

Evidence Based Training programs for neurological disorders



Rotem Soll (MsC PT)



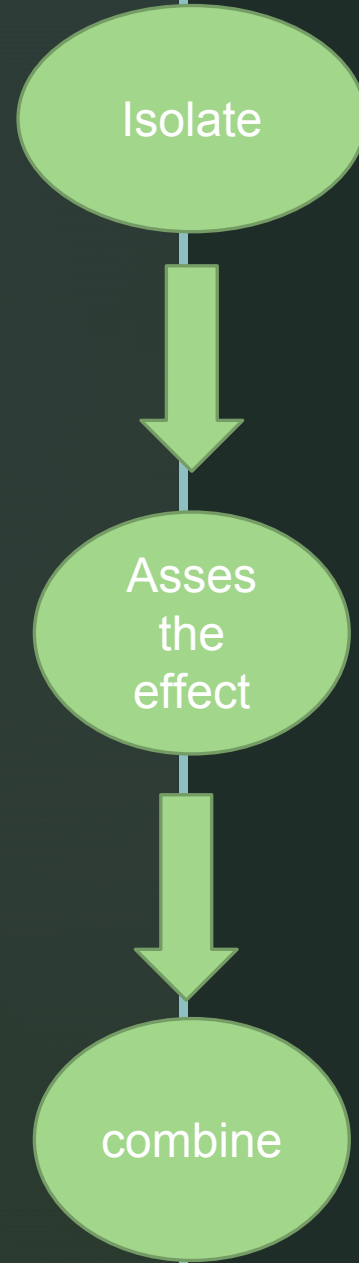
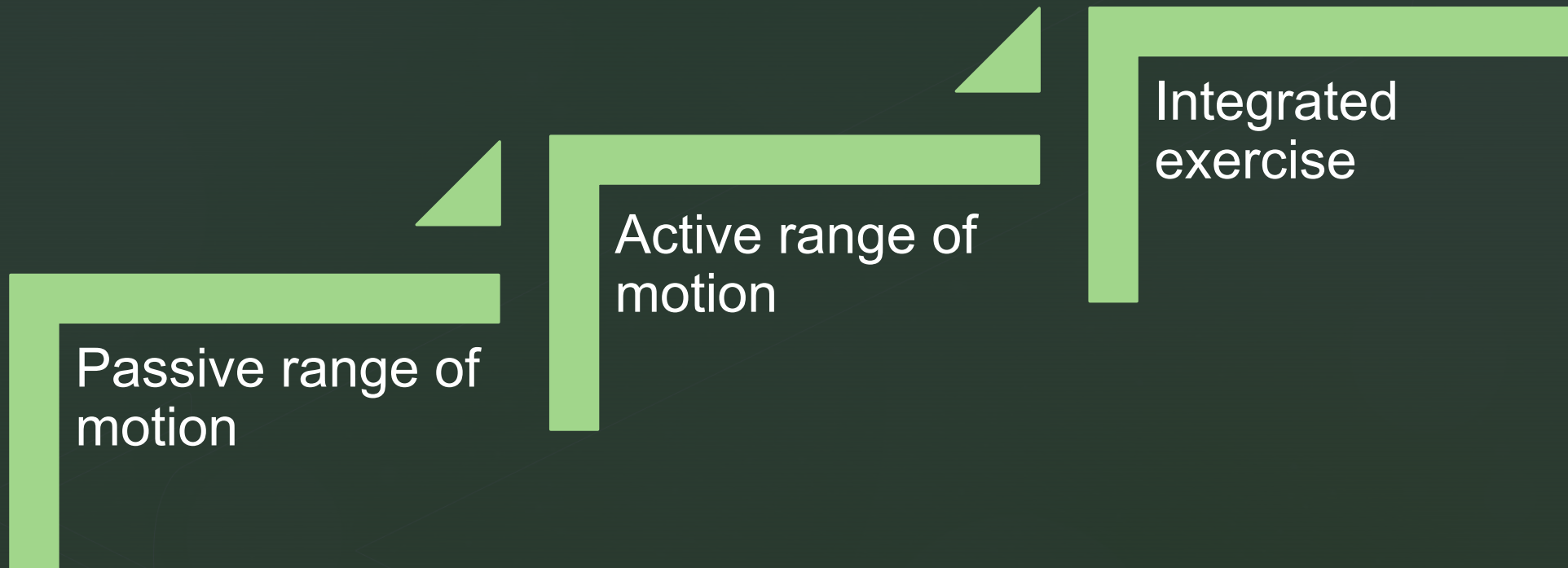
רותם סול

פיזיותרפיה · פילאטיס שיקומי · אימון גופני

Targets

- Modifying Anxiety and Depression
- Preventing cardiorespiratory deterioration due to deconditioning
- Modifying Sarcopenia
- Preventing Bone loss
- Maintaining Activities of Daily Living (walking, sit-to-stand, Dressing-up)
- Influencing the Perception Of pain

Exercise Stair Case Model (Halbachi, 2017)



DEBATE

Open Access



Exercise prescription for patients with multiple sclerosis; potential benefits and practical recommendations

Farzin Halabchi¹, Zahra Alizadeh¹, Mohammad Ali Sahraian² and Maryam Abolhasani^{3,4*}

- Aerobic Fitness – **6MWT**
- Muscular Strength- **30 seconds sit to stand Test, 10RM testing for muscle Endurance, 5 times sit to stand with weights.**
- Flexibility- **modified Bench sit and reach test (1 foot on floor and other straight)**

Finding the Right Exercise ...prescription

- 2-3 times a week
- 8-15 repetitions maximum (60-80% of 1 RM)
- Day to day variability in fatigue (Flexibility in the resistance Program)
- Full recovery to prevent overuse of skeletal muscles
- 1-3 sets/ 4-10 exercises
- Large Muscle Group before Small muscle Group
- Balance Agonist- Antagonist According to spasticity
- Lower Extermity Vs. Upper Extermity (?)

Assisted Exercise (Sczesny-Kaiser, 2017)

- Anti Gravity Training with Slings
- Assisted sling support on a Trademill
- Arm Active- Passive Trainer



Slings Home-Based Exercise



Aerobic exercise (sheikh,2019)

- Choosing the right Measurement:
- Aerobic capacity
- Recovery
- Blood Pressure (?)
- Resting Heart Rate (?)





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Review
Does aerobic exercise benefit persons with tetraplegia from spinal cord injury? A systematic review
Stephen H. Figoni, David R. Dolbow ✉, Edwin C. Crawford, Margaret L. White & Sambit Pattanaik
Pages 690-703 | Published online: 11 Feb 2020

Download citation | <https://doi.org/10.7551/2681-2020.17229.35> | Check for updates

- **Arm-Crank Training** increased Mean Peak Power output by 33%
- **Functional electrical stimulation cycling** induces Higher cardiac output Than arm crank curls
- Vo2max is affected by increased muscle pump in the legs
- The combination of arm-curls and NEMS while cycling produces the Highest cardiovascular response

(Figoni, 2021)

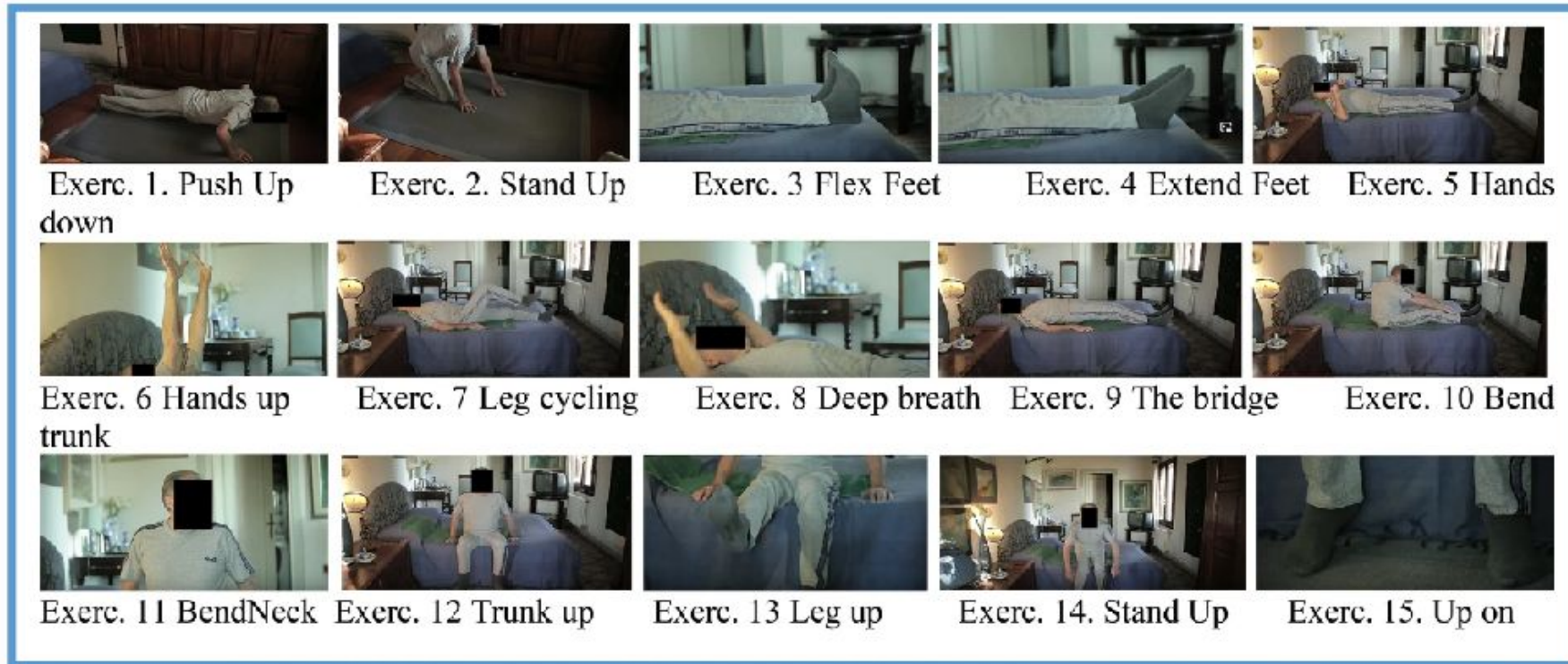
Full Body In bed Gym

[/https://www.bedgym.com](https://www.bedgym.com)

In Association with NMES

Fig. 1

From: [Skeletal muscle weakness in older adults home-restricted due to COVID-19 pandemic: a role for full-body in-bed gym and functional electrical stimulation](#)



The aim of the routine is to stimulate all main skeletal muscles, alternating exercises to mobilize arms and legs, spinal cord and neck, diaphragm and ventilation accessory muscles. The routine (as number of repetitions and speed) is continuously increased in intensity up to fatigue threshold. A video: <https://www.youtube.com/watch?v=N1RuG3371-Y> describes them dynamically [28]

(Carraro, 2021)

Strength exercise (Sveen, 2013)

- How do we monitor **muscle Damage**?
- Closed Vs. open Kinetic chain
- Eccentric Vs . Concentric strength exercise

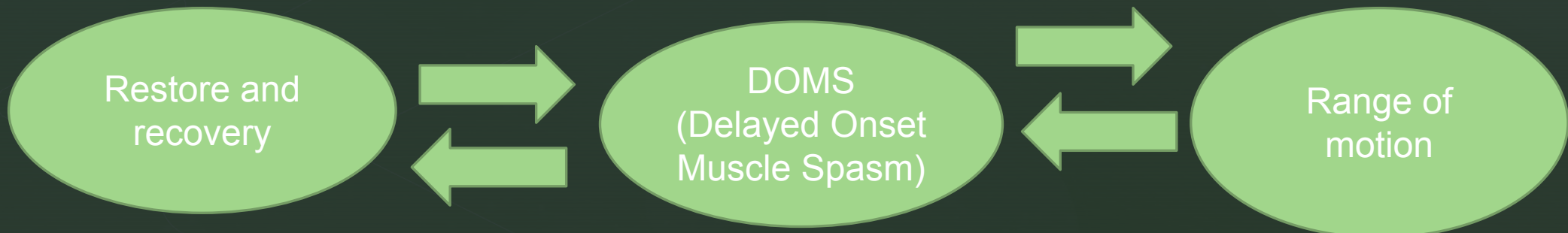


Table 1. A representation of exercise interventions done in LGMD 2A, LGMD 2L, and LGMD 2I. Number in parenthesis represents the article reference.

Exercise mode/N	Duration	Frequency	Intensity	Improved outcome
Cycling N = 6 (8)	10 weeks	3 days/week 30 min/session	70% of VO_{2max}	VO_{2max} , lower limb strength, 6MWT, 5 x STS, 6SST.
Cycling N = 9 (9)	12 weeks	50 sessions in total 30 min/session	65% of VO_{2max}	VO_{2max} , workload, self-reported physical endurance, lower limb muscle strength, and walking distance.
Strength: LOIT N = 6 HIT N = 3 Control group N = 6 (10)	6 months 3 months	3 days/week Twice at home and once at lab 3 days/week at lab	Low intensity Knee extension, Elbow flexion 40% of 1RM, increase with 5% every other week 3 sets x 12-15 reps High intensity: Knee extension, Elbow flexion Wrist flexion & extension Ankle plantar flexion 70-85% of 1RM 3 x 8-12 reps for 1 month 80-90% of 1RM 3 x 6-10 reps for 2 months 85-92% 3 x 8-4 reps for 3 months	Bicep strength and endurance, wrist flexion, extension, and endurance
Treadmill training using HAL® N = 3 (11)	8 weeks F/U at 6 weeks post intervention	3 days/week Maximum of 30 minutes/session	Velocity of treadmill was set individually Up to 50% body weight support	10MWT, 6MWT, and TUG

Lab Measurements

- VO2MAX
- CREATINE KINASE



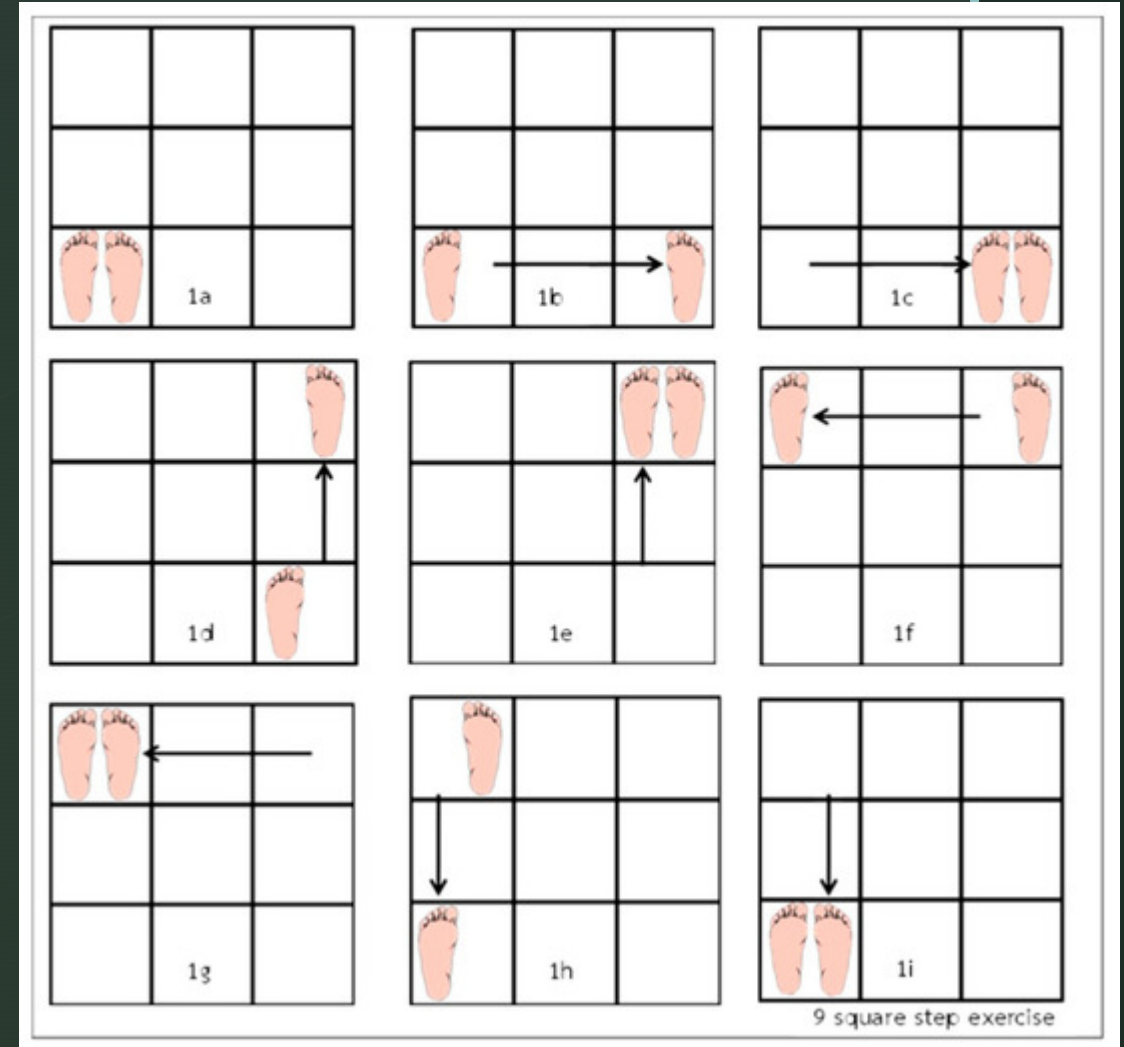
Exercise mode/N	Duration	Frequency	Intensity	Improved outcome
Anti-gravity: N = 3 (12)	10 weeks of control period 10 weeks of training	3 days/week 40 min/session	70-80% of maximum heart rate (HRmax) Run/walk, jogging, and high knee lift 12 reps of squats and lunges 15-20 reps of calf raise	6MWT and dynamic balance
Bodyweight supported: N = 3 (13)	10-week control period 10 weeks of training	3 days/week 40 min/session	70-80% of HRmax Closed-kinetic-chain strength exercises: squats, calf raises, and lunges Aerobic: Walk/run, jogging in place, or high knee-lift	Closed kinetic chain leg strength and training distance
Electrical stimulation N = 11 Strength N = 13 (14)	8 weeks	3 days/week	Shoulder abduction Knee extension 25% 1RM, 2 sets x 10 reps 30% 1RM, 3 sets x 10 reps 35% 1RM, 3 sets x 10 reps 50% 1RM, 3 sets x 10 reps Monophasic wave type. Surface electrodes. Pulse frequency 50Hz, voltage output 0-500 V, pulse duration 200 μ s, duty cycle 5:10, 10 minutes of stimulation	Strength, VAS, climb 8 steps, 10MWT, dressing with t-shirt, endurance (number of reps per minute), and modified Lawton ADL.

Functional Measurements

- The Kinetic chain
- Dressing- up
- Reps per Minute

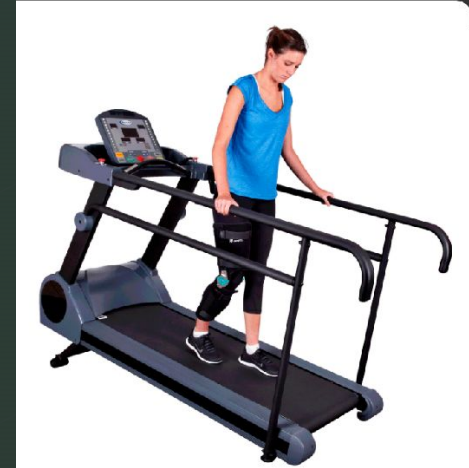
Square Step Exercise (SSE)

- Coordination
- Balance
- Initiation of movements
- Can be done individually or in a group



Treadmill as a tool for exercise with a Neurologic Disorders

- Limits of stability
- Fall Report
- Balance Measures
- Mobility test (according to joint specific task)
- Cognitive function



(Suteerawattananon.2002)

Telerehabilitation

Delivery of medical or rehabilitative care to persons with rehabilitation needs via Telecommunication or the internet.
(Marcalee, 2022)

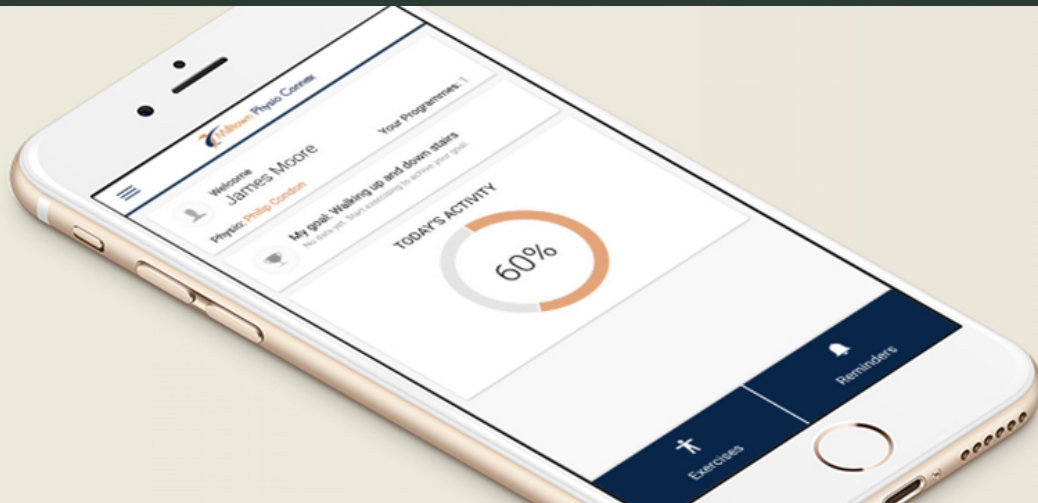
- App-based
- One on One based meetings
- Whatss app based
- Facebook based

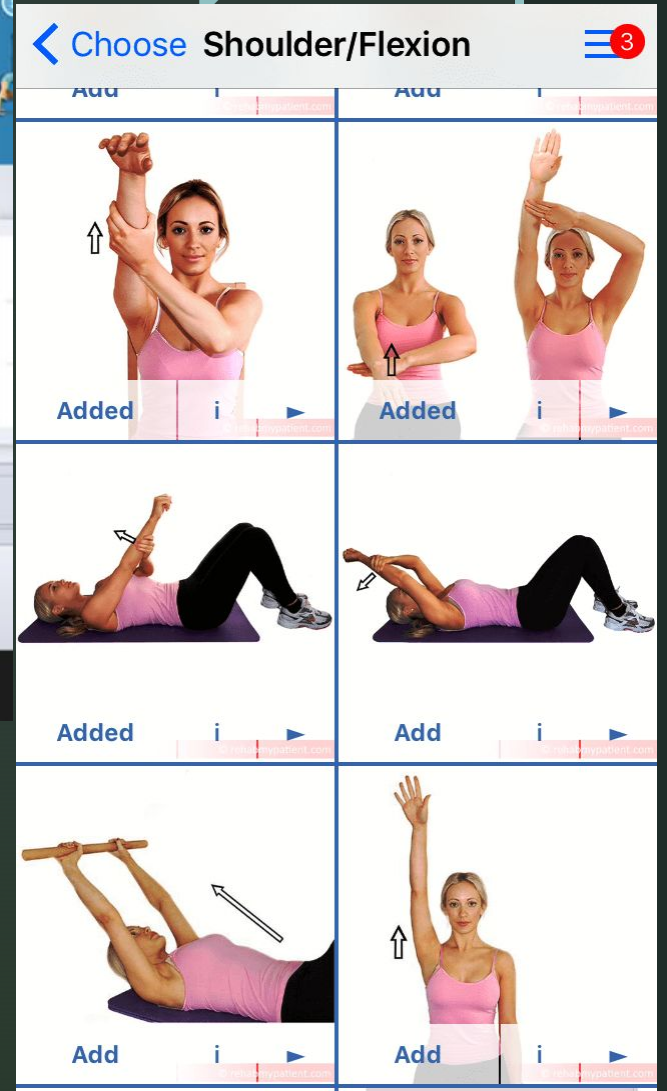
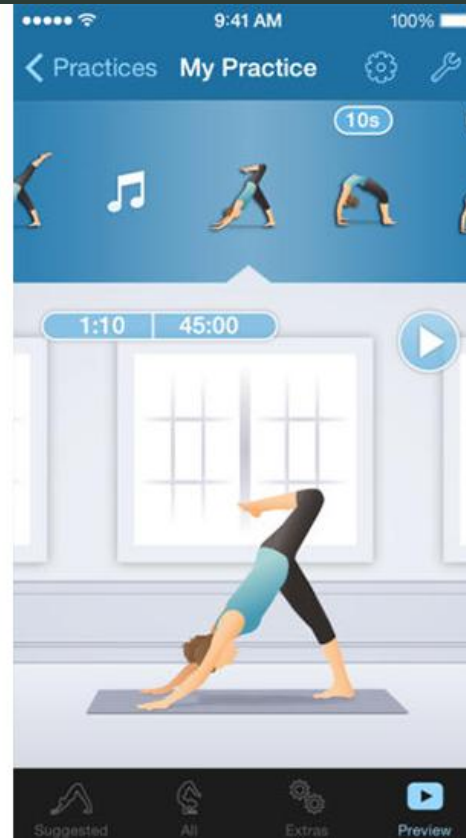
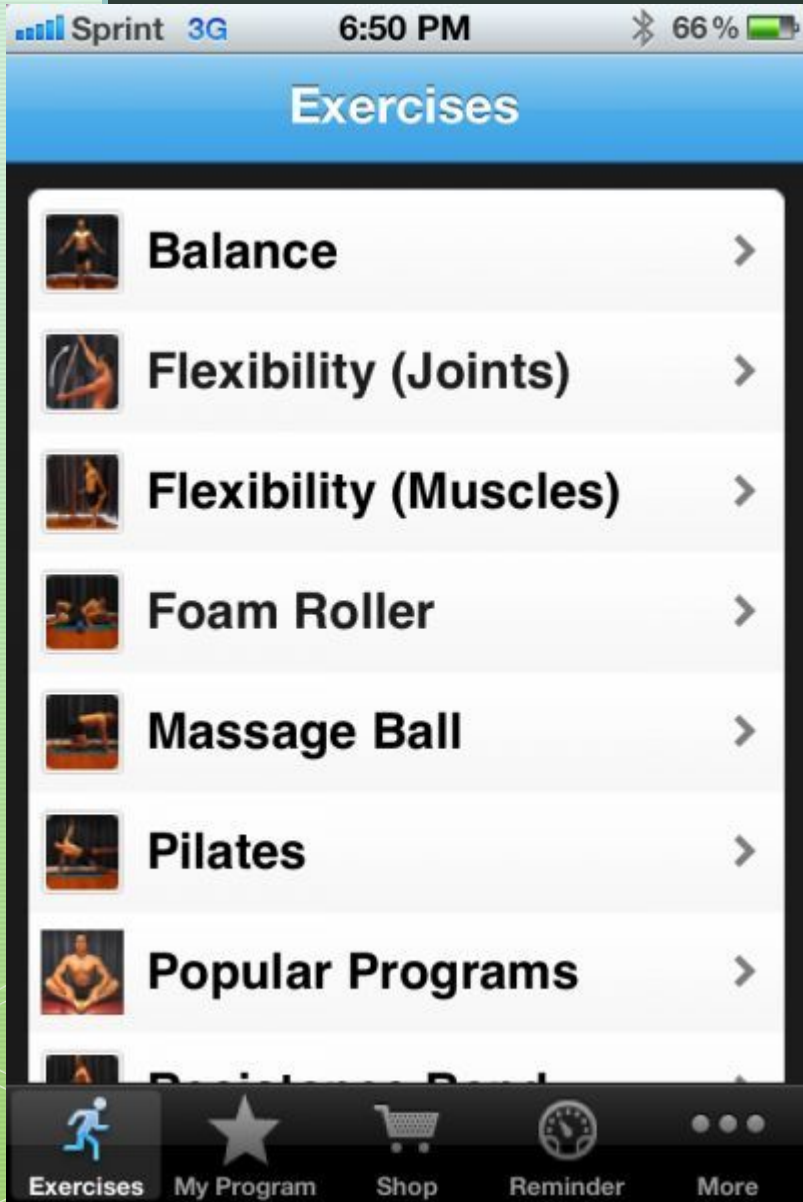
Long lasting
Programm

Adherence

Low costs

Individualized
(?)





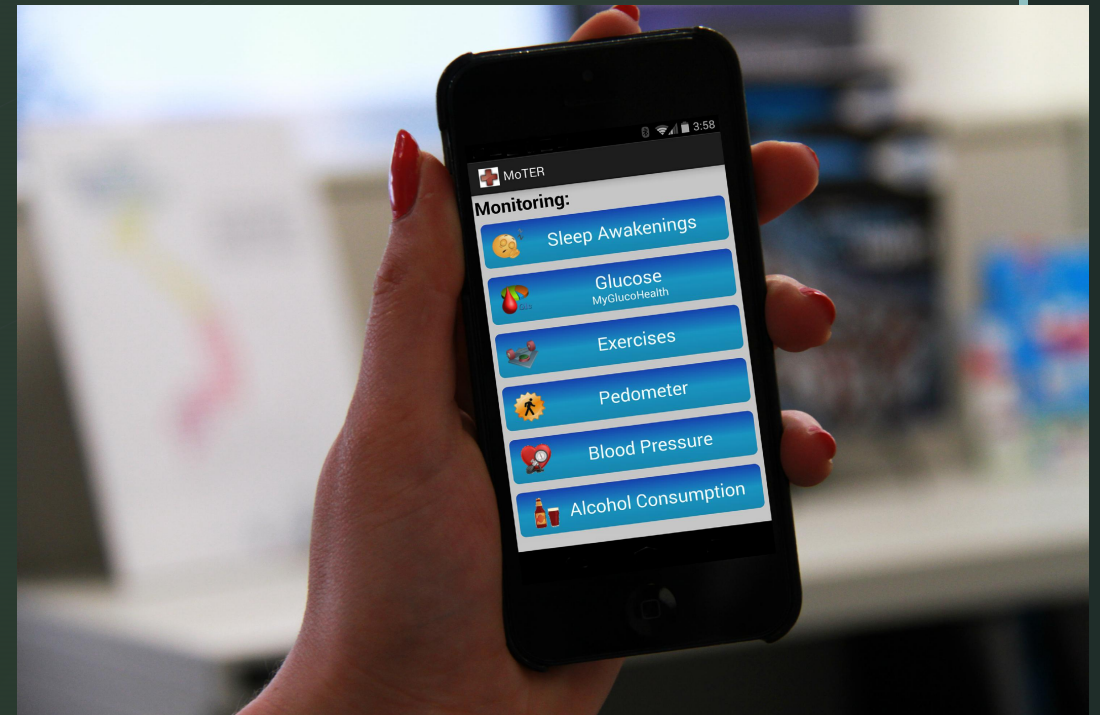
Smart phone based
exercises

(Moral-Munoz, 2021)

Smart phone based exercises



- www.curablehealth.com
- www.medicalexpress.com



Virtual Reality

Allow the trainer to imitate the patient's real environment

Increases motivation and compliance

The software keeps the scores and helps monitoring the patient's progress





Whole Body Vibration (Jung , 2020)

- stimulation of the contracting muscle spindles and alpha motor neurons in accordance with the tonic vibration reflex/
- Reduces spasticity
- Helps Maintaining Muscle length (Mainteince the joint range of motion)

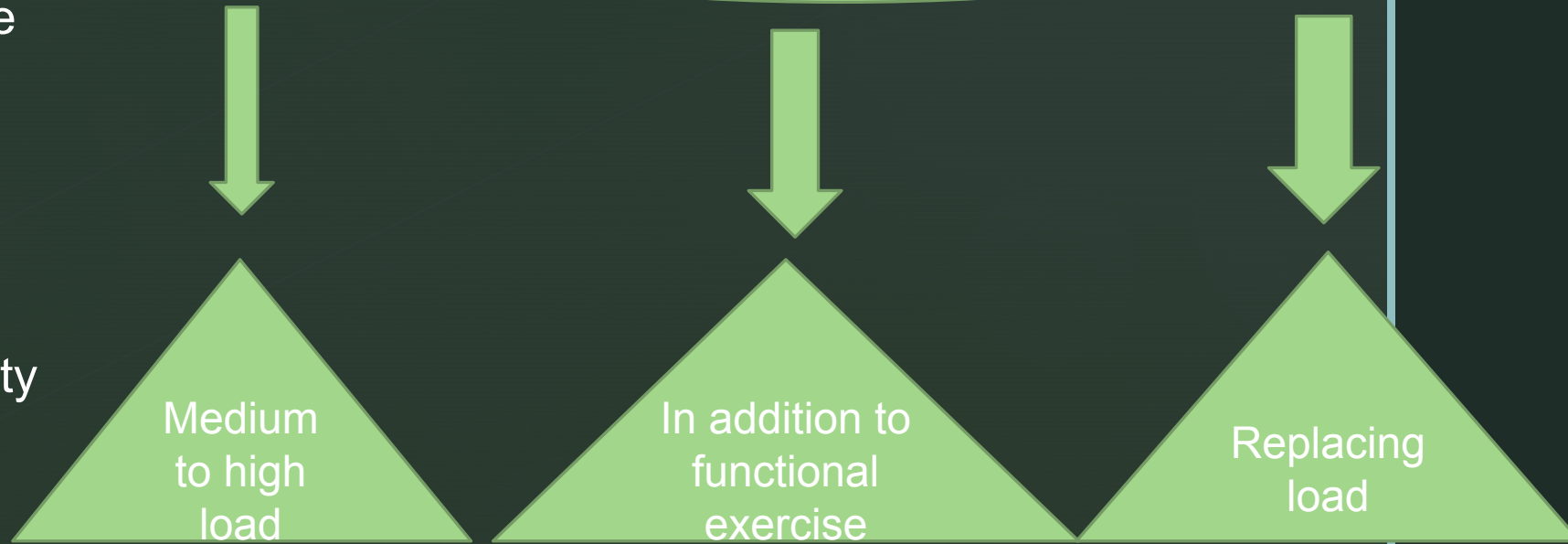


(Ko, 2016)

Neuro muscular Electrical Stimulation (NMES)

Stimulating the muscles through electrical currents at a certain frequency transmitted through superficial electrodes

- Mechanics of NEMS:
- Improving muscle strength
- Biomechanics of movement
- Functional Mobility



(Cobo-Vicente, 2021)

Pedometer

- Monitoring Compliance (sebastiao, 2018)
- Combined with other exercises
- In minimal mobility patients
- Walking diary compared to a pedometer
- Video screenshots or personal diary



(Healey, 2017)

BOBO Balance

www.bobo-balance.com

- Motion sensors
- Different exercises and surfaces
- Software and machine learning
- Prescribe Personalized evidence based training plans
- Allows coaches and therapists to follow and monitor **progress** and **compliance**



Balance

Coordination / Stability



Wearable

Strengthening / Flexibility



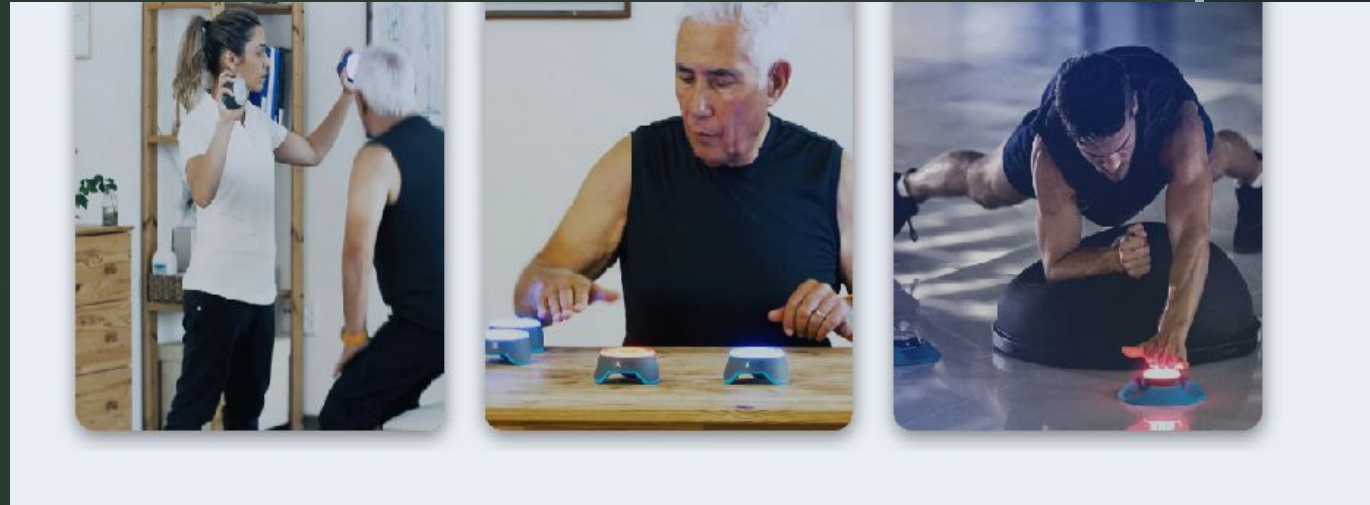
Cycling

Endurance / Aerobic

Blaze Pod

blazepod.com

- Coordination specific training
- Chain and speed of reaction
- Allows cognitive training
- Spatial awareness
- Motivation
- Analytics allowing the trainer /therapist to follow and monitor the program



!Thank you for Listening

