The effect of cycling using active-passive trainers on spasticity, cardiovascular fitness, function and quality of life in people with Multiple Sclerosis (MS)

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Introduction
Exercise is beneficial for people with Multiple Sclerosis (pwMS) however exercise options for those with moderate to high levels of disability are limited. Cycling, delivered with an Active Passive Trainer (APT) is one exercise option often offered within rehabilitation/exercise settings and many pwMS buy APT’s for home use. Anecdotally pwMS report they feel better and their spasticity reduces after APT cycling, however there is a lack of evidence to support this.

Aim
The aim of the study is to evaluate the feasibility and potential effectiveness of a progressive, four week programme of exercise using lower limb APT (Motomed) on spasticity, cardiovascular fitness, function and quality of life in people with moderate to severe Multiple Sclerosis.

Method
People with MS admitted to the Physical Disability Rehabilitation Unit (PDRU) at the Queen Elizabeth University Hospital in Glasgow were invited to take part in the study. Participants were included if they had MS, were aged over 18 years, an Expanded Disability Status Scale (EDSS) of 6.0-8.5 (moderate to severe disability) and spasticity in their lower limbs (self reported). Participants were excluded if they had cognitive impairment (cannot understand instructions), other co-morbidities which would preclude them taking part in exercise or visual impairment (cannot see the screen on the APT).

They were randomly assigned to intervention or control (usual care) groups. Both groups received four weeks of conventional, personalised in-patient rehabilitation and in addition the intervention group received 4 weeks of cycling on the APT for 30 mins/day (2 mins passive warm up, 26 mins active cycling, 2 mins passive cool down), 5 days/week. Usual care and changes in medication were noted.

Outcome measures were assessed before and after the 20 day study period. They include cardiovascular fitness measured using the Oxygen Uptake Efficiency Slope (OUES), spasticity assessed by Modified Ashworth Scale (MAS) and the Multiple Sclerosis Spasticity Scale (MSSS-88), function assessed by the Functional Independence Measure (FIM) and the Timed 25 foot walk test (T25FW), Quality of Life measured by MSQOL-54. Cycling data: symmetry, distance cycled and power will be recorded following each cycling session in the intervention group.

The study ran from July 2016 – June 2017 and was funded by the CSP Charitable Fund.

Results
24 patients were recruited, 15 intervention and 9 to the control group. There were no differences between the groups in terms of age, EDSS or years since diagnosis. There was no significant difference in any outcome measure over time.

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Intervention Pre</th>
<th>Intervention Post</th>
<th>Control Pre</th>
<th>Control Post</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>T25FW</td>
<td>60s (±43)</td>
<td>64s (±56)</td>
<td>39s (±15)</td>
<td>23s (±12)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>FIM</td>
<td>98 (±21)</td>
<td>104 (±19)</td>
<td>88 (±25)</td>
<td>98 (±14)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>MSQOL 54; PH</td>
<td>28 (±14)</td>
<td>52 (±28)</td>
<td>43 (±17)</td>
<td>63 (±25)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>MH</td>
<td>52 (±32)</td>
<td>63 (±25)</td>
<td>34 (±18)</td>
<td>54 (±28)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>MSSS 88</td>
<td>237 (±66)</td>
<td>204 (±88)</td>
<td>220 (±61)</td>
<td>176 (±48)</td>
<td>&gt;0.05</td>
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<tr>
<td>OUES</td>
<td>0.734 (±0.296)</td>
<td>0.829 (±0.254)</td>
<td>0.768 (±0.382)</td>
<td>0.746 (±0.317)</td>
<td>&gt;0.05</td>
</tr>
</tbody>
</table>

There was 100% adherence to the cycling programme in the intervention group. Over the 4 week intervention participants significantly increased the total distance cycled and cycling speed. For each day of cycling there was an average increase of 0.45 rpm and 0.04 miles per day. The average difference between start and end distance cycled was an increase of 0.64 miles.

Conclusions/Recommendations
With an in-patient study it is difficult to separate the effects of therapy and APT cycling. A larger study of longer duration and community based is required.

Exploring the views of users of APTs is also required.

Evaluating symptoms such as spasticity remains a challenge.

References


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