



University of
Strathclyde
Glasgow

Co-creating a technological approach to rehabilitation and life after stroke

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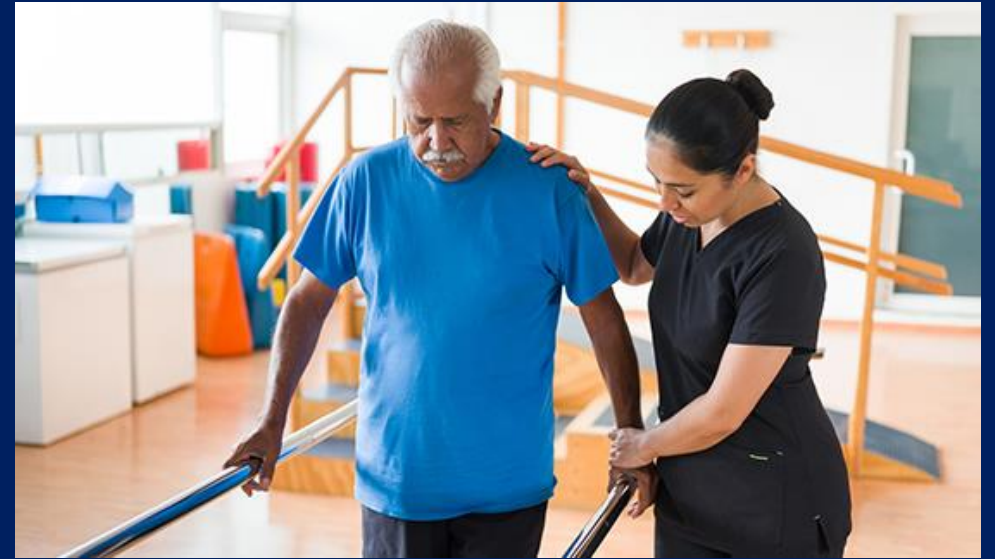
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 - Chest Heart and Stroke Scotland
- **UK/Scottish Government**
 - Chief Scientists Office (Scottish Government)
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 - InnovateUK (UK government)

Problem

- Not meeting minimum guidelines
- Increase intensity
- Technology most realistic solution
- Technology
 - Not always useful
 - Not always used
 - Single impairment focus



Centre for Co-Creation of Rehabilitation Technology

Aim

- Co-create useful and accessible technology with end users
- Integrate technology to offer personalised rehabilitation

X THE PLACE OF
USEFUL LEARNING



Staff

- Dr Andy Kerr; Director
- Dr Anja Kuschmann; Speech Therapist
- Prof Madeleine Grealy; Psychologist
- Milena Slachetka, Physiotherapist

PGR

- Renad Albasri (Prosthetics and Orthotics)
- Thomas Johnson (Biomedical Engineer)
- Fiona Boyd (Biomedical Engineer)
- Janeesata Kuntapun (Physiotherapy)
- Evelyn Hamilton (Speech Therapy)
- Chioma Wodu (Biomedical Engineer)



TERG

Technology
Enriched
Rehabilitation
Gym



Structure

Dosage

- Two hour sessions
- 2-5 times per week
- 8 weeks

Priming

- Aerobic exercise
- Sensory stimulation

High intensity practice

- Power assistance
- Robotics
- Treadmill
- Gaming

Enrichment

- Gaming
- Socialisation
- Performance feedback
- Problem solving

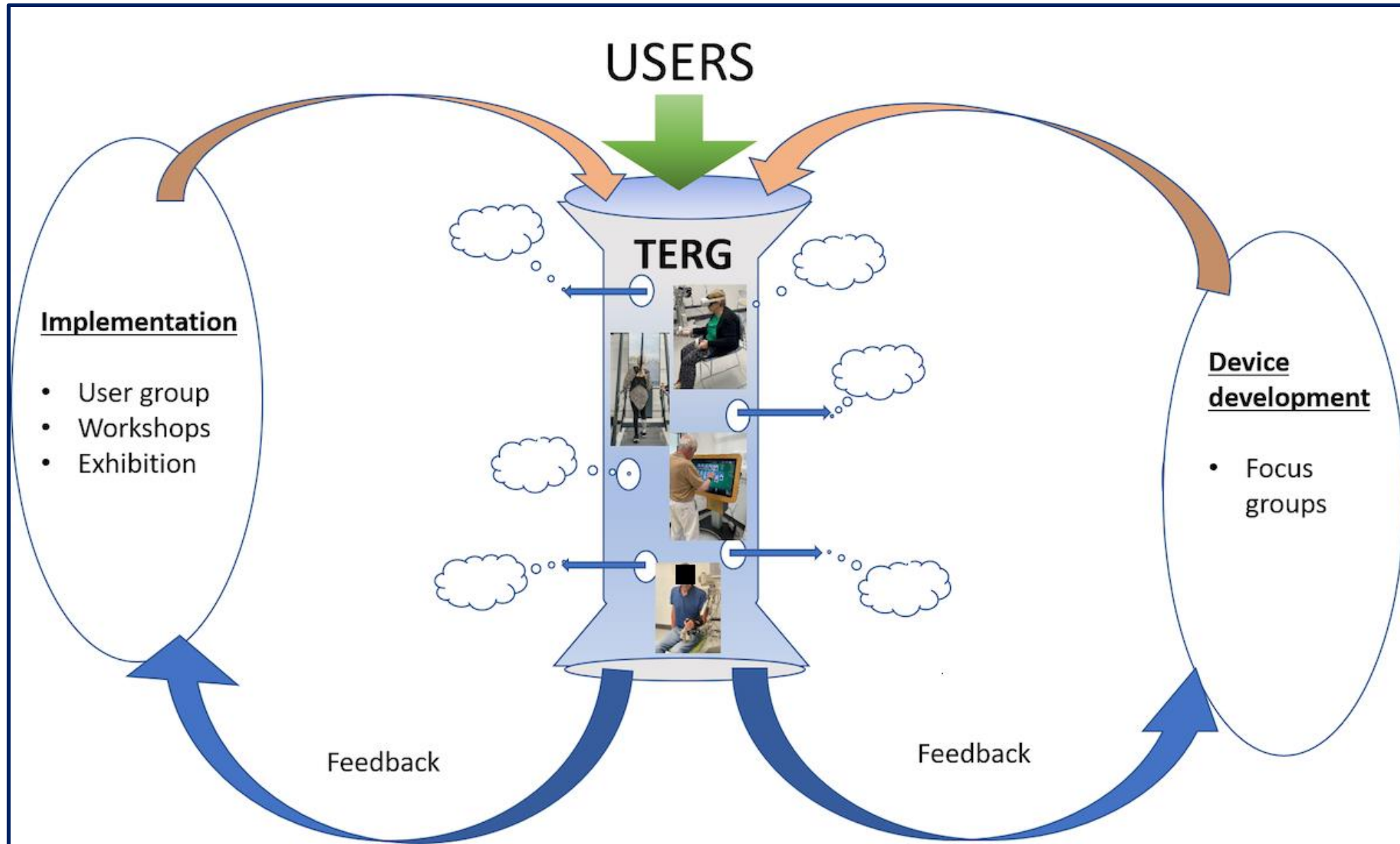
Combined approach

- Motor
- Cognitive
- Communication
- Tailored to goals



Supervised by AHP BUT delivered exclusively with technology; commercial and prototype

Participatory co-creation design



Primary Outcomes

- New devices
- Multi-technology solution (TERG) co-created with end users:
 - Demonstrated feasibility
 - Preliminary data of effect
 - Community adoption

Devices

Principle developer	Title	Funding	Population
Kerr	Low-cost de-weighting system for arm and hand rehabilitation	Medical Devices Doctoral training programme + commercialisation funding	Stroke
Wodu	Low-cost orthosis for hand rehabilitation in people with moderate to severe spasticity after a stroke	PhD studentship from Nigerian Government	Stroke
Campbell	Low-cost clinical tool for measuring ankle propulsion strategy in gait	Prosthetics and Orthotics Doctoral training	Stroke
Spirit Digital & Kerr	A novel method for remote assessment of exercise capacity using a telehealth platform and a wearable medical device	Innovate UK	COPD
Johnson	Gait quality feedback system for self-rehabilitation	Industry (PAL Technologies)	Stroke
Boyd	Rehabilitation intensity tracker and collaborative game	EPSRC	Stroke
Nown	Real-time movement sonification system for stroke survivors with hemiparesis	Medical Devices Doctoral training programme	Stroke

TERG

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Feasibility

Early stroke patients

- Acute NHS stroke Unit
- N=60, 1 dropout
- Almost 1 hr of additional rehab, per day
- No safety incidents

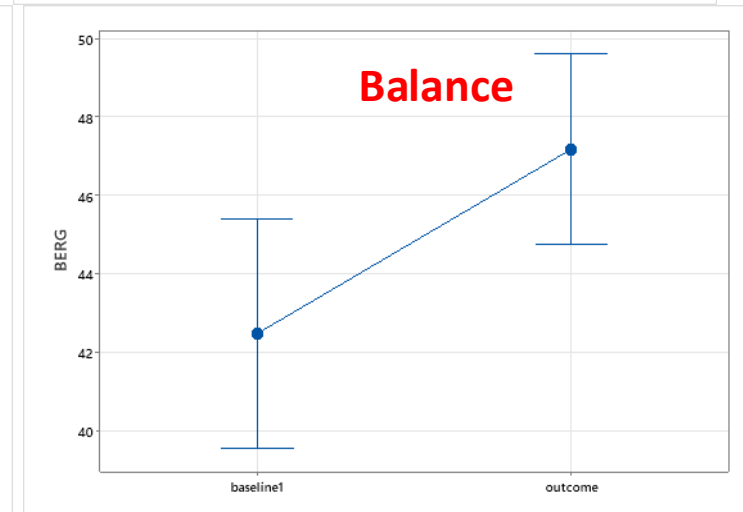
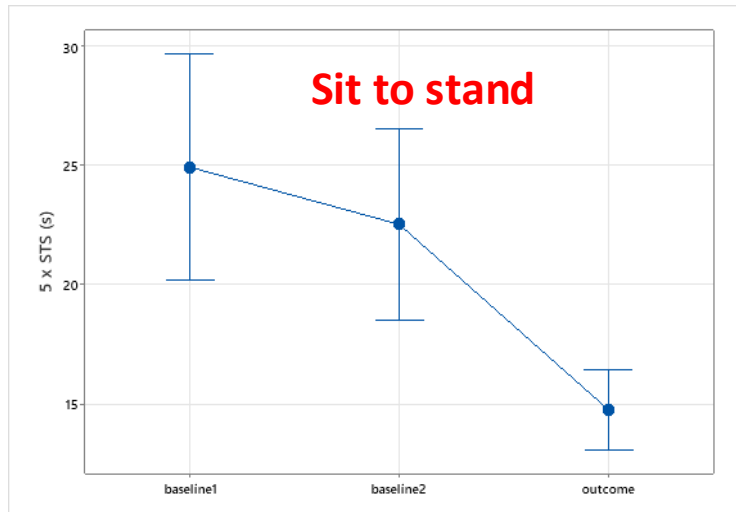
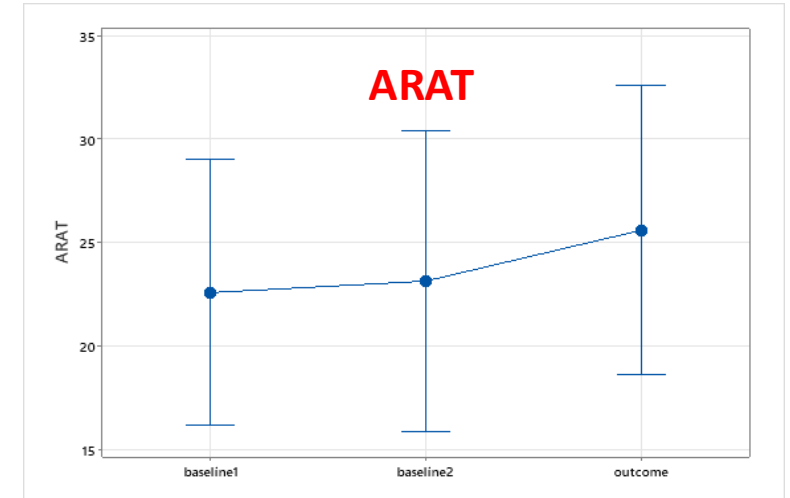
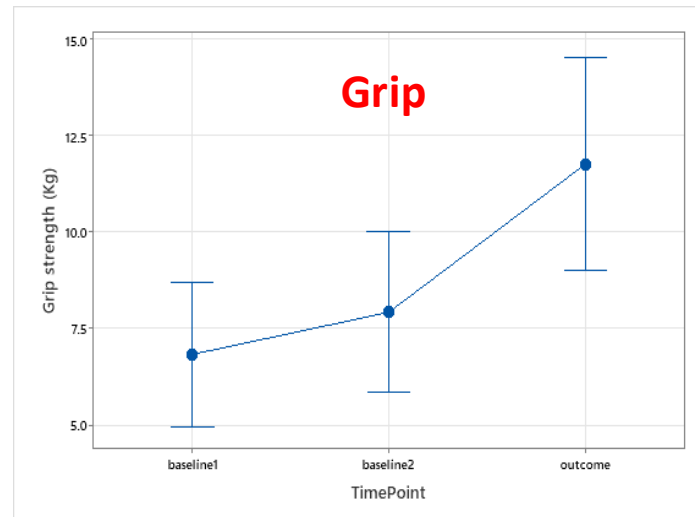
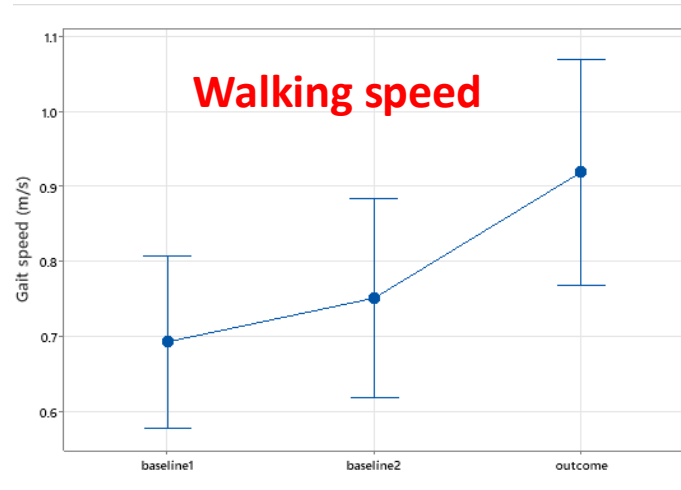
Long term stroke survivors

- University facility
- N=118, 11 dropouts
- 19 hours of extra rehab
- Minor safety incidents
 - Muscle/joint aches
 - Two falls



Kerr et al (2023). An intensive exercise program using a technology-enriched rehabilitation gym for the recovery of function in people with chronic stroke: *JMIR Rehabilitation and Assistive Technologies*, 10, p.e46619.

Evidence of effect



ANOVA

- Gait speed: $F=3.09$, $P=0.04^*$
- 5 x STS: $F=7.73$, $P = 0.001^*$
- Grip strength: $F=5.29$, $P=0.04^*$
- BERG: $F= 6.03$, $P=0.016^*$
- ARAT: $F=0.22$, $P = 0.8$

Community roll-out

Summer 2025

University Hospital Wishaw	Patients in hospital
Blantyre Life community centre	After hospital discharge
Edinburgh Community Rehabilitation	After hospital discharge or self referral at any stage in their recovery journey
Olympia Leisure centre, Dundee	Self referral



Funders Collaborators



Three questions

1. Is there a role for AI in personalising rehabilitation?
2. Is group-based exercise always best solution?
3. How do we deliver this to LIC?



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