

- **Presenting author's contact details:** Email address
- Full postal address
- Daytime and evening phone number

**Ruth Da-Silva** [Ruth.Da-Silva@newcastle.ac.uk](mailto:Ruth.Da-Silva@newcastle.ac.uk)

Institute of Neuroscience and NIHR Newcastle Biomedical Research Centre

Newcastle University

3-4 Claremont Terrace

Newcastle upon Tyne

NE2 4AE

Tel: daytime: 01912086261

Evening: 07751757591

**Presentation type:** oral

- **Author and co-authors' details** (maximum of 20 authors):
  - Full first and family name(s)
  - Affiliation details: department, institution / hospital, city, state (if relevant), country

Ruth H. Da-Silva, Institute of Neuroscience, Newcastle University, Newcastle upon Tyne, UK

Helen Rodgers, Institute of Neuroscience, Newcastle University, Newcastle upon Tyne, UK

Lisa Shaw Institute of Neuroscience, Newcastle University, Newcastle upon Tyne, UK

Frederike van Wijck, School of Health and Life Sciences, Glasgow Caledonian University, Glasgow, UK

Sarah Moore, NIHR Newcastle Biomedical Research Centre, Newcastle University, Newcastle upon Tyne, UK

Daniel Jackson, School of Computing Science, Newcastle University, Newcastle upon Tyne, UK

Richard Francis, Institute of Neuroscience, Newcastle University, Newcastle upon Tyne, UK

Louise Sutcliffe, Institute of Neuroscience, Newcastle University, Newcastle upon Tyne, UK

Madeline Balaam, School of Computing Science, Newcastle University, Newcastle upon Tyne, UK

Lianne Brkic, Institute of Neuroscience, Newcastle University, Newcastle upon Tyne, UK

Thomas Ploetz, School of Computing Science, Newcastle University, Newcastle upon Tyne, UK

Chris Price, NIHR Newcastle Biomedical Research Centre, Newcastle University, Newcastle upon Tyne, UK

**Title:** Wristband Accelerometers to motiVate arm Exercise after Stroke (WAVES): activity data from a pilot randomised controlled trial.

**Background:** Encouraging impaired limb use during routine and rehabilitation activities after stroke is challenging. We evaluated changes in stroke arm activity related to vibration prompts delivered by a wrist-worn accelerometer (“CueS wristband”).

**Methods:** A pilot randomised controlled trial was conducted with adults <3 months after stroke causing any arm impairment. All received instruction for a self-directed four-week programme encouraging bimanual tasks, and wore a wristband on the impaired side 8am – 8pm. Intervention wristbands were programmed to deliver vibration prompts if hourly activity targets were unmet. To allow for incremental recovery, patient preference and diurnal variability, the target was selected as 5%, 10% or 20% above median levels recorded hourly over the previous 3 days. Data were downloaded at twice weekly reviews.

Activity counts per minute (CPM) were calculated from CueS mean signal vector magnitude (1s epoch) at the first (baseline) and the last (endpoint) review. Standard accelerometers recorded natural arm activity over 72hrs starting at 4 and 8 weeks post-baseline. Mann Whitney U test compared CPM between groups, and for 1 hour before/after prompts amongst intervention participants.

**Results:**

33 participants (14 intervention; 19 control) enrolled over 16 months: mean age 71 years (SD11); 13 male; mean days post-stroke 30 (SD19); median baseline Action Research Arm Test 20/57 [IQR 3.5,41].

Median number of prompts delivered were 7 per participant/day [IQR: 6,8]. Median CPM during 1 hour before/after prompts was 651 versus 759 (+16.6%; p=0.002).

Table 1: CPM median [IQR] at each outcome interval.

	Baseline CPM	Endpoint CPM	4 week CPM	8 week CPM
Control	499 [359, 714] n=17	550 [444, 990] n=15	574 [516, 891] n=13	428 [288, 712] n=11
Intervention	683 [487, 1298] n=14	907 [516, 1696] n=14	916 [617, 1675] n=11	1317 [656, 1395] n=11
Control vs Intervention p-value	p=0.100	p=0.134	p=0.063	p=0.003

CPM increased immediately after prompting, suggesting a direct behavioural impact. Compared to control, the intervention group continued to increase CPM beyond wristband removal. Whilst these results are encouraging, this was a small study and data may not reflect only arm activity.

**Conclusion:** Personalised prompts delivered by a wrist-worn accelerometer may enhance self-directed arm activity after stroke.

(300 max, each table =10words)