



Clinical Studies



- ☐ Total number of studies
- Publications
- □ Key clinical studies
 - > Israel: sub acute stroke
 - > Germany: sub acute stroke
 - > Italy: chronic stroke
 - > Japan: sub acute stroke
- New article
- □ General conclusions
- Ongoing studies





- ☐ The ReoGo was launched in rehab centers in 2007
- Clinical studies focused on Efficacy, Safety and patients satisfaction
- New directions in ReoGo therapy include combined use with EEG or EMG
- □ In many cases we only learn about such studies after they are published
- ☐ In this presentation we will discuss the main publications



- □ Total number of studies
- Publications
- Key clinical studies
 - > Israel: sub acute stroke
 - > Germany: sub acute stroke
 - > Italy: chronic stroke
 - ➤ Japan: sub acute stroke
- New article
- □ General conclusions





☐ Total number of studies: 13

- ≥9 completed
- ▶4 ongoing
- No. of patients: ~350

☐ Sites: USA, Japan, Italy, Germany, Israel





- Total number of studies
- Publications
- La Key clinical studies
 - Israel: sub acute stroke
 - Germany: sub acute stroke
 - > Italy: chronic stroke
 - > Japan: sub acute stroke
- New article
- General conclusions
- Ongoing studies



Publications





Publications

of the

nical

nts

Motor

other Mountain of the staff

A Milk Colomb

near Nati, Server

minutes falls

select Brade for

and indicates in the last



The American Journal of Occupational Therapists, 2012,USA

Top Stroke Rehabilitation, 2011, Germany

Journal of Neuroengineering and Rehabilitation, 2011, Italy

Journal of rehabilitation Medicine, 2009, Italy

European Journal of physical and Rehabilitation, 2008, Israel

FOR FUNCTIONAL RECOVERY OF THE UPPER LIMBS: LOT STUDY ON PATIENTS AFTER STROKE

IO*, Miena Goldoni, PT*, Pierina Clerici, PT*, Maurizio Agosti, PT* and Marco Franceschini, MD*

division NOCSAE Hospital AUCL of Modern, Modern, "Gertarrics and Rehabilitation with Hospital of Partie, Parties and "IROCS San Rethaule Plastic, Rome, Italy

bility of administrating colornic in patient; after strain; to replance and compliance with the treatment has an office on and outcome.

incontrolled study. (Cl) chronic hemiputwic school

of with a ration system for the rich Model (Left, Irrad). Subrich Model (Left, Irrad). Subrich and the sides of performed and the follows performed scanned (T): Fugl-Mayer rate for pair, Translay Arm warfer pair, Translay Arm warship, Thursbook Independent (E): Questionnessee, Theod Uptains of Life performances not using all Life performances and case were administed to the cities were administed to the

Bids, Salt and Filter demand personal time To and To GM Type Ball, Filter ye down load to Bids ye dail, Fall ye dail, and significant differences there will not TO GM ye 1 506, Bids No. 5 1 100.

STRODUCTION:

from a the mean case of disability in informational comtion, with a significant impact on informational, family, and section familiars. As such any familiar of neumons that is, cases the functional sections of present other varies could explain the probability of present other varies could explain the probability of present of the section of fact the condition carries for the reflecter, their function and section in probability of the probability, their function and

Therefore, in the west formers in property to concerned, wellter the second of the second of the second of the second of the impactance of the second of the first second of the secon

While the steps of the interest, it has emerged that the proposed feeting man be incomes and specific in order for incomes in the effective (1). In addition, therefore many be reported, functional and automatic (2, 3), as in to bring show

obotics in Spinal Cord Injury: A Case Report

euromuscular training ents. A feasibility study

1 THRONG \$ 7, S. PARANC S. PL. RESC. \$ 7

Okannight of Antahilias in Department mania absorbination (Joner, Barraina, Antalacian Isasali) of Badhime, 101 Anta Challengo (Imman for Sanhari Antahilia and Beharina (Antahilia) Distring of Jamages, Tamaria (Antahilia) Distring of Jamages, Tamaria (Antahilia)

Sensest in daily life 13 Several studies hed the contribution of reduces webrecalling effective treatment options for oper extensity functions in patients with following mode: 1 Bather than using at assigne seclandage for a disabled trocards focus in on the development post of minutes as a therapy and, and in and for therapiers. The incompanies see and computers as supposing and be productively of clinicians in their clinics a dealered antechnal's functional money the development of solutio measurements I by the preparing public braith business such strike minted disolder, and by the phone on health care cost reductions. treated in shoney length of stay for

can of the worky was to conduct a prosenance of patent acceptance of the flavor wastern of patent acceptance of the flavor of the flavor account therapy that was reproducible to example the patent of the upper I post stock patents in reporters belief to the patent of the patent o

PR ST WINDS EMBER

o agains has properly de tree plants some from a described toda de described a de de described a de de described

per an indicate the first con-

STATE OF SERVICE

on (50) others a man hand, the face of of me to prophete with the control of the control

The second secon

The second state of the second second



- ☐ Total number of studies
- Publications
- Key clinical studies
 - ► Israel: sub acute stroke
 - Germany: sub acute stroke
 - > Italy: chronic stroke
 - ➤ Japan: sub acute stroke
- New article
- General conclusions
- Ongoing studies





Robot- assisted therapy for neuromuscular training of sub-acute stroke patients

A feasibility study

I. Treger, S. S. Faran, H. Ring,

Israel, 2008

European Journal of physical and Rehabilitation Medicine



Objective:

☐ Preliminary assessment of patient acceptance of an upper extremity ReoGo Robot Therapy

Design:

- ☐ 10 sub acute stroke patients
- ☐ 15 sessions of 45 minutes of ReoGo treatment in addition to physical and occupational therapy



2008, Israel

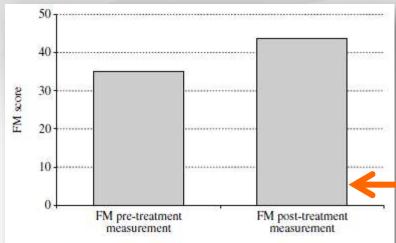


Figure 3.—Fugl-Meyer values.

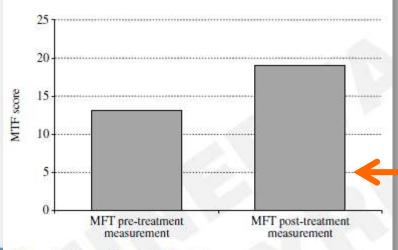


Figure 4.—Manual Function Test values.

Results

Motor impairment was significantly improved in the

Robot- assisted upper arm therapy

Table I.—Results of acceptance feedback questionnaire, Fugl-Meyer and Manual Function Test.

	Mea	n values	P values	
	After 1 week of treatment	After 3 weeks of treatment	r values	
Acceptance of Reo™ Therapy System Feedback Ouestionpaire (max. value = 75)	54	65	0.006*	
	Pretreatment	Post-treatment		
Fugl-Meyer Test	35.0	43.5	0.001*	
Manual Function Test (proximal part only)	8.2	10.3	0.01*	
Manual Function Test (distal part only)	5.0	8.7	0.005*	
Manual Function Test (overall)	13.2	19.0	0.002*	

^{*}Statistically significant.

Conclusions

- ☐ Motor impairment was significantly improved in the ReoGo upper arm therapy
- Excellent patients compliance
- ☐ High patient motivation led to a high number of repetitions of functional movement per session



What is the average number of repetitions per session

of **ReoGo** therapy vs. **physiotherapy**?





Average Repetitions Per Session



210 (SD 54)

23 min. (SD 6)



32* (20-44)

36 min. +/- 14

Increased number of repetitions, better brain recovery



- ☐ Total number of studies
- Publications
- Key clinical studies
 - Israel: sub acute stroke
 - ➤ Germany: sub acute stroke
 - > Italy: chronic stroke
 - > Japan: sub acute stroke
- New article
- General conclusions
- Ongoing studies





Active and repetitive robot assisted training improves the functional recovery of the arm in sub-acute stroke patients

S. Faran, S. van Kaick, C. Eickhoff, K-H. Mauritz

Germany, 2008

International Stroke Conference, New Orleans, LA

Objective:

- ☐ To determine whether motor training with the ReoGo for 60 minutes daily as compared to splint therapy will lead to significant improvement in :
 - Selective arm motor control
 - > Arm activities

Design:

- ☐ 20 sub-acute stroke patients, with first ischemic stroke onset 3 weeks- 3 months prior to treatment
- ☐ Two groups
- ☐ Treatment protocol:
 - ➤ Daily therapy sessions
 - ≥4 weeks
 - ≥20 sessions of one hour
 - ➤ ReoGo or air splint therapy



Main Outcome Measures:

- ☐ Fugl Meyer (FM) test
- ☐ Action Research Arm Test (ARAT)

The tests were performed at baseline and after 4 weeks

2008, Germany

Results:

□ FM:

Significant improvement in the ReoGratement (11.09 points)

□<u>ARAT:</u>

Significant improvement in the ReoGetreatment (14.3 points)

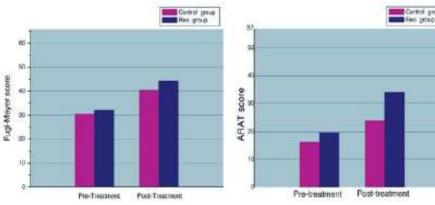


Fig. 2 Fugl-Meyer differences between the two groups pre and post treatment

Fig. 3 ARAT differences between the two groups pre and post treatment

☐ FM and ARAT Vs Motor Power Scale at Baseline:

improvement (delta from baseline) in the Reo therapy was considerably higher for patients entering the therapy with higher motor power.

Conclusions:

☐ Motor recovery of the upper limb in hemiplegic stroke patients can be significantly improved through additional sensori-motor training in the sub- acute phase.

☐ The score of the Fugl-Meyer in the Reo group improved by 18.2%, a difference that can be considered to be clinically relevant.



- Total number of studies
- Publications
- Key clinical studies
 - Israel: sub acute stroke
 - Germany: sub acute stroke
 - ► Italy: chronic stroke
 - > Japan: sub acute stroke
- New article
- General conclusions
- Ongoing studies





Robot-aided therapy for upper limbs in patients with stroke-related lesions. Brief report of a clinical experience

2011, Italy

F. Bovolenta, M. Goldoni, P. Clerici, M. Agosti, M. Franceschini

JOURNAL OF NEUROENGINEERING AND REHABILITATION

Objectives

- ☐ To verify the improvement of the motor impairment and functionality after a rehabilitation treatment with the ReoGo™
- ☐ To verify the persistence of the effects after 1 month.

☐ To evaluate patients' degree of acceptance and compliance with the treatment

Design:

- 19 patients (13 males,6 female) with chronic hemiparesis
- Average age 55.74 (±12.6) years
- ☐ First acute event of cerebrovascular stroke
- ☐ Unsuccessful conclusion of a previous rehabilitation program

Treatment protocol:

- 20 sessions with ReoGo robotic system
- 45 min each
- ☐ 5 days a week, 4 weeks

Main Outcome Measures:

- Fugl -Meyer (FM) test,
- Medical Research Council (MRC),
- > Ashworth scale
- Visual Analogue Scale pain
- > Frenchay Arm test
- Box and Block test,
- > FIM motor
- > Time up and Go test
- ➤ Euro Quality of Life
- Visual Analogue scale satisfaction



Results

Table 3 Performance at the clinical assessment tasks

		T-1 (N = 19)			T0/N = 10)			T1 (N = 10)			T2(N - 16)		
		Mean ± Std. Dev.	Median	Min; Max	Mean ± Std. Dev.	Median	Min; Max	Mean ± Std. Dev.	Median	Min; Max	Mean ± Std. Dev.	Media	ı
Fugl-Meyer Test (n = 18)	Upper Limb	31.33 ± 17.42	33.5	5;54	31.21 ± 16.92	33	7;55	40.37 ± 18.57	49 ^b	9;62	41.75 ± 18.95	49.5 ^b	9
Ashworth Scale (n = 18)	Shoulder	0.67 ± 0.77	0.5	0;2	0.37 ± 0.6	0	0;2	0.16 ± 0.37	0	0; 1	0.25 ± 0.77	0	-
	目bow	1.67 ± 0.91	1.5	0;3	1.79 ± 0.98	2	0;3	1.26 ± 0.93	1 ^b	0;3	1.44 ± 1.03	1 ^b	- 1
	Wrist	0.89 ± 1.02	1	0,4	1±1	1	0,4	0.68 ± 0.67	1	0;2	0.63 ± 0.62	- 1	- (

Results:

- ☐ FM: Significant Improvement in upper limb:
 - ➤ Baseline 33
 - ➤ 4 weeks 49
 - > one month of follow up 49.5
- □ All subjects showed excellent compliance and remarkable satisfaction
- No dropouts associated to intolerance to treatment
- Motor learning maintained 1 month after, indicated that patients were not in a spontaneous recovery stage



- ☐ Total number of studies
- Publications
- Key clinical studies
 - Israel: sub acute stroke
 - Germany: sub acute stroke
 - > Italy: chronic stroke
 - ► Japan: sub acute stroke
- New article
- General conclusions
- Ongoing studies





Clinical Trial of ReoGo for the Rehabilitation of Post-Stroke Hemiplegia- exploratory study

K. Takahashi, K. Domen, K. Hachisuka, T. Sakamoto, M. Toshima, Y. Otaka, M. Seto, K. Itie, B. Haga, T. Takebayashi, T. Kimura

Japan

AHA, International Stroke Conference (ISC2011),LA,2011

Objective:

☐ To examine whether robotic therapy in addition to standard UE training improves UE function more than self-training in addition to standard training.

☐ To examine which severity level of hemiplegia could benefit from the robotic therapy

Design:

- ☐ Prospective, single-blinded, randomized, multicenter
- 6 rehabilitation facilities
- ☐ 60 patients (41 men, 19 women; mean age, 64.8 ±10.8 years)
- ☐ Sub-acute post-stroke Hemiplegia (UE Brunnstrom stage III to IV) experienced stroke in the previous 4 to 8 weeks

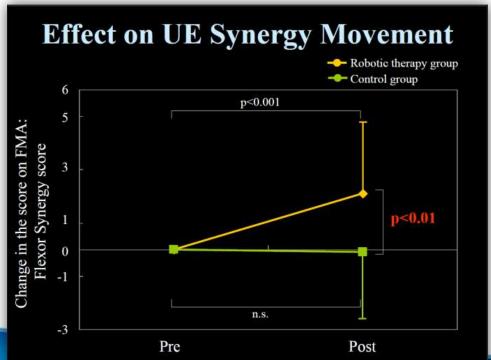
Treatment protocol:

- ☐ In addition to daily therapy sessions
- ☐ 40 min of ReoGo therapy or self-training (control group).
- ☐ 6 weeks (7 days a week)



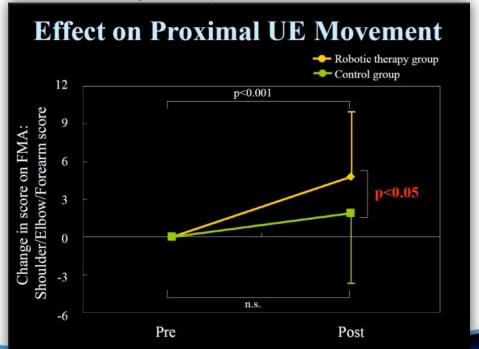
Results:

- ☐ Robotic therapy group, as compared to control group
 - ➤ Significant improvement in the FM Flexor Synergy score (score change **2.1 ± 2.7** vs **0.1 ± 2.4**; p<.01)



Results:

- ☐ Robotic therapy group, as compared to control group
 - ➤ Shoulder/Elbow/Forearm score
 - \triangleright (score change **4.8 ± 5.0** vs **1.9 ± 5.5**; p<.05).



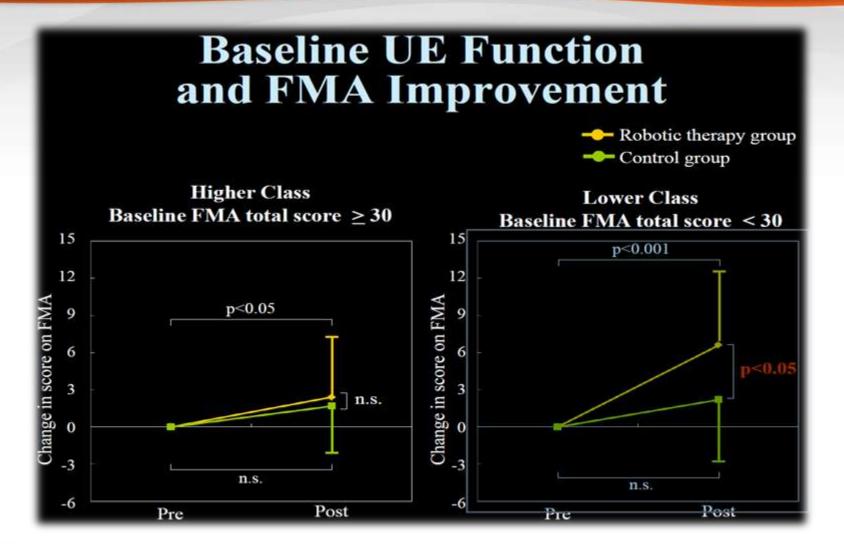
Results:

- □ Participants were divided with baseline FM total score into: higher (>30) or lower (<30) function cohort,.
 - ➤ In the higher function cohort no significant difference between two groups.
 - ➤ In the lower function cohort,

 RoGo therapy significantly improved FM Shoulder/Elbow

 /Forearm score compared with control group (score change 6.6 ± 5.1 vs 2.2 ± 6.2; p<.05)





Conclusions:

- ☐ People with moderately severe hemiplegia benefit from the ReoGo ,robotic therapy
- ☐ ReoGo treatment benefits includes:
 - Repetitive movement
 - Correct movement pattern
 - > Constant amount of assistance



In this presentation:

- Total number of studies
- Publications
- Key clinical studies
 - Israel: sub acute stroke
 - Germany: sub acute stroke
 - > Italy: chronic stroke
 - > Japan: sub acute stroke
- New article
- General conclusions
- Ongoing studies



Development and Validation of the First Robotic Scale for the Clinical Assessment of Upper Extremity Motor Impairments in Stroke Patients

Omer Einav, Diklah Geva, Doron Yoeli, Marina Kerzhner, Karl-Heinz Mauritz

Topics in Stroke Rehabilitation, November 2011

Objective

To develop and validate the first robotic-based procedure for assessing upper extremity motor impairments in stroke patients, and to test its discriminative power.

Design

- 100 Stroke patients were evaluated before starting treatment by:
 - ReoGo scale (9 tasks)
 - Fugl-Meyer (FM) motor test
 - Wolf Motor Function Test (WMFT)
 - > Action Research Arm Test (ARAT).

Results

- ☐ The total ReoGo score correlated closely with the upper extremity scores of the FM, WMFT and ARAT (r = 0.95, 0.93 and 0.90, respectively).
- ☐ The ReoGo score was able to discriminate between low, moderate, and high functioning patients (86% agreement K = 0.79, with FM).

Conclusions

☐ The validity of the Reo Scale Assessment is comparable with that of the FM, WMFT, and ARAT.

☐ The objective measuring and scoring of the ReoGo make it an efficient tool for assessing motor function of stroke patients in clinical and research settings.



In this presentation:

- Total number of studies
- Publications
- ☐ Key clinical studies
 - > Israel: sub acute stroke
 - Germany: sub acute stroke
 - > Italy: chronic stroke
 - > Japan: sub acute stroke
- New article
- General conclusions
- Ongoing studies





□ ReoGo treatment is safe with no side effects

□ ReoGo Therapy is appropriate for a wide range of post-stroke populations (sub-acute and chronic)

☐ Significant functionality improvements maintained overtime

☐ Patient compliance and satisfaction are excellent

□ Remarkable recovery of UE mobility in severe hemiplegia



In this presentation:

- Total number of studies
- Publications
- Key clinical studies
 - Israel: sub acute stroke
 - Germany: sub acute stroke
 - > Italy: chronic stroke
 - > Japan: sub acute stroke
- New article
- General conclusions
- Case study & Ongoing studies





Use of Robotics in Spinal Cord Injury: A Case Report

Lori Sledziewski, Roseann C. Schaaf, Julie Mount

The American Journal of Occupational Therapy, Feb. 2012

Objective

to examine the use of robotics to treat upper extremity (UE) dysfunction in tetraplegic patients with spinal cord injury (SCI).





Method.

A 51-yr-old man with an incomplete SCI received combined traditional occupational therapy with ReoGo, 28 days post injury.

The ReoGo treatment includes:

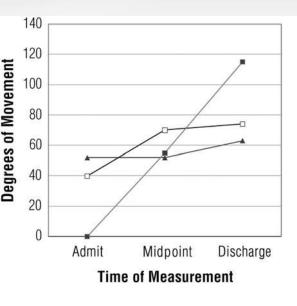
18 consecutive 1 hour sessions

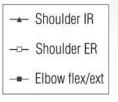
3 sets of 10 repetitions for each of the following exercises:

- (1) Forward reach, (2) Forward thrust, (3) Horizontal reach,
- (4) Hand to mouth



Results





M.R. demonstrated improvements on all outcome measures.

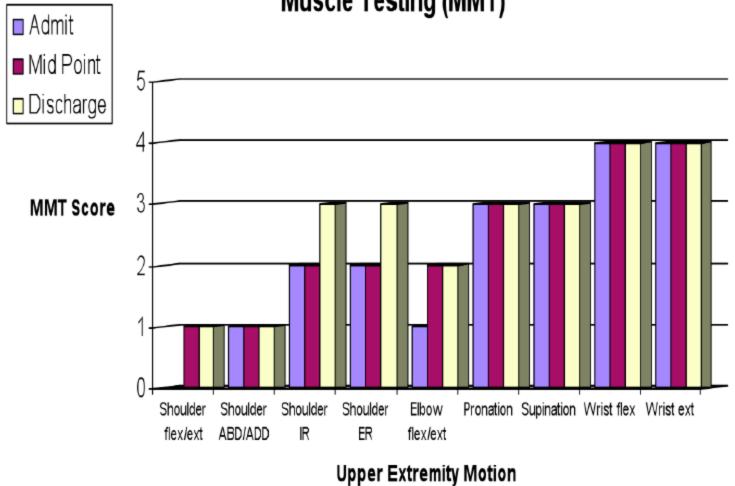
- (1) Increase in AROM
- (2) Increased independence in self-care (FIM score)
- (3) Increase in strength (MMT score)
- (4) Increase in perceived right UE function (CUE score)

Conclusion:

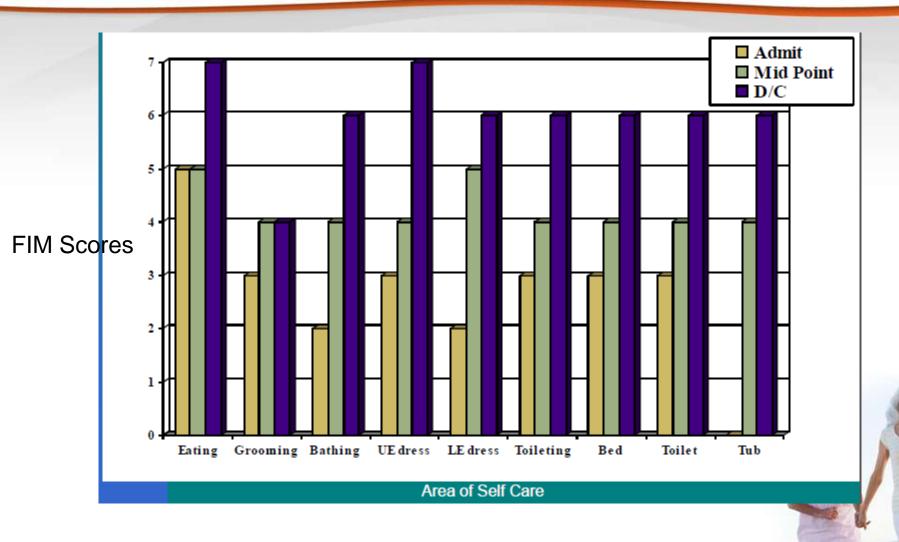
The findings demonstrate the ReoGo's utility in combination with traditional occupational therapy.











- Germany , Neils Birbaumer
- □ Combined treatment of ReoGo and BCI EEG

21 stroke patients (40)

Daily training sessions of 45 min. for 4 weeks

- □ Results Training effect was greatest with the ReoGo compared to the hand orthosis (control)
- □ ReoGo was very well accepted and tolerated by all patients.

On Going Studies

Italy,2011

> F. Bovolenta – article to be published

- > Franco Molteni ReoGo and EMG
 - One case study , chronic stroke patient

Using surface dynamic electromyography during Upper-extremity robotic training

F. MOLTENI, M. CAIMMI, A. CAZZANIGA, G. GASPERINI, E. GIANDOMENICO, C. GIOVANZANA

Europa Medicophysica, 2008

Design

- 5 Sub acute stroke patients
- 2 weeks therapy 10 sessions
- 30 min of ReoGo reaching exercises in the following modes:
 - Guided
 - Initiated
 - Step initiated
- The EMG pattern of the arm and shoulder muscles was recorded

Results

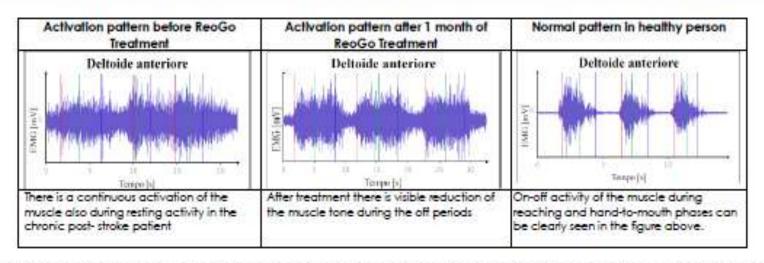
In general in this preliminary study the pattern of activity of the arm and shoulder muscles has improved

Conclusion

The dynamic EMG could be useful for monitoring the patient's muscular activity during robotic treatment



Muscle activity patterns correlates with ReoGo treatment



After I month of treatment, the patient has improved the motion control (as presented in the table above): the on- off pattern is more similar to the normal one (there are clear activation and rest periods). The improvement is evident,

On Going Studies

USA – at least 3 more studies

☐ Kessler Institute for Rehabilitation, USA

■ NY Presbyterian Hospital, affiliated to ColumbiaUniversity, USA

□ National Institute of Neurological Disorders and Stroke, USA



New Clinical Study, 2011







New Clinical Study, 2011



Retting people back on their feet Ambulator



Robot-Assisted Gait Training for Patients with Hemiparesis Due to Stroke

Stanley Fisher, Leah Lucas, T. Adam Thrasher

Topics in Stroke Rehabilitation, May-June 2011

USA, 2011

Crand Rounds

Robot-Assisted Gait Training for Patients with Hemiparesis Due to Stroke

Name Trans ADD Trans Lane Trans Co. (No.)

Solida Sactigad State, States, Sec. Stafford Splitters State Staffs, Sec.

The control of the co

A large proportion of others hand; in American temperature, and the part of cases are design, function as the part of cases are designed, and deplicate the cases are designed to the part of the cases are designed to the part of the cases o

makes to get medians also some flag

of these forms general or the offsection of collection and controls, because it is not close that the age of section against by required for requireming gain special experience by required being section for the property of the collection of the c

C Value Trans.

-



Objective

To compare the outcomes of robot-assisted gait training (RAGT) using ReoAmbulator with a traditional therapy program

Design

- □ 20 Stroke patients (two groups of 10)
- ☐ Control group: 1-hour sessions of conventional therapy
- □ RAGT group: 30 min. of conventional therapy and 30 min. of ReoAmbulator
- ☐ 24 sessions



Outcome measures

- 8-meters walk test
- ☐ 3-minute walk test
- ☐ Tinetti balance assessment

Results

- □ Stroke patients improved walking function following ReoAmbulator therapy
- ☐ The functional gains of the robotic therapy were not significantly better than conventional physical therapy.



Conclusion

ReoAmbulator and conventional physical therapy, as applied in this study,* may produce similar clinical outcomes.

The added value of the ReoAmbulator treatment

- ➤ Physical therapy required significantly more therapist time (12 additional therapist-hours per patient) than the RAGT.
- ReoAmbulator therapy can provide a controlled, consistent level of therapy in many different settings.
- *Please note that the duration of the robotic therapy in this study was only 30 min

Therapy with a robotic touch



Thank You



www.motorika.com