Wristband Accelerometers to motivate arm Exercise after Stroke (WAVES)

Ruth Da Silva
Occupational Therapist
Stroke Research Group

The problem being addressed

- 69% will have reduced function in arm
- Only 5-20% will make a full recovery
- High doses of therapy required
- Inattention and cognitive deficits impact on self-directed practice

The solution? ……the CueS device

Open Lab

Study aims and objectives

- Completeness and summary stats of data
- Enrol one participant per month per site
- Report attrition
- Assess the feasibility of a multi-centre RCT
- Report adherence to programme
- Serious adverse events
- Success of outcome assessor blinding
- Report frequency of usual care

WAVES: a self-directed intervention

Example of one days data

- Blue = arm activity
- Green = threshold
- Orange = prompt delivered
- Magenta = median of previous 60 seconds of activity
Pilot Randomised Controlled Trial

Control n=19
- Male 7 (37%)
- Age 69 (61-80)
- Time post-stroke 26 days (13-48)
- ARAT 15 [2-35]
- MAL (AoU) 0.3 [0.1-1.3]
- Pain (Numeric rating) 0 [0-4]
- Fatigue (Numeric rating) 7 [5-9]

Intervention n=14
- Male 6 (43%)
- Age 73 (61-80)
- Time post-stroke 27 days (13-48)
- ARAT 37 [16-45]
- MAL (AoU) 1.4 [0.5-2.6]
- Pain (Numeric rating) 0 [0-3]
- Fatigue (Numeric rating) 6 [5-7]

Recruitment and retention results
- 8 weeks

Control n=19
- 67% recorded usual care
- 99% days wore the device
- 79.4% wear time per day
- 1 incident of unblinding
- 8 SAEs reported – non related to study

Clinical outcomes

<table>
<thead>
<tr>
<th>Outcome measure</th>
<th>Scores at 4 weeks</th>
<th>Scores at 8 weeks</th>
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</thead>
<tbody>
<tr>
<td>ARAT total score</td>
<td>Intervention group 44 [29, 57] (n=12)</td>
<td>Control group 35 [15, 52] (n=14)</td>
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<td>Intervention group 54 [37, 57] (n=10)</td>
<td>Control group 31 [21, 55] (n=13)</td>
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<tr>
<td>Motor Activity Log (AoU)</td>
<td>Intervention group 3.8 [2.0, 4.5] (n=12)</td>
<td>Control group 1.1 [0.3, 2.9] (n=15)</td>
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<td>Intervention group 4.2 [2.1, 4.3] (n=10)</td>
<td>Control group 1.2 [0.7, 2.9] (n=14)</td>
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<tr>
<td>Pain numeric rating scale 1-10</td>
<td>Intervention group 0 [0, 4] (n=12)</td>
<td>Control group 1 [0, 8] (n=16)</td>
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<td>Intervention group 0 [0, 5] (n=10)</td>
<td>Control group 5 [0, 8] (n=14)</td>
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<tr>
<td>Fatigue numeric rating scale 1-10</td>
<td>Intervention group 2 [2, 5] (n=12)</td>
<td>Control group 3 [2, 8] (n=16)</td>
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<td>Intervention group 5 [2, 5] (n=10)</td>
<td>Control group 7 [5, 8] (n=14)</td>
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</tbody>
</table>

Effect of prompts on activity data

- 7 prompts delivered per day [IQR: 6, 8]
- 66.5% of prompts led to increase in activity
- Prompt increase of 16.6% (p = 0.002)

Comparison of CPM between groups

<table>
<thead>
<tr>
<th>Table 1: CPM median [IQR] at each outcome interval.</th>
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<td>CPM</td>
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<td>Control vs Intervention p-value</td>
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Participants feedback

Confusing at times as it was buzzing while doing my exercises. Bit of a pain wearing the wrist band. Enjoyed being able to see activity on the laptop – allows me to see how I’m progressing. Now I’m more conscious of using it (my arm).

I just put it on in the morning and get on with my day.

Wrist-worn monitoring and cueing is safe and feasible.

Activity in stroke arm increased following prompts.

Arm activity continued post intervention.

Clinical trial of efficacy is required.

Acknowledgements

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Co-applicants on the WAVES study: M Balaam¹, K Brittain¹, L Brkic¹, T Ploetz¹, H Rodgers¹, L Shaw¹, F van Wijck²

¹Newcastle University, ²Glasgow Caledonian University