Physical Fitness Training for Patients With Stroke

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Cardiorespiratory and musculoskeletal fitness are low after stroke. Interventions to improve physical fitness after stroke could have a range of physical, cognitive, and psychosocial benefits.

Objectives

The primary aims of this updated review were to determine whether physical fitness training after stroke reduces death, dependence, and disability. The secondary aims were to assess the effects of training on adverse events, risk factors, physical fitness, mobility, physical function, quality of life, mood, and cognitive function. Cognition outcomes have become an important poststroke intervention target and are, therefore, added to this review update.

Methods

Search Methods

We searched the Cochrane Stroke Group Trials Register (last searched February 2015), the Cochrane Central Register of Controlled Trials (CENTRAL 2015, Issue 1: searched February 2015), MEDLINE (1966 to February 2015), EMBASE (1980 to February 2015), CINAHL (1982 to February 2015), SPORTDiscus (1949 to February 2015), and 5 additional databases (February 2015). We also searched ongoing trials registers, hand-searched relevant journals and conference proceedings, screened reference lists, and contacted experts.

Selection Criteria

Randomized trials comparing either cardiorespiratory training or resistance training, or both (mixed training), with usual care, no intervention, or a nonexercise intervention in stroke survivors.

Data Collection and Analysis

Two review authors independently selected trials, assessed quality and risk of bias, and extracted data. We analyzed data using random-effects meta-analyses. Diverse outcome measures limited the intended analyses.

Results

We included 58 trials, involving 2797 participants, which comprised cardiorespiratory interventions (28 trials and 1408 participants), resistance interventions (13 trials and 432 participants), and mixed training interventions (17 trials and 957 participants). There were few deaths with no between-group differences at the end of intervention (n=13) or at the end of follow-up (additional n=9). No dependence data were reported. Global indices of disability showed moderate improvement after cardiorespiratory training (standardized mean difference, 0.52; 95% confidence interval, 0.19–0.84; \(P=0.002\)) and a small improvement after mixed training (standardized mean difference, 0.26; 95% confidence interval, 0.04–0.49; \(P=0.02\)); benefits at follow-up were unclear. Significant increases in the speed and tolerance of walking were observed after cardiorespiratory and mixed training, which involved walking (Table); some benefits persisted after the interventions finished. Balance scores improved slightly after mixed training (standardized mean difference, 0.27; 95% confidence interval, 0.07–0.47; \(P=0.008\)). The variability, quality of the included trials, and lack of data prevent conclusions about other outcomes and limit the generalisability of the observed results.

Reviewer Conclusions

Cardiorespiratory training and, to a lesser extent, mixed training reduce disability during or after usual stroke care; perhaps mediated by improved mobility and balance. There is sufficient evidence to incorporate cardiorespiratory and mixed training, involving walking, within poststroke rehabilitation programs to improve the speed and tolerance of walking; improvement in balance may also occur. There is insufficient evidence to support the use of resistance training. The effects of training on death and dependence after stroke are unclear, but these outcomes are rarely observed in physical fitness training trials. Cognitive function is underinvestigated despite...
being an important outcome for people with stroke. Further well-designed randomized trials are needed to determine the optimal exercise prescription and identify long-term benefits.

Acknowledgments
This article is based on a Cochrane Review published in The Cochrane Library 2016, Issue 10 (see www.thecochranelibrary.com for information). Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, and The Cochrane Library should be consulted for the most recent version of the review.

Disclosures
Drs Saunders and Greig were coauthors of one included study (Mead 2007). Dr Mead has received research funding for exercise after stroke. She has received honoraria from Later Life Training to develop an educational course of exercise after stroke for exercise professionals. She has also received honoraria and expenses to present work on exercise after stroke at conferences. She has led a trial of exercise after stroke that is included in the review (Mead 2007). The other authors report no conflicts.

References

Key Words: exercise • physical fitness • risk factors • stroke • systematic review

<table>
<thead>
<tr>
<th>Fitness Training Intervention</th>
<th>Walking Outcome</th>
<th>End of Intervention</th>
<th>End of Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (n)</td>
<td>Mean Difference (95% Confidence Interval)</td>
<td>Significance Level</td>
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<tr>
<td>Cardiorespiratory training</td>
<td>Maximum walking speed</td>
<td>14 (631) 6.71 m/min (2.73 to 10.69)</td>
<td>P&lt;0.0006</td>
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<td>Preferred walking speed</td>
<td>10 (505) 4.28 m/min (1.71 to 6.84)</td>
<td>P=0.001</td>
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<td>6 minute walking test</td>
<td>15 (826) 30.29 m (16.19 to 44.39)</td>
<td>P&lt;0.0001</td>
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<tr>
<td>Resistance training</td>
<td>Maximum walking speed</td>
<td>4 (104) 1.92 m/min (-3.50 to 7.35)</td>
<td>NS</td>
</tr>
<tr>
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<td>Preferred walking speed</td>
<td>3 (80) 2.34 m/min (-6.77 to 11.45)</td>
<td>NS</td>
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<tr>
<td></td>
<td>6 minute walking test</td>
<td>2 (66) 3.78 m (-68.56 to 76.11)</td>
<td>NS</td>
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<tr>
<td>Mixed training</td>
<td>Maximum walking speed</td>
<td>...</td>
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<td></td>
<td>Preferred walking speed</td>
<td>9 (639) 4.54 m/min (0.95 to 8.14)</td>
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<td>6 minute walking test</td>
<td>7 (561) 41.60 m (25.25 to 57.95)</td>
<td>P&lt;0.00001</td>
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</tbody>
</table>

N indicates trial number; n, participant number; and NS, nonsignificant.
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