EMPOWERING THERAPY WITH ROBOTS

EGZOTech

Willkommen zum Webinar!

Eine Vielfalt an Möglichkeiten - EMG & FES in der Therapie

EGZOTech

Ablauf

- Vorstellung Multiunitsetting
- Einblick in die Technologien hinter den Geräten
  - EMG
  - EMS/FES
  - EMG ausgelöste EMS/FES
- Vorteile für Therapeut:innen
- Vorteile für Patient:innen
- Vorstellung der einzelnen Geräte/ Feedback der Therapeut:innen und Patient:innen

Das Multi-Unit-Setting: Parallelbehandlungen & Gruppenbehandlungen

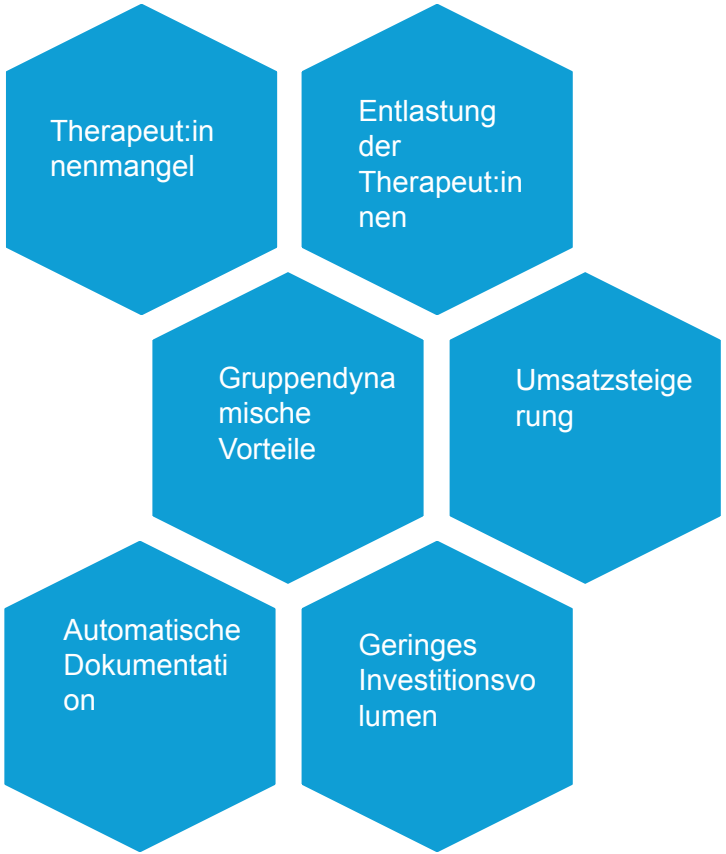
- Parallelbehandlung (Ergotherapie): 2 Patient:innen
- Gruppenbehandlung (Physiotherapie) : bis zu 8 Patient:innen
- 1-2 Therapeut:innen

Das Multi-Unit-Setting:
Parallelbehandlungen & Gruppenbehandlungen

Warum und wie Parallel-/ Gruppenbehandlungen mit EGZOTech-Robotern

Physiotherapie
Ergotherapie
Sporttherapie

Heilmittel
KTL
GOÄ



Training über alle Phasen der Rehabilitation hinweg

Lovett-Skala/ MRC

0 – CPM oder CPM+EMS

1 – 3 EMG-ausgelöste Mobilisation und
EMG-ausgelöste Mobilisation + EMS

3 – 5 Übungen gegen Widerstand – Isokinetik

Passiv
Assistiv
Aktiv

Training innerhalb verschiedener Patient:innenklientel

0 – CPM oder CPM+EMS

1 – 3 EMG-ausgelöste Mobilisation und EMG-ausgelöste Mobilisation + EMS

3 – 5 Übungen gegen Wiederstand – Isokinetik

Einblick in die Technologien hinter unseren Geräten

- EMG
- EMS/ FES
- EMG ausgelöste EMS/FES

- ✔ CPM
- ✔ CPM + EMG
- ✔ CPM + EMS/FES
- ✔ CPM + EMG + EMS/FES
- ✔ CAM

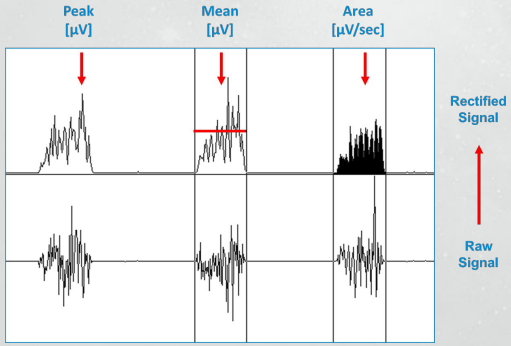
EMG = Elektromyographie
EMS = Elektrische Muskelstimulation
FES = Funktionelle elektrische Muskelstimulation
CPM = Continuous passive Motion; CAM = Continuous active Motion

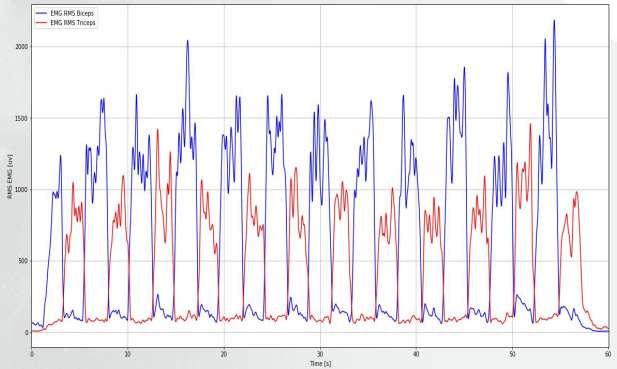
Was ist Oberflächen-EMG (sEMG)?

Elektromyographie

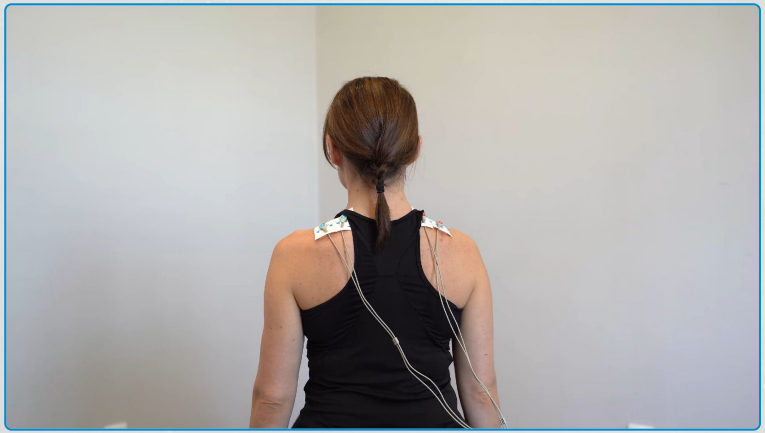
ist die Untersuchung der Muskelfunktion durch die Analyse des elektrischen Signals, das die Muskeln aussenden.

Wir arbeiten mit oberflächlichen Klebeelektroden.

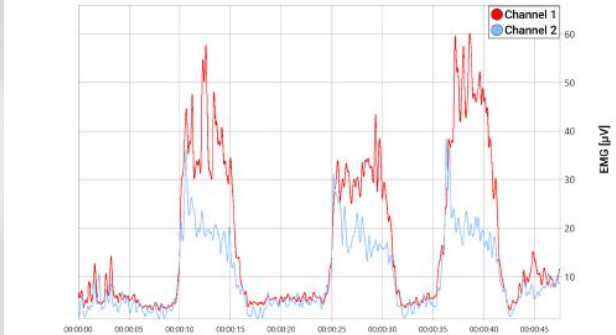




Befunderhebung mit EMG



EMG evaluation



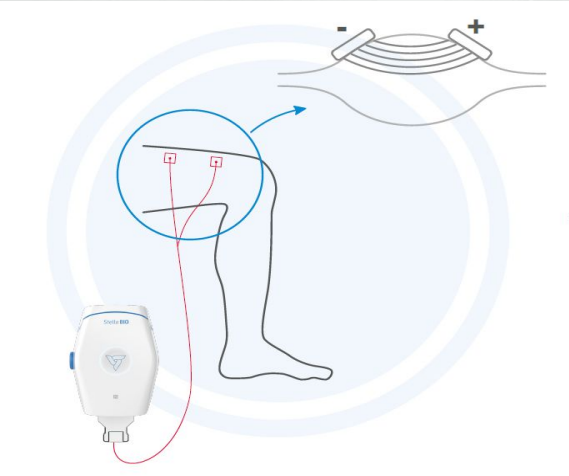
Exercise start	10:58:24
Duration	00:00:47

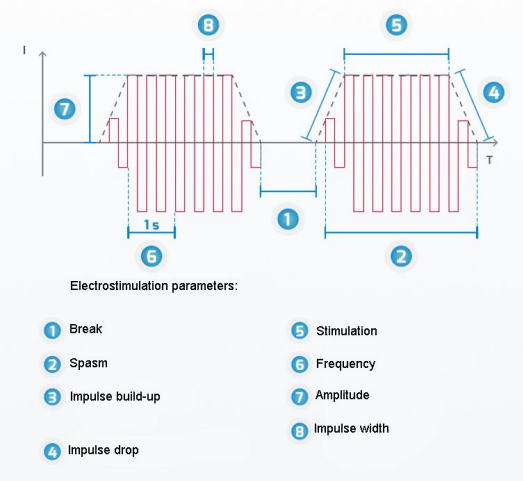
Channel	Minimum	Maximum	Average	Muscle tone
Channel 1	3.01 µV	60.05 µV	16.87 µV	4.76 µV
Channel 2	1.40 µV	38.31 µV	10.21 µV	4.16 µV

Was ist EMS/ FES?

EMS = Elektrische Muskelstimulation

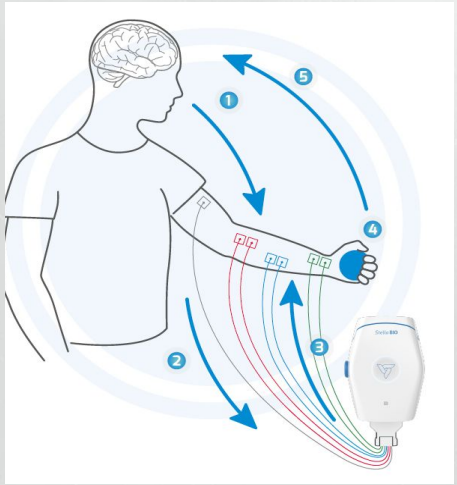
FES = Funktionelle elektrische Muskelstimulation (eine Muskelfunktion, die teils oder komplett eingeschränkt ist, wir stimultiert)

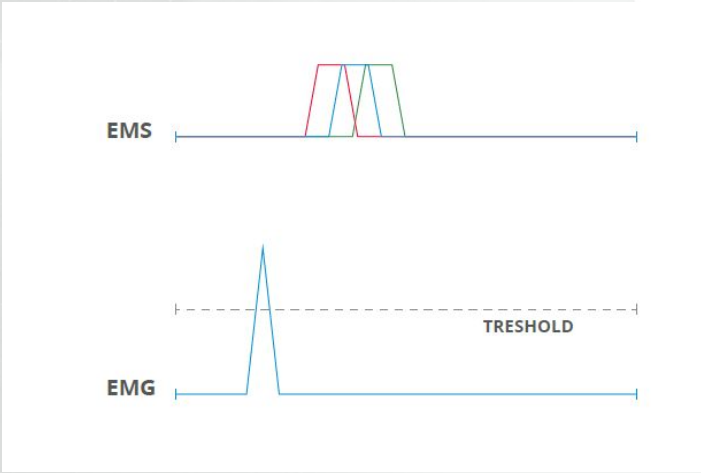




Was ist funktionelle EMS = FES?

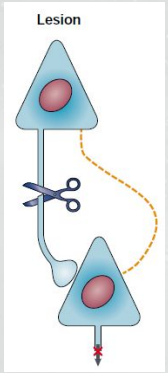
Die/der Patient/-in muss die Bewegung aktiv beginnen, wenn seine Muskulatur die Schwelle erreicht, wird die Elektrostimulation ausgelöst, was zu einer Kontraktion führt.

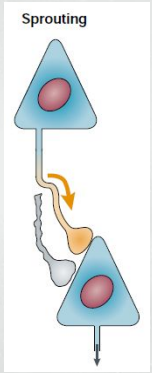


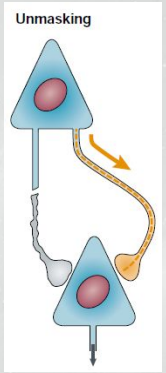


Neuroplastizität und motorisches Lernen

Die Fähigkeit des Nervensystems, auf innere oder äußere Reize zu reagieren, indem es seine Struktur, Funktionen und Verbindungen neu organisiert. *Cramer i in. 2011*







Neuroplastizität ist eine Modifikation des Nervensystems auf zellulärer- und Verhaltensebene.

Es wird durch eine Verletzung oder Aktivität/Training ausgelöst

Unsere Roboterfamilie

- Luna EMG + Mezos SIT
- Stella BIO
- Meissa OT
- Sidra LEG

Luna EMG + Mezos SIT

EGZOTech

Luna EMG + Mezos SIT







Meissa OT

EGZOTech

Meissa OT





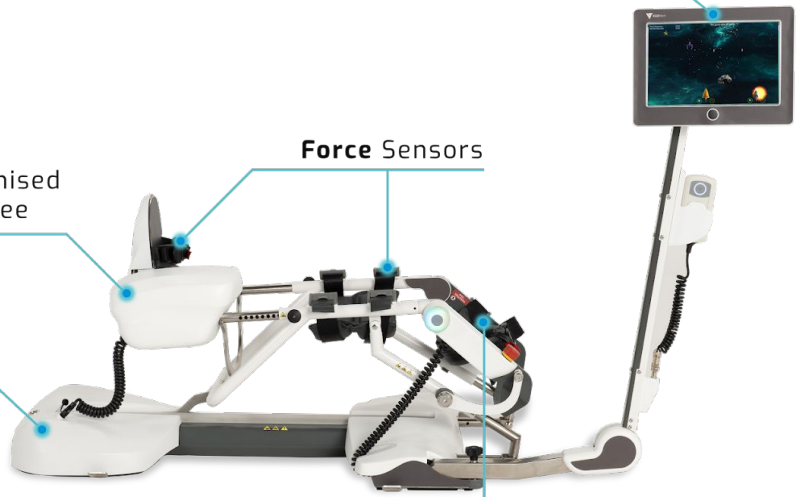


Sidra LEG

Engaging Rehabilitation games
and automated reports

Force Sensors

Double-Motor for synchronised
movement of ankle and knee



EMS & EMG triggered
electrical muscle situational

Stella BIO

Interesse?

25. + 26.10.:

Robotik im Einsatz - Angewandte Praxis (Ingolstadt, Therapiezentrum Bei der Arena)

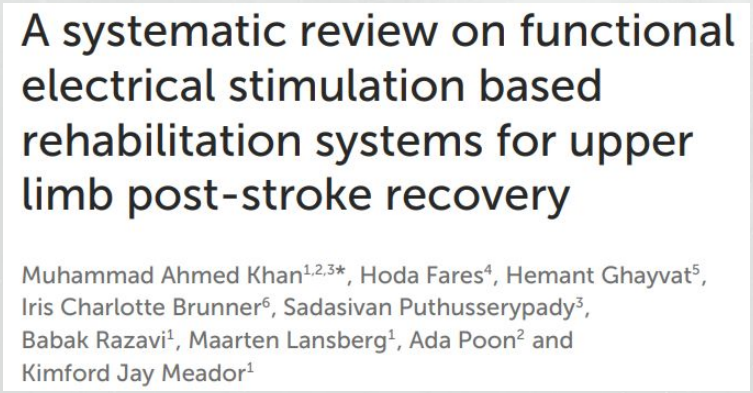
Vorteile von Robotik (im Multi-Unit-Setting) für die Patient:innen

Vorteile von Robotik (im Multi-Unit-Setting) für die Therapeut:innen

Was sagt die Literatur?

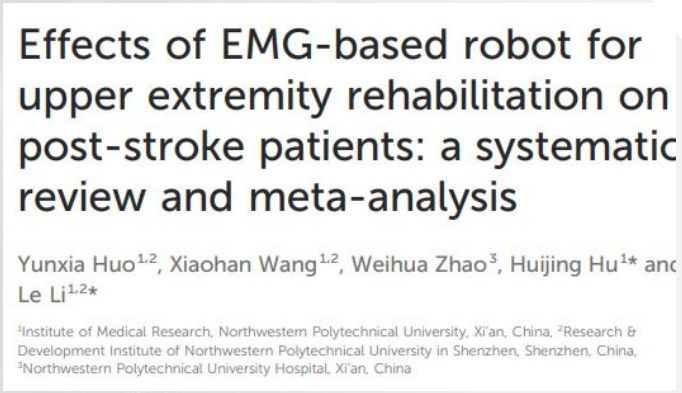
1) Mahammad 2023 - *The aim of the study was to present a comprehensive and systematic review of functional electrostimulation (FES) systems used in neurorehabilitation of the upper limb in the context of stroke therapy* (25 Studies)

2) Huo 2023 - *Is EMG - based robot is more effective than conventional therapies ?* (13 studies)



A systematic review on functional electrical stimulation based rehabilitation systems for upper limb post-stroke recovery

Muhammad Ahmed Khan[1,2,3]*, Hoda Fares[4], Hemant Ghayvat[5], Iris Charlotte Brunner[6], Sadasivan Puthusserypady[3], Babak Razavi[1], Maarten Lansberg[1], Ada Poon[2] and Kimford Jay Meador[1]



Effects of EMG-based robot for upper extremity rehabilitation on post-stroke patients: a systematic review and meta-analysis

Yunxia Huo[1,2], Xiaohan Wang[1,2], Weihua Zhao[3], Huijing Hu[1]* and Le Li[1,2]*

[1]Institute of Medical Research, Northwestern Polytechnical University, Xi'an, China, [2]Research & Development Institute of Northwestern Polytechnical University in Shenzhen, Shenzhen, China, [3]Northwestern Polytechnical University Hospital, Xi'an, China

Was sagt die Literatur?

Results and discussion: The review analyzed 25 studies and found that the use of FES-based rehabilitation systems resulted in favorable outcomes for the stroke recovery of upper limb functional movements, as measured by the FMA (Fugl-Meyer Assessment) (Manually controlled FES: mean difference = 5.6, 95% CI (3.77, 7.5), $P < 0.001$; BCI-controlled FES: mean difference = 5.37, 95% CI (4.2, 6.6), $P < 0.001$; EMG-controlled FES: mean difference = 14.14, 95% CI (11.72, 16.6), $P < 0.001$) and ARAT (Action Research Arm Test) (EMG-controlled FES: mean difference = 11.9, 95% CI (8.8, 14.9), $P < 0.001$) scores.

4.4 Can the effectiveness of FES systems be further enhanced by combining them with other systems/paradigm?

To enhance the performance of FES rehabilitation, it can either be combined with other rehabilitation systems (like robotic systems and exoskeletons) or any additional paradigm (like virtual reality), hence, developing a "Hybrid FES Rehabilitation System".

4.4.1 Hybrid with other rehabilitation systems (robotics system and exoskeleton)

In (98), the integration of electrical stimulation with robotic arm training resulted in significant improvements in the range of motion for shoulder and elbow movements in subacute stroke survivors, compared to conventional robotic training. Meadmore

Was sagt die Literatur?

Result: Thirteen studies with 330 subjects were included. The results showed that the outcomes post intervention was significantly improved in the EMG-based robot group. Results from subgroup analyses further revealed that the efficacy of the treatment was better in patients in the subacute stage, those who received a total treatment time of less than 1000 min, and those who received EMG-based robotic therapy combined with electrical stimulation (ES).

Conclusion: The effect of EMG-based robot is superior to conventional therapies in terms of improving upper extremity motor control, spasticity and activity limitation. Further research should explore optimal parameters of EMG-based robot therapy and its long-term effects on upper limb function in post-stroke patients.

Was sagt die Literatur?

„Patients who started rehabilitation early (within 7 days after stroke) had better long-term outcomes than those who started rehabilitation after more than 1 month"

[1]Massimo Musicco, Leonardo Emberti, Giuseppe Nappi, Carlo Caltagirone,Early and long-term outcome of rehabilitation in stroke patients: The role of patient characteristics, time of initiation, and duration of interventions, Archives of Physical Medicine and Rehabilitation,Volume 84, Issue 4,2003,Pp: 551-558,

[2]Coleman, E.R., Moudgal, R., Lang, K. et al. Early Rehabilitation After Stroke: a Narrative Review. Curr Atheroscler Rep 19, 59 (2017). https://doi.org/10.1007/s11883-017-0686-6

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