



## XCITE CLINICAL STATION

Combining multi-channel FES, mass practice and task-specific training in brain injury rehabilitation

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Zachary Staats, OTR/L

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## Disclosures



- > Zachary Staats, OTR/L is an employee of Restorative Therapies, Inc.
- > Xcite Clinical Station is manufactured and sold by Restorative Therapies, Inc.
- > Clinical use and application of Xcite Clinical Station will be discussed throughout this presentation.
- > In addition other products manufactured and sold by Restorative Therapies, Inc. will be referenced in this presentation (RT300, RT200, RT600).

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## Objectives



- > Identify 5 benefits of combining FES with traditional occupational therapy and physical therapy interventions in brain injury rehabilitation
- > Discuss peer-reviewed evidence to support the use of functional electrical stimulation, massed practice and task-specific training in brain injury rehabilitation
- > Identify at least three strategies for incorporating functional electrical stimulation, massed practice and task-specific training into brain injury rehabilitation
- > Describe how Xcite Clinical Station can be used to achieve functional and health-related goals in brain injury rehabilitation

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## Benefits of Electrical Stimulation

- Reduce muscle atrophy
- Improve local circulation
- Increase range of motion
- Decrease muscle spasms
- Muscle re-education

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## Functional Electrical Stimulation (FES)

Electrical stimulation of peripheral nerves to force muscles to contract during the performance of an activity with the goal of improving performance of that activity.

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## Benefits of FES

- > Facilitates practice of activities that would not otherwise occur because of paralysis
- > FES can:
  - engage attention
  - be repetitive
  - be challenging
  - provide sensory and visual feedback to the participant

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### What we're learning from the literature...

- > FES combined with OT is more effective than OT alone in the following areas:
  - UE Functional Use
  - Self-care Capability
  - UE Motor Control
- > FES combined with PT is more effective than PT alone in the following areas:
  - LE Function/Control
  - LE Muscle Mass and Strength

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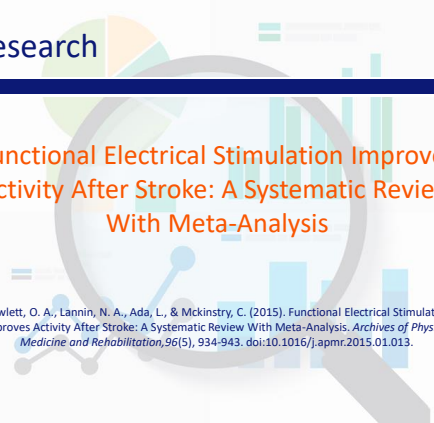
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### Research



### Functional Electrical Stimulation Improves Activity After Stroke: A Systematic Review With Meta-Analysis

Howlett, O. A., Lannin, N. A., Ada, L., & Mckinstry, C. (2015). Functional Electrical Stimulation Improves Activity After Stroke: A Systematic Review With Meta-Analysis. *Archives of Physical Medicine and Rehabilitation*, 96(5), 934-943. doi:10.1016/j.apmr.2015.01.013.

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### Inclusion Criteria

- > **Design**
  - Randomized or controlled clinical trial
  - Methodological quality of PEDro > 4 (moderate to high quality clinical trials)
- > **Participants**
  - Adults: 18+
  - Any level of disability, any level of chronicity
  - At least 80% of participants had to have had a stroke; remaining 20% had to have stroke-like condition
- > **Intervention**
  - Primary experimental intervention was FES (electrical stimulation producing muscle contraction delivered via surface electrodes during practice of an upper- or lower-limb activity)
- > **Outcome Measures**
  - Measures of activity limitation without electrical stimulation
- > **Comparisons**
  - FES vs. nothing/placebo
  - FES vs. same activity training only

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## Included Trials

- > 18 trials (19 comparisons)
- > 485 total participants
  - Mean age range: 48 to 70
  - 52% men
- > 9 comparisons against no FES/placebo
- > 10 comparisons against training alone
- > 61% of the trials were carried out greater than 6 months post stroke

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## Outcome Measures

- > Lower-limb activity:
  - Walking speed (m/s)
- > Upper-limb activity:
  - Motor Assessment Scale
  - Arm Motor Ability Test
  - Nine-hole Peg Test
  - Action Research Arm Test
  - Box and Block Test
  - Upper Extremity Function Test
  - Wolf Motor Function Test

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## Findings

- > 18 out of 4,921 trials met inclusion criteria
- > FES had a moderate effect on activity (standardized mean difference [SMD], .40; 95% confidence interval [CI], .09–.72) compared with no or placebo intervention.
- > FES had a moderate effect on activity (SMD, .56; 95% CI, .29–.92) compared with training alone.
- > When subgroup analyses were performed, FES had a large effect on upper-limb activity (SMD, 0.69; 95% CI, 0.33–1.05) and a small effect on walking speed (mean difference, .08m/s; 95% CI, .02–.15) compared with control groups.

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## Conclusion

FES appears to moderately improve activity compared with both no intervention and training alone. These findings suggest that FES should be used in stroke rehabilitation to improve the ability to perform activities.

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## Putting It Into Practice

- > Portable NMES units
- > Wearable FES systems
- > FES Ergometry
- > Free-standing, multi-system stimulators

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## Portable NMES

- > Usually 2 or 4 channels
- > Parameters vary between brands
  - Amplitude
  - Pulse Width
  - Frequency
  - Wave Form
- > Channels can fire synchronously or asynchronously to allow for pairing with functional and therapeutic activities.

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## Wearable FES Systems

- > Bioness
  - L300 Go for foot drop
  - L300 for foot drop
  - L300 Plus for foot drop plus thigh weakness
  - H200 for hand paralysis



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## FES Ergometry

- > Electrical stimulation is delivered to peripheral nerves in concert with crank rotation (or the motor)
- > Muscles contract in response to stimulation (FES evoked) or in combination with volition
- > Ergometer provides precisely controlled assistance or resistance levels
- > FES ergometry replaces or augments volitional movement to allow a neurologically impaired patient to undertake *progressive resistance exercise* for therapeutic outcomes

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## FES Ergometry



RehaMove FES Cycling System  
by Hasomed and Motomed



Myocycle  
by Myolyn

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## RTI's Product Line – FES Powered Systems



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## Free-standing, multi-channel stimulators



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Xcite Clinical Station: Clinical Application

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### Choose a Library



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### Choose an Activity



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### Review Activity Details



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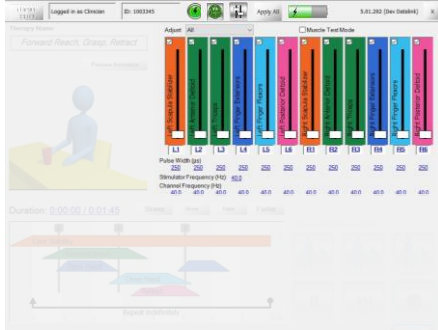
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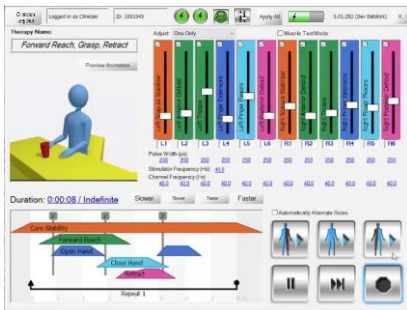


## Customizing an Xcite Activity



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## Xcite Activity in Action



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## References

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