinions or clinical experience of acknowledged authorities

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