Executive Summary

Evidence based review of stroke rehabilitation (EBRSR) 19TH Edition

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How to read the evidence tables: .................................................................2
1. Brain Reorganization, Recovery and Organized Care ..................................................4
   1a. Organized Stroke Care – Interdisciplinary Care/Team ........................................6
   1b. Elements of Stroke Rehabilitation ......................................................................11
   1c. Outpatient Therapy .............................................................................................13
2. Lower Extremity Motor and Mobility Rehabilitation .....................................................16
3. Hemiplegic Upper Extremity Motor Rehabilitation .......................................................35
4. Rehabilitation of Cognitive Impairment Post-Stroke .................................................51
   4a. Rehabilitation of Perceptual Disorders Post-Stroke ..............................................64
   4b. Rehabilitation of Aphasia Post-stroke ..................................................................73
5. Medical Complications Post-Stroke ...........................................................................83
   5a. Dysphagia and Aspiration ....................................................................................83
   5b. Nutrition Post-Stroke ..........................................................................................88
   5c. Venous Thromboembolism Post Stroke ................................................................88
   5d. Post-Stroke Seizures ............................................................................................89
   5e. Thalamic/Central Pain States Post Stroke (CPSP) ..............................................90
   5f. Fatigue ..................................................................................................................92
6. Depression and Community Reintegration Post-stroke ..............................................94
   6a. Depression ..........................................................................................................94
   6b. Community Reintegration Post Stroke .................................................................100
How to read the evidence tables:

The results of each randomized controlled trial (RCT) are split by outcome measure, and findings are presented for those studies comparing an intervention to conventional therapy.

Red statements indicate that the majority of study results when grouped together show no significant differences between intervention and comparator groups, pre to post intervention.

Green statements indicate that the majority of study results when grouped together show a significant between group difference in favour of the intervention group, pre to post intervention.

Yellow statements indicate that the study results when grouped together are mixed or conflicting, some studies show benefit in favour of the intervention group, while others show no difference between groups, pre to post intervention.
Evidence statements are based upon a **Modified Sackett Scale**:

<table>
<thead>
<tr>
<th>Level of evidence</th>
<th>Study design</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1a</td>
<td>Randomized controlled trial (RCT)</td>
<td>More than 1 higher quality RCT (PEDro score ≥6).</td>
</tr>
<tr>
<td>Level 1b</td>
<td>RCT</td>
<td>1 higher quality RCT (PEDro score ≥6).</td>
</tr>
<tr>
<td>Level 2</td>
<td>RCT</td>
<td>Lower quality RCT (PEDro score &lt;6).</td>
</tr>
<tr>
<td></td>
<td>Prospective controlled trial (PCT)</td>
<td>PCT (not randomized).</td>
</tr>
<tr>
<td></td>
<td>Cohort</td>
<td>Prospective longitudinal study using at least 2 similar groups with one exposed to a particular condition.</td>
</tr>
<tr>
<td>Level 3</td>
<td>Case Control</td>
<td>A retrospective study comparing conditions, including historical cohorts.</td>
</tr>
<tr>
<td>Level 4</td>
<td>Pre-Post</td>
<td>A prospective trial with a baseline measure, intervention, and a post-test using a single group of subjects.</td>
</tr>
<tr>
<td></td>
<td>Post-test</td>
<td>A prospective post-test with two or more groups (intervention followed by post-test and no re-test or baseline measurement) using a single group of subjects</td>
</tr>
<tr>
<td></td>
<td>Case Series</td>
<td>A retrospective study usually collecting variables from a chart review.</td>
</tr>
<tr>
<td>Level 5</td>
<td>Observational</td>
<td>Study using cross-sectional analysis to interpret relations. Expert opinion without explicit critical appraisal, or based on physiology, biomechanics or &quot;first principles&quot;.</td>
</tr>
<tr>
<td></td>
<td>Case Report</td>
<td>Pre-post or case series involving one subject.</td>
</tr>
</tbody>
</table>
# Measures of Functional Outcomes

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke severity</td>
<td>These outcome measures assessed the severity of one’s stroke through a</td>
<td>• Canadian Neurological Scale (CNS)</td>
</tr>
<tr>
<td></td>
<td>global assessment of a multitude of deficits a stroke survivor may</td>
<td>• Modified Rankin Scale (MRS)</td>
</tr>
<tr>
<td></td>
<td>experience.</td>
<td>• National Institutes of Health Stroke Scale (NIHSS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Oxford Handicap Scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Scandinavian Stroke Scale (SSS)</td>
</tr>
<tr>
<td>Activities of Daily Living</td>
<td>These outcome measures assessed performance and level of independence in</td>
<td>• Barthel Index (BI)</td>
</tr>
<tr>
<td></td>
<td>various everyday tasks.</td>
<td>• Canadian Occupational Performance Measure (COPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Frenchay Activities Index (FAI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Functional Independence Measure (FIM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Motor Assessment Scale (MAS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Nottingham Extended Activities of Daily Living</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rivermead Activities of Daily Living</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Stroke Impact Scale (SIS)</td>
</tr>
<tr>
<td>Motor function</td>
<td>These outcome measures covered gross motor movements and a series of</td>
<td>• Action Research Arm Test (ARAT)</td>
</tr>
<tr>
<td></td>
<td>general impairment measures when using the upper extremities.</td>
<td>• Fugl-Meyer Assessment (FMA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Nine Hole Peg Test (9HPT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wolf Motor Function Test (WMFT)</td>
</tr>
<tr>
<td>Ambulation and mobility</td>
<td>These outcomes measures assessed ambulatory abilities during distance-</td>
<td>• 10-Metre Walk Test</td>
</tr>
<tr>
<td></td>
<td>based or timed walking exercises commonly.</td>
<td>• 6-Minute Walk Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Functional Ambulation Category</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Gait Speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Walking Speed (WS)</td>
</tr>
<tr>
<td>Balance</td>
<td>These outcome measures assessed postural stability, and both static and</td>
<td>• Berg Balance Scale</td>
</tr>
<tr>
<td></td>
<td>dynamic balance.</td>
<td>• Activities-Specific Balance Confidence Scale</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Timed Up &amp; Go Test (TUG)</td>
</tr>
<tr>
<td>Cognition</td>
<td>These outcome measures assessed an individual’s overall cognitive</td>
<td>• Mini Mental Status Examination (MMSE)</td>
</tr>
<tr>
<td></td>
<td>processing capability factoring in multiple domains.</td>
<td></td>
</tr>
<tr>
<td>Speech and language</td>
<td>These outcome measures assessed speech and language outcome measures.</td>
<td>• Frenchay Aphasia Screening Test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Functional Communication Profile</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Western Aphasia Battery</td>
</tr>
<tr>
<td>Spasticity</td>
<td>These outcome measures assessed changes in muscle tone, stiffness, and</td>
<td>• Modified Ashworth Scale (MAS)</td>
</tr>
<tr>
<td></td>
<td>contractures.</td>
<td></td>
</tr>
</tbody>
</table>
### Mental Health

These outcome measures assess psychiatric dysfunction in a number of mental health related dimensions.
- General Health Questionnaire
- Beck Depression Inventory (BDI)
- Geriatric Depression Scale (GDS)
- Hospital Anxiety and Depression Scale (HADS)
- Montgomery-Asberg Depression Rating Scale

### Quality of Life

These outcome measures assessed an individual’s overall quality of life and their perception of it, generally compared to their preinjury status.
- EuroQol Quality of Life (EQ-5D)
- Life Satisfaction Index
- Medical Outcome Trusts’ Short Form Health Survey (SF-36 or SF-12)
- Nottingham Health Profile
- Sickness Impact Profile

### Community Reintegration

These outcome measures assess an individual’s ability to reintegrate into their community and social behaviours.
- Reintegration to Normal Living Index (RNLI)

### Caregiver Burden

These outcome measures assess the level of burden for caretakers of stroke survivors.
- Caregiver Strain Index

### Length of stay

Assessed how long a patient was admitted to a stroke unit or outpatient service.

### Mortality

A measure of mortality.
1a. Organized Stroke Care – Interdisciplinary Care/Team

<table>
<thead>
<tr>
<th>Study (PEDro Score)</th>
<th>Acute Stroke Care (n=7)</th>
<th>Combined Acute/Rehabilitation (n=7)</th>
<th>Subacute Rehabilitation (n=7)</th>
<th>Mobile Stroke Teams (n=4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silva et al. (2005)</td>
<td>Ma et al. (2004a)</td>
<td>Yagura et al. (2005)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Langhorne et al. (2010b)</td>
<td>Chan et al. (2014)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Efficacy of Stroke Rehabilitation Organized Care

Acute Rehabilitation Units

**Acute Continuous Monitoring Compared to an Alternative Intervention**

<table>
<thead>
<tr>
<th>Study (PEDro Score)</th>
<th>Mortality</th>
<th>Dependency</th>
<th>Length of Stay</th>
<th>Institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silva et al. (2005) (3)</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td></td>
</tr>
<tr>
<td>Cavallini et al. (2003) (5)</td>
<td>❌</td>
<td>❌</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Sulter et al. (2003) (7)</td>
<td>✓</td>
<td>❌</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Langhorne et al. (2010) (8)</td>
<td>✓</td>
<td>✓</td>
<td>❌</td>
<td></td>
</tr>
</tbody>
</table>

**Acute Intensive Rehabilitation Compared to Alternative Intervention**

<table>
<thead>
<tr>
<th>Study (PEDro Score)</th>
<th>Mortality</th>
<th>Dependency</th>
<th>Length of Stay</th>
<th>Institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Di Lauro et al. (2003) (7)</td>
<td></td>
<td>❌</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Langhorne et al. (2010a) (8)</td>
<td>✓</td>
<td>✓</td>
<td>❌</td>
<td></td>
</tr>
</tbody>
</table>

**Acute Stroke Unit Care Compared to General Medical Ward Care**

<table>
<thead>
<tr>
<th>Study (PEDro Score)</th>
<th>Mortality</th>
<th>Dependency</th>
<th>Length of Stay</th>
<th>Institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ronning &amp; Guldvog (1998b) (6)</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Cabral et al. (2003) (5)</td>
<td></td>
<td>❌</td>
<td>❌</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions

1. Acute stroke care, characterized by intensive monitoring and treatment for medical complications, is associated with reductions in combined death/dependency and the need for institutionalization, but not reductions in mortality, length of hospital stay, or functional disability.

Combined Acute and Rehabilitation Units

<table>
<thead>
<tr>
<th>Study (PEDro Score)</th>
<th>Mortality</th>
<th>Dependency</th>
<th>Length of Stay</th>
<th>Institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garraway et al. (1980) (5)</td>
<td>✓</td>
<td>✓</td>
<td>✓ *</td>
<td></td>
</tr>
<tr>
<td>Sivenius et al. (1985) (6)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Indredavik et al. (1991) (7)</td>
<td>✓ (6 weeks)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Indredavik et al. (1997) (7)</td>
<td>✓ (52 weeks)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Indredavik et al. (1999a) (7)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✗</td>
</tr>
<tr>
<td>Kaste et al. (1995a) (8)</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Fagerberg et al. (2000) (8)</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Ma et al. (2004b) (5)</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chan et al. (2014) (9)</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

* No test of statistical significance was performed

Conclusions

1. Interdisciplinary combined acute and rehabilitation stroke units reduce combined death/dependency, need for institutionalization, and length of hospital stay, but not overall mortality, when compared to general medical wards.

Key Studies Combined Acute and Rehabilitation Unit

- Indredavik B, Bakke F, Slordahl SA, Rokseth R, Haheim LL. Treatment in a combined acute and rehabilitation stroke unit: which aspects are most important? Stroke 1999b;30:917-23.
Brain Reorganization, Recovery and Organized Care


Subacute Rehabilitation

Stroke Rehabilitation Units Compared to General Medical Ward

<table>
<thead>
<tr>
<th>Study (PEDro Score)</th>
<th>Mortality</th>
<th>Dependency</th>
<th>Length of Stay</th>
<th>Institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peacock et al. (1972) (5)</td>
<td>🛠️</td>
<td>🕵️️</td>
<td>🕒</td>
<td>🏠</td>
</tr>
<tr>
<td>Stevens et al. (1984) (6)</td>
<td>🛠️</td>
<td>🕵️️</td>
<td>🕒</td>
<td>🏠</td>
</tr>
<tr>
<td>Kalra et al. (1994a, 1994b, 1993) (5)</td>
<td>🚧 (Severe)</td>
<td>🚧 (Moderate)</td>
<td>🚧 (Moderate/Severe)</td>
<td>🚧 (Moderate)</td>
</tr>
<tr>
<td>Kalra &amp; Eade (1995) (5)</td>
<td>🚧</td>
<td>🚧</td>
<td>🚧</td>
<td>🚧</td>
</tr>
<tr>
<td>Juby et al. (1996) (6)</td>
<td>🛠️</td>
<td>🕵️️</td>
<td>🕒</td>
<td>🏠</td>
</tr>
<tr>
<td>Drummond et al. (2005) (6)</td>
<td>🛠️ (at 10yr)</td>
<td>🕵️️</td>
<td>🕒</td>
<td>🏠</td>
</tr>
<tr>
<td>Yagura et al. (2005) (6)</td>
<td>🛠️</td>
<td>🕵️️</td>
<td>🕒</td>
<td>🏠</td>
</tr>
</tbody>
</table>

Conclusions

1. **Interdisciplinary specialized subacute stroke rehabilitation is associated with reduced mortality and combined death/dependency, but not the need for institutionalization or length of hospital stay, when compared to general rehabilitation.**

2. **Subgroups of patients will benefit from subacute rehabilitation in different ways: patients with more severe strokes experience reduced mortality; those with moderate strokes experience improved functional outcomes; and those with mild strokes do not improve to a greater extent compared with standard care.**

Key Studies for Subacute Rehabilitation

Mobile Stroke Teams

Mobile Stroke Team Compared to Conventional Medical Management

<table>
<thead>
<tr>
<th>Study (PEDro Score)</th>
<th>Mortality</th>
<th>Dependency</th>
<th>Length of Stay</th>
<th>Institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hamrin (1982) (4)</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Wood Dauphinee et al. (1984b) (6)</td>
<td>✓ (Males)</td>
<td>✓ (Males)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kalra et al. (2000, 2005) (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dey et al. (2005) (8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion
1. Discrete care elements associated with stroke units do not provide the same benefit when provided by a mobile stroke team.

Meta-Analyses of Combined Results

Mortality

Pooled Analysis for Mortality

<table>
<thead>
<tr>
<th>Model of Care</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute stroke care</td>
<td>0.80 (0.61, 1.03)</td>
</tr>
<tr>
<td>Combined acute and subacute stroke rehabilitation</td>
<td>0.88 (0.66, 1.16)</td>
</tr>
<tr>
<td>Subacute rehabilitation</td>
<td>0.60 (0.44, 0.81)</td>
</tr>
<tr>
<td>Mobile stroke team</td>
<td>1.13 (0.83, 1.55)</td>
</tr>
<tr>
<td>Overall</td>
<td>0.83 (0.71, 0.95)</td>
</tr>
</tbody>
</table>

Death or Dependency

Pooled Analysis for Death or Dependency

<table>
<thead>
<tr>
<th>Model of Care</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute stroke care</td>
<td>0.70 (0.56, 0.86)</td>
</tr>
<tr>
<td>Combined acute and subacute stroke rehabilitation</td>
<td>0.56 (0.44, 0.71)</td>
</tr>
<tr>
<td>Subacute rehabilitation</td>
<td>0.63 (0.48, 0.83)</td>
</tr>
<tr>
<td>Mobile stroke team</td>
<td>1.00 (0.73, 1.38)</td>
</tr>
<tr>
<td>Overall</td>
<td>0.680.60-0.77</td>
</tr>
</tbody>
</table>
Conclusions
1. All models of care, except for mobile stroke teams, were associated with statistically significant reductions in the odds of death or dependency.
2. The pooled result was similar to that obtained by the Stroke Unit Trialists’ Collaboration (2013) for the same outcome (OR 0.79, 95% CI 0.68 to 0.90).

Institutionalization

Pooled Analysis for Need for Institutionalization

<table>
<thead>
<tr>
<th>Model of Care</th>
<th>Initial Analysis OR (95% CI)</th>
<th>Modified Analysis OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute stroke care</td>
<td>0.53 (0.38, 0.74)</td>
<td>0.95 (0.60, 1.52)</td>
</tr>
<tr>
<td>Combined acute and subacute stroke rehabilitation</td>
<td>0.53 (0.31, 0.89)</td>
<td>0.53 (0.31, 0.89)</td>
</tr>
<tr>
<td>Subacute rehabilitation</td>
<td>0.84 (0.62, 1.14)</td>
<td>0.84 (0.62, 1.14)</td>
</tr>
<tr>
<td>Mobile stroke team</td>
<td>1.23 (0.70, 2.17)</td>
<td>1.23 (0.70, 2.17)</td>
</tr>
<tr>
<td>Overall</td>
<td>0.70 (0.58, 0.85)</td>
<td>0.84 (0.68, 1.04)</td>
</tr>
</tbody>
</table>

Length of Stay

Pooled Analysis for Length of Stay

<table>
<thead>
<tr>
<th>Model of Care</th>
<th>Weighted Mean Difference (95% CI) (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute stroke care</td>
<td>-2.9 (-10.0, 4.3)</td>
</tr>
<tr>
<td>Combined acute and subacute stroke rehabilitation</td>
<td>-17.5 (-30, -4.5)</td>
</tr>
<tr>
<td>Subacute rehabilitation</td>
<td>-13.2 (-48.3, 21.9)</td>
</tr>
<tr>
<td>Mobile stroke team</td>
<td>13.55 (0.3, 26.8)</td>
</tr>
<tr>
<td>Overall</td>
<td>-7.04 (-13.21, -0.9)</td>
</tr>
</tbody>
</table>

Summary

Summary of Results: Effectiveness of Stroke Care

<table>
<thead>
<tr>
<th>Model of Care</th>
<th>Mortality</th>
<th>Dependency</th>
<th>Length of Stay</th>
<th>Institutionalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>✗</td>
<td></td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>Combined</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Subacute</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Mobile</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Overall</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Brain Reorganization, Recovery and Organized Care

Conclusion
1. Specialized stroke care can improve multiple outcomes including mortality, dependency, need for institutionalization, and length of hospital stay.

1b. Elements of Stroke Rehabilitation

Earlier Therapy is Better

Conclusion
1. Early mobilization may be beneficial for improving motor function and ambulation and mobility, but not stroke severity, length of stay or mortality.
2. The evidence is mixed concerning activities of daily living.

Key Studies for Earlier Therapy

• Bernhardt J. Efficacy and safety of very early mobilisation within 24 h of stroke onset (AVERT): A randomised controlled trial. The Lancet (2015);386:46-55.

Intensity of Physiotherapy and Occupational Therapy Post Stroke

Conclusions
1. Greater intensities of physiotherapy and occupational therapy appeared to result in improved functional outcomes.
2. There are significant problems delivering an optimal dose of therapy intensities in actual clinical practice.

Key Studies for Intensity of Physiotherapy and Occupational Therapy Post Stroke

Brain Reorganization, Recovery and Organized Care


Follow-up:

Intensity of Aphasia Therapy Post Stroke

**Conclusion**

1. For patients who can tolerate it, more intensive speech and language therapy appears to result in improved outcomes.

**Key Studies for Intensity of Aphasia Therapy**


Weekend Therapy and Other Innovative Approaches to Increase Therapy Intensity

**Conclusion**

1. The evidence on weekend therapy providing better outcomes on 5 day per week therapy is mixed.

**Key Studies for Weekend Therapy**


Caregiver-Mediated Intensity of Therapy

**Conclusions**

1. There is strong evidence that additional caregiver-supported therapy results in improved functional outcomes compared to conventional therapy alone.
2. Greater intensities of therapy with caregiver support may result in improved functional outcomes.
3. More research is needed to strengthen the current evidence.
Brain Reorganization, Recovery and Organized Care

Key Studies for Caregiver Mediated Intensity of Therapy


Task Specific Therapy

Conclusions

1. Task-specific therapy allows for the best recovery.
2. NDT or the Bobath restorative approach results in longer lengths of stay and offers no advantage over other therapy approaches.
3. Task-specific therapeutic approaches allow for the best recovery with improved FIM scores, improved discharge destination and shorter lengths of stay.

Key Articles for Task-Specific Therapy

- Langhammer B, Stanghelle JK. Bobath or Motor Relearning Programme? A follow-up one and four years post stroke. Clinical Rehabilitation 2003; 17:731-734
- Van Vliet PM, Lincoln NB, Foxall A. Comparison of Bobath based and movement science-based treatment for stroke: a randomized controlled trial. J Neurol Neurosurg Psychiatry (2005); 76:503-508.

1c. Outpatient Therapy

Outpatient Stroke Rehab Therapy

Conclusion

1. The evidence is mixed as to whether home- or clinic-based therapy appeared to improve outcomes during outpatient rehabilitation.

Key Studies for Outpatient Stroke Rehab Therapy


Follow-up:

Brain Reorganization, Recovery and Organized Care


Hospital vs. Home-Based Outpatient Therapies

**Conclusion**

1. **There appears to be no difference in efficacy between home or hospital-based therapy during outpatient rehabilitation.**

**Key Studies for Hospital vs Home-Based Outpatient Therapies**

  
  Follow-up:

**Early Supported Discharge (ESD)**

**Outcome at End Of Scheduled Follow-Up (ESD Vs. Conventional Care) Stratified By Level Of Service Provision (More Coordinated To Less Coordinated) (Langhorne et al. 2017)**

<table>
<thead>
<tr>
<th>Death or dependency</th>
<th>Significant Result</th>
<th>Odds Ratio (OR) and 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall result</td>
<td>Yes</td>
<td>0.80 (0.67 to 0.95)</td>
</tr>
<tr>
<td>ESD team with coordination and delivery</td>
<td>Yes</td>
<td>0.67 (0.52 to 0.87)</td>
</tr>
<tr>
<td>ESD team coordination</td>
<td>Yes</td>
<td>0.82 (0.61 to 1.10)</td>
</tr>
<tr>
<td>no ESD team coordination</td>
<td>No</td>
<td>1.11 (0.75 to 1.62)</td>
</tr>
</tbody>
</table>
Brain Reorganization, Recovery and Organized Care

Visual picture of above Table showing the three types of ESD formats and benefits.

Conclusions
1. Early supported discharge may not be efficacious compared to conventional care for outpatient stroke rehabilitation.
2. Early supported discharge with home therapy may not be more beneficial than early supported discharge with day clinic therapy for ambulation or balance.

Key Studies for Early Supported Discharge
### Lower Extremity Assessment and Outcome Measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
</table>
| **Motor Function**        | These outcome measures covered gross motor movements and a series of general impairment measures when using the lower extremities. | • Brunnstrom Recovery Stages  
• Chedoke McMaster Stroke Assessment Scale  
• Fugl-Meyer Assessment  
• Rivermead Motor Assessment |
| **Activities of Daily Living** | These outcome measures assessed performance and level of independence in various everyday tasks. | • Barthel Index and Modified Barthel Index  
• Frenchay Activities Index  
• Functional Independence Measure  
• Motor Assessment Scale  
• Stroke Impact Scale |
| **Spasticity**            | These outcome measures assessed changes in muscle tone, stiffness, and contractures. | • Modified Ashworth Scale  
• Modified Tardieu Scale |
| **Range of Motion**       | These outcome measures assessed a patient’s ability to freely move their lower extremity through flexion, abduction, and subluxation movements for instance, both passively and actively. | • Active ROM  
• Passive ROM |
| **Proprioception**        | These outcome measures assessed sensory awareness about one’s body and the location of limbs. | • Joint Position Sense Test  
• Revised Nottingham Sensory Assessment |
| **Global Stroke Severity**| These outcome measures assessed the severity of one’s stroke through a global assessment of a multitude of deficits a stroke survivor may experience. | • Modified Rankin Scale  
• National Institutes of Health Stroke Scale  
• Scandinavian Stroke Scale |
| **Muscle Strength**       | These outcome measures assessed muscle power and strength during movements and tasks. | • Hand Grip Strength  
• Isokinetic Peak Torque  
• Manual Muscle Strength Test  
• Medical Research Council Scale |
| **Functional Ambulation** | These outcomes measures assessed ambulatory abilities during distance-based or timed walking exercises commonly. | • 10-Metre Walk Test  
• 2-Minute Walk Test  
• 30-Second Sit-to-Stand Test  
• 6-Minute Walk Test  
• Functional Ambulation Category  
• Gait Distance  
• Gait Speed |
| **Balance**               | These outcome measures assessed postural stability, | • Berg Balance Scale  
• Community Balance and Mobility Scale  
• Rate of Falls |
Lower Extremity Motor and Mobility Rehabilitation

| and both static and dynamic balance. | • Sitting Balance  
• Sit-to-Stand Test  
• Timed Up & Go Test |
| **Functional Mobility** | These outcome measures assessed a person’s ability to move around their environment, from one position or place to another, to complete everyday activities or tasks. | • Clinical Outcome Variable Scale  
• Functional Independence Measure  
• Rivermead Mobility Index |
| **Gait** | These outcome measures assessed various phases of the gait cycle. | • Functional Gait Assessment  
• Gait Assessment and Intervention Tool  
• Gait Cycle Time  
• Step Length, Step Reaction Time and Step Test  
• Stride Length and Stride Width |

**Therapy Intensity**

**Conclusions**

1. *Overall, there is strong evidence that early intensive therapy may improve gait and general motor function.*

2. *There is conflicting high-quality evidence regarding the effect of augmented physical therapy on gait at follow-up.*

**Task-Specific Training**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>ADLs</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
</tr>
</thead>
</table>
| Bobath Concept Approach | 1a  
3 RCTs | 1b  
1 RCT | 1b  
1 RCT | 1a  
2 RCTs |
| Motor Relearning Programmes | 1b  
1 RCT | 1b  
2 RCTs | 1a  
3 RCTs |  

**Conclusions**

1. *Task-specific training of the lower limbs may improve functional ambulation, balance and ADLs post stroke.*

2. *Further research is required to determine the efficacy of task-specific circuit training.*

3. *The Neurodevelopmental Approach may improve ADLs when compared to conventional care.*

**Key Studies for Task-Specific Training**

Lower Extremity Motor and Mobility Rehabilitation


**Overground Walking**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overground Walking</td>
<td>✓ 6 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusion**

1. **Overground walking may be beneficial for improving functional ambulation and gait but not balance.**

**Key Studies for Overground Walking**


**Exercise Bicycle**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle Ergometer</td>
<td>✓ 1 RCT</td>
<td>✓ 1b 2 RCTs</td>
<td>✓ 2 1 RCT</td>
<td>✓ 1b 2 RCTs</td>
<td>✓ 1a 6 RCTs</td>
<td>✓ 1b 1 RCT</td>
<td>✓ 2 1 RCT</td>
<td>✓ 1b 2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. **Cycle ergometer training may be beneficial for improving motor function, balance and ADLs, but not beneficial for functional mobility, gait, spasticity and muscle strength.**
2. **The evidence is mixed for cycle ergometer training improving functional ambulation.**

**Key Studies for Exercise Bike**

Lower Extremity Motor and Mobility Rehabilitation

Treadmill Training in the Absence of Partial Body Weight Support

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treadmill Training</td>
<td>1b 1 RCT</td>
<td>1b 2 RCTs</td>
<td>1a 7 RCTs</td>
<td>1a 5 RCTs</td>
<td>1b 2 RCTs</td>
<td>1a 6 RCTs</td>
</tr>
</tbody>
</table>

Conclusions

1. **Treadmill training may improve functional ambulation, but may not impact balance, ADLs and motor function.**
2. **The evidence is mixed for functional ambulation and gait.**

Key Studies for Treadmill Training


Partial Body Weight Support and Treadmill Training (PBWSTT)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial Body Weight Support Treadmill Training</td>
<td>1b 1 RCT</td>
<td>1b 4 RCTs</td>
<td>1b 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 3 RCTs</td>
<td>1a 9 RCTs</td>
<td>2 1 RCT</td>
<td>1a 6 RCTs</td>
</tr>
</tbody>
</table>

Conclusions

1. **Based on all RCTs, partial-body weight support treadmill training does not appear to improve ADLs, stroke severity with a mixed picture for gait and functional ambulation.**
2. **There is strong evidence that partial body weight support treadmill training may not improve gait or balance outcomes compared to conventional or other gait training interventions based on the most definitive trial, the LEAPs trial (Duncan et al. 2011).**
**Lower Extremity Motor and Mobility Rehabilitation**

**Key Studies for Partial Body Weight Support and Treadmill Training**


**Physiotherapy Exercise Programs and Aerobic Training**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overground Walking</td>
<td>![Overground Walking Icon]</td>
<td>![ADLs Icon]</td>
<td>![Spasticity Icon]</td>
<td>![Muscle Strength Icon]</td>
<td>![Functional Ambulation Icon]</td>
<td>![Balance Icon]</td>
<td>![Functional Mobility Icon]</td>
<td>![Gait Icon]</td>
</tr>
<tr>
<td>Cycle Ergometer</td>
<td>![Cycle Ergometer Icon]</td>
<td>![ADLs Icon]</td>
<td>![Spasticity Icon]</td>
<td>![Muscle Strength Icon]</td>
<td>![Functional Ambulation Icon]</td>
<td>![Balance Icon]</td>
<td>![Functional Mobility Icon]</td>
<td>![Gait Icon]</td>
</tr>
<tr>
<td>Treadmill Training</td>
<td>![Treadmill Training Icon]</td>
<td>![ADLs Icon]</td>
<td>![Spasticity Icon]</td>
<td>![Muscle Strength Icon]</td>
<td>![Functional Ambulation Icon]</td>
<td>![Balance Icon]</td>
<td>![Functional Mobility Icon]</td>
<td>![Gait Icon]</td>
</tr>
</tbody>
</table>

**Conclusion**

1. Overground walking appears to improve functional ambulation and gait but not balance.
2. Cycle ergometer training may be beneficial for improving motor function, balance and ADLs, but not beneficial for functional mobility, gait, spasticity and muscle strength. The evidence is mixed for cycle ergometer training improving functional ambulation.
3. Treadmill training may improve functional ambulation, but may not impact balance, ADLs and motor function. The evidence is mixed for functional ambulation and gait.

**Key Articles for Physiotherapy Exercise Programs**

Lower Extremity Motor and Mobility Rehabilitation


Strength Training to Improve Mobility

<table>
<thead>
<tr>
<th>Intervention</th>
<th>ADLs</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength and Resistance Training</td>
<td>1b</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>2 RCTs</td>
<td>6 RCTs</td>
<td>7 RCTs</td>
<td>9 RCTs</td>
<td>4 RCTs</td>
<td>7 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. Due to conflicting findings, it is unclear whether strength and resistance training for the lower limbs improves ADLs, muscle strength, functional ambulation and gait.
2. There was considerable heterogeneity in the type, duration, and intensity of strength/resistance interventions.
3. There is strong evidence that strength and resistance training for the lower limbs improves balance but not functional mobility.

Key Studies for Strength and Resistance Training


Sit-to-Stand Training

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Muscle Strength</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sit to Stand Training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

Conclusion
Lower Extremity Motor and Mobility Rehabilitation

1. **Sit-to-stand training may be beneficial for improving gait and muscle strength, but not balance.**

   **Key Study for Sit to Stand Training**

### Trunk Training

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trunk Training</td>
<td>1a 4 RCTs</td>
<td>2</td>
<td>2 RCTs</td>
<td>2 RCTs</td>
<td>2 RCTs</td>
<td>1a</td>
<td>5 RCTs</td>
<td>1b</td>
</tr>
</tbody>
</table>

**Conclusion**

1. **Both trunk training and enhanced trunk training may be beneficial for most lower limb rehab outcomes, in particular balance and motor function where the evidence is strong.**

   **Key Study for Trunk Training**

### Balance Training

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance Trainers</td>
<td>1b 3 RCTs</td>
<td>1a</td>
<td>2 RCTs</td>
<td>1b 2 RCTs</td>
<td>1b 3 RCTs</td>
<td>1a</td>
<td>2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusion**

1. **Balance training does not appear to improve stroke severity, muscle strength or gait. The evidence is mixed for improvements in balance, ADLs, motor function and functional ambulation.**

   **Key Studies on Balance Training**
Lower Extremity Motor and Mobility Rehabilitation


Balance Training and Risk of Falling

Conclusion

1. Falls prevention programs may not reduce the rate of falls post stroke.

Key Study for Balance Training and Risk of Falling


Caregiver Mediated Programs

<table>
<thead>
<tr>
<th>Intervention</th>
<th>ADLs</th>
<th>Balance</th>
<th>Functional Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caregiver Mediated Programs</td>
<td>1a 1b</td>
<td>1b 1b</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 RCTs</td>
<td>1 RCT</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion

1. Caregiver-mediated programs may improve lower limb functional mobility, balance and ADLs.

Key Study on Caregiver Mediated Training Programs


Electromechanical and Robotic Assisted Mobility Training

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Proprioception</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>End Effectors</td>
<td>1a 1b</td>
<td>1a</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
</tr>
<tr>
<td>Robotics</td>
<td>3 RCTs</td>
<td>6 RCTs</td>
<td>1 RCT</td>
<td></td>
<td>4 RCTs</td>
<td>8 RCTs</td>
<td>3 RCTs</td>
<td>6 RCTs</td>
<td>3 RCTs</td>
<td>6 RCTs</td>
<td>3 RCTs</td>
</tr>
<tr>
<td>Exoskeleton</td>
<td>1a 2 1b</td>
<td>1a</td>
<td>2 1b</td>
<td>2</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1a</td>
<td>1a</td>
</tr>
<tr>
<td>Robotics</td>
<td>8 RCTs</td>
<td>6 RCTs</td>
<td>2 RCTs</td>
<td>1 RCT</td>
<td>4 RCTs</td>
<td>17 RCTs</td>
<td>13 RCTs</td>
<td>6 RCTs</td>
<td>3 RCTs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusions
1. *End effector robotics, using body weight support and moving foot plates, has been shown to improve functional ambulation and functional mobility and may help with motor function, ADLs, muscle strength and balance.*
2. *The Lokomat, or a similar exoskeletal system (e.g. LokoHelp, AutoAmbulator, Walkbot), may improve motor function, muscle strength, functional ambulation, balance and gait; it does not improve ADLs and functional mobility.*
3. *Specifically, Lokomat training may be beneficial for lower limb rehabilitation following stroke while evidence is more mixed for exoskeleton devices being effective for lower limb rehabilitation following stroke.*

Key Studies for Gait Robotics
- Han EY, Im SH, Kim BR, Seo MJ, Kim MO. Robot-assisted gait training improves brachial–ankle pulse wave velocity and peak aerobic capacity in subacute stroke patients with totally dependent ambulation: Randomized controlled trial. Medicine 2016; 95(41).

### Functional Electrical Stimulation/FES-Based Neural Orthosis for Gait Cycle

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>FES</td>
<td>1a 7 RCTs</td>
<td>1a 6 RCTs</td>
<td>1a 4 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 4 RCTs</td>
<td>1a 12 RCTs</td>
<td>1a 5 RCTs</td>
<td>1a 2 RCTs</td>
<td>1a 7 RCTs</td>
</tr>
</tbody>
</table>

Conclusions
1. *Functional electrical stimulation may be a suitable adjunct for therapies targeting lower limb motor function post stroke.*
2. *FES has been shown to improve ADLs, muscle strength, functional ambulation and gait. It may help motor function and spasticity but does not improve balance and functional mobility more than conventional care.*
Lower Extremity Motor and Mobility Rehabilitation

Key Studies for Functional Electrical Stimulation

- Daly JJ, Zimbelman J, Roenigk KL, McCabe JP, Rogers JM, Butler K et al. Recovery of coordinated gait: Randomized controlled stroke trial of Functional Electrical Stimulation (FES) versus no FES, with weight-supported treadmill and over-ground training. Neurorehabil Neural Repair 2011; 25(7):588-596.

Neuromuscular Electrical Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMES</td>
<td>1b 1 RCT</td>
<td>1b</td>
<td>1a</td>
<td>1a</td>
<td>1a 2 RCTs</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT 5 RCTs</td>
<td>1a 18 RCTs</td>
<td>2 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions
1. **NMES may be beneficial for functional mobility and muscle strength.**
2. **The literature is mixed for NMES regarding its improvement to functional ambulation, balance, spasticity, range of motion, stroke severity and activities of daily living.**
3. **NMES may not be beneficial for improving motor function or gait.**
4. **There was considerable heterogeneity in the delivery and type of NMES used.**

Biofeedback

Gait Training with Movement or Postural Control Visual Biofeedback

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gait Training with Movement or Postural Control Visual Biofeedback</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1a 3 RCTs</td>
<td>2 1 RCT</td>
<td>1a 8 RCTs</td>
</tr>
</tbody>
</table>

Conclusion
1. **Gait training with movement or postural visual feedback is likely not beneficial for lower limb rehab post stroke.**

Key Studies for Gait Training with Movement or Postural Control Visual Feedback
Lower Extremity Motor and Mobility Rehabilitation


EMG Biofeedback

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>ROM</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMG Biofeedback</td>
<td>2</td>
<td>1b</td>
<td>2</td>
<td>1b</td>
<td>2</td>
<td>2</td>
<td>1a</td>
</tr>
</tbody>
</table>

Conclusions

1. **EMG biofeedback may produce improvements in motor function, muscle strength and functional ambulation, but not ADLs, ROM or functional mobility.**
2. **The evidence is mixed regarding gait.**

Key Study for EMG Biofeedback


Rhythmic Auditory Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>ROM</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhythmic Auditory Stimulation</td>
<td>2</td>
<td>1b</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
</tr>
</tbody>
</table>

Conclusions

1. **Rhythmic auditory stimulation with physical exercise, including over ground gait training or treadmill training, is likely beneficial for lower limb rehabilitation following stroke.**
2. **Rhythmic auditory stimulation training may improve gait, functional ambulation and balance post stroke.**

Key Studies for Rhythmic Auditory Stimulation for Gait Training
Lower Extremity Motor and Mobility Rehabilitation


**Dual Task Training**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual -Task Training</td>
<td>2 1 RCT</td>
<td>2 1 RCT</td>
<td>1b 2 RCTs</td>
<td>1b 2 RCTs</td>
<td>1a 4 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. The literature is mixed concerning dual-task training’s ability to improve functional ambulation, balance and gait.
2. Dual-task training may not be beneficial for improving motor function and activities of daily living.

**Transcutaneous Electrical Nerve Stimulation**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENS</td>
<td>1a 2 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 7 RCTs</td>
<td>1a 2 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 6 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. TENS may be beneficial for improving functional mobility, functional ambulation, range of motion and spasticity.
2. The literature is mixed regarding TENS for improving motor function, activities of daily living, gait, balance, and muscle strength.
**Lower Extremity Motor and Mobility Rehabilitation**

### Aquatic Therapy

<table>
<thead>
<tr>
<th>Intervention</th>
<th>ADLs</th>
<th>Proprioception</th>
<th>Spasticity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Therapy</td>
<td>1a 3 RCTs</td>
<td>✔</td>
<td>2 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1a 8 RCTs</td>
<td>1a 9 RCTs</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusions**

1. *Aquatic therapy may be beneficial for improving functional ambulation, activities of daily living, muscle strength, and proprioception.*
2. *The literature is mixed regarding aquatic therapy for improving gait and balance.*
3. *Aquatic therapy may not be beneficial for improving mobility or spasticity although the data is limited.*

### Brain Stimulation

#### Repetitive Transcranial Magnetic Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Frequency rTMS</td>
<td>1a 6 RCTs</td>
<td>✔</td>
<td>2 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 2 RCT</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 2 RCTs</td>
</tr>
<tr>
<td>High Frequency rTMS</td>
<td>1a 3 RCTs</td>
<td>✔</td>
<td>1a 4 RCTs</td>
<td>✔</td>
<td>1a 4 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1b 1 RCT</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusions**

1. *Repetitive transcranial magnetic stimulation may be an effective intervention improving gait, balance, spasticity, range of motion, activities of daily living, muscle strength and stroke severity.*
2. *The literature is mixed regarding the effect of rTMS on motor function and functional ambulation.*
3. *The levels of evidence for low and high frequency rTMS are shown in the colour coded table above.*

**Key Studies for rTMS**

Lower Extremity Motor and Mobility Rehabilitation

**Transcranial Direct Current Stimulation (tDCS)**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anodal tDCS</td>
<td>1b 1 RCT</td>
<td>1a 2 RCTs</td>
<td>1a 2 RCTs</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
<tr>
<td>Dual tDCS</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusions**

1. *The literature is mixed concerning the benefit of tDCS on lower extremity motor outcomes.*
2. *Anodal tDCS improves muscle strength and may improve motor function, functional ambulation and balance.*
3. *Dual tDCS may improve balance.*

**Key Studies for tDCS**


**Virtual Reality and Gait/Balance**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Proprioception</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Functional Mobility</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Reality</td>
<td>1a 5 RCTs</td>
<td>1a 10 RCTs</td>
<td>2 1 RCT</td>
<td>2 1 RCT</td>
<td>2 1 RCT</td>
<td>1a 9 RCTs</td>
<td>2 1 RCT</td>
<td>2 1 RCT</td>
<td>1a 17 RCTs</td>
<td>1b 2 RCTs</td>
<td>1a 6 RCTs</td>
</tr>
<tr>
<td>VR with Treadmill</td>
<td>2 1 RCT</td>
<td>2 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1a 9 RCTs</td>
<td>2 1 RCT</td>
<td>1a 7 RCTs</td>
<td>2 1 RCT</td>
<td>1a 7 RCTs</td>
<td>1a 7 RCTs</td>
<td>1a 7 RCTs</td>
<td>1a 7 RCTs</td>
</tr>
</tbody>
</table>
Lower Extremity Motor and Mobility Rehabilitation

Conclusions
1. Virtual reality training has been shown to improve gait and may improve motor function, ADLs, functional ambulation, balance and functional mobility.
2. Virtual reality with treadmill training has been shown to improve gait, balance and functional ambulation.

Action Observation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Observation</td>
<td>2 RCTs</td>
<td>1b</td>
<td>1b</td>
</tr>
</tbody>
</table>

Conclusions
1. Action Observation has been shown to improve gait and balance and may improve functional ambulation.

Motor Imagery/Mental Practice

Conclusions
1. Mental practice/motor imagery in combination with gait/balance training, may improve gait, balance, functional ambulation and motor function.
2. Mental practice may not be beneficial for improving functional mobility and activities of daily living.

Key Studies for Mental Practice

Assistive Walking Devices: Canes

Conclusions
1. Single-point canes improve gait speed and endurance, while quad canes improve balance.
### Lower Extremity Motor and Mobility Rehabilitation

#### Ankle Foot Orthoses

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Functional Ambulation</th>
<th>Balance</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>AFO</td>
<td>1a 4 RCTs ✔</td>
<td>2 4 RCTs</td>
<td>1b 3 RCTs ✔</td>
</tr>
</tbody>
</table>

**Conclusions**

1. **Ankle foot orthoses may be effective for improving gait and functional ambulation, but the evidence is mixed for balance.**

**Key Studies for AFOs**


#### Pharmaceuticals

**Amphetamines**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
<th>Functional Ambulation</th>
<th>Functional Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamines</td>
<td>1a 8 RCTs ✗</td>
<td>1a 6 RCTs ✗</td>
<td>1a 3 RCTs ✗</td>
<td>1b 1 RCT ✗</td>
<td>1b 1 RCT ✗</td>
</tr>
</tbody>
</table>

**Conclusions**

1. **Amphetamines do not improve lower limb motor function or ADLs post stroke.**

**Key Studies for Amphetamines**


**Methylphenidate**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methylphenidate</td>
<td>1a 2 RCTs ✗</td>
<td>1a 2 RCTs ✔</td>
<td>1b 1 RCT ✔</td>
</tr>
</tbody>
</table>
Conclusions

1. **Methylphenidate can improve functional independence but not lower limb motor function post stroke.**

**Key Studies for Methylphenidate**


**Levodopa**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levadopa</td>
<td>1a 2 RCTs</td>
<td>1a 3 RCTs</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusions**

1. **Levodopa has been shown to improve lower limb motor function and may improve ADLs.**

**Serotonergic Agents**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoxetine</td>
<td>1a 2 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 3 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. **Fluoxetine has been shown to improve lower limb motor function post stroke, it may improve functional independence but does not change stroke severity outcomes measures.**

**Key Studies for Serotonergic Agents**

Lower Extremity Motor and Mobility Rehabilitation

**Spasticity Post Stroke**

**Botulinum Toxin**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Functional Ambulation</th>
<th>Gait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botulinum Toxin A</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 5 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. Botulinum Toxin A injections used to treat focal spasticity has been shown to improve spasticity when compared to conventional care.
2. There is less evidence to show it improves motor function in the lower extremity.
3. Botulinum Toxin A may improve functional ambulation and gait.

**Additional Conclusions**

4. Botulinum toxin injection reduces lower limb spasticity post stroke compared to placebo or nerve block.
5. Botulinum toxin injection is more effective in combination with an ankle foot orthosis, but not with electrical stimulation, taping, or stretching.
6. Botulinum toxin injection may be more effective in higher dosages, but is not impacted by location of injection.
7. Botulinum toxin injection guided by ultrasonography may be more effective than by electrical stimulation or palpation.

**Key Studies on Botulinum Toxin to Treat Spasticity**


**Oral Anti-Spastic Medications in the Lower Extremity**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Anti-Spastic Medications</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1a 4 RCTs</td>
</tr>
</tbody>
</table>
Conclusions

1. Oral medications are effective interventions for reducing lower limb spasticity post stroke, although some may be associated with side effects.
2. Oral anti-spastic medications may improve ADLs.

Key Studies for Oral Anti-Spasticity Medications


TENS/NMES and Spasticity

Conclusions

1. Transcutaneous electrical stimulation is an effective intervention for reducing lower limb spasticity post stroke.
2. Neuromuscular/functional electrical stimulation may not be effective.

Key Studies for TENS/NMES and Spasticity

## 3. Hemiplegic Upper Extremity Motor Rehabilitation

(Evidence Reviews Chapters 10-11 and Clinician’s Handbook Chapter 4)

### Upper Extremity Outcome Measure Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Function</td>
<td>Assess gross motor movements and a series of general impairment measures when using the upper extremities</td>
<td>• Action Research Arm Test (ARAT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fugl-Meyer Assessment (FMA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rivermead Mobility Assessment (RMA)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Wolf Motor Function Test (WMFT)</td>
</tr>
<tr>
<td>Global Stroke Severity</td>
<td>Assess the severity of stroke through global assessment of deficits post stroke.</td>
<td>• Brunnstrom Recovery Stages (BRS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Modified Rankin Scale (MRS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• National Institutes of Health Stroke Scale (NIHSS)</td>
</tr>
<tr>
<td>Muscle Strength</td>
<td>Assess muscle power and strength during movement and tasks.</td>
<td>• Hand Grip Strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Isokinetic Peak Torque (IPT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Manual Muscle Strength Test (MMST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Medical Research Council Scale (MRCS)</td>
</tr>
<tr>
<td>Dexterity</td>
<td>Assess fine motor and manual skills through a variety of tasks, particularly with the use of the hand.</td>
<td>• Box and Block Test (BBT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Finger to Nose Test (FNT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Minnesota Manual Dexterity Test (MMDT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Nine Hole Peg Test (9HPT)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Purdue Pegboard Test (PT)</td>
</tr>
<tr>
<td>Range of Motion</td>
<td>Assess ability to freely move upper extremity at joints both passively and actively</td>
<td>• Active Range of Motion (AROM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maximal Elbow Extension Angle During Reach (MEEAR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Passive Range of Motion (PROM)</td>
</tr>
<tr>
<td>Proprioception</td>
<td>Assess bodily sensory awareness and location of limbs.</td>
<td>• Joint Position Sense Test (JPST)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Revised Nottingham Sensory Assessment (RNSA)</td>
</tr>
<tr>
<td>Activities of Daily Living</td>
<td>Assess performance and level of independence in various everyday tasks.</td>
<td>• Barthel Index (BI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Canadian Occupational Performance Measure (COPM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Chedoke Arm and Hand Activity Inventory (CAHAI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Functional Independence Measure (FiM)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Modified Barthel Index (mBI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Motor Activity Log (MAL)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Stroke Impact Scale (SIS)</td>
</tr>
<tr>
<td>Spasticity</td>
<td></td>
<td>• Ashworth Scale (AS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Modified Ashworth Scale (mAS)</td>
</tr>
</tbody>
</table>
Hemiplegic Upper Extremity Motor Rehabilitation

Enhanced or More Intensive Therapy in Upper Extremity

Conclusion

1. Additional upper limb therapy does not appear to be superior to conventional therapy for improving upper limb motor function or functional independence.

Key Studies for Intensive Therapy


Repetitive Task-Specific Techniques for Upper Extremity

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Global Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Specific Training</td>
<td>1a 11 RCTs</td>
<td>1a</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 2 RCTs</td>
<td>1b 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. Task-specific training, alone or in combination with other therapy approaches, may be beneficial for improving motor function, spasticity, range of motion and muscle strength, but not stroke severity or ADLs.

Key Study for Task Specific Training


Strength Training

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength Training</td>
<td>1a 6 RCTs</td>
<td>1b 2 RCTs</td>
<td>1b 2 RCTs</td>
<td>1b 2 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 3 RCTs</td>
</tr>
</tbody>
</table>
Hemiplegic Upper Extremity Motor Rehabilitation

Conclusions

1. Strength training may improve motor function and range of motion, but not dexterity or spasticity.
2. The literature is mixed regarding strength training and functional strength for improving ADLs, and muscle strength.

Key Study for Strength Training


Constraint-Induced Movement Therapy (CIMT)

CIMT in Subacute Phase

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Proprioception</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIMT in Subacute Phase</td>
<td>1a 8 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 8 RCTs</td>
<td>2 1 RCT</td>
<td>1b 1 RCT</td>
<td></td>
</tr>
<tr>
<td>mCIMT in Subacute Phase</td>
<td>1a 7 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 6 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 2 RCTs</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusions

1. Constraint induced movement therapy in the acute/subacute phase may be beneficial for improving spasticity and muscle strength, but not motor function.
2. The literature is mixed regarding improvement on ADLs and dexterity.
3. Modified constraint-induced movement therapy in the acute/subacute phase is beneficial for improving motor function,
4. It is not yet been shown to be beneficial in improving ADLs, dexterity, spasticity, proprioception or muscle strength.

Key Study for CIMT in Subacute Phase

Hemiplegic Upper Extremity Motor Rehabilitation

CIMT in Chronic Phase

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIMT during the chronic phase</td>
<td>1a 13 RCTs</td>
<td>1a</td>
<td>1a 2 RCTs</td>
</tr>
<tr>
<td>mCIMT during the chronic phase</td>
<td>1a 10 RCTs</td>
<td>1a</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions

1. **Constraint-induced movement therapy may be beneficial for improving motor function, ADLs and muscle strength in the chronic phase following stroke.**

2. **Modified constraint-induced movement therapy may be beneficial for improving motor function and ADLs in the chronic phase following stroke.**

Key Studies for CIMT in Chronic Phase


**Priming the Motor System**

**Action Observation**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action Observation</td>
<td>1a 6 RCTs</td>
<td>1a 3 RCTs</td>
<td>1b 4 RCTs</td>
<td>2 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusion

1. **Action observation may be beneficial for improving dexterity and spasticity, but not muscle strength. The evidence is mixed regarding improvement for motor function and ADLs.**
Hemiplegic Upper Extremity Motor Rehabilitation

Key Study for Action Observation

Mirror Therapy

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Proprioception</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirror therapy</td>
<td>1a 15 RCTs</td>
<td>✓</td>
<td>✓</td>
<td>1a 6 RCTs</td>
<td>1b 1 RCT</td>
<td>✓</td>
<td>1a 5 RCTs</td>
</tr>
</tbody>
</table>

Conclusion
1. Mirror therapy may improve motor function, dexterity proprioception and stroke severity, but the literature is mixed regarding improvements in ADLs, spasticity and muscle strength.

Key Study for Mirror Therapy

Mental Practice

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental practice</td>
<td>1a 15 RCTs</td>
<td>1a</td>
<td>2 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusion
1. Mental practice may produce improvements in motor function and muscle strength, but the evidence is mixed regarding improvements in ADLs.

Key Study for Mental Practice
Hemiplegic Upper Extremity Motor Rehabilitation

**Bilateral Arm Training**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral Arm Training</td>
<td>1a 4 RCTs</td>
<td>1a 2 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusion**

1. **Bilateral arm training may improve motor function, but not muscle strength. The literature is mixed regarding bilateral arm training for improving dexterity and ADLs.**

**Key Studies for Bilateral Arm Training**


**Music Therapy**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>ROM</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music therapy</td>
<td>1b 4 RCTs</td>
<td>2 3 RCTs</td>
<td>2 1 RCT</td>
<td>2 1 RCT</td>
<td>2 2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. **Overall, the literature is mixed regarding music therapy for upper limb rehabilitation post stroke.**
2. It should be noted that many of the studies in this section differ significantly on the implementation of music therapy.

**Key Study in Music Therapy**

Hemiplegic Upper Extremity Motor Rehabilitation

Sensory Stimulation and Sensorimotor Training of the Upper Extremity

Transcutaneous Electrical Nerve Stimulation (TENS)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>TENS</td>
<td>√</td>
<td>1a 10 RCTs</td>
<td>1a 2 RCTs</td>
<td>1a 3 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. **TENS may be beneficial for improving motor function, but the evidence is mixed regarding improvement in dexterity, ADLs and muscle strength.**

Key Study for TENS


Electroacupuncture

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Global Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electro-Acupuncture</td>
<td>1a 6 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 5 RCTs</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusion

1. **Electroacupuncture improves spasticity and may improve motor function, stroke severity and muscle strength, but not ADLs.**

Acupuncture

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Global Stroke Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acupuncture</td>
<td>1a 8 RCTs</td>
<td>1a 7 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 2 RCTs</td>
<td>1a 4 RCTs</td>
</tr>
</tbody>
</table>

41
Conclusion
1. **Acupuncture likely does not improve upper limb motor function or level of independence. It does appear to improve spasticity.**

**Key Studies in Acupuncture**

**EMG / Biofeedback in Hemiparetic Upper Extremity**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMG Biofeedback</td>
<td>1a 8 RCTs</td>
<td>1b 1 RCT</td>
<td>1a</td>
<td>2</td>
<td>1b 2 RCTs</td>
<td>1b 2 RCTs</td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion**
1. The literature is mixed regarding EMG biofeedback alone for improving ADLs, ROM, stroke severity and muscle strength, but does not appear to be beneficial for improving motor function, dexterity or spasticity.
Hemiplegic Upper Extremity Motor Rehabilitation

## Motor Stimulation

### Functional Electrical Stimulation and NMES

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclic NMES</td>
<td>1a 7 RCTs ✓</td>
<td>1a 3 RCTs ×</td>
<td>1a 6 RCTs ✓</td>
<td>1b 2 RCTs ✓</td>
<td>1b 2 RCTs ✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>EMG-NMES</td>
<td>1a 7 RCTs ✓</td>
<td>1b 4 RCTs ✓</td>
<td>1a 5 RCTs ✓</td>
<td>2 1 RCT ✓</td>
<td>2 2 RCTs ✓</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>FES</td>
<td>1a 11 RCTs ✓</td>
<td>1b 1 RCT ✓</td>
<td>1a 5 RCTs ✓</td>
<td>1a 8 RCTs ✓</td>
<td>1b 2 RCTs ✓</td>
<td>1a 1 RCT ✓</td>
<td>×</td>
</tr>
</tbody>
</table>

### Conclusions

1. **Cyclic NMES** may be beneficial for improving motor function but not ADLs and muscle strength. The literature is mixed regarding improvements in spasticity and range of motion.
2. **EMG triggered NMES** may be beneficial for improving dexterity, spasticity and range of motion, but not motor function and muscle strength.
3. The literature is mixed regarding improvements in ADLs.
4. **FES** may be beneficial for improving dexterity, but not muscle strength.
5. The literature is mixed regarding improvements in motor function, ADLs, spasticity, range of motion and stroke severity.

### Key Studies for Functional Electrical Stimulation


## Brain Stimulation

### Invasive Motor Cortex Stimulation (MCS)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Cortex Stimulation</td>
<td>1a 4 RCTs ✓</td>
<td>2 1 RCT ✓</td>
<td>1a 3 RCTs ✓</td>
<td>2 1 RCT ×</td>
</tr>
</tbody>
</table>
Hemiplegic Upper Extremity Motor Rehabilitation

Conclusion
1. The literature is mixed concerning invasive motor cortex stimulation for improving upper limb rehabilitation post stroke.

Key Study for Invasive Motor Cortex Stimulation

Repetitive Transcranial Magnetic Stimulation (rTMS)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Proprio-Caption</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low frequency rTMS</td>
<td>1a 20 RCTs</td>
<td>1a 10 RCTs</td>
<td>1a 9 RCTs</td>
<td>1a 7 RCTs</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 5 RCTs</td>
<td>1a 10 RCTs</td>
</tr>
<tr>
<td>High frequency rTMS</td>
<td>1a 7 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a 6 RCTs</td>
<td>1a 1 RCT</td>
<td>1a 6 RCTs</td>
<td>1a 6 RCTs</td>
<td>1a 6 RCTs</td>
<td>1a 6 RCTs</td>
</tr>
<tr>
<td>Bilateral rTMS</td>
<td>1b 1 RCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusions
1. Low frequency rTMS may be beneficial for improving motor function, dexterity, ADLs, proprioception, stroke severity, but not spasticity or range of motion.
2. High frequency rTMS may be beneficial for improving dexterity, ADLs, stroke severity and muscle strength, but not motor function.

Key Studies for rTMS
Hemiplegic Upper Extremity Motor Rehabilitation

Transcranial Direct Current Stimulation (tDCS)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anodal tDCS</td>
<td>1a 11 RCTs</td>
<td>1a 5 RCTs</td>
<td>1a 4 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 9 RCTs</td>
</tr>
<tr>
<td>Cathodal tDCS</td>
<td>1a 9 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 3 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 2 RCTs</td>
<td>1a 6 RCTs</td>
</tr>
<tr>
<td>Dual tDCS</td>
<td>1a 4 RCTs</td>
<td>1a 5 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 4 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. The literature is mixed for anodal, cathodal or dual (bilateral) transcranial direct current stimulation (tDCS), alone or in combination with other therapy approaches, for upper limb rehabilitation post stroke.

Telerehabilitation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telerehabilitation</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. Home-based telerehabilitation interventions were not effective for improving upper limb motor function when compared to an active control.

Key Studies for Telerehabilitation

Orthosis in Hemiparetic Upper Extremity

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orthotics</td>
<td>1a 5 RCTs</td>
<td>1b 2 RCTs</td>
<td>1a</td>
<td>1b 7 RCTs</td>
<td></td>
<td>1b 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusions
1. Splinting, taping, and orthoses likely do not improve upper limb motor function, dexterity, ADLs, spasticity or muscle strength but may improve range of motion.

Key Studies for Hand Splinting


Robotics in Rehabilitation of Upper Extremity

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Proprioception</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various arm/shoulder end-effectors</td>
<td>1a 17 RCTs</td>
<td>1b 6 RCTs</td>
<td>1a</td>
<td>1b 6 RCTs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bi-Manu Track</td>
<td>1b 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b</td>
<td></td>
<td></td>
<td>1b 1 RCT</td>
<td></td>
</tr>
<tr>
<td>Arm/shoulder Exoskeletons</td>
<td>1a 4 RCTs</td>
<td>1b 2 RCTs</td>
<td>1b</td>
<td></td>
<td></td>
<td>1b 1 RCT</td>
<td></td>
</tr>
<tr>
<td>Hand end-effectors</td>
<td>1a 2 RCTs</td>
<td>1a 2 RCTs</td>
<td></td>
<td>1b 1 RCT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand Exoskeletons</td>
<td>1a 6 RCTs</td>
<td>1a 4 RCTs</td>
<td>1a</td>
<td>1b 1 RCT</td>
<td>2</td>
<td>1b 1 RCT</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions
1. Arm/shoulder end-effector or exoskeleton, alone or in combination with other therapy approaches, may not be beneficial for upper limb rehabilitation following stroke.
Hemiplegic Upper Extremity Motor Rehabilitation

2. **Hand end-effectors may not be beneficial for improving upper limb rehabilitation, but hand exoskeletons may be beneficial for improving ADLs, spasticity, range of motion and muscle strength.**

3. **The evidence is mixed for hand exoskeleton’s ability to improve motor function and dexterity.**

**Key Studies for Robotics**


**Virtual Reality**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Dexterity</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual reality</td>
<td>1a 30 RCTs</td>
<td>1a 7 RCTs</td>
<td>1a 10 RCTs</td>
<td>1a 4 RCTs</td>
<td>2 2 RCTs</td>
<td>1b 1 RCTs</td>
<td>1a 12 RCTs</td>
</tr>
</tbody>
</table>

**Conclusion**

1. **Virtual reality therapy may be more beneficial than conventional therapy for improving motor function and stroke severity, but not ADLs, dexterity, spasticity or muscle strength.**

**Key Studies for Virtual Reality Therapy**

Hemiplegic Upper Extremity Motor Rehabilitation

Medications

Antidepressants and Upper Extremity Function

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>ADLs</th>
<th>Stroke Severity</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antidepressants</td>
<td>1a 3 RCTs</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. Antidepressants may help improve impaired upper extremity motor function following a stroke, although more recent data is calling this into question.

Key Studies for Antidepressants and Upper Extremity


Peptides: Cerebrolysin

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>ADLs</th>
<th>Stroke Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cerebrolysin</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusion

1. Cerebrolysin may improve upper limb motor function, dexterity, and measures of independence/daily living.

Key Studies for Cerebrolysin

Hemiplegic Upper Extremity Motor Rehabilitation

Treatment of Spasticity in the Upper Extremity Post Stroke

Botulinum Toxin in the Hemiplegic Upper Extremity

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Motor Function</th>
<th>Dexterity</th>
<th>Activities of Daily Living</th>
<th>Spasticity</th>
<th>ROM</th>
<th>Muscle Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botulinum Toxin A</td>
<td>1a 8 RCTs</td>
<td>1a 2 RCTs</td>
<td>1a 10 RCTs</td>
<td>1a 18 RCTs</td>
<td>1a 4 RCTs</td>
<td>1b 1 RCT</td>
</tr>
<tr>
<td>Botulinum Toxin B</td>
<td></td>
<td>1b 1 RCT</td>
<td>1a 2 RCTs</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusions
1. Botulinum A likely improves spasticity in the upper limb following stroke, but not range of motion or activities of daily living.
2. The effect on general upper limb motor function is conflicting and less clear.
3. Botulinum toxin A in combination with other types of therapeutic approaches may be beneficial for certain aspects of upper limb function.
4. Botulinum toxin B has been less well studied to date in comparison to botulinum toxin A.

Key Studies for Botulinum Toxin for Upper Extremity Spasticity


Hemiplegic Shoulder Pain

Conclusions
1. The association between shoulder subluxation and hemiplegic shoulder pain is unclear.
2. Hemiplegic shoulder pain may be associated with spastic muscle imbalance and contracted shoulder.
3. There is high variability in the reported frequency of hemiplegic shoulder pain.
4. Sustained positioning and static stretching of the hemiplegic shoulder may not be effective in reducing pain or improving motor function.
5. Active therapies for the hemiplegic shoulder may be effective in reducing pain, increasing range of motion, and improving motor function.
Hemiplegic Upper Extremity Motor Rehabilitation

6. While a wide variety of treatment options are available, it is unclear which is the most effective.

Electrical Stimulation in Hemiplegic Shoulder Pain

Conclusions

1. Surface neuromuscular electrical stimulation may be effective in reducing subluxation and improving range of motion in the hemiplegic shoulder, although its effectiveness may be negatively correlated with stroke onset.

2. Intramuscular neuromuscular electrical stimulation may be effective in reducing hemiplegic shoulder pain, although its effectiveness may be negatively correlated with stroke onset.

3. Transcutaneous electrical nerve stimulation may be effective in improving range of motion in the hemiplegic shoulder, although it may only be effective at higher intensity.

4. Functional electrical stimulation may be effective in reducing subluxation and improving motor function in the hemiplegic shoulder.

Key Studies for Electrical Stimulation at Shoulder


Botulinum Toxin Injections for the Hemiplegic Shoulder

Conclusion

1. Botulinum toxin may be effective in reducing pain and improving range of motion in the hemiplegic shoulder, but only when delivered in higher doses.
4. Rehabilitation of Cognitive Impairment Post-Stroke

(Evidence Reviews Chapters 12-14 and Clinician’s Handbook Chapter 5)

The Nature of Cognitive Impairment Post Stroke

<table>
<thead>
<tr>
<th>Attention</th>
<th>• Focus attention, sustained attention, selective attention, divided attention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>• Visual memory, auditory memory, working memory, episodic memory, semantic memory, working memory, procedural memory</td>
</tr>
<tr>
<td>Executive Function</td>
<td>• Initiation, processing speed, problem solving, planning</td>
</tr>
<tr>
<td>Perception, praxis</td>
<td>• Visuo-spatial, visuo-perceptual, Unilateral neglect, inattention, apraxia, agnosia, prosopagnosia</td>
</tr>
<tr>
<td>Language</td>
<td>• Aphasia: Broca's, Wernicke's, transcortical motor/sensory or mixed, conductive, global</td>
</tr>
</tbody>
</table>

Vascular Cognitive Impairment (VCI)

Conclusions
1. Vascular cognitive impairment (VCI) is the current term that reflects the range of cognitive deficits due to the impact of cerebrovascular disease, including stroke.
2. VCI without dementia reflects deficits in one or more domains not severe enough to cause functional decline, reflecting a single strategic lesion or multiple infarcts that impact functional activities.
3. Impairments of attention, executive function, and processing speed appear to be a consistent pattern of deficits in all subtypes.
4. Since 30% of all stroke survivors progress to a dementia syndrome, more research is needed to identify biomarkers for those at risk.
5. The severity of white matter change is associated with poorer cognitive performance and increasing limitations in activities of daily living post stroke.
6. Cognitive impairment is associated with decreased ADL and IADL function, and patients may require longer-term, ongoing rehabilitation.
Rehabilitation of Perceptual Disorders Post-stroke

Conclusions

1. **Following stroke, as many as two-thirds of patients experience cognitive impairment or decline.**
2. **The presence of cognitive impairment is associated with a substantial increase in risk for dementia.**
3. **Risk for developing dementia may be up to 10 times greater among individuals with stroke than for those without.**
4. **At the time of stroke, 10% of patients may have existing dementia. Another 10% may develop dementia shortly after a first-ever stroke.**
5. **More than 33% of patients may experience dementia after a recurrent stroke.**

Prevalence of Dementia Post-Stroke

Conclusions

1. **While cognitive decline may progress post stroke, approximately 16-20% of patients with cognitive impairment improve.**
2. **While most improvements occur in the first three months, recovery may continue for the first year post stroke.**
3. **The presence of post-stroke cognitive impairment has been associated with a 3-fold increase in risk for mortality.**
4. **Mortality rates among patients with stroke and dementia are 2 to 6 times greater than among those without dementia.**

Natural Course of Vascular Cognitive Impairment

Conclusions

1. **Following stroke, as many as two-thirds of patients experience cognitive impairment or decline.**
2. **The presence of cognitive impairment is associated with a substantial increase in risk for dementia.**
3. **Risk for developing dementia may be up to 10 times greater among individuals with stroke than for those without.**
4. **At the time of stroke, 10% of patients may have existing dementia. Another 10% may develop dementia shortly after a first-ever stroke.**
5. **More than 33% of patients may experience dementia after a recurrent stroke.**

Diagnosis of Vascular Cognitive Impairment

Conclusion

1. **At present, there is no gold standard for the diagnosis and assessment of VCI. Harmonized standards for brief and more extensive testing protocols have been developed for clinical and research use.**
## Screening and Assessment of Cognitive Impairment Post Stroke

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
</table>
| **Attention** | These outcome measures assessed an individual’s ability to attend as well as identify target stimuli and remain focused on a particular goal. | - Attentive Matrices Test  
- Colour Trails Test  
- Symbol Digit Substitution Test (Symbol Digit Modalities Test)  
- Trail-making Test A |
| **Executive function** | These outcome measures assessed an individual’s ability to plan, follow rules and self-monitor. | - Digit Span Test (Backward)  
- Stroop Interference Test  
- Trail-making Test B  
- Verbal Fluency Test  
- Wisconsin Card Sorting Task |
| **Learning and Memory** | These outcomes measures assessed an individual’s ability to explicitly and implicitly learn and recall information. | - 10-word recall test (RBANS)  
- Delayed Recognition Span Test (DRST)  
- Rivermead Behavioural Memory Test  
- Stroke Impact Scale (Memory Subsection)  
- Wechsler Memory Scale (WMS)  
- Word List Recall/Delayed Recall Test  
- Word List Memory Test |
| **Global Cognition** | These outcome measures assessed an individual’s overall cognitive processing capability factoring in multiple domains. | - Abbreviated Mental Test  
- Clock Drawing Test  
- Functional Independence Measure Cognitive Subscale (FIM-Cog)  
- Mini Mental Status Examination (MMSE)  
- Montreal Cognitive Assessment (MoCA)  
- Wechsler Adult Intelligence Scale (WAIS) |
| **Visuospatial perception and orientation** | These outcome measures assessed an individual’s ability to correctly process and mentally manipulate visuospatial information. | - Motor-Free Visual Perception Test (MVPT)  
- Rey-Osterrieth Complex Figure Test  
- |
| **Amusia** | These outcome measures assessed an individual’s ability to perceive pitch and recognize music. | - Montreal Battery of Amusia |
| **Activities of Daily Living** | These outcome measures assessed an individual’s proficiency at performing everyday activities. | - Barthel Index (BI)  
- Functional Independence Measure (FIM)  
- Lawton Instrumental Activities of Daily Life Scale  
- Stroke Impact Scale (ADL Subsection) |
Rehabilitation of Perceptual Disorders Post-stroke

Pharmacotherapy for Vascular Cognitive Impairment

Disease-Modifying Pharmacological Management in VCI

Antihypertensives

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antihypertensives</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 3 RCTs</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. The effect of treatment for hypertension on risk for cognitive decline and dementia is uncertain.
2. In individuals with previous stroke or TIA, treatment has been associated with reduced risk.
3. There is no evidence that one particular antihypertensive agent is superior to another for the prevention of cognitive decline.

Key Studies for Hypertensives Improving Cognitive Outcomes


Symptomatic Pharmacological Management in VCI

Cholinesterase Inhibitors

Donepezil

Conclusions

1. Treatment with donepezil may improve cognitive and global function in patients with vascular dementia.

Key Studies of Donepezil

Rehabilitation of Perceptual Disorders Post-stroke

Rivastigmine

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rivastigmine</td>
<td>1b 1 RCT</td>
<td>✗</td>
<td>✗</td>
<td>1b 1 RCT</td>
<td>✗</td>
</tr>
</tbody>
</table>

Conclusion

1. Treatment with rivastigmine may stabilize cognitive performance and improve behaviour in patients with vascular dementia. Further research is required.

Key Study for Rivastigmine


Galantamine

Conclusion

1. Treatment with galantamine may improve cognitive and global function in patients with mixed dementia.

2. However, its impact on patients with post-stroke cognitive impairments is less clear.

Key Studies for Galantamine


Summary Comments on Cholinesterase Inhibitors

Conclusions

1. Three reversible acetylcholinesterase inhibitors, donepezil, rivastigmine, and galantamine, have been investigated in the treatment of vascular dementia.

2. Donepezil and galantamine can be helpful in VAD or mixed Alzheimer's disease and cerebrovascular disease. Limited evidence for treatment with rivastigmine.

3. Although there is strong evidence that Donepezil is effective in vascular dementia; several meta-analyses have not recommended these drugs for Mild Cognitive Impairment which is what is most common post stroke (Tricco et al., 2013; Russ & Morling, 2012; Birks & Flicker, 2006)
Rehabilitation of Perceptual Disorders Post-stroke

### Nimotidine in Vascular Dementia

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nimodipine</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusions**
1. *Nimodipine may be beneficial for improving learning and memory, and global cognition.*
2. *Nimodipine may not be beneficial for improving activities of daily living.*

**Key Study for Nimodipine**

### Memantidine in Vascular Dementia

**Conclusion**
1. *Treatment with memantine may be associated with stabilization or improvement of cognitive function in patients with vascular dementia.*

**Key Studies for Memantidine**

### Pentoxyfylline in Vascular Dementia

**Conclusion**
1. *Treatment with pentoxyfylline may improve cognitive function in patients with multi-infarct dementia.*

**Key Studies for Pentoxyfylline**
Rehabilitation of Perceptual Disorders Post-stroke

**Antidepressants**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>Visual-Spatial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antidepressants</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusions**

1. Antidepressants may be beneficial for improving learning and memory but may not be beneficial for improving other cognitive outcomes.

**Key Study of Antidepressants for Cognition**


**Impact of Depression on Cognitive Disorders**

**Conclusions**

1. It is unclear whether depression is associated with cognitive impairment post stroke.
2. Depression-related cognitive impairment can sometimes mimic the signs of dementia and is referred to as pseudodementia.
3. Pseudodementia tends to be more sudden onset, more rapid progression, with a previous history of depression.
4. It is characterized by more variable, effort-related cognitive deficits with little nocturnal exacerbation.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Dementia</th>
<th>Pseudodementia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>Often insidious</td>
<td>Usually acute or subacute</td>
</tr>
<tr>
<td>Progression</td>
<td>Usually slow, early changes often missed</td>
<td>Usually rapid</td>
</tr>
<tr>
<td>Symptom duration at presentation</td>
<td>Long</td>
<td>Short</td>
</tr>
<tr>
<td>Psychiatric history or recent life crisis</td>
<td>Uncommon</td>
<td>Common</td>
</tr>
<tr>
<td>Extensive self-report of mental impairment</td>
<td>Uncommon</td>
<td>Common</td>
</tr>
<tr>
<td>Mental status or psychometric testing</td>
<td>Progressive decline</td>
<td>Variable, effort-related</td>
</tr>
<tr>
<td>Memory impairment</td>
<td>Common, most severe for recent events</td>
<td>Common, often selective amnesia, inconsistent deficits over time</td>
</tr>
</tbody>
</table>
Rehabilitation of Perceptual Disorders Post-stroke

Cognitive Rehabilitation for Attention, Memory, Executive Function Post Stroke

Interventions for cognitive rehabilitation are broadly classified as:

1. Direct remediation/cognitive skill training to re-establish previously learned patterns of behaviour.
2. Compensatory strategy training, either establishing new patterns of cognitive activity through internal compensatory cognitive mechanisms or establishing new patterns of activity through external compensatory mechanisms such as external aids, environmental structuring and support.

Remediation of Attention

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attentional Training</td>
<td>1b 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. Attention training may have a positive effect on specific, targeted outcomes but overall attentional training may not be helpful for improving attentional deficits.
2. Further research within the stroke population is required using like outcome measures to better evaluate comparisons between studies.

Key Studies for Attentional Training


Remediation of Memory Deficits

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory Training</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. Compensatory strategies can be used to improve memory outcomes post stroke. Further research within the stroke population is required.
2. There is limited research investigating group therapy post stroke, and little evidence supporting the use of group-based interventions for the improvement of memory.
Rehabilitation of Perceptual Disorders Post-stroke

Key Study for Remediation of Memory Deficits

**Remediation of Executive Functioning and Problem Solving**

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Workplace Interventions</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>Trial and Error Learning</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>Problem Solving Therapy</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
</tbody>
</table>

**Conclusions**
1. The standardization of both intervention and outcome measures would help resolve the conflicts seen between individual studies.
2. Analogical problem-solving skills training may improve problem solving abilities and instrumental activities of daily living, but there is conflicting evidence.
3. Tailored interventions to improve return to work are not effective in improving cognition.

Key Study for Remediation of Executive Function and Problem Solving

**Physical Activity and Cognition**

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise Programs</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
</tbody>
</table>

**Conclusions**
1. Exercise may be beneficial for improving learning and memory, and overall cognitive abilities.
2. Exercise may not be beneficial for improving attention or executive function.
3. Higher intensity exercises may not be more beneficial than lower intensity exercises for improving cognition.
Rehabilitation of Perceptual Disorders Post-stroke

**Key Study for Exercise and Cognition**

**Multimodal Treatment**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>Visual-Spatial</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimodal training (exercise and cognitive training)</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusion**

1. The literature is mixed regarding multimodal interventions for improving cognitive rehabilitation.

**Key Studies for Mutimodal Treatment of Cognitive Disorders**

**Mental Imagery**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Learning and Memory</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Imagery</td>
<td>1b 1 RCT</td>
<td>2 1 RCT</td>
<td>1b 2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. Mental imagery may be beneficial for improving attention, and activities of daily living.
2. Mental imagery may not be beneficial for improving learning and memory.

**Key Study for Mental Imagery and Cognitive Disorders**
Rehabilitation of Perceptual Disorders Post-stroke

**Cognitive-Motor Interference**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Global Cognition</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive Motor Interference</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

**Conclusion**

1. The literature is mixed regarding cognitive-motor interference for cognitive rehabilitation.

**Key Study on Cognitive Motor Interference**


**Music Impacting Cognition**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>Visual-Spatial</th>
<th>Amusia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music Therapy</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

**Conclusion**

1. Music may not be helpful for improving cognitive function. Further research is required.

**Key Study for Music Therapy**


**Computer-Based Cognitive Training**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>Visual-Spatial</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Based Cognitive Training</td>
<td>1a</td>
<td>1a</td>
<td>1b</td>
<td>1a</td>
<td>1b</td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>2 RCTs</td>
<td>4 RCTs</td>
<td>1 RCT</td>
<td>3 RCTs</td>
<td>1 RCT</td>
<td>2 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. The literature is mixed regarding computer-based training for improving attention.
Rehabilitation of Perceptual Disorders Post-stroke

2. *Computer-based training may not be helpful for improving executive function or global cognition.*

**Key Study for Computer Training**


**Virtual Reality in Improving Cognition**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>Visual-Spatial</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Reality Training</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

**Conclusion**

1. *Virtual reality may not be beneficial for improving cognition.*

**Key Study for Virtual Reality**


**Repetitive Transcranial Magnetic Stimulation (rTMS)**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning and Memory</th>
<th>Global Cognition</th>
<th>Visual-Spatial</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>rTMS</td>
<td>1b</td>
<td>1b</td>
<td>1a</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

**Conclusions**

1. *rTMS may have a positive effect on cognitive function following stroke although much of the research has not shown a positive effect.*

2. *Further research is required to determine if this effect is a result of a specific placement or frequency of the rTMS therapy*

**Key Study for rTMS**

Rehabilitation of Perceptual Disorders Post-stroke

Transcranial Direct Current Stimulation (tDCS)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Attention</th>
<th>Learning and Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>tDCS</td>
<td><img src="image" alt="Image" /></td>
<td><img src="image" alt="Image" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

Conclusion

1. Anodal tDCS to the left dorsolateral prefrontal cortex may not help to improve working memory and attention. Further research is required.

Acupuncture and Electroacupuncture

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Attention</th>
<th>Executive Function</th>
<th>Learning &amp; Memory</th>
<th>Global Cognition</th>
<th>Visual-Spatial</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acupuncture</td>
<td><img src="image" alt="Image" /></td>
<td><img src="image" alt="Image" /></td>
<td><img src="image" alt="Image" /></td>
<td>1b 2 RCTs</td>
<td><img src="image" alt="Image" /></td>
<td>2 1 RCT</td>
</tr>
<tr>
<td>Electroacupuncture</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td><img src="image" alt="Image" /></td>
<td><img src="image" alt="Image" /></td>
</tr>
</tbody>
</table>

Conclusions

1. Acupuncture may be beneficial for improving global cognition and activities of daily living. Electroacupuncture may be beneficial for improving attention, and visuospatial perception and orientation, but not other cognitive outcomes.
## 4a. Rehabilitation of Perceptual Disorders Post-Stroke

### Screening and Assessment Tests for Unilateral Neglect

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
</table>
| Visuospatial Processing & Neglect | These outcome measures assessed visuospatial processing and orientation to examine neglect severity | • Behavioural Inattention Test (BIT)  
• Catherine Bergego Scale  
• Clock Drawing Test  
• Comb and Razor Test  
• Extinction Task  
• Line Cancellation (Line Bisection) Test  
• Motor-Free Visual Perception Test (MVPT)  
• Rey-Osterrieth Complex Figure Test  
• Single and Double-digit Cancellation  
• Verbal Cancellation Test (Letter Cancelation)  
• Visual Scanning Tasks |
| Learning and Memory             | These outcomes measures assessed an individual’s ability to explicitly and implicitly learn and recall information | • Corsi Vertical Span Test                                                                     |
| Global Cognition                | These outcome measures assessed an individual’s overall cognitive processing capability factoring in multiple domains. | • Mini Mental Status Examination (MMSE)  
• Wechsler Adult Intelligence Scale (WAIS)                                                   |
| Motor Rehabilitation            | These outcome measures covered gross motor movements, as well as fine, dexterous movements when using the upper extremities. | • Action Research Arm Test (ARAT)  
• Box and Block Test (BBT)  
• Fugl-Meyer Assessment  
• Motricity Index  
• Nine Hole Peg Test (9HPT)  
• Rivermead Mobility Index (RMI)  
• Wolf Motor Function Test |
| Stroke Severity                 | These outcome measures assessed the severity of one’s stroke through a global assessment of a multitude of deficits a stroke survivor may experience. | • Canadian Neurological Scale (CNS)  
• National Institutes of Health Stroke Scale (NIHSS)  
• Modified Rankin Scale (MRS) |
| Activities of Daily Living      | These outcome measures assessed performance and level of independence in various everyday tasks | • Activities of Daily Living Questionnaire  
• Barthel Index (BI)  
• Functional Independence Measure (FIM) |
Rehabilitation of Perceptual Disorders Post-stroke

Treatments of Spatial Neglect

Remedial Versus Compensatory Approach

Treatments of neglect can be divided into a remedial or compensatory approach

Remedial Treatments in Unilateral Spatial Neglect

Visual Scanning

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Global Cognition</th>
<th>Motor Rehab</th>
<th>Stroke Severity</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual Scanning Training</td>
<td>1a 5 RCTs</td>
<td>1b 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 4 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. The literature is mixed regarding visual scanning training for improving neglect.
2. Visual scanning training may not be beneficial for improving activities of daily living.

Key Articles on Visual Scanning


Computer-Based Scanning in Neglect

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Global Cognition</th>
<th>Motor Rehab</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer-Based Rehabilitation</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. Computer-based visual scanning therapy for neglect does not appear to be effective in improving visual perception.
Rehabilitation of Perceptual Disorders Post-stroke

Key Study for Computer-Based Visual Scanning


Virtual Reality Therapy for Neglect

**Conclusion**

1. *Virtual reality treatment for neglect appears to be effective in improving visual perception.*

Compensatory Approach in Unilateral Spatial Neglect

Prisms Adaptation for Neglect

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Learning and Memory</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prism Glasses</td>
<td><img src="image" alt="1a 10 RCTs" /></td>
<td><img src="image" alt="2 1 RCT" /></td>
<td><img src="image" alt="1b 1 RCT" /></td>
</tr>
</tbody>
</table>

**Conclusion**

1. *Prismatic adaptation with a significant rightward shift appears to be beneficial for neglect; however, the long-term effect is unclear.*
2. *The literature is mixed regarding prism adaptation training for improving neglect.*

Key Study for Prism Adaptation


Limb Activation in Neglect

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Motor Rehab</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limb Activation</td>
<td><img src="image" alt="1a 3 RCTs" /></td>
<td><img src="image" alt="1b 1 RCT" /></td>
<td><img src="image" alt="1b 1 RCT" /></td>
</tr>
</tbody>
</table>

**Conclusions**

1. *Limb activation may not be beneficial for improving neglect.*

Key Studies on Limb Activation and Neglect

Rehabilitation of Perceptual Disorders Post-stroke


**Sensory Feedback Strategies for Neglect**

**Conclusions**

1. The use of external sensory stimulation in the treatment of neglect may be beneficial, although evidence is limited.
2. Electrical somatosensory stimulation may be a useful supplement to visual scanning training.
3. Visuomotor feedback strategies appear to be beneficial in the treatment of neglect.

**Key Studies for Sensory Strategies for Neglect**


**Mirror Therapy**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mirror Therapy</td>
<td>![1b](1 RCT)</td>
</tr>
</tbody>
</table>

**Conclusion**

1. Visuomotor feedback strategies appear to be beneficial in the treatment of neglect.
2. Mirror training may be beneficial for improving neglect.

**Key Study for Mirror Therapy in Neglect**


**Eye Patching and Hemispatial Glasses**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Motor Rehab</th>
<th>Stroke Severity</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Patching</td>
<td>![1b](1 RCT)</td>
<td>![1b](1 RCT)</td>
<td>2</td>
<td>![1b](3 RCTs)</td>
</tr>
</tbody>
</table>

**Conclusions**
Rehabilitation of Perceptual Disorders Post-stroke

1. *Eye patching and hemispatial glasses may not be beneficial for neglect, stroke severity, motor rehabilitation.*
2. *They may be beneficial for activities of daily living.*

Key Study for Eye Patching/Hemispatial Glasses


Caloric Stimulation

Conclusion

1. *The effectiveness of caloric stimulation as part of a treatment intervention for unilateral spatial neglect has not been well studied.*

Galvanic Vestibular Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanic Vestibular Stimulation</td>
<td>1a 5 RCTs</td>
</tr>
</tbody>
</table>

Conclusions

1. *Galvanic vestibular stimulation (GVS) may not be beneficial for improving neglect.*
2. *There does not appear to be a difference in efficacy between left or right GVS, and high or low volume GVS.*

Optokinetic Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Stroke Severity</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optokinetic Stimulation</td>
<td>1b 1 RCT</td>
<td>2 1 RCT</td>
<td>2 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. *The literature is mixed regarding optokinetic stimulation training for improving neglect.*
2. *Although optokinetic stimulation appears to have a positive effect on neglect, it is uncertain whether the addition of optokinetic stimulation to a program of rehabilitation for neglect would be of benefit.*
Rehabilitation of Perceptual Disorders Post-stroke

**Trunk Rotation Therapy**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>ADLs</th>
</tr>
</thead>
</table>
| Trunk Rotation Therapy        | ![Symbol 1b](#) 
1 RCT                      | ![Symbol 1b](#) 
1 RCT                      |

**Conclusion**

*The literature is mixed concerning trunk rotation therapy for improving neglect and activities of daily living.*

**Neck Muscle Vibration**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>ADLs</th>
</tr>
</thead>
</table>
| Neck Muscle Vibration        | ![Symbol 2](#) 
1 RCT                      | ![Symbol 2](#) 
1 RCT                      |

**Conclusion**

1. *The literature is mixed concerning visual exploration with neck muscle vibration for improving activities of daily living.*

**Transcutaneous Electrical Nerve Stimulation (TENS)**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Global Cognition</th>
<th>ADLs</th>
</tr>
</thead>
</table>
| TENS         | ![Symbol 1a](#) 
3 RCTs                | ![Symbol 2](#) 
1 RCT                | ![Symbol 1b](#) 
1 RCT                |

**Conclusion**

1. *The literature is mixed concerning visual exploration with neck muscle vibration for improving activities of daily living.*
Rehabilitation of Perceptual Disorders Post-stroke

Repetitive Transcranial Magnetic Stimulation for Neglect

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Motor Rehab</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>rTMS</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
<td>![Diagram]</td>
</tr>
<tr>
<td></td>
<td>1a</td>
<td>1a</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>5 RCTs</td>
<td>3 RCTs</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. The literature is mixed regarding rTMS for improving neglect and motor rehabilitation.
2. rTMS may not be beneficial for improving activities of daily living.

Key Study for rTMS and Neglect

- Yang NY, Fong KN, Li-Tsang CW, Zhou D. Effects of repetitive transcranial magnetic stimulation combined with sensory cueing on unilateral neglect in subacute patients with right hemispheric stroke: a randomized controlled study. Clinical rehabilitation. 2017; 31(9):1154-63.

Theta Burst Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visual Spatial Processing &amp; Neglect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theta Burst Stimulation</td>
<td>![Diagram]</td>
</tr>
<tr>
<td></td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>6 RCTs</td>
</tr>
</tbody>
</table>

Conclusions

1. TBS may be beneficial for improving neglect.

Key Study for Theta Burst Stimulation


Transcranial Direct Current Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transcranial Direct Current Stimulation</td>
<td>![Diagram]</td>
</tr>
<tr>
<td></td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

70
Rehabilitation of Perceptual Disorders Post-stroke

**Conclusion**

1. **tDCS may be beneficial for improving neglect.**

**Key Study for tDCS**


**Dopaminergic Drugs**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Visuospatial Processing &amp; Neglect</th>
<th>Learning and Memory</th>
<th>Motor Rehab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dopamine</td>
<td>![Visuospatial Processing &amp; Neglect](1b 1 RCT)</td>
<td>![Learning and Memory](1b 1 RCT)</td>
<td>![Motor Rehab](1b 1 RCT)</td>
</tr>
</tbody>
</table>

**Conclusion**

1. **Dopaminergic medication may not be beneficial for improving neglect, learning and memory, and motor rehabilitation.**

**Key Study on Dopaminergic Drugs**

## 4b. Rehabilitation of Aphasia Post-stroke

### Assessment and Aphasia Outcomes

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
</table>
| Discourse              | These outcome measures assessed aspects of speech such as content and grammar, as well as the overall ability for giving instructions, storytelling or description. | • Cookie Theft Picture Description  
• Discourse Quality  
• Discourse Quantity, Word and Utterance Count  
• Speech Content Analysis |
| Naming                 | These outcome measures assessed an individual's ability to retrieve and name certain objects. This includes fluency, convergent naming, divergent naming and confrontation naming. | • Boston Naming Test  
• Picture Naming and Category Test  
• Naming Tests (Fluency Tests)  
• Verbal Fluency Test |
| Verbal Fluency         | These outcome measures assessed the overall fluency of verbal expression. This includes aspects of speech such as prosody, the spontaneity of production or vocabulary and phase length. | • Mean Phrase Length  
• Mean Vocal Reaction Time  
• Melodic Intonation Therapy Task  
• Spontaneous Speech |
| Social Communication   | These outcome measures assess the more social aspects of communication, such as social appropriateness and turn-taking. | • Amsterdam-Nijmegen Everyday Language Test  
• Functional Communication Profile  
• Measure of Participation in Conversation  
• Speech Questionnaire |
| Repetition             | These outcome measures assess the ability for an individual to repeat a given word, phrase or text. | • Phonological Measures – repetition  
• Standardized Language Test |
| Writing                | These outcome measures are designed to assess the ability of an individual to produce written language. | • Written Language |
| General Comprehension  | These outcome measures assess an individual's ability to comprehend speech and/or language in multiple modalities. | • Gesture Comprehension  
• Semantic Association Test  
• Body-Part Identification  
• Discrimination Tasks |
| Reading Comprehension  | These outcome measures specifically assess comprehension of written language and alphanumeric symbols. | • Reading Comprehension Battery for Aphasia |
| Auditory Comprehension | These outcome measures specifically assess comprehension of heard speech sounds. | • Complex Ideation  
• Miscellaneous Commands  
• Token Test |
Rehabilitation of Aphasia

Global speech and Language

These outcome measures are generally comprehensive aphasia batteries that examine multiple aspects of speech and language. Should the study report specific subscales of these batteries, they will be counted towards their corresponding category above.

- Aachen Aphasia Test
- American Speech-Language Hearing Association Functional Assessment of Communication Skills
- Aphasia Severity Rating Scale
- Boston Diagnostic Aphasia Examination
- Communicative Activities in Daily Living
- Porch Index of Communicative Ability
- Western Aphasia Battery

Apraxia

These outcome measures assess apraxia impairment.

- Ideomotor Apraxia
- Apraxia Battery for Adults

Activities of Daily Living

These outcome measures assessed performance and level of independence in various everyday tasks.

- Barthel Index (BI)
- Functional Independence Measure (FIM)
- Therapy Outcome Measure – activity

Therapy of Aphasia Post-Stroke

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Naming</th>
<th>Verbal Fluency</th>
<th>Social Communication</th>
<th>Writing</th>
<th>General Comprehension</th>
<th>Reading Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Speech and Language Therapy</td>
<td>2 3 RCTs</td>
<td>2 3 RCTs</td>
<td>2 2 RCTs</td>
<td>1a 4 RCTs</td>
<td>2 1 RCT</td>
<td>2 2 RCTs</td>
<td>2 1 RCT</td>
<td>2 3 RCTs</td>
<td>1a 3 RCTs</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions

1. General speech and language therapy may improve writing in stroke survivors with aphasia.
2. Speech and language therapy may not be beneficial for global speech and language or social communication, in addition to activities of daily living.

Key Studies for General Speech and Language Therapy


Intensity of SLT on Aphasia

Conclusions

1. Moderate intensity language therapy may not be more effective in treating aphasia when compared to less intensive therapy; however, the benefit of high intensity language therapy in those that can tolerate it is not yet known.
Rehabilitation of Aphasia

Key Study for Intensity of Language Therapy


Word-Retrieval Interventions

<table>
<thead>
<tr>
<th></th>
<th>Discourse</th>
<th>Naming</th>
<th>Verbal Fluency</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>Writing</th>
<th>General Comprehension</th>
<th>Reading Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical Retrieval therapy</td>
<td>1b 1 RCT</td>
<td>1a 2 RCT</td>
<td>1b 1 RCT</td>
<td>1a 1 RCT</td>
<td>1a 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 2 RCTs</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions

1. **Lexical (word) retrieval therapy may not be beneficial for improving aphasia related outcomes post-stroke.**

Key Study of Word Retrieval


Trained Volunteers in Aphasia Training

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteer Facilitated Speech and Language Therapy</td>
<td>2 1 RCT</td>
<td>1b 3 RCTs</td>
</tr>
</tbody>
</table>

Conclusions

1. **Volunteer facilitated speech and language therapy may not be more beneficial than speech language pathology delivered therapy for improving aphasia related outcomes post-stroke.**
2. **Volunteers can provide an effective adjunct to speech-language pathologists’ treatment.**

Key Studies for Volunteers in Speech and Language Therapy

Rehabilitation of Aphasia

Group Therapy for Aphasia Post-Stroke

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Naming</th>
<th>Social Communication</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Interaction</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>3 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. Group therapies may not be more beneficial than individual therapies for improving aphasia related outcomes post-stroke.
2. There is mixed evidence that group therapies offer more benefit than recreational social activities.

Key Study for Group Therapy


Training Conversation / Communication Partners

Conclusion

1. Training communication partners may result in improved participation in conversation and improved conversational skills of persons with aphasia and their communication partners

Key Study for Training Communication Partners


Computer-Based Treatment

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Verbal Fluency</th>
<th>Repetition</th>
<th>Writing</th>
<th>General Comprehension</th>
<th>Reading Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer based therapies</td>
<td>1b</td>
<td>2</td>
<td>1b</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1b</td>
</tr>
<tr>
<td></td>
<td>2 RCTs</td>
<td>1 RCT</td>
<td>2 RCTs</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

Conclusion

1. The literature is mixed regarding computer-based therapies ability to improve naming.
2. Computer-based therapy may be beneficial for repetition.
Rehabilitation of Aphasia

Key Studies for Computer-Based Language and Speech Therapy


Telerehabilitation and Speech Language Therapy

Conclusions

1. Remote assessment of language following stroke may be as effective as face-to-face assessment of stroke outcomes among individuals with aphasia.
2. Remotely administered language therapy may be an effective alternative to face-to-face therapy.

Music-Based Speech Language Therapy

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Naming</th>
<th>Verbal Fluency</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
<th>Apraxia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Music therapy</td>
<td>1b 2 RCTs</td>
<td>1b 2 RCTs</td>
<td>1a 3 RCTs</td>
<td>1a 2 RCTs</td>
<td>1b 1 RCT</td>
<td>2 1 RCT</td>
<td>1b 2 RCTs</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusion

1. Music-based speech language therapies, such as melodic intonation therapy may be beneficial in improving verbal fluency, but not social communication, discourse, or global speech and language.
2. There is limited evidence which suggests it may be no better than standard language therapy.

Key Studies for Music Based Speech Language Therapies

Rehabilitation of Aphasia

**Constraint-Induced (CI) Aphasia Therapy**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Naming</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>Writing</th>
<th>General Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constraint Induced Aphasia Therapy</td>
<td>1b</td>
<td>1a</td>
<td></td>
<td>1b</td>
<td>1a</td>
<td></td>
<td></td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>3 RCTs</td>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td></td>
<td></td>
<td>2 RCTs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 RCTs</td>
</tr>
</tbody>
</table>

**Conclusions**

1. *Constraint induced aphasia therapy may be beneficial for improving repetition and writing.*
2. *Constraint induced aphasia therapy may not be beneficial for improving global speech and language and social communication.*
3. *The literature is mixed concerning constraint induced aphasia therapy’s ability to improve auditory comprehension.*
4. *Evidence for the effectiveness of constraint-induced aphasia therapy on language function and everyday communication in individuals with chronic aphasia suggests that it may be as effective as conventional aphasia therapy.*

**Key Study for Constraint-Induced Aphasia Therapy**


---

**Repetitive Transcranial Magnetic Stimulation (rTMS)**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Naming</th>
<th>Verbal Fluency</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>General Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Frequency rTMS</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td>1a</td>
<td></td>
<td></td>
<td></td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>3 RCTs</td>
<td>7 RCTs</td>
<td>3 RCTs</td>
<td>3 RCTs</td>
<td>5 RCTs</td>
<td></td>
<td></td>
<td></td>
<td>1 RCT</td>
</tr>
</tbody>
</table>

**Conclusion**

1. *Inhibitory rTMS may be beneficial for improving discourse, naming, verbal fluency, social communication and global speech and language.*

**Key Study for rTMS in Aphasia**

Rehabilitation of Aphasia

Transcranial Direct Current Stimulation

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Naming</th>
<th>Verbal Fluency</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>General Comprehension</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>tDCS</td>
<td>![speech bubble]</td>
<td>✔️ 1a 5 RCTs</td>
<td>❌ 1b 1 RCT</td>
<td>❌ 1b 1 RCT</td>
<td>❌ 1b 1 RCT</td>
<td>✔️ 1b 1 RCT</td>
<td>❌ 1b 1 RCT</td>
</tr>
</tbody>
</table>

Conclusions
1. **Excitatory tDCS may not be beneficial for improving naming post-stroke.**
2. **The addition of tDCS to traditional aphasia therapies may improve remediation of language deficits other than naming.**
3. **Further research is needed to fully understand the current conflicting results of tDCS compared to sham-tDCS treatment.**

**Key Studies for tDCS in Aphasia**

Drug Therapy for Post-Stroke Aphasia

**Piracetam**

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Discourse</th>
<th>Naming</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>Writing</th>
<th>General Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piracetam</td>
<td>![speech bubble]</td>
<td>✔️ 1b 1 RCT</td>
<td>❌ 1a 2 RCTs</td>
<td>❌ 1b 1 RCT</td>
<td>❌ 1b 1 RCT</td>
<td>✔️ 1a 2 RCTs</td>
<td>❌ 1a 2 RCTs</td>
<td>❌ 1a 2 RCTs</td>
<td>❌ 1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusion**
1. **Piracetam may not be beneficial for improving aphasia related outcomes post-stroke.**

**Key Study for Piracetam and Aphasia**
Rehabilitation of Aphasia

Bromocriptine and Levodopa

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Discourse</th>
<th>Naming</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>General Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bromocriptine or Levodopa</td>
<td>1a 2 RCTs</td>
<td>1a 5 RCTs</td>
<td>2 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. Bromocriptine does not appear to be better than placebo in improving aphasia disorders.
2. There appears to be little effectiveness of levodopa as an adjunct to speech and language therapy.

Key Studies of Bromocriptine and Levodopa as Adjunct to Aphasia Therapy

Amphetamines

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamines</td>
<td>1a 2 RCTs</td>
</tr>
</tbody>
</table>

Conclusion

1. Dextroamphetamine appears to improve aphasia recovery when combined with language therapy based on 2 small RCTs.

Key Study for Dextroamphetamine and Aphasia
Rehabilitation of Aphasia

**Donepezil**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>General Comprehension</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Donepezil</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>x</td>
<td>1b 1 RCT</td>
<td>x</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusions**

1. *Acetylcholinesterase inhibitors may be beneficial for improving naming, but not social communication, repetition, general and auditory comprehension, and global speech and language.*

**Key Study for Donepezil in Aphasia**


**Memantine**

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Discourse</th>
<th>Naming</th>
<th>Social Communication</th>
<th>Repetition</th>
<th>Auditory Comprehension</th>
<th>Global Speech &amp; Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memantine</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
<td>1b 1 RCT</td>
</tr>
</tbody>
</table>

**Conclusion**

1. *Memantine may be beneficial for improving discourse, naming, social communication auditory comprehension and global speech and language, but not repetition.*

**Key Studies of Memantine in Aphasia Therapy**

Rehabilitation of Aphasia

Cognitive Rehabilitation for Apraxia

Apraxia Therapy

<table>
<thead>
<tr>
<th>Interventions</th>
<th>General Comprehension</th>
<th>Apraxia</th>
<th>ADLs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apraxia Training</td>
<td>2</td>
<td>2</td>
<td>1a</td>
</tr>
<tr>
<td></td>
<td>1 RCT</td>
<td>1 RCT</td>
<td>2 RCTs</td>
</tr>
</tbody>
</table>

Conclusions

1. **Apraxia strategy training may be beneficial for improving activities of daily living.**
2. **Gesture training for apraxia may be beneficial for improving general comprehension, apraxia and activities of daily living.**

Key Studies for Apraxia Treatment

5. Medical Complications Post-Stroke

(Evidence Reviews Chapters 15-17 and Clinician’s Handbook Chapter 6)

5a. Dysphagia and Aspiration

Dysphagia Post-Stroke

Conclusions
1. Dysphagia is characterized by reduced coordination of oropharyngeal muscles potentially due to a reduction of cortical connectivity which may have a negative impact on factors of pulmonary function.
2. Oral weakness of the facial, palatal and pharyngeal muscles can contribute to dysphagia symptomology.

Aspiration Post-Stroke

Conclusions
1. The incidence of aspiration in the acute phase of stroke varies from 16% to 52%.
2. Silent aspiration occurs in 8% to 27% of acute stroke patients. Of identified aspirators, 20% to 67% developed silent aspiration.
3. Factors indicative of the development of aspiration include: a delayed swallow reflex, reduced peristalsis, respiratory tract infection, abnormal volitional coughing and cough with swallow, dysphonia, soft palate dysfunction, and facial hypesthesia.
4. Tested factors that may not be predictive of aspiration include: poor oral motility and bedside evaluations (which were associated with the identification of non-aspirators).
5. While silent aspiration shows a lower incidence among acute stroke patients than aspiration, both are prevalent and reliably identified.

Pneumonia Post-Stroke

Conclusion
1. Stroke severity, level of consciousness, age, oral hygiene and other factors contributing to the aspiration of bacterial laden secretions and refluxed material are major indicators for increased risk of pneumonia.
Medical complication post-stroke

Dysphagia and Nutritional Outcome Measures

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
</table>
| Pharyngeal Phase     | Assessed aspects of the pharyngeal phase of swallowing.                  | • Duration of Stage Transition  
                                      • Incidence of Aspiration  
                                      • Pharyngeal Transit Time (PTT) |
| Esophageal Phase     | Assessed aspects of the esophageal phase of swallowing.                   | • Cricopharyngeal Opening Duration  
                                      •                                                                 |
| Oral Phase           | Assessed aspects of the oral phase of swallowing.                         | • Oral Transit Time (OTT)  
                                      • Tongue Strength (Overall)  
                                      •                                                                 |
| Dysphagia Evaluation | Assessed global tests of swallowing function, oral hygiene and eating behaviours in dysphagic individuals. | • Dysphagia Severity Rating Scale (DSRS)  
                                      • Mann Assessment of Swallowing Ability  
                                      • Functional Oral Intake Scale (FOIS)  
                                      • Standardized Swallowing Assessment (SSA)  
                                      • Videofluoroscopic Swallowing Study (VFSS)  
                                      • Kubota Water Swallow Test  
                                      •                                                                 |
| Respiratory Infections | Assessed respiratory sequelae of dysphagia including aspiration and pneumonia. | • Pneumonia Incidence and Frequency  
                                      •                                                                 |
| Lipid Consumption    | Related to triglyceride body composition.                                   | • Triglyceride levels  
                                      • Cholesterol and Total Cholesterol levels  
                                      • High Density Lipoprotein (HDL)  
                                      • Low Density Lipoprotein (LDL)  
                                      •                                                                 |
| Calorie Consumption  | Assessed caloric intake and fluid intake.                                   | • Proportion of Prescribed Feed Delivered  
                                      • Total Fluid Intake  
                                      • Caloric Intake  
                                      •                                                                 |
| Protein and Carbohydrate Consumption | Amount of protein and carbohydrates consumed, usually daily. | • Protein Intake  
                                      • Carbohydrate Intake  
                                      • Carbohydrate-Protein Ratio  
                                      •                                                                 |
| Vitamin and Mineral Consumption | Assessed the consumption of vitamin or minerals. | • Calorie-Nitrogen Deficit  
                                      • 25-Hydroxyvitamin D Levels  
                                      • Iron Intake  
                                      •                                                                 |
| Body Composition     | Different anthropometric measurements.                                     | • Biceps Skinfold Thickness  
                                      • Body Mass Index (BMI)  
                                      • Mid-Arm Muscle Circumference (MUAC)  
                                      • Triceps Skinfold Thickness  
                                      • Waist Circumference  
                                      • Weight Gain  
                                      •                                                                 |
| Blood Glucose Management |                                                                               | • Fasting Glucose Level  
                                      • Glucose Tolerance Test  
                                      •                                                                 |
| Plasma Proteins      | Deal with circulating protein levels in a participant’s blood.             | • Albumin Levels  
                                      • Pre-Albumin  
                                      • Transferrin  
                                      • Hemoglobin  
                                      •                                                                 |
| Blood Pressure       | Measures of blood pressure.                                                | • Systolic Blood Pressure  
                                      • Diastolic Blood Pressure  
                                      •                                                                 |
| Lymphocyte Count     | Measure of neutrophil to lymphocyte concentrations                          | • Neutrophil-Lymphocyte Ratio  
                                      •                                                                 |
Medical complication post-stroke

### Activities of Daily Living
Assessed performance and level of independence in various everyday tasks.
- Barthel Index (BI)
- Functional Independence Measure (FIM)

### Stroke Severity
Assessed the severity of one’s stroke through a global assessment of a multitude of deficits a stroke survivor may experience.
- Canadian Neurological Scale (CNS)
- Modified Rankin Scale (mRS)
- National Institutes of Health Stroke Scale (NIHSS)
- European Stroke Scale (ESS)

Management of Dysphagia and Aspiration Post-Stroke

#### Diagnosis of Dysphagia and Aspiration

**Conclusions**
1. There are a variety of clinical screening tests for determining dysphagia following stroke.
2. There was a wide range of sensitivity (68-97%) and specificity (53-86%) values for the different bedside clinical examinations.
3. There is a wide range in the validity and clinical usefulness of bedside clinical examinations.
4. There was a wide range of sensitivity (first-step=71.4-100%; second-step=13-76.4%) and specificity (first-step=38-100%; second-step=70.3-100%) values for the swallowing provocation test.
5. There is a wide range in the validity and clinical usefulness of the water swallowing test and the swallowing provocation test.
6. Combination of the Water Swallowing Test and oxygen desaturation test may result in an improvement in the predictive accuracy of detecting aspiration and pneumonia over either of these screening tests conducted alone.
7. There is no ideal or defined volume of water that is used to assess dysphagia on the water swallowing test.
8. There is moderate evidence but widespread clinical acknowledgement that the introduction of swallow screening may reduce the incidence of pneumonia among patients with dysphagia when compared to no screening protocol or usual care.

**Dysphagia Imaging Studies in Stroke**

**Videofluoroscopic Modified Barium Swallow (VMBS) Studies**

**Conclusions**
1. Videofluoroscopic Modified Barium Swallow (VMBS) studies are considered the gold standard for dysphagia/aspiration diagnosis.
2. Further research is required to determine conclusively when a VMBS study should be administered or re-administered.
3. There is limited evidence that videofluoroscopic (VFS) results may be associated with swallowing function.

**Fiberoptic Endoscopic Evaluation of Swallowing (FEES)**

**Conclusions**
Medical complication post-stroke

1. There is conflicting moderate evidence regarding the reported incidence of pneumonia after flexible endoscopic evaluation of swallowing (FEES) is used versus facial oral tract therapy or videofluoroscopy.
2. There is limited evidence indicating that the incidence of pneumonia may be reduced when dysphagic patients are assessed with FEES versus no assessment. Additionally, FEES may be responsible for a higher proportion of patients treated with instrumental assessment and on standard diet at discharge which may be related to longer periods of non-oral feeding.
3. Flexible endoscopic evaluation of swallowing may reduce the incidence of pneumonia and improve other important factors associated with dysphagia recovery; however, the evidence is limited and further research is required.

Management of Dysphagia

Swallow Treatment Programs

Conclusion
1. Expiratory muscle training may be beneficial for improving the pharyngeal phase, but there is conflicting evidence for its ability to improve a dysphagia evaluation.

Key Study for Swallow Treatment Programs

Dietary Modifications

Conclusion
1. There is conflicting evidence on the efficacy of dietary modifications to improve the pharyngeal phase, or respiratory infections.

Key Study on Dietary Modifications

Low-Risk Feeding Strategies

Conclusions
1. It is important to encourage stroke survivors to feed themselves as the risk of aspiration pneumonia increases 20-fold when they are fed by someone else, generally because they are encouraged to eat at a faster rate.
2. Feed with hand-over-hand support at eye level if necessary.
3. Postural feeding strategies include chin tuck, head tilt, etc

Compensatory Strategies

Thermal Stimulation

Conclusion
1. Thermal stimulation with NMES may be more beneficial than thermal stimulation alone for improving the pharyngeal phase, and dysphagia evaluations.
Medical complication post-stroke

Key Study on Thermal Stimulation


Transcutaneous Electrical Stimulation (TENS)

Conclusions

1. **Suprathyroid, or suprathyroid with infrahyoid NMES may be beneficial for improving the pharyngeal phase, oral phase and dysphagia evaluations.**
2. **Infrahyoid NMES alone may not be beneficial for improving dysphagia related outcomes.**

Key Studies on TENS in Dysphagia


Repetitive Transcranial Magnetic Stimulation

Conclusions

1. **The literature is mixed concerning the efficacy of high frequency rTMS for dysphagia and activities of daily living.**
2. **Bilateral rTMS may lead to greater improvements in dysphagia than unilateral rTMS.**

Key Study on rTMS


Transcranial Direct Current Stimulation (tDCS)

Conclusion

1. **Contralesional anodal tDCS may be beneficial for improving dysphagia evaluations, but not respiratory infections.**

Key Study on tDCS


Feeding Tubes

Conclusion

1. **Gastrostomy tube feeding may be more beneficial than nasogastric tubes for improving body composition and calorie consumption but not respiratory infections.**

Key Studies on Feeding Tubes

Medical complication post-stroke


5b. Nutrition Post-Stroke

Malnutrition in Stroke

**Conclusions**

1. **The prevalence of malnutrition varies from 6 - 62% post stroke, depending on timing of assessment and criteria used to define malnutrition.**
2. **There is currently no “gold standard” for the assessment of nutritional status**

5c. Venous Thromboembolism Post Stroke

**Treatment of Venous Thromboembolism**

LMW Heparin in Acute Stroke Patients

**Conclusions**

1. **It is unclear whether low molecular weight heparin and unfractionated heparin are effective in preventing venous thromboembolism post stroke, without an increased risk of bleeding complications.**
2. **However, the efficacy of these medications has been demonstrated in non-stroke populations.**
3. **LMW Heparin agents would offer patients a safe and simple treatment alternative to vitamin K antagonist like warfarin, with no need for regular laboratory monitoring and a similar risk of bleeding.**

**Key Studies for LMW Heparin in Acute Stroke Patients**

Medical complication post-stroke

Mechanical Treatments for Deep Venous Thrombosis

Conclusions
1. The literature is mixed regarding the efficacy of intermittent pneumatic compression and graded compression stockings as an effective prophylactic intervention for deep vein thrombosis.
2. There is strong evidence that graduated compression stockings do not reduce the risk of DVT.
3. There is strong evidence that thigh length compression stockings reduce the risk of DVT when compared to below knee stockings.
4. There is strong evidence that intermittent pneumatic compression (IPC) reduces the risk of DVT when compared to no treatment with IPC.
5. There is moderate evidence heparin equivalent to both pneumatic compression and electrical stimulation in reducing risk of DVTs.

Key Studies for Mechanical Treatments for Deep Venous Thrombosis
• CLOTS (Clots in Legs Or sTockings after Stroke) Trial Collaboration. (2010). Thigh-length versus below-knee stockings for deep venous thrombosis prophylaxis after stroke: a randomized trial. Annals of Internal Medicine, 153(9), 553.
• CLOTS (Clots in Legs Or sTockings after Stroke) Trials Collaboration. (2013). Effectiveness of intermittent pneumatic compression in reduction of risk of deep vein thrombosis in patients who have had a stroke (CLOTS 3): a multicentre randomised controlled trial. The Lancet, 382(9879), 516-524.

5d. Post-Stroke Seizures

Conclusions
1. Post-stroke seizures not a common complication post stroke, although the rates vary widely across studies and stroke onset.
2. Common risk factors for post-stoke seizures include cortical strokes, severe strokes, greater disability, and younger age.
3. The majority of seizures post stroke are simple partial seizures.
4. Post-stroke seizures appear to be more common in hemorrhagic and cortical strokes, although this may be more directly related to stroke severity rather than etiology or location.

Key Study on Post Stroke Seizures

Prevention of Post-Stroke Seizures

Conclusions
1. There is no evidence that prophylactic anticonvulsive treatment is beneficial post stroke.
2. **Treating all stroke patients with anticonvulsants as primary seizure prophylaxis is not recommended.**

**Key Study for Prevention of Post Stroke Seizure**

**Treatment of Post-Stroke Seizures**

**Conclusions**
1. Insufficient evidence exists to guide selection of monotherapy for antiepileptic medications in patients with post-stroke seizures.
2. There is Level 1b and Level 2 evidence that lamotrigine, gabapentin, and carbamazepine are similar in reducing the rate of recurrent post-stroke seizures, but carbamazepine is more poorly tolerated.
3. Decisions to initiate antiepileptic therapy should be tailored to patients' individual needs.

**Key Studies for the Treatment of Post Stroke Seizures**

**5e. Thalamic/Central Pain States Post Stroke (CPSP)**

**Pathophysiology of Central Post-Stroke Pain**

**Conclusion**
1. The precise pathophysiology of central post-stroke pain is unknown, but it appears to be associated with a lesion involving the spino-thalamo-cortical pathway.

**Clinical Features of Central Post-Stroke Pain**

**Conclusions**
1. Central-post stroke pain generally involves some form of spontaneous and evoked sensory abnormality on the affected side including dysesthesia, allodynia, and hyperalgesia.
2. Development of central post-stroke pain is most often within the first month of stroke onset.

**Treatment of Central Pain Post Stroke**

**Amitriptyline**

**Conclusion**
1. There is conflicting evidence (based on 2 RCTs) amitriptyline reduces pain post-stroke.
Medical complication post-stroke

Key Studies of Amitriptyline to Treat Central Pain Post Stroke

I.V. Lidocaine

Conclusion
1. There is moderate evidence (1 RCT) lidocaine results in short-term (45 min) pain relief only.

Key Study for IV Lidocaine to Treat Central Pain Post Stroke

Anticonvulsants

Conclusions
1. Lamotrigine and Gabapentin have been shown in 1 RCT each to reduce pain
2. Pregabalin have been shown to improve other important mood and quality of life issues but not pain per se
3. Levetiracetam has not been shown to alter pain when compared to placebo.

Key Studies for Anticonvulsants to Treat Central Pain Post Stroke

Narcotics

Conclusions
1. There is moderate evidence (1 RCT) high strength u-opioid agonist levorphanol reduces CPSP.
2. There is moderate evidence (1 RCT) I.V. morphine results in analgesia; only a minority may benefit from long-term treatment.

Key Study for Narcotics in Treatment of Post Stroke Central Pain

Mexilitine

Conclusion
1. There is limited evidence Mexilitine reduces CPSP.
Medical complication post-stroke

Key Study of Mexiletine in Treatment of Post Stroke Central Pain

Motor Cortex Stimulation

Conclusions
1. There is limited evidence that brain stimulation reduces CPSP (motor cortical stimulation > deep brain stimulation > spinal cord stimulation).
2. rTMS may provide benefit for post-stroke pain when compared to sham stimulation.

Key Studies of Motor Cortex Stimulation and Treatment of Post Stroke Central Pain

Fluvoxamine

Conclusion
1. There is limited evidence SSRI fluvoxamine is useful in CPSP relatively early after stroke onset.

Key Studies for Fluvoxamine and Treatment of Post Stroke Central Pain

Algorithmic Treatment Approach to Central Post Stroke Pain

Conclusions
1. A wide range of pharmacological interventions are available for the treatment of central pain post stroke, including anticonvulsants, antidepressants, anesthetics, and narcotics.
2. The majority of these require further research to determine their effectiveness in pain reduction with Gabapentin, Lamotrigine and perhaps Amitriptyline showing the most promise; narcotics are a treatment of last resort.
3. Repetitive transcranial magnetic stimulation may be effective in reducing central pain post stroke when delivered at higher frequencies, although further research is required.

5f. Fatigue

Conclusions
1. Fatigue is a common condition post stroke, although there is variation in reported rates.
2. Risk factors for post-stroke fatigue include depression, chronic pain, and sleep disorders
3. Fatigue may be associated with poor recovery.
Medical complication post-stroke

Treatment of Post-Stroke Fatigue

Modafinil

Conclusion

1. The literature is mixed on the use of Modafinil for treating post-stroke fatigue.

Key Studies of Modafinil for Post Stroke Fatigue


Cognitive Therapy/Graded Activity Training

Conclusion

1. Limited evidence shows that and cognitive behavioural therapy with graded activity training may be effective treatments for post-stroke fatigue.

Key Study for Cognitive Behavioural Therapy in Post Stroke Fatigue

• Zedlitz AMEE, Rietveld TCM, Geurts AC, Fasotti L. Cognitive and graded activity training can alleviate persistent fatigue after stroke: A randomized, controlled trial. Stroke (2012);43:1046-1051
6. Depression and Community Reintegration Post-stroke

(Evidence Reviews Chapters 18-19 and Clinician’s Handbook Chapter 7)

6a. Depression

Risk Factors for Depression

The most commonly identified risk factors for post stroke depression include:

- Female sex (especially those with severe depression)
- Previous history of depression
- Stroke severity, functional limitations or need for assistance with activities of daily living
- Cognitive impairment
- Social factors (living alone, divorced or living in a nursing home)

Why is Depression Post Stroke Important?

Depression post stroke is important because it is associated with:

- Increased physical impairment and decreased physical recovery.
- Increased cognitive impairment.
- Decrease social participation and quality of life.
- Increased risk for mortality.
- Increased risk of depression for informal caregivers.
- Increase healthcare utilization for both.

Outcome Measures in Post Stroke Depression and Community Reintegration

<table>
<thead>
<tr>
<th>Category</th>
<th>Rationale</th>
<th>Individual Assessment Tools</th>
</tr>
</thead>
</table>
| Activities of daily living        | These outcome measures assessed performance and level of independence in various everyday tasks. | • Activities of Daily Living Scale  
• Barthel Index (BI)  
• Frenchay Activities Index (FAI)  
• Functional Independence Measure (FIM)  
• Nottingham Extended Activities of Daily Living  
• Stroke Impact Scale (activities of daily living) |
| Anxiety                           | These measures assessed the presence and severity of anxiety disorder, and its individual symptoms. | • State-trait Anxiety Inventory  
• Hospital Anxiety and Depression Scale (HADS) |
| Balance, Ambulation, Mobility     | These outcome measures assessed motor function, balance, ambulatory abilities and gait. | • 6-Minute Walk Test  
• Berg Balance Scale  
• Modified Rivermead Mobility Index (MRMI)  
• Timed Up & Go Test (TUG) |
| Caregiver Burden                 | These outcome measures assess the level of burden for caretakers of stroke survivors. | • Bakas Caregiver Outcome Scale  
• Zarit Burden Interview |
<table>
<thead>
<tr>
<th>Depression and Community Reintegration Post-stroke</th>
</tr>
</thead>
</table>
| **Cognition** | These outcome measures assessed an individual’s overall cognitive processing capability factoring in multiple domains. | • Mini Mental Status Examination (MMSE)  
• Montreal Cognitive Assessment (MoCA) |
| **Community Reintegration Social Participation** | These outcome measures assess an individual’s ability to reintegrate into their community and social behaviours. | • Reintegration to Normal Living Index (RNLI)  
• Social Support Inventory for Stroke Survivors (SSIS)  
• Use of Community/Aids Received |
| **Depression** | These measures assessed the severity and presence of major and/or minor depressive disorder and its individual symptoms. | • Beck Depression Inventory (BDI)  
• Geriatric Depression Scale (GDS)  
• Hospital Anxiety and Depression Scale (HADS)  
• Patient Health Questionnaire (PHQ-9)  
• Post-Stroke Depression Rating Scale  
• Stroke Aphasic Depression Questionnaire  
• Zung Self-Rating Depression Scale |
| **Driving** | These outcome measures assess both motor related skills and cognitive/perceptual skills for driving motor vehicles. | • Adelaide Driving Self-efficacy Scale  
• Useful Field of View  
• Visual Scanning Analyzer |
| **Education** | These outcome measures assessed an individual’s knowledge of stroke, living with stroke and related information to care services. | • Stroke Care Information Test  
• Health education impact questionnaire  
• Stroke Knowledge and Lifestyle Modification Questionnaire |
| **Emotional Lability** | These outcome measures assessed the severity and frequency of emotional volatility and inappropriate emotional responses. | • Emotional Distress Scale  
• Emotional Incontinence – Kim’s Criteria  
• Stroke Impact Scale (emotion) |
| **Mental Health and Mood CoFactors** | These outcome measures assess psychiatric dysfunction in a number of mental health related dimensions and assessments examining aspects of behavior or personality which relate to, but are not directly equivalent with, mood related outcomes. | • Apathy Scale  
• Depression, anxiety and stress scale (DASS-21)  
• Hospital Anxiety and Depression Scale (HADS)  
• Patient Health Questionnaire (PHQ-9)  
• State-Trait Anger Expression Inventory  
• Symptom Checklist 90-item revised |
| **Quality of Life** | These outcome measures assessed an individual’s overall quality of life and their perception of it, generally compared to their preinjury status. | • Assessment of Quality of Life Instrument  
• EuroQol Quality of Life (EQ-5D)  
• Medical Outcome Trusts’ Short Form Health Survey (SF-36 or SF-12)  
• Sickness Impact Profile  
• Stroke and Aphasia Quality of Life Scale-39 (SAQOL-39) |
Depression and Community Reintegration Post-stroke

| Satisfaction with Care | These outcome measures assessed an individual’s satisfaction with various aspects of their care. | • Client Satisfaction Questionnaire  
• Satisfaction with stroke care questionnaire |
|------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Self-Efficacy          | These outcome measures assess an individual’s confidence in their own knowledge and abilities, and can relate to both a patient or their caregiver. | • Stroke self-efficacy questionnaire  
Caregiver Self-Efficacy  
• Caregiver Competence Scale  
• Preparedness for caregiving scale |
| Sexuality              | These outcome measures assess sexual function and dysfunction. | • Changes in Sexual Functioning Questionnaire |
| Stroke Severity        | These outcome measures assessed the severity of one’s stroke through a global assessment of a multitude of deficits a stroke survivor may experience. | • Modified Rankin Scale (MRS)  
• National Institutes of Health Stroke Scale (NIHSS)  
• Oxford Handicap Scale  
• Stroke-Adapted Sickness Impact Profile (SA-SIP30) |

**Drug Therapy for Post-Stroke Depression**

**Heterocyclic Antidepressants in Post Stroke Depression**

**Conclusions**

1. *Nortriptyline may be beneficial for improving post-stroke depression.*  
2. The literature is mixed concerning heterocyclic antidepressants ability to improve activities of daily living

**Key Study for Tricyclic Antidepressants in Post Stroke Depression**


**Selective Serotonin Reuptake Inhibitors (SSRIs) in PSD**

**Conclusions**

1. *Escitalopram or citalopram may be beneficial for improving post-stroke depression, anger, emotional lability and activities of daily living.*  
2. The literature is mixed concerning the efficacy of fluoxetine for post-stroke depression.

**Key Studies for SSRIs in Post Stroke Depression**

Depression and Community Reintegration Post-stroke


Psychostimulants (Amphetamines)

Conclusions

1. **Methylphenidate (a psychostimulant) may be effective in treating depression post-stroke and has an earlier onset of action than traditional antidepressants.**

Key Study for Methylphenidate in Treatment of Post Stroke Depression


Summary of Effectiveness of Anti-Depressants

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Example</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterocyclic Antidepressants</td>
<td>Nortriptyline</td>
<td>Yes – High side effect profile</td>
</tr>
<tr>
<td>Selective Serotonin Reuptake Inhibitors (SSRIs)</td>
<td>Sertraline, Fluoxetine, Celexa</td>
<td>Yes – May also improve neurorecovery (Chollet et al)</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>Methylphenidate</td>
<td>Less Certain – Earlier onset</td>
</tr>
</tbody>
</table>

Conclusion

1. **There is strong evidence that heterocyclic antidepressants and SSRIs improve PSD.**
2. **Methylphenidate (a psychostimulant) may be effective in treating PSD with earlier onset of action.**

Functional Improvement with Antidepressants

Conclusion

1. **There is strong evidence that heterocyclic and SSRI antidepressant medications are associated with greater functional recovery and improvement in ADLs.**

Non-Pharmacological Treatments of PSD

Exercise for Depressive Symptoms Post Stroke

Conclusions

1. **The literature is mixed concerning physical activity interventions for improving depression.**
2. **Physical activity does not seem to be beneficial for improving anxiety, activities of daily living or quality of life post-stroke.**

Key Studies for Exercise and Depression

Depression and Community Reintegration Post-stroke


Repetitive Transcranial Magnetic Stimulation

Conclusion

1. High frequency rTMS may be beneficial for improving depression and apathy post-stroke, but not activities of daily living.

Key Study for rTMS in Post Stroke Depression

- Gu SY, Chang MC. The effects of 10-Hz repetitive transcranial magnetic stimulation on depression in chronic stroke patients. Brain stimulation (2017);10:270-274.

Transcranial Direct Current Stimulation

Conclusion

1. Dual tDCS could be beneficial for improving post-stroke depression.

Key Study for tDCS in Post Stroke Depression


Cognitive- Behavioural Therapy (CBT) Post-Stroke

Conclusions

1. The literature is mixed regarding the effectiveness of CBT for improving post-stroke depression.
2. CBT does not appear improve activities of daily living or quality of life.

Key Studies on Cognitive Behavioural Therapy and Depression

Depression and Community Reintegration Post-stroke


Care Provision and Educational Resources

Conclusions

1. **Coordinated care and comprehensive follow-up may be beneficial for improving post-stroke depression, but not other mood related outcomes.**
2. **Goal-setting programs or home visits may not be beneficial for improving mood related outcomes post-stroke.**

Key Studies of Care Provision and Post Stroke Depression

Art Therapy

Conclusions

1. **Art therapy may be beneficial for improving depression, activities of daily living and quality of life post-stroke, but not anxiety.**

Key Study in Art Therapy in Treating Post Stroke Depression

Music Therapy in Depression

Conclusion

1. **The literature is mixed regarding music therapies efficacy for improving mood related outcomes post-stroke.**

Key Study for Music Therapy in Depression
Depression and Community Reintegration Post-stroke

6b. Community Reintegration Post Stroke

Effects of Caregiving Post Stroke

Conclusions

1. Commonly identified effects of caregiving on the caregiver include decreased health (both physical and mental), decreased social contact and activity, increased risk for depression, increased carer stress, strain or burden and an overall decrease in quality of life.
2. Decreased social contact and activity in itself may contribute to increased carer strain, increased risk of depression and decreased life satisfaction.
3. Age, severity of stroke, stroke-related impairments, and functional and cognitive status have been reported as influencing caregiver outcomes.

Patient Education Programs

Conclusion

1. Education programs may not benefit patient or caregiver outcomes.

Key Studies for Patient Education Programs


Psycho-social and Emotional Support

Conclusion

1. There is conflicting evidence about the effect of psychosocial and emotional support programs to improve mental health, activities of daily living, quality of life and optimism.

Key Studies of Psychosocial Support Post Stroke


Discharge Planning and Active Care Management

Conclusion

1. Discharge planning and active care management may not improve patient or caregiver outcomes.

Key Studies for Discharge Planning Post Stroke

Depression and Community Reintegration Post-stroke


Self-Management Strategies

**Conclusion**

1. **Self management programs may be beneficial for improving self-efficacy.**

**Key Studies of Self Management Strategies Post Stroke**


Caregiver Skills Training

**Conclusion**

1. **Caregiver training may not have specific benefits to carers.**

**Key Studies for Caregiver Sills Training**


Conclusions on Community Supports

**Conclusions**

1. **Higher levels of social support are associated with greater functional gains, less depression, improved mood and social interaction as well as improved quality of life.**
2. **Social support is predictive of discharge destination.**
3. **Interventions to help access community support services is associated with increased social activity.**
4. **It is important to include the caregiver as well in social support interventions.**
Depression and Community Reintegration Post-stroke

Exercise and Physiotherapy Interventions

Conclusions
1. **Home exercise programs with picture descriptions may not be beneficial for improving activities of daily living, balance, ambulation and mobility, and self-efficacy.**
2. **Community walking programs may be beneficial for improving balance, ambulation and mobility as well as community reintegration and social support.**
3. **For caregivers, client centered support with activities of daily living may not be beneficial for improving activities of daily living, balance ambulation and mobility, community reintegration and social support, quality of life and optimism, self-efficacy or caregiver burden.**

Key Study for Exercise and Physiotherapy Interventions

Sexuality, Aging, and Disability

Conclusions
1. **A decrease in sexual activity is very common post-stroke and is likely related to a changed body image, reduced self-esteem and lack of communication with one’s partner.**
2. **There is consensus opinion that sexual issues need to be addressed as an important part of community reintegration.**
3. **Sexual rehabilitation programs may not be beneficial for improving activities of daily living, mental health, quality of life and optimism and sexual health.**

Key Study for Sexuality Post Stroke

Driving Post-Stroke

Conclusion
1. **Despite a lack of research, patients for whom there is a concern about their ability to drive post-stroke by law in Ontario need to be reported and properly assessed.**
2. **Simulator training, useful field of view training or Dynavision training may not be beneficial for improving driving related outcomes.**

Key Studies for Driving Post Stroke
- Devos et al. (2009)
Depression and Community Reintegration Post-stroke

Return to Work Post Stroke

Conclusion

1. **Occupational workplace therapy may not be beneficial for improving activities of daily living, balance, ambulant and mobility, cognition or quality of life and optimism.**

Key Study for Return to Work Post Stroke


Leisure/Socialization

Conclusions

1. **Deterioration in social and leisure activities is common post-stroke and is greatest in women, the young and those who are better educated.**
2. **Perceptions about how others view their disabilities and perceptions about how they will be able to cope post-stroke may influence the degree of social isolation experienced.**
3. **Research is limited in this area.**