



WIRELESS EMG FEEDBACK FOR MOTOR IMPAIRMENTS

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Abstract

Study Design: Case Series

INTRODUCTION

Surface electromyographic biofeedback (EMG BF) has been evidence-based since the 1970's for neuromuscular retraining. A new, wireless tablet based system (JogO), is available to enhance ease of use by the therapist and patient, with improved patient outcomes. We will present various case studies supporting functional recovery with the JogO system.

METHOD(S)

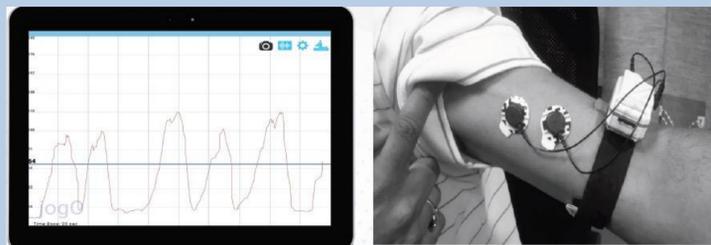
Using a sample of convenience, patients with a history of CNS lesions and urinary incontinence received JogO based EMG BF to supplement an ongoing program of standard physiotherapy.

RESULT(S)

Two subjects with CNS involvement obtained greatly improved functional scores as measured by the Barthel and Berg Balance when comparing function pre and post EMG BF interventions. Subject #1, (70 y/o, R MCA infarct) used JogO for ankle dorsiflexion. Evaluations initial and 8 weeks post: MMT ankle dorsiflexion improved from 1+ to 3/5. Barthel (20/100) improved (87/100); Berg Balance Scale (0/56) improved (52/56). Subject #2 (56 y/o, Right temporal tumor excision) used JogO on various Left UE and LE groups. Evaluations initial and 12 weeks post: Bartel (0/100) improved (70/100); Berg Balance Scale (0/56) improved (44/56). Comparing Barthel and Berg baseline against post achieved a 0.05 level of significance. One subject with incontinence reported after "eight sessions of pelvic floor physiotherapy (with the JogO unit) helped me resolve my bladder dysfunction".

CONCLUSION(S)

EMG BF has been available as a treatment modality for decades. It is recently becoming more incorporated into rehabilitation due to its ease of application and usage, simplified and meaningful feedback to the patient, portability and cost-effectiveness.



JOGO provides real-time feedback on muscle performance reflecting the quality of goal directed movement responses which serve as reference for error detection and points to effective movement strategies and recovery enabled by neural plasticity.

Background

Measurement of skeletal muscle activity is over 100 years old. In 1930's, Jacobson, used surface EMG to measure muscle relaxation techniques. Basmajian (1960's) is considered the father of surface EMG Biofeedback. He initially measured single MU training with fine wire electrodes.

Advantages of Wireless EMG & JOGO system:

Avoid movement artifact of wires/cabling between the subject and the equipment.

Allows more freedom to provide immediate, understandable feedback to the subject.

Allows training in functional activities vs. supine or sitting.

Ease of setup, less than 5 minutes.

Tablet based software is easy to upgrade and includes games.

EMG biofeedback provides immediate and meaningful information to the patient and clinician regarding their muscle performance. It is proportional to force production and motor unit recruitment. It is effective due to the neuroplasticity of the CNS by developing alternate neuronal pathways in helping to re-establish voluntary control of skeletal muscles throughout the body.

Purpose

To determine if benefits exist in using a wireless EMG feedback system for motor re-education in various patients.

Methods

Patients with PMH including CVA, Cerebral Palsy (spastic type), TBI, urinary incontinence Were often referred for EMG biofeedback training prior to or after receiving "standard" physiotherapy.

Procedure

- Physiotherapy evaluation
- Determine plan of care.
- If appropriate, include JOGO for neuromuscular retraining.
- Document therapeutic effectiveness of plan of care.

Case One

70 year old female with left hemiparesis, post Right MCA infarct, intact sensorium, presented for homecare physiotherapy services. Gentle and sustained stretching of spastic group of muscles, especially bilateral hamstrings, tendoachilles, biceps, wrist flexors, trunk rotators. Passive ROM exercises, pelvic bridging, balance/gait training. Hand function training, prehension/grip, inhibition of synergy patterns.

JOGO EMG BF for improving dorsiflexion (20 sessions @ average of 20 minutes/session). Now pt. is able to do many more functional activities but with residual weakness and stiffness.

	Initial	8 wks post
MMT Ankle Dorsiflexors	1+/5	3/5
Barthel's	20/100	87/100
Berg Balance	0/56	52/56

Case Two

56 year old female with Right temporal SOL, underwent right temporal craniotomy & total excision of tumor. Post OP, patient unable to move LUE or LLE. Left facial palsy, required support in side turning/high sitting. JOGO EMG BF used on L. upper/lower limb. Patient responded to EMG BF compared to conventional physiotherapy

At time of discharge, patient able to side turn, transfer from bed, walk independently with stick support. Facial palsy had spontaneous recovery and no therapy indicated.

	Initial	8 wks post
MMT Ankle Dorsiflexors	1-/5	1+/5
Barthel's	0/100	70/100
Berg Balance	0/56	44/56

Case Three

12 y/o patient with CP. Received 12 yrs of conventional rehab with no meaningful functional gains. Dr. Gary/JOGOevaluated via Skype – Dec. '18. Primary deficits included when attempting ambulation with parental maximal assist, no head control, poor ankle dorsiflexion & knee flexion.

Pt made steady improvement with protocols suggested by Dr. Gary. With the help of LE exercise and AFO, pt. is now able to stand for 15 minutes with very minimal support from parents. JOGO EMG BF was introduced with the goal of enabling better control of neck, shoulder muscles. After 2 months of JOGO treatment, patient is able to hold chin away from the chest – something that wasn't achieved with conventional physiotherapy. After two months, patient is able to sit and stand with good head control for extended periods of time.

Case Four

Patient is an 40 y/o female with a diagnosis of urinary retention, urgency & inability to fully void (residual 70ml). "Eight sessions of pelvic floor physiotherapy (using JOGO) has helped me restore my bladder dysfunction and brought back the confidence in me. Thank you." The JogO helped me measure my progress as well as the level of pelvic floor muscle contraction and relaxing.

Session	Relaxation achieved	Contraction Achieved
1	20mV/sec	Not attempted
2	12mV/sec	Not attempted
3	9mV/sec	Not attempted
4	5mV/sec	25mV/sec
5	3mV/sec	35mV/sec
6	0mV/sec	Achieved complete voiding with no residual.
7-8	Continued training for optimal carryover.	

Conclusions

Based on the findings from these case studies, EMG BF with the wireless JOGO system is effective in improving neuromuscular control in patients with various neuromuscular conditions.