Brief Report

Effect of Aerobic Exercise (Walking) Training on Functional Status and Health-related Quality of Life in Chronic Stroke Survivors
A Randomized Controlled Trial

Carron D. Gordon, PhD; Rainford Wilks, DM; Affette McCaw-Binns, PhD

Background and Purpose—Little is known about the effects of community-based walking programs in persons with chronic stroke. The purpose of this study was to determine the effects of aerobic (walking) training on functional status and health-related quality of life in stroke survivors.

Methods—A single-blind randomized controlled trial was conducted. The intervention group (n=64) walked overground for 30 minutes, 3 times per week for 12 weeks. The control group (n=64) received massage to the affected side. Medical Outcomes Short Form, 36-Item Short Form Health Survey (SF-36), was used to assess health-related quality of life; Barthel Index and Older Americans Resource and Services scale for functional status; 6-minute walk test for endurance; and Motricity Index for lower extremity strength.

Results—There was a trend toward greater improvement over time for the Physical Health Component of the SF-36 (P=0.077) and significantly greater improvement over time for distance walked in 6 minutes in favor of the walking group (P<0.001).

Conclusions—Aerobic walking improves the physical health component of quality of life and endurance in persons with chronic stroke. It should form part of a comprehensive health promotion strategy.

Clinical Trial Registration—Trial was not registered as enrollment commenced before 2005. (Stroke. 2013;44:00-00.)

Key Words: exercise training ■ randomized trial ■ stroke ■ walking

Aerobic exercise training in stroke has been shown to increase lower extremity strength,1 improve aerobic capacity,2 and functional abilities.3 Although these outcomes may impact health-related quality of life (HRQL),4 the effect of aerobic exercise on HRQL has been much less investigated. Improvement in HRQL after combined aerobic and strengthening exercise has been reported,5 whereas others have shown no effect.6 Aerobic training alone was investigated in only 1 study with no effect.7 Previous studies used mainly treadmill and cycle ergometers, with none examining more accessible and less expensive modes of aerobic training such as overground walking. The purpose of this study was to determine the effect of a community-based, 12-week aerobic (walking) exercise program on functional status and HRQL in community-dwelling stroke survivors.

Methods

Design and Subjects
A single-blind randomized controlled trial was done. The study received ethics approval, and subjects gave written informed consent.

Design and Subjects
A single-blind randomized controlled trial was done. The study received ethics approval, and subjects gave written informed consent.

Design and Subjects
A single-blind randomized controlled trial was done. The study received ethics approval, and subjects gave written informed consent.

Design and Subjects
A single-blind randomized controlled trial was done. The study received ethics approval, and subjects gave written informed consent.
Table 1. Clinical and Demographic Characteristics of Subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control (n=64)</th>
<th>Intervention (n=64)</th>
<th>PValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>64.9 (11.1)</td>
<td>63.4 (9.4)</td>
<td>0.401</td>
</tr>
<tr>
<td>Range</td>
<td>43–90</td>
<td>42–85</td>
<td></td>
</tr>
<tr>
<td>Sex, % (n)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>45.3 (29)</td>
<td>45.3 (29)</td>
<td>1.0</td>
</tr>
<tr>
<td>Female</td>
<td>54.7 (35)</td>
<td>54.7 (35)</td>
<td></td>
</tr>
<tr>
<td>Type of stroke, % (n)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ischemic</td>
<td>84.3 (43)</td>
<td>87.3 (48)</td>
<td>0.875</td>
</tr>
<tr>
<td>Hemorrhagic</td>
<td>7.2 (8)</td>
<td>12.7 (7)</td>
<td></td>
</tr>
<tr>
<td>Side of lesion, % (n)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Right</td>
<td>65.6 (42)</td>
<td>56.3 (36)</td>
<td>0.365</td>
</tr>
<tr>
<td>Left</td>
<td>34.4 (22)</td>
<td>43.8 (28)</td>
<td></td>
</tr>
<tr>
<td>Time since stroke, mean (SD), mo</td>
<td>11.8 (3.6)</td>
<td>12.8 (3.6)</td>
<td>0.122</td>
</tr>
<tr>
<td>Use of walking aid at recruitment</td>
<td>Yes</td>
<td>32.8 (21)</td>
<td>0.562</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>67.2 (43)</td>
<td></td>
</tr>
</tbody>
</table>

Control

The control group received light massage to the affected limbs for 25 minutes, 3 times per week, for 12 weeks, at home.

Outcomes

Primary outcomes were the Physical and Mental Component Summary scores of the Medical Outcomes Survey, 36-Item Short Form Health Survey (SF-36), the Barthel Index, and the instrumental activities of daily living dimension of the Older Americans Resources and Services Questionnaire.

Secondary outcomes were functional exercise capacity/endurance (6-minute walk test), resting heart rate, and lower limb strength. Resting heart rate was recorded using a polar A1 heart rate monitor (Model#1902690 by Polar Electro Oy, Finland). Lower extremity strength was determined with the Motricity Index.

Data Analyses

To detect a difference of 5 points (SD of 10) between the groups on the SF-36, with an α-level (2-sided) of 0.05 and β of 20 (80% power), a sample size of 63 per group was needed.

The groups were compared at baseline on all variables using χ² and Student t test. Between-group differences were examined using a 2-way mixed ANOVA with time as a repeated-measures factor. The significance level was set at 0.05. An intention-to-treat analysis was performed for missing data.

Table 2. Group-by-Time Mean (SD) for SF-36 Summary Scores

<table>
<thead>
<tr>
<th>Domains</th>
<th>Group</th>
<th>Baseline</th>
<th>6 wk</th>
<th>3 mo</th>
<th>PValue*</th>
<th>PValue†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Health Component</td>
<td>Control</td>
<td>31.7 (11.5)</td>
<td>33.9 (14.9)</td>
<td>32.5 (12.6)</td>
<td>0.024</td>
<td>0.077</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>33.5 (9.8)</td>
<td>37.5 (10.9)</td>
<td>39.1 (11.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Health Component</td>
<td>Control</td>
<td>42.2 (12.4)</td>
<td>46.1 (11.4)</td>
<td>46.7 (11.7)</td>
<td>0.758</td>
<td>0.731</td>
</tr>
<tr>
<td></td>
<td>Intervention</td>
<td>43.7 (13.01)</td>
<td>45.8 (14.4)</td>
<td>47.2 (13.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SF-36 indicates 36-Item Short Form Health Survey.

*P value for main effect of group.
†P value for group-by-time interaction.
Persons in the walking group improved in their endurance for walking over the 12 weeks of training. These findings were similar to others, who used treadmill training protocols, suggesting that overground walking used in the present study may be just as effective as treadmill walking. If persons are able to increase their ability to walk longer distances and to do so quicker, these have implications for their functional ambulation in the community. The lower resting heart rate in the walking group after training may be suggesting a cardiovascular training effect of overground walking.

The program could be considered labor intensive because training was done one-on-one. However, given the simplicity of the intervention (requiring no special equipment), overground walking may be just as effective as treadmill walking. If persons are able to increase their ability to walk longer distances and to do so quicker, these have implications for their functional ambulation in the community. The lower resting heart rate in the walking group after training may be suggesting a cardiovascular training effect of overground walking.

The program could be considered labor intensive because training was done one-on-one. However, given the simplicity of the intervention (requiring no special equipment), over ground walking may be just as effective as treadmill walking. If persons are able to increase their ability to walk longer distances and to do so quicker, these have implications for their functional ambulation in the community. The lower resting heart rate in the walking group after training may be suggesting a cardiovascular training effect of overground walking.

The study subjects were those whose stroke occurred 6 to 24 months before the study and could walk independently. The results cannot be extended to those more severely affected. Because subject recruitment was slower than anticipated, oversampling was not achieved. Attrition may have reduced the power to detect significant group differences on some outcomes.

Conclusions

Brisk overground walking could be incorporated into comprehensive, community-based exercise programs aimed at encouraging regular physical activity and improving overall health of moderately impaired community-dwelling persons with chronic stroke.

Sources of Funding

The study was funded by the Caribbean Health Research Council, the Epidemiology Research Unit (ERU), and Graduate Studies and Research, the University of the West Indies, Mona. The director of the ERU was part of the supervisory committee of the project and assisted with clinical examination of the subjects.

Disclosures

None.

References

Effect of Aerobic Exercise (Walking) Training on Functional Status and Health-related Quality of Life in Chronic Stroke Survivors: A Randomized Controlled Trial
Carron D. Gordon, Rainford Wilks and Affette McCaw-Binns

Stroke. published online March 7, 2013;
Stroke is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231
Copyright © 2013 American Heart Association, Inc. All rights reserved.
Print ISSN: 0039-2499. Online ISSN: 1524-4628

The online version of this article, along with updated information and services, is located on the World Wide Web at:
http://stroke.ahajournals.org/content/early/2013/03/07/STROKEAHA.111.000642

Permissions: Requests for permissions to reproduce figures, tables, or portions of articles originally published in Stroke can be obtained via RightsLink, a service of the Copyright Clearance Center, not the Editorial Office. Once the online version of the published article for which permission is being requested is located, click Request Permissions in the middle column of the Web page under Services. Further information about this process is available in the Permissions and Rights Question and Answer document.

Reprints: Information about reprints can be found online at:
http://www.lww.com/reprints

Subscriptions: Information about subscribing to Stroke is online at:
http://stroke.ahajournals.org/subscriptions/