

Functional Electrical Stimulation in the Neurological Population

NeuroRehab Allied Health Network

ATSA
Melbourne, 2023

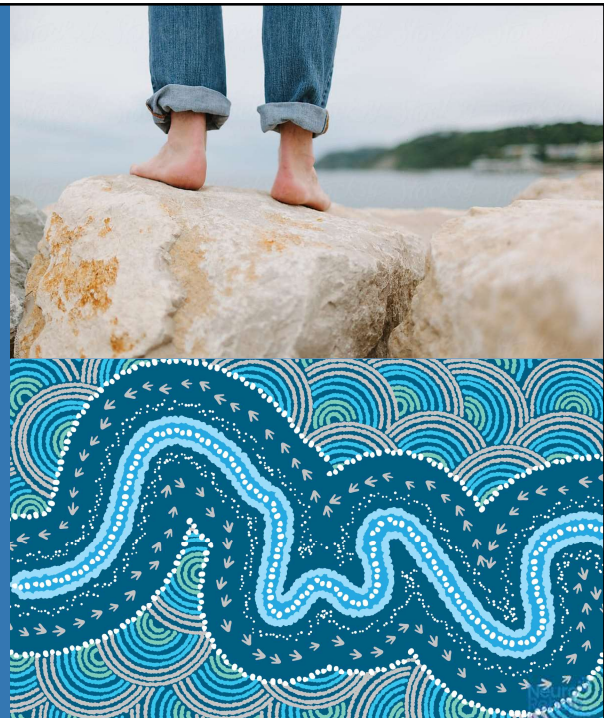


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2C0

Acknowledgement of Country

We'd like to begin by acknowledging the Traditional Owners of the land on which we meet today. We recognize their continuing connection to land, waters and culture and pay our respects to Elders past, present and emerging.



2

ZC0 Bec

Zoe Crasborn, 2023-03-23T06:32:07.033

ZC0

Presenters



Zoe Crasborn

Senior Occupational Therapist (MCRNOT)

Zoe has 8 years experience working with clients with neurological conditions. She completed her Bachelor of OT in New Zealand and completed Masters in Clinical Rehabilitation (Neurological Rehabilitation) at Flinders University. Zoe has strong interests in non-invasive brain stimulation and movement disorders.



Rebecca Grenfell

Senior Physiotherapist (MPhysio, BHSc)

Bec graduated from LaTrobe University with a Masters of Physiotherapy. She is a keen advocate for people with a disability and is Chair of the Australian Physiotherapy Association Disability Committee (Victorian branch). Bec has undertaken further research in movement disorders, publishing several papers looking at the effects of music & movement therapy in Parkinson's disease. She has also undertaken further studies in Italy, at a specialised neurological rehabilitation hospital.



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Agenda

- What is FES?
- Why do we use FES?
- Who can use FES?
- Why is FES so great in rehab?
- What a FES may program looks like
- Demonstrations



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Slide 3

ZC0 Zoe and Bec
Zoe Crasborn, 2023-03-23T06:32:17.939

Slide 4

RG0 Zoe
Rebecca Grenfell, 2023-05-10T22:59:38.537

RG0

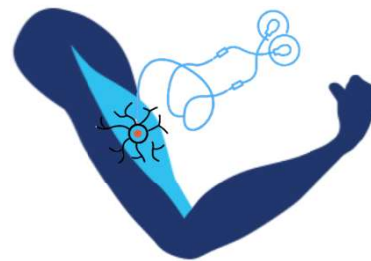
What is FES?



Functional



Electrical stimulation

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Basic principle of how does FES help to move again

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Slide 5

RG0 Zoe
Rebecca Grenfell, 2022-07-21T04:27:07.521

Slide 6

RG0 Zoe
Rebecca Grenfell, 2023-05-10T22:59:52.070

ZC1

Why we use FES?

- Promoting active use of muscles (1)
- Maintain or increase range of motion (8, 13)
- Prevent disuse atrophy (1, 3, 4)
- Improve muscle strength & performance (16, 17)
- Improve muscle endurance (17)
- Reduce contractures and tightness (2)
- Relax muscle spasms & reduce spasticity (12)
- Muscle re-education & selective muscle strengthening (14)
- Improved gait pattern & correct gait disorders (2, 14)
- Increase local blood stimulation & circulation (15)
- Improve oedema (15)
- Improve sensation
- Improve muscle quality (7, 8, 9)
- Improved bone mineral density (5, 6)
- Cardiovascular fitness (9, 10, 11)
- Habilitation – learning new activity via movement normally unobtainable (18, 19)
- Restorative therapy - CNS cell birth & CNS myelination (18, 19)
- Secondary effects of atrophy, including reduced function, increased insulin sensitivity, increased risk of type 2 diabetes & increased risk of cardiovascular disease (17)



1. Pool, D., et al. (2015)
2. Karniel, et al. (2019)
3. Barss et al. (2018)
4. Dirks et al. (2015)
5. Frotzler et al. (2008)
6. Ba'jaer et al. (2000)
7. Bajd et al. (1989)
8. Cramer et al. (2002)
9. Wheeler et al. (2002)
10. Davis et al. (2008)
11. McCormack et al. (2010)
12. Martin et al. (2012)
13. Yan et al. (2005)
14. Shin et al. (2022)
15. Barton et al. (2018)
16. Wist et al. (2016)
17. Glanz et al. (1996)
18. Schick et al. (2022)
19. Karamian et al. (2022)

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What does the evidence say?

FES addresses changes in:

- Changes in the brain & nervous system
- Changes in the spine & peripheral nervous system
- Prevents secondary complications
- Changes to function & quality of life



Schick, T. et al. Functional Electrical Stimulation in Neurorehabilitation, Synergy Effects of Technology and Therapy (2022). <https://doi.org/10.1007/978-3-030-90123-3>

Karamian, B. et al. The role of electrical stimulation for rehabilitation and regeneration after spinal cord injury. *J Orthop Traumatol* 23, 2 (2022). <https://doi.org/10.1186/s10195-021-00623-6>

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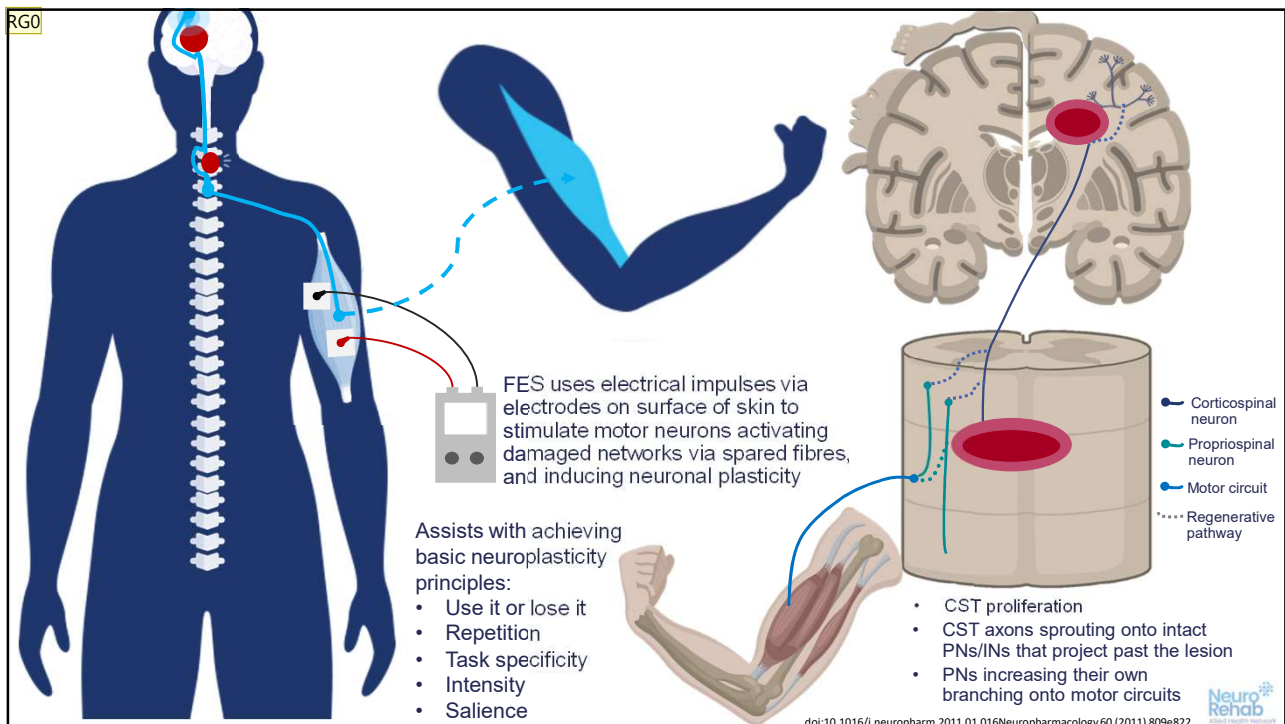
Slide 7

RG0 **Bec**
Rebecca Grenfell, 2023-05-10T23:00:04.727

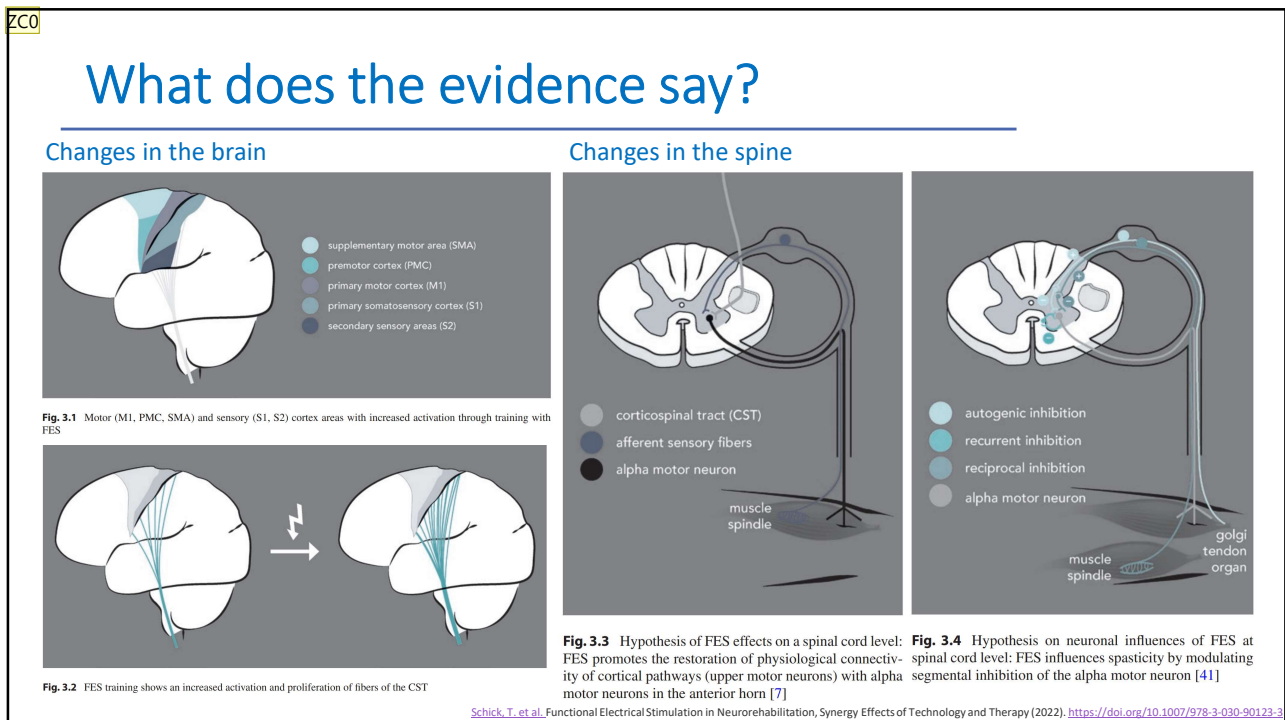
ZC1 **Bec**
Zoe Crasborn, 2023-05-10T23:00:05.266

Slide 8

RG0 **Bec**
Rebecca Grenfell, 2023-05-10T23:00:09.977



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10

Slide 9

RG0 **Bec**
Rebecca Grenfell, 2023-05-10T23:00:16.832

Slide 10

ZC0 **Bec**
Zoe Crasborn, 2023-05-19T11:05:55.850

ZC0

Who can use FES?

Most suitable for clients with upper motor lesions/deficits

- Multiple Sclerosis
- CVA or stroke
- SCI
- Acquired Brain Injury
- Traumatic Brain Injury
- Transverse Myelitis
- Cerebral Palsy
- Movement disorders



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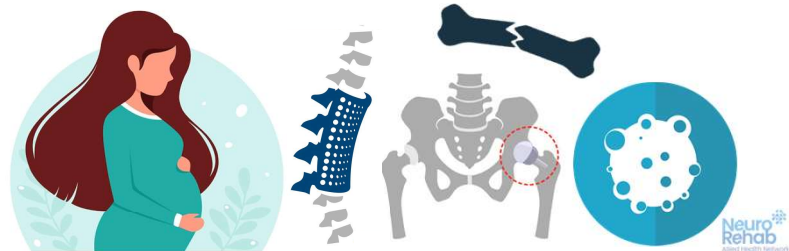
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Precautions

Contraindications

NRAH will complete a medical screening process

- | | |
|-------------------------|----------------------------|
| • Skin sensitivity | • Pregnancy |
| • Cognitive capacity | • Metal implants near stim |
| • Autonomic dysreflexia | • Unhealed fracture |
| • Joint hypermobility | • Cancerous tumor |
| • Recent Botox | |
| • Pacemakers | |



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Slide 11

ZC0 **Zoe**
Zoe Crasborn, 2023-03-23T05:58:55.804

Slide 12

RG0 **Zoe**
Rebecca Grenfell, 2023-05-10T22:59:20.095

RG0

What setting up a FES program looks like

- Health Screening
- Assessment
- Goal setting
- Setting up the unit parameters & electrodes
- Functional task practice
- Clinic based sessions for more complex movements/EMG triggered



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What setting up a FES program looks like

- Set up a home exercise program – use of the self-trigger button
- Client, carer and family training
- Progressing the activity/reviews



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Slide 13

RG0 **Bec**
Rebecca Grenfell, 2023-05-10T23:06:14.772

Slide 14

RG0 **Bec**
Rebecca Grenfell, 2023-05-10T23:06:19.570

An illustration of a man with glasses and a red shirt, sitting at a desk. Above his head is a large, light blue square containing a white brain icon. To his right is a yellow circle. In the bottom right corner, there is a clipboard with a checklist. A hand is holding a black pen, writing on the list. The clipboard has a blue border and a black clip at the top. The checklist has several lines, with the first three marked with red checkmarks. The text 'Neuro Rehab' is visible in the bottom right corner.

ZC0

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Slide 15

RG0 **Bec**
Rebecca Grenfell, 2023-05-10T23:06:24.202

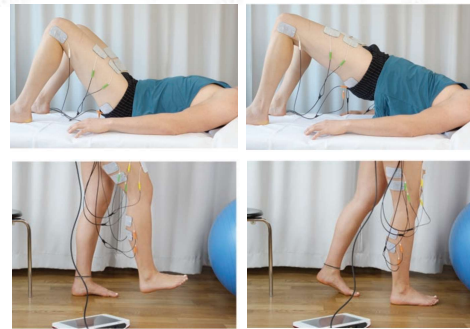
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ZC0 **Bec**
Zoe Crasborn, 2023-05-19T11:06:22.008

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Skills on how to achieve best outcomes

- Setup considerations (electrodes, parameters & environment)
- Using evidence-based fatigue management approach
- Facilitation techniques
- Allow for carry over
- Progress to more active movements / using less stimulation as the body adapts



This will be covered more comprehensively in the workshop

Schick T. et al. Functional Electrical Stimulation in Neurorehabilitation, Synergy Effects of Technology and Therapy (2022).
<https://doi.org/10.1007/978-3-030-90123-3>

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Any adverse effects

- Redness over skin
- Burn/reaction to electrode
- Discomfort
- Delayed onset muscle soreness or neuromuscular fatigue

These can be reduced by adjusting the parameters or changing electrode type

- **NOTE:**
All forms of exercise have the same risk and associated delayed onset muscle soreness and neuronuclear fatigue



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Slide 17

ZC0 Zoe
Zoe Crasborn, 2023-05-10T23:00:54.407

Slide 18


ZC0 Zoe
Zoe Crasborn, 2023-05-10T23:01:07.439




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Demonstrations

Grasp and release



Step tap



- Setup task/environment
- Palpate muscles
- Apply electrodes
- Setup parameters
- Stim muscles / switch use

Neuro Rehab
Center for NeuroRehabilitation

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Slide 19

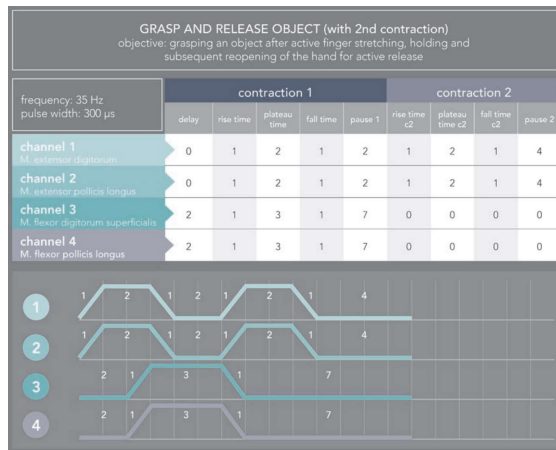
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Zoe Crasborn, 2023-05-10T23:01:19.626

Slide 20

ZC0 **Zoe**
Zoe Crasborn, 2023-04-12T07:12:50.869

Demonstrations

Grasp and release



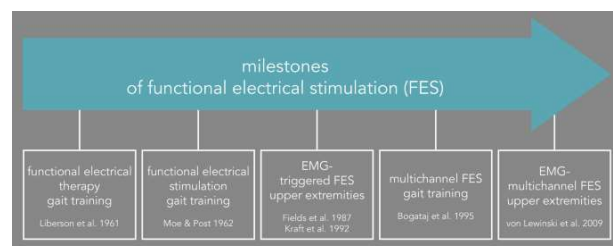
Step tap



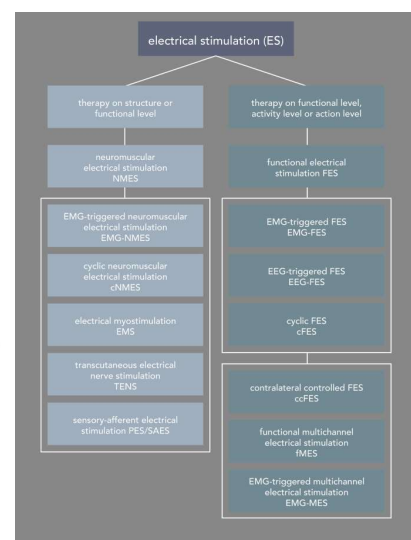
Schick, T. et al. Functional Electrical Stimulation in Neurorehabilitation, Synergy Effects of Technology and Therapy (2022). <https://doi.org/10.1007/978-3-030-90123-3>

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FES evolution & advances



Schick, T. et al. Functional Electrical Stimulation in Neurorehabilitation, Synergy Effects of Technology and Therapy (2022). <https://doi.org/10.1007/978-3-030-90123-3>



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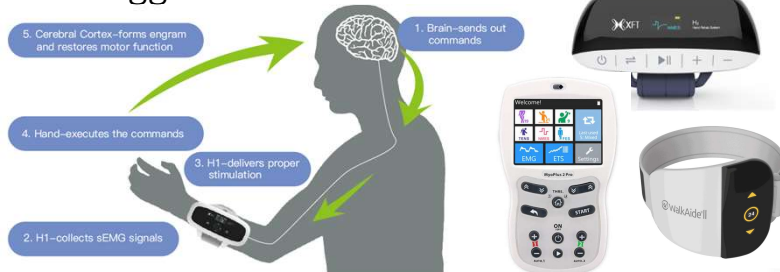
RG0 Bec

Rebecca Grenfell, 2023-05-10T23:24:14.321

RG0

FES evolution & advances

EMG triggered FES



- NRAH also offer OmniHi5 & Walkaide 2, Neurotrac MyoPlus Pro
- See these & access demonstrations NeuroRehab Allied Health Network **Exhibitor Listing – Hall 2, Stand 296**



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RG0

NRAH FES for Neuro Population Workshop 2023

Agenda

Day 1

- Introduction on FES
- Indications for use
- Precautions & contraindications
- Stimulation physiology & parameters
- Electrode placement
- Theories & mechanisms
- Current evidence
- Case studies
- Fatigue considerations
- Exercise programs

Day 2

- Explanation of devices
- Demonstration & Trouble shooting
- Breakout rooms & hands on learning
- Funding considerations
- Future directions

WORKSHOP
Functional Electrical Stimulation in the Neurological Population

Learn all about Estims in our 1.5 day workshop. Access hands on learning, combined with the theory of neuromodulation therapies. Understand stimulation physiology & maximising parameters. Explore case studies, future directions & evidence-based practice.

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Allied Health Network
SIGN UP TODAY!

27th & 28th of July 2023
<https://nrah.com.au/fes-for-neuro-population>
Online & 1-5 Canterbury St, Deer Park VIC 3023

SIGN UP HERE



<https://nrah.com.au/fes-for-neuro-population>



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Slide 23

RG0 Zoe
Rebecca Grenfell, 2023-05-15T05:53:49.638

Slide 24

RG0 Zoe
Rebecca Grenfell, 2023-05-15T05:23:41.086

Questions?



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