Single Case Study: Low threshold electrical stimulation (LTES) using the Mollii suit as treatment modality for severe ataxia in an adult with Multiple Sclerosis

Leeds Community Healthcare NHS Trust

Sheila Marsden (sheilamarsden@nhs.net)
Therapy Lead/Specialist Occupational Therapist
Community Neurological Rehabilitation Services

Aim: To explore the benefit of the LTES using the Mollii suit to subdue symptoms of ataxia and improve function in a community setting.

Literature Review

- NICE guidelines for Multiple Sclerosis (2019) do not specify any recommendations for the treatment of ataxia in Multiple Sclerosis
- Anecdotal evidence suggest that ataxia as a symptom is difficult to treat and see carryover in function
- All recommended treatment modalities for patients with ataxia and compensations require further research (Bates et al., 2016)
- Recently, there have been some emerging case study evidence using the Mollii suit for management of spasticity and ataxia (Schuhfried et al., 2012 and Reed, 2018)
- At time of publication there were no RCT or independent comparative observational studies completed. (NICE, 2017)

Methodology

The Mollii suit was developed in Sweden by Inervations AB and is supplied in the UK by Remotion Ltd. It utilises low frequencies at 20 Hz (below level of muscle contraction to allow spinal cord reflex to allow spinal reflexes to occur). It targets spinal reflexes to alleviate their disruption, based on the mechanisms of activity versus underactivity in any upper motor neuron lesion. It selects the underactive muscles over the over active at the spinal cord level (reciprocal inhibition).

Identification of Participant

Inclusion criteria
Adults or children with spasticity, muscle tone, ataxias, dystonias and other forms of motor impairment due to neurological impairment

Exclusion criteria
Implanted electrical devices or medical devices affected by magnets e.g. pacemaker, etc

Cautions
Uncontrolled epilepsy, cardiovascular disease, malignancy (cancer), infectious disease, fever, rashes, skin problems

Methods

Pre intervention outcome measures completed

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Suit worn 1 hour daily for 3 days prior to admission; and then daily for first 2 weeks of admission. This regimen was reduced to alternate days for the remaining period of the study

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4 weeks inpatient rehabilitation, input ranging from 8 to 10 sessions per week

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Measures repeated post intervention

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Follow up measures were repeated 4 weeks later to assess carry over effect. Participant continued home programme during this period

Data Collection

1. Modified Fatigue Impact Scale (MFIS)
2. Motricity Index and Trunk Control Test
3. Scale for the Assessment and Rating of Ataxia (SARA)
4. Arm Activity Measure (ArMA)
5. Video analysis including time taken for Arm movements (5 repetitions), drinking from water hydrant tube, slide transfer and walking

Goals

1. Reduction in the time taken and improvement in fluidity of movement when using the water hydrant
2. Improvement in the speed, quality and control of movement when transferring through flexion
3. To be able to play with a ball or balloon with his 18 month old son
4. To explore walking with an adapted frame

Results

Measure	Pre Intervention	Post Intervention (4 weeks)	Change percentage and progress
Modified Fatigue Impact Scale	Physical 31/36 Cognitive 28/40 Psychosocial 5/8 Total score: 64/84	Physical 13/36 Cognitive 22/40 Psychosocial 2/8 Total score: 37/84	Lower score signifies improvement. 42% decrease in reported fatigue
Motricity Index	Trunk score: 23/100 Arm Score: 61/99 Leg score: 75/99 Required supervision from 2 staff to move from lying to sitting	Trunk score: 87/100 Arm Score: 92/99 Leg score: 99/99 Functionally, able to move from lying to sitting independently	Trunk score: 278% Arm score: 51% Leg score: 32%
Scale for the Assessment and rating of ataxia (SARA)	Gait: 8/8 Stance: 6/6 Sitting: 4/4 Speech: 1/6 Finger Chase: 3/4 Finger nose : 4/4 Fast alternating: 3/4 Heel-shin slide: 2.5/4	Gait: 6/8 Stance: 6 Sitting: 3/4 Speech: 0/6 Finger Chase: 1.5/4 Finger nose : 2/4 Fast alternating: 3/4 Heel-shin slide: 1/4	Descending scale with 0 meaning normal, no difficulties.
Arm Activity Measure (ArMA) Section A Caring for the affected arm Section B Independently completing tasks with affected arm	Section A: 11/32 Section B: 50/52	Section A: 9/32 Section B: 38/52	Lower score signifies improvement. Section A : 18% Section B: 24%

Participant maintained all measures at 4 weeks follow up.

Video analysis:

Achieved goals 1 and 2

Goal 3 : Partially achieved, participant is now able to pass/pick up a ball or balloon.

Goal 4: He was able to walk 100 metres using the pulpit frame with assistance from 2 therapists; 1 therapist guided the hips and the other was required to stabilise the frame. The participant had not walked for over a year prior to this.

Conclusion

Combining Mollii suit regimen with active therapy input helped to subdue the symptoms of ataxia, which had significant carry over effect in the participant's functional performance

Recommendation: It is recommended that the participant engage in further intensive rehabilitation in an inpatient setting. In addition, further studies are required to evaluate the effectiveness of LTES using the Mollii suit with other individuals with ataxia and other movement disorders.

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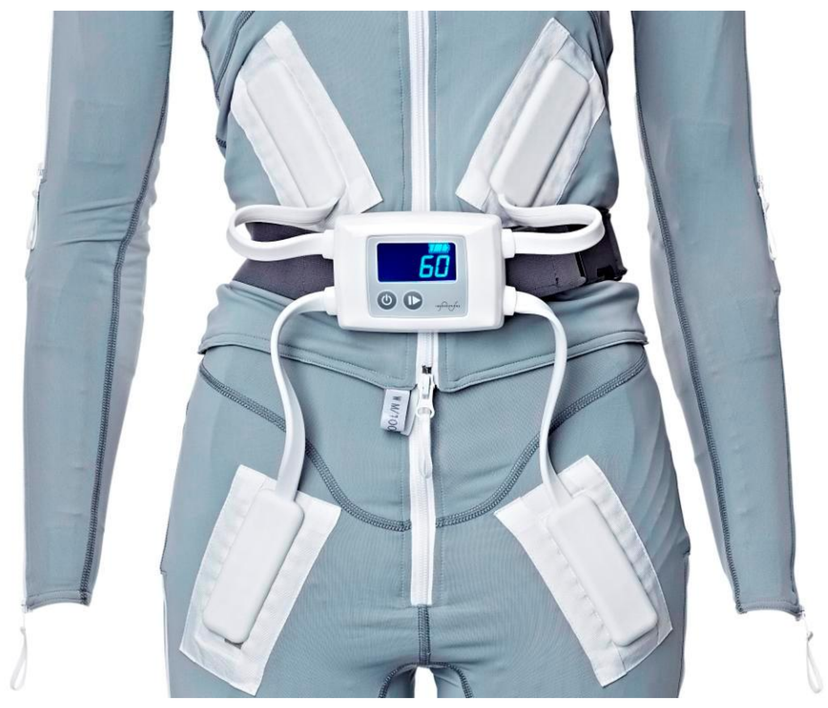

References
1. Bates, C., Baxter, P., Bonney, H., Bremner, F., Bunn, L., Carrillo Perez-Tome, M., ... & Ealing, J. (2016). Management of the ataxias towards best clinical practice. Third Edition July 2016. Ataxia UK.
2. National Institute of Health and Care Excellence (NICE): Multiple sclerosis in adults: Management Clinical Guideline (CG186) Published date: October 2014 Last updated: July 2019
3. National Institute of health and care excellence, 2017 Mollii suit for spasticity, Medtech innovation briefing [MIB100].
4. Reed, S. A case study to assess the effects of an electrical stimulation suit on the functional mobility of an individual with a traumatic brain injury. 2018 conference abstract from https://www.hobbsrehabilitation.co.uk/news/2018/a-case-study-to-assess-the-effects-of-an-electrical-stimulation-suit-on-the-functional-mobility-of-an-individual-with-a-traumatic-brain-injury
5. Schuhfried, O., Crevenna, R., Fialka-Moser, V. and Paternostro-Sluga, T. Non- invasive neuromuscular electrical stimulation in patients with central nervous system lesions; an educational review. J Rehabil Med. 2012 Feb:44 (2);99-105.