The Effect of Multi-Directional Walking Training with Treadmill on Gait Outcomes and Balance in Subacute Post-stroke Hemiplegic Patients: A Preliminary Analysis

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To examine the effects of MULTI-DIRECTIONAL walking training on GAIT outcomes and BALANCE in hemiplegic patients with subacute stroke.

**STROKE**
- Muscles weakness & synergistic movement
- ↓ Postural control & balance
- Gait dysfunction & risk of fall
- ↓ Functional ambulation

**In stroke patients:**
- **Backward walking after 3 weeks** (Yang *et al*, 2005)
  - ↑ walking speed, stride length & symmetry index
- **Lateral walking after 3 weeks** (Kim *et al*, 2017)
  - ↑ gait velocity, stride length & gait symmetry

**Objective**

**GAIT outcomes**
- Stride length
- Cadence
- Gait speed
- Gait symmetry ratio

**Balance outcomes**
- Limits of Stability (LOS)
  - Reaction time
  - Movement velocity
  - Maximum COG excursion
  - Directional control
- Sensory Organization Test (SOT)
  - Composite score
Methodology

Inclusion Criteria:
• Stroke within 3 months
• *MFAC Class 4 or 5
• Able to walk for 15 mins

Exclusion Criteria:
• Had major operation
• Recurrent stroke
• Adverse musculoskeletal/ neurological/ cardiac diseases

Patients recruited in Geriatric Day Hospital of PMH

Randomization

**Intervention Group**
Forward, backward and lateral (right & left) treadmill walking for 15 minutes + Conventional therapy

12 sessions

**T1- Assessment**

**T2- Reassessment**

**Active Control group**
Forward treadmill walking for 15 minutes + Conventional therapy

12 sessions

**T1- Assessment**

**T2- Reassessment**

* MFAC: Modified Functional Ambulatory Classification
Class IV: Assisted walker, Class V: Supervised Walker
Results

Demographics of subjects (N=18)
Period: March 2017 to Dec 2018

<table>
<thead>
<tr>
<th></th>
<th>Intervention: 9, Control: 9</th>
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<tbody>
<tr>
<td>No. of subjects</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Female: 11, Male: 7</td>
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<tr>
<td>Age (Years)</td>
<td>71.7 ± 8.1</td>
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<tr>
<td>Type of stroke</td>
<td>Ischemic: 15, Hemorrhagic: 3</td>
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<tr>
<td>Weeks post stroke</td>
<td>7.4 ± 3.7</td>
</tr>
<tr>
<td>MFAC</td>
<td>Class IV: 4, Class V: 14</td>
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</tbody>
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Sensory Organization Test (SOT)  | T₁   | T₂   | P value |
--------------------------------|------|------|---------|
Composite Score                | 55.7 | 64.9 | 0.001   |

Limits of Stability (LOS)      | T₁   | T₂   | P value |
--------------------------------|------|------|---------|
Reaction time (sec)             | 1.00 | 1.10 | 0.39    |
Movement Velocity (deg/sec)     | 1.96 | 2.41 | 0.06    |
Max Excursion (%)               | 55.9 | 64.3 | 0.17    |
Directional control (%)         | 56.3 | 60.9 | 0.39    |

Gait parameters                | T₁   | T₂   | P value |
--------------------------------|------|------|---------|
Stride length (m)              | 1.02 | 1.06 | 0.42    |
Cadence (step/min)             | 67.5 | 70.7 | 0.4     |
Gait speed (m/sec)             | 0.56 | 0.58 | 0.53    |
Gait symmetry ratio            | 1.08 | 1.07 | 0.97    |

Table.1 Means of balance outcomes

Table.2 Means of gait outcomes

Composite score in SOT

2x2 (Group x time) ANOVA test: No Significant difference (ps>0.05)
• Both **forward and multi-directional walking group** appear to improve the balance and gait parameters in stroke patients

• **Significant difference** in composite score in **Sensory Organization Test** after training in both groups

• Further study and analysis on the effects of the walking direction for gait outcomes and balance of stroke patients will be carried out.

**References:**