

# ROBOTICS AND ADVANCED TECHNOLOGIES FOR REHABILITATION



# Luna EMG



## Luna EMG: robotic device for upper and lower limb neurological and early stage orthopedic rehabilitation.

Improve a patient's muscle strength, range of motion and coordination, after strokes, SCIs, MS, TBI, orthopaedic injuries surgeries (knee/hip replacements, ankle alignment).

### Multi-Functional Isokinetic System for Training and Diagnostics



The most unique feature - **EMG-assisted movement.\*** - active training, even for very weak patients (MMT 1)

\*EMG = electromyography, electrical activity of the muscle. Robot detects the patient's muscle activity via sensors and converts it into intended movement.



This is a medical device. For your safety, use it in accordance with the manual or label. If in doubt, consult a specialist as this medical device may not be suitable for you.

## 6 attachments for whole body rehabilitation

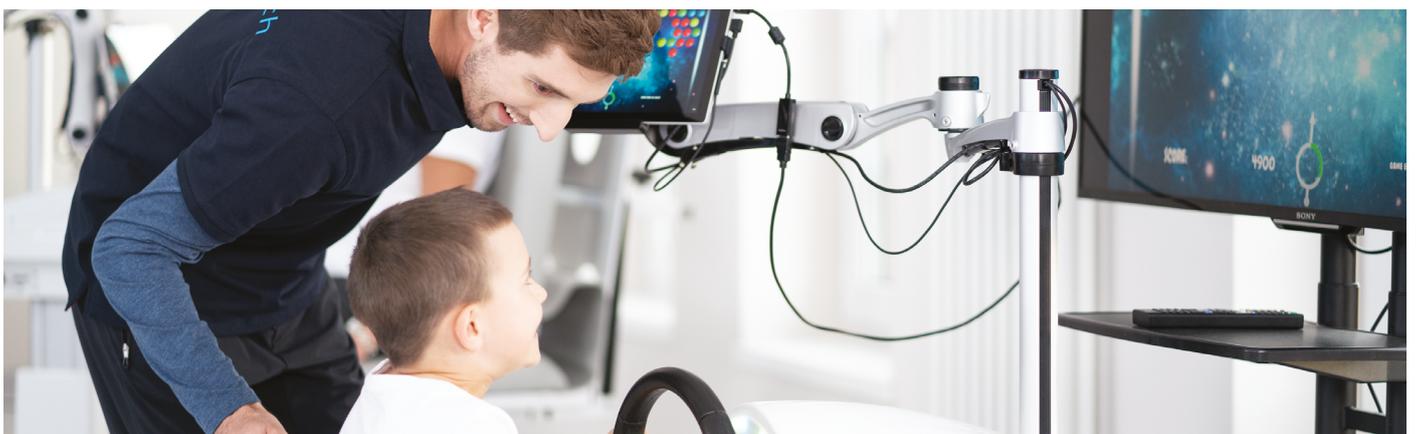
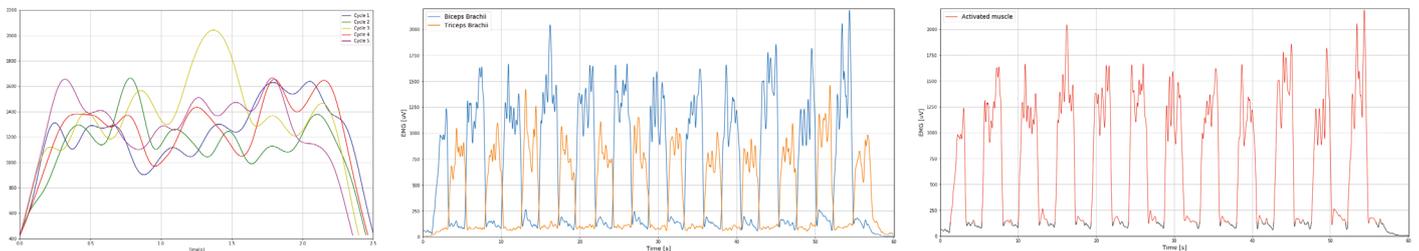
You can work with all the major joints - wrist, elbow, shoulder, hip, knee and ankle, as well as trunk.



## Occupational therapy set and pelvic floor training adds-on



Interactive orthopaedic and EMG games make the rehabilitation process more interesting and fun for the patients. Automatic report availability.



*Motivation, enjoyment, and engagement are higher with the use of gamification [1]*

Luna EMG provides support for successfully facilitating older adults' physical activity through gamified technology.

(1) Kappen D.L., Mirza-Babaei P., Nacke L.E. (2020) Older Adults' Motivation for Physical Activity Using Gamified Technology: An Eight-Week Experimental Study. In: Gao Q., Zhou J. (eds) Human Aspects of IT for the Aged Population. Healthy and Active Aging. HCII 2020. Lecture Notes in Computer Science, vol 12208. Springer, Cham. [https://doi.org/10.1007/978-3-030-50249-2\\_22](https://doi.org/10.1007/978-3-030-50249-2_22)

## Training in all stages of rehabilitation

### MMT Levels

0 → 1 → 2 → 3 → 4 → 5



MMT LEVELS	EXPLANATION
0	No contraction
1	Flickering contraction
2	Full Range of Motion with eliminated gravity
3	Full Range of Motion with Against gravity
4	Full Range of Motion with Against gravity with minimal resistance
5	Full Range of Motion with Against gravity with maximal resistance

Getting to function - go step by step

From passive to active-resistive training

**LUNA EMG IS DESIGNED FOR A PATIENT'S COMPLETE RECOVERY JOURNEY**



*„Active participation of the patient contributes to significantly higher activation of the sensorimotor network during active motor control rather than during movement performed passively [2]”*

*„Robotics as an ideal means of training for severely affected patients where external assistance such as actuator assistance to movement and/or exoskeleton support may overcome problems of muscle weakness. [3]”*

## Research results

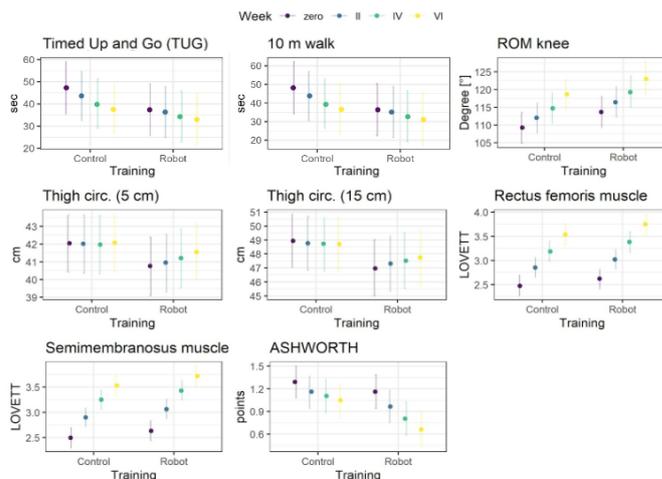


Article

### The Influence of EMG-Triggered Robotic Movement on Walking, Muscle Force and Spasticity after an Ischemic Stroke

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- Group:** 30 patients
- Training period:** 6 weeks, 1,5 h per day, 5 days a week
- Intervention:** Rehabilitation was based on individual standard physiotherapy and lower limb training with robot Luna EMG
- Results:** gait function improvement after the therapy



*“Due to a stroke I had a “frozen shoulder” which was very painful. While exercising actively on Luna EMG with shoulder extension the pain decreased and my range of motion in the shoulder increased. Now I can drive my car again and be more independent!”* Jacek, stroke patient

(2) Ziejka, K.; Skrzypek-Czerko, M.; Karłowicz, A. The Importance of Stroke Rehabilitation to Improve the Functional Status of Patients with Ischemic Stroke. *J. Neurol. Neurosurg. Nurs.* 2015, 4, 178–183, doi:10.15225/PNN.2015.4.4.6.

(3) Hesse, S. (2007). What does the clinician expect from machines and robots in Neurorehabilitation. In *European Symposium Technical Aids for Rehabilitation-TAR 2007: 2007*. Berlin (Germany).



**European Funds**  
Smart Growth

**European Union**  
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# Meissa OT



Meissa OT is an advanced robot designed for upper limb rehabilitation. It serves both as a training and assessment tool, utilizing a 4-channel EMG/EMS (Electromyography/Electrical Muscle Stimulation) system.

## The primary functions of the Meissa OT robot include

- Continuous Active Motion (CAM) - allowing patients to perform controlled active movements to improve
- Continuous Passive Motion (CPM) - supporting passive limb movement, especially beneficial for those with limited mobility
- EMG-Triggered Robotic Assistive Movement the system responds to EMG signals, enabling patients to control the robot's movement with their own muscles
- Electromyography Measurement and Biofeedback (EMG Biofeedback) the robot can measure EMG signals and provide feedback to help patients better understand and control their muscles
- Electrical Muscle Stimulation (EMS) - the device can stimulate muscles using electrical impulses, aiding in the rehabilitation process
- Electromyography-Triggered Electrical Muscle Stimulation (EMG EMS) - this feature allows precise adjustment of muscle stimulation to the patient's muscle activity

## Meissa OT enables rehabilitation through

- Assessment and training of various types of grips: cylindrical, pincer, hook, palmar, tweezers, spherical and lateral
- Functional exercises, activities of daily living (ADL) with variable strength
- Active-assistive exercises with supported movement of the upper limb (EMG activated)
- Exercises for flexion/extension and abduction/adduction of the wrist and pronation/supination of the forearm
- Each movement enables synchronised electromyography with electrostimulation, supporting muscle contraction during movement phases (Lovett D-5)
- Engaging Rehabilitation games and EMG BIOFeedback
- EMS & EMG triggered electrical muscle stimulation
- Motor with easy adjustable axis of movement





Engaging Rehabilitation games  
and EMG BIOFeedback

Motor with easy adjustable  
axis of movement



Force Sensors

EXCHANGABLE EXTENSIONS  
for occupational therapy

## WHAT IS INCLUDED IN MEISSA OT

- Force Sensors
- EXCHANGABLE EXTENSIONS for occupational therapy
- Extensions for elementary and occupational therapy movements of the hand and fingers (ball key, screwdriver, knob door handle)
- Easy to use with quick and simple exchange of extensions and touchscreen operation
- Device mounted to the table top and easy to adjust axis of movement to the patient
- Can be rotated in relation to the platform horizontally in a range of 180° to 180 and vertically in the range of 0 to 90°
- Pre-set therapeutic protocols and therapeutic games
- Programs for home therapy and telerehabilitation

## INTENDED USE FOR NEUROLOGICAL AND ORTHOPAEDIC PATIENT

- Helps to relearn voluntary motor functions of the upper extremities
- Maintaining or increasing range of motion
- Measurement evaluation and increase of upper limbs strength
- Relaxation of muscle spasms
- Prevention or retardation of disuse atrophy
- Increasing local blood circulation

## EVALUATION

- Range of Motion
- Force
- Muscle activity

Meissa OT is an advanced rehabilitation robot that is suitable for both adults and children, providing effective rehabilitation solutions for in-clinic and home-use applications.



# Stella BIO



EGZO Tech

## ELECTROMYOGRAPHY & ELECTRICAL STIMULATION FOR CLINICAL & HOME USE



Stella BIO is the 4+2 channel world's most sensitive electromyograph with implemented electrostimulation.

Stella BIO is based on four main technological concepts:

### 1. EMG-triggered functional electrical stimulation (EMG-FES, FES)

Patient initiates the movement. When EMG activity reaches a pre-set threshold level, the functional electrostimulation starts.

### 2. Electrical muscle stimulation (EMS)

Electric muscle stimulation (EMS) is a way to trigger muscle contraction via external electric impulses.

### 3. Electromyography measurements and biofeedback (EMG Biofeedback)

EMG biofeedback is a method of retraining muscle by creating new feedback systems as a result of the conversion of electrical activity of the muscle into visual and auditory signals.

### 4. Transcutaneous electrical nerve stimulation (TENS)

Transcutaneous electrical nerve stimulation (TENS) is a therapy that uses low voltage electrical current to provide pain relief.



Use EMG-triggered electrostimulation EMG-FES and EMG Biofeedback programs with games to:

- Enhance voluntary movement
- Make patients more aware of muscle activity
- Help to control the movement
- Train functional tasks (hand opening & grasping, hand-to-mouth)

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# PATIENT GROUPS

Neurological (post-stroke, SCI, TBI, CP, neuropathy, foot drop etc)

- regain of lost functions
- strengthen the muscles
- decrease of the spasticity
- improve of the coordination

## Pelvic floor disorders

To improve urinary incontinence (urge, stress and mixed), fecal control, sexual disfunctions

- women after labour,
- women practising high-impact sports,
- older men and women with weak pelvic floor due to aging,
- men after prostatectomy

Learning to **control and strengthen** pelvic floor muscle is **crucial** in therapy of pelvic floor disorders.

Orthopedic (after surgeries, muscle weakness, post-injury recovery)

- decrease of pain
- prevent muscle disuse
- strength muscles

Available programs:

- atrophy training
- muscle spasm relaxation
- circulation training
- agonist/antagonist training

## Pain management

Pain in neck area, shoulder, lower back, knee, ankle and other joints

Use different kind of TENS programs:

- conventional
- frequency modulated
- acupuncture-like TENS (AL-TENS)
- burst

to relieve and manage acute and chronic pain

## Sports

Healthy athletes can choose out of several sports programs:

- Exercise prep
- Active recovery
- Strength & Endurance training
- Power training

Training modules and protocols are pre-arranged, easy to follow and apply for specific patient groups.

Rehabilitation **games** make the process of training more interesting, engaging and fun!



“We’ve used Stella BIO as a part of our rehabilitation process. While using the EMG Biofeedback programs, my son was rediscovering his body and his muscles, how they work. Games are an excellent motivator for Kajetan and they work really well.”  
Beata, Kajetan’s mom (Spinal Muscular Atrophy patient)



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# Sidra LEG



The world's only two-motor rehabilitation robotic exerciser with synchronised electrostimulation and electromyography triggered lower limb movement.



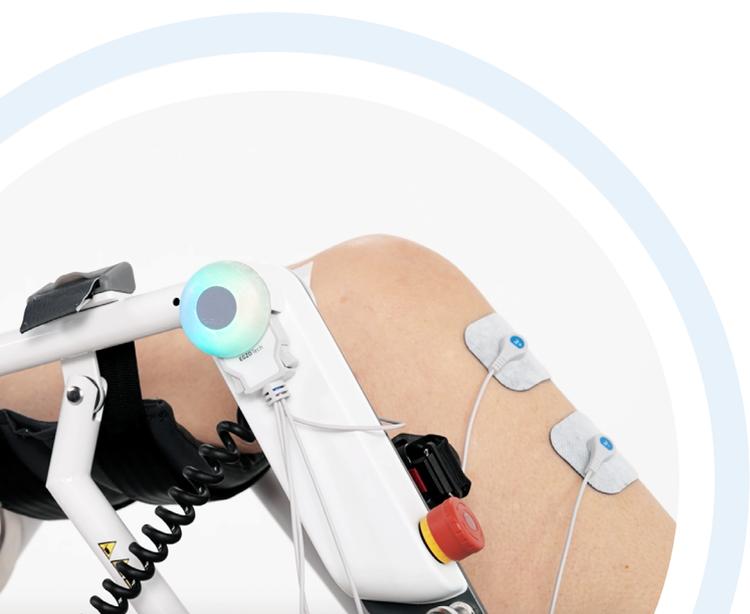
## For both training and assessment with 4-channel EMG/EMS

- Continuous active motion (CAM)
- Continuous passive motion (CPM)
- EMG-triggered robotic assistive movement
- Electromyography measurement and biofeedback (EMG Biofeedback)
- Electrical muscle stimulation (EMS)
- Electromyography triggered electrical muscle stimulation (EMG+EMS)

Length-adjustable and extension interchangeable for adults and pediatric applications in all stages of rehabilitation (MMT/ Lovett scale from 0 to 5).

## UNIQUE FEATURE

- Synchronised movement of ankle and knee at the same time to help patients to re-learn correct gait movement pattern.
- Engaging Rehabilitation games and automated reports
- Double-Motor for synchronised movement of ankle and knee
- Force Sensors



Engaging Rehabilitation games  
and automated reports

Force Sensors

Double-Motor for synchronised  
movement of ankle and knee



## ASSESSMENT FEATURES TO EVALUATE

- MUSCLE ACTIVITY
- RANGES OF MOTION IN ISOLATED JOINTS AND PLANES
- MAXIMAL MUSCLE STRENGTH
- Free rotation movement with possibility to lock the mechanism in a given position
- Added motors with goniometer
- Force sensors for plantar flexion/dorsi-flexion and push/pull

## INTENDED USE FOR NEUROLOGICAL AND ORTHOPAEDIC PATIENT

- Helps to relearn voluntary motor functions of the lower extremities
- Maintaining or increasing range of motion
- Measurement evaluation and increase of lower limbs strength
- Birlaxation of muscle spasms
- Prevention or retardation of disuse atrophy
- Increasing local blood circulation
- Easy to use with pre-set therapeutic protocols and automatic report availability
- Offline and online options with telemedicine and telerehabilitation.
- Engaging rehabilitation games for patients

# Discover the EGZOTech family of rehabilitation robots

Contact us to schedule a presentation!

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