Functional Electrical Stimulation and Cycling in Stroke Rehabilitation: A Systematic Review
S. Babiarz, SPT, K. Haynes, SPT, M. Mazich, SPT, H. Zhang, SPT, A. Goode, PT, DPT, PhD, R. Clendaniel, PT, PhD

Background

Stroke is a leading cause of serious long-term disability and a source of significant financial burden in the United States. Hemiparesis is one of the most common lasting impairments following a stroke, which can result in severe deficits in gait and balance and consequently, negatively impact functional capacity and quality of life. Current strategies for stroke rehabilitation include treadmill training, cycling, and functional electrical stimulation (FES). However, the effects of combined cycling and FES as a treatment strategy for stroke rehabilitation remains largely unexplored.

Purpose

To conduct a systematic review on current evidence for the effect of cycling with FES on gait and balance in subacute stroke rehabilitation.

Methods

● Systematic Review performed following PRISMA guidelines.
● Electronic databases included Pubmed, CINAHL, Embase, and Cochrane

Figure 1. Search Strategy

Table 1. Inclusion and Exclusion Criteria

<table>
<thead>
<tr>
<th>INCLUDED</th>
<th>EXCLUDED</th>
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<tbody>
<tr>
<td>Subacute or chronic stroke patients</td>
<td>Acute stroke patients</td>
</tr>
<tr>
<td>Adult (≥18 y.o.)</td>
<td>Non-randomized control trial design</td>
</tr>
<tr>
<td>Intervention included lower extremity cycling with electrical stimulation</td>
<td>Outcome measures not including gait or balance</td>
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<tr>
<td>At least one primary outcome measure focusing on gait or balance</td>
<td>Not available in English</td>
</tr>
<tr>
<td>Available in English</td>
<td>Full-text not available</td>
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</tbody>
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Results

- FES + Cycling improves some aspects of gait and balance in subacute stroke patients with hemiparesis.
- Whether FES + Cycling is more effective than Cycling without FES is unclear
- Gait velocity is increased post FES + Cycling intervention.
- Improvements are not significantly greater than controls
- Balance was improved post FES + Cycling intervention as demonstrated by increased scores on Berg Balance Scale and Trunk Control Test.
- Improvements were not significantly greater than controls.
- Following FES + Cycling, subjects improved scores on the Motricity Index (MI) leg subscale.
- Some studies found significant differences in MI scores between treatment groups while others did not.
- Limitations:
  - Inclusion of only full-text articles printed in English
  - Comparison complicated by the use of varied outcome measures

Clinical Relevance

- Gait velocity and balance are often used as indicators for safe community ambulation, a priority for many stroke survivors.
- Recovery in gait and balance can reduce fall risk in stroke survivors, which can prevent secondary injuries and minimize additional burden of disease.
- Lower extremity cycling in conjunction with electrical stimulation is an effective physical therapy intervention in the recovery of gait and balance following stroke.
- The use of FES + Cycling may accelerate the rate of recovery for patients with hemiparesis, and functional gains are maintained during follow-up assessments.

Acknowledgements / References

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