Safely improving mobility in high risk groups: results of RESTORE and AMOUNT trials
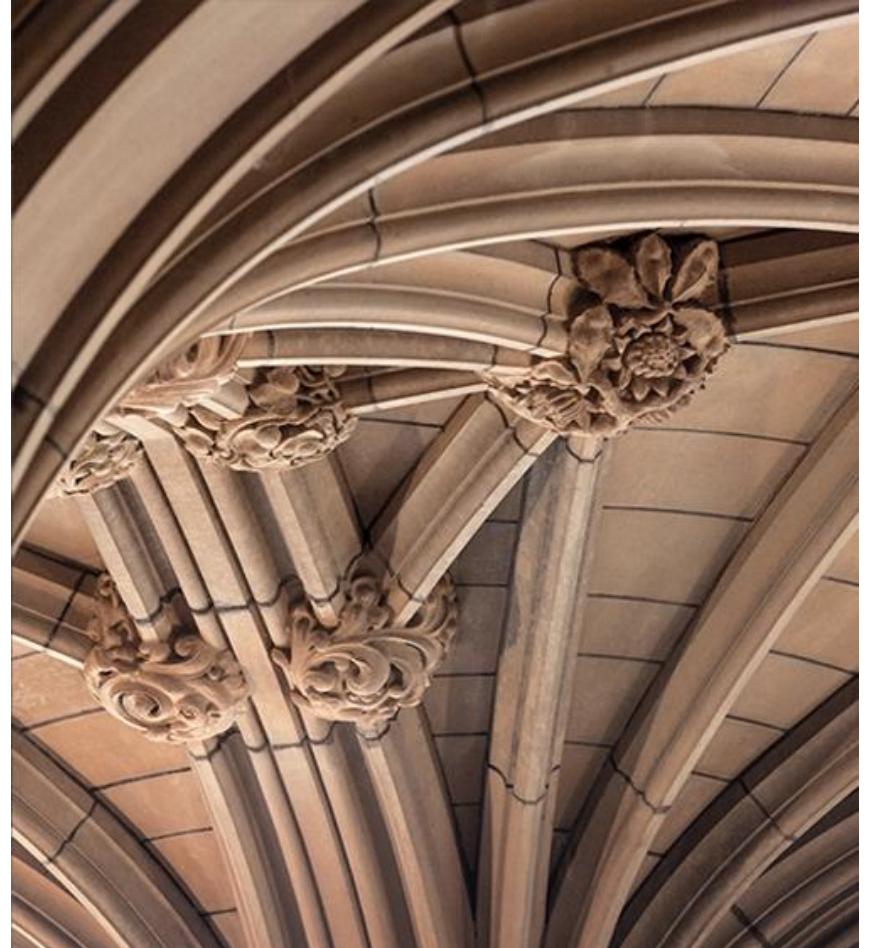
Prof Cathie Sherrington
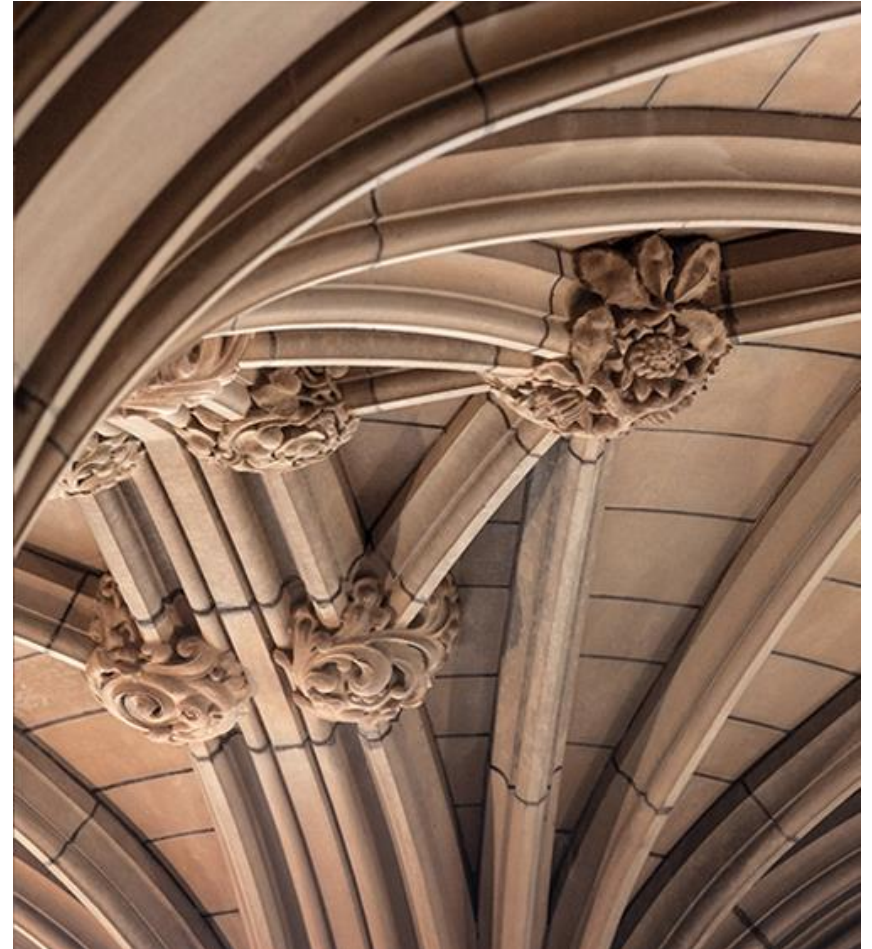School of Public Health

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Background

- Strong evidence for mobility benefits of supervised physiotherapy interventions for rehabilitation populations
- Long term ongoing physiotherapist input probably not 'scalable'
- Physiotherapist-prescribed home exercise informed by behaviour change strategies +/- technology may help
- Impact of home exercise on falls not clear clinical groups
- Sherrington (2014): home-based exercise improved mobility but increased falls in people recently discharged from hospital
- Can we do better by adding fall prevention advice?

Exercise and fall prevention self-management after fall-related lower limb fracture: the RESTORE (Recovery Exercises and Stepping On after fracture) trial

Sherrington C[1], Fairhall N[1], Kirkham C[1], Clemson L[1], Howard K[1], Vogler[1], Close JCT[2], Moseley AM[1], Cameron ID[1],Mak J[1], Sonnabend D[1],Lord SR[2].

[1]University of Sydney
[2]Neuroscience Research Australia, UNSW

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RESTORE primary research question

Population: older people following fall-related lower limb or pelvic fracture who have completed usual care

Intervention: exercise and fall prevention self-management intervention

Control: usual care
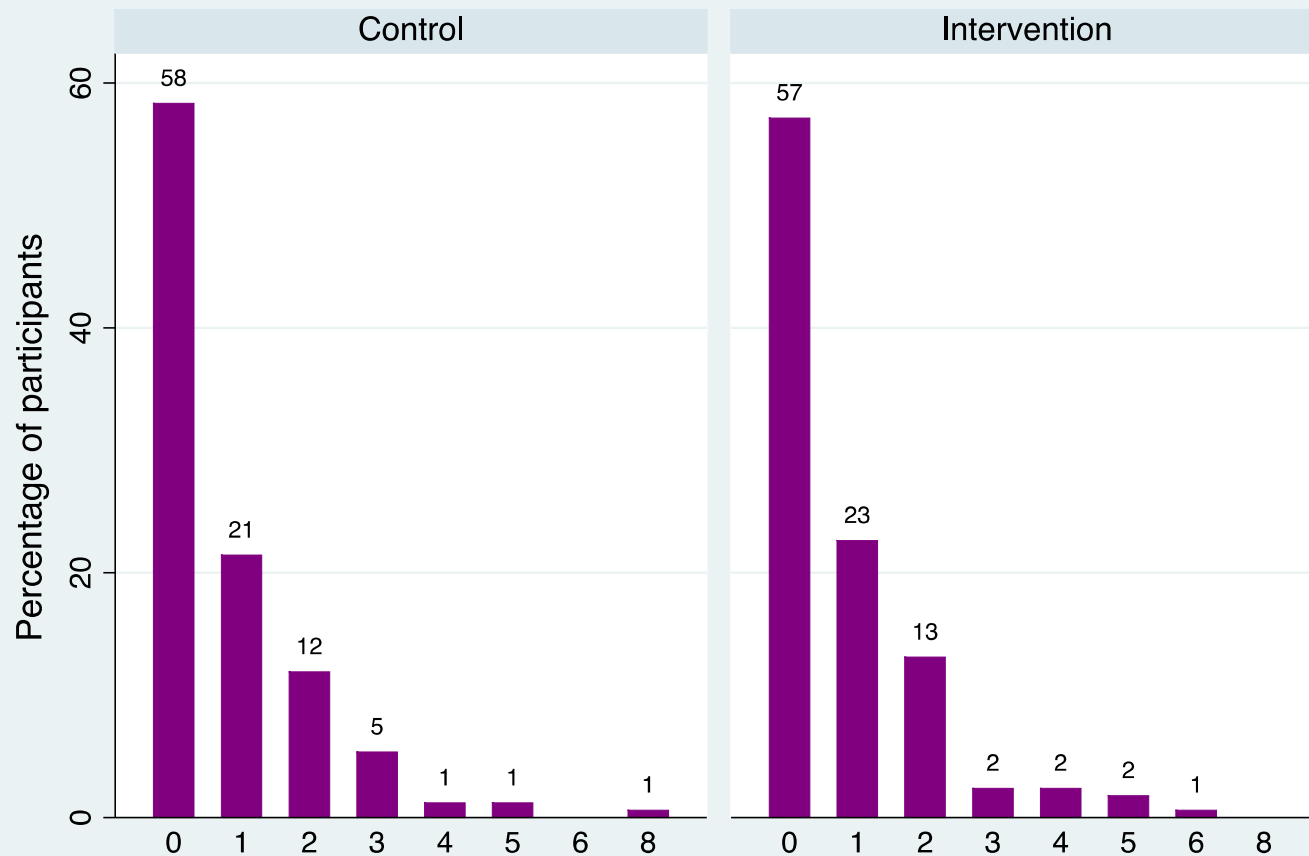
Outcome: mobility-related disability and falls

Time: 12 months after randomisation

Amount
Activity and MObility UsiNg Technology rehabilitation trial

RESTORE intervention

- 10 home visits and 5 phone calls from a physiotherapist to prescribe an individualised exercise program with motivational interviewing

- Home exercise based on Weight Bearing for Better Balance (WEBB) available at www.webb.org.au

- 3 times/week strength and balance exercises: challenging balance and functional strength (based on Borg RPE "hard" level) and use of weight belts or vests as appropriate

- fall prevention education through individualised advice from the physiotherapist or attendance at the group based " Stepping On" program (eight two-hour group sessions)
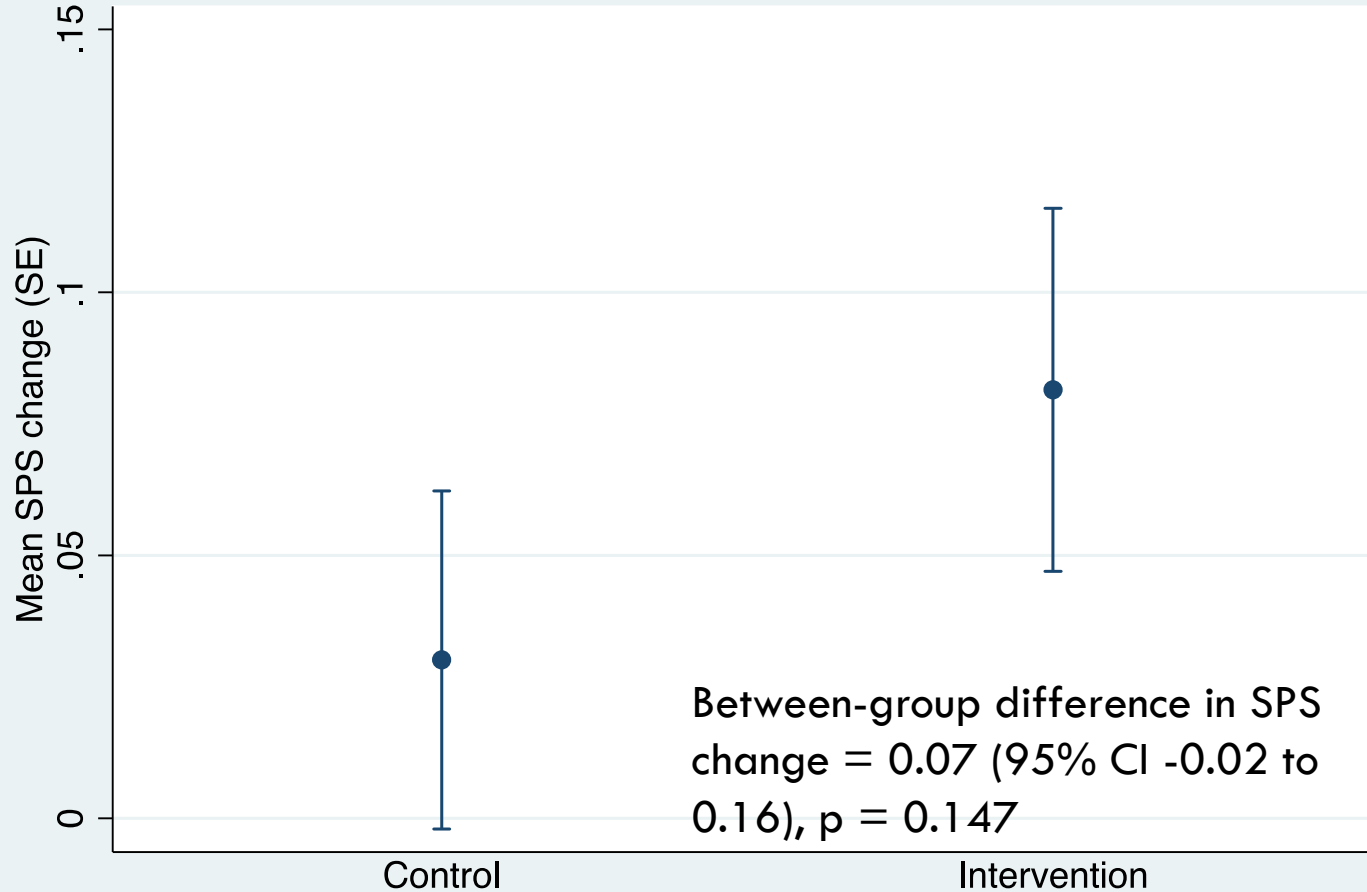
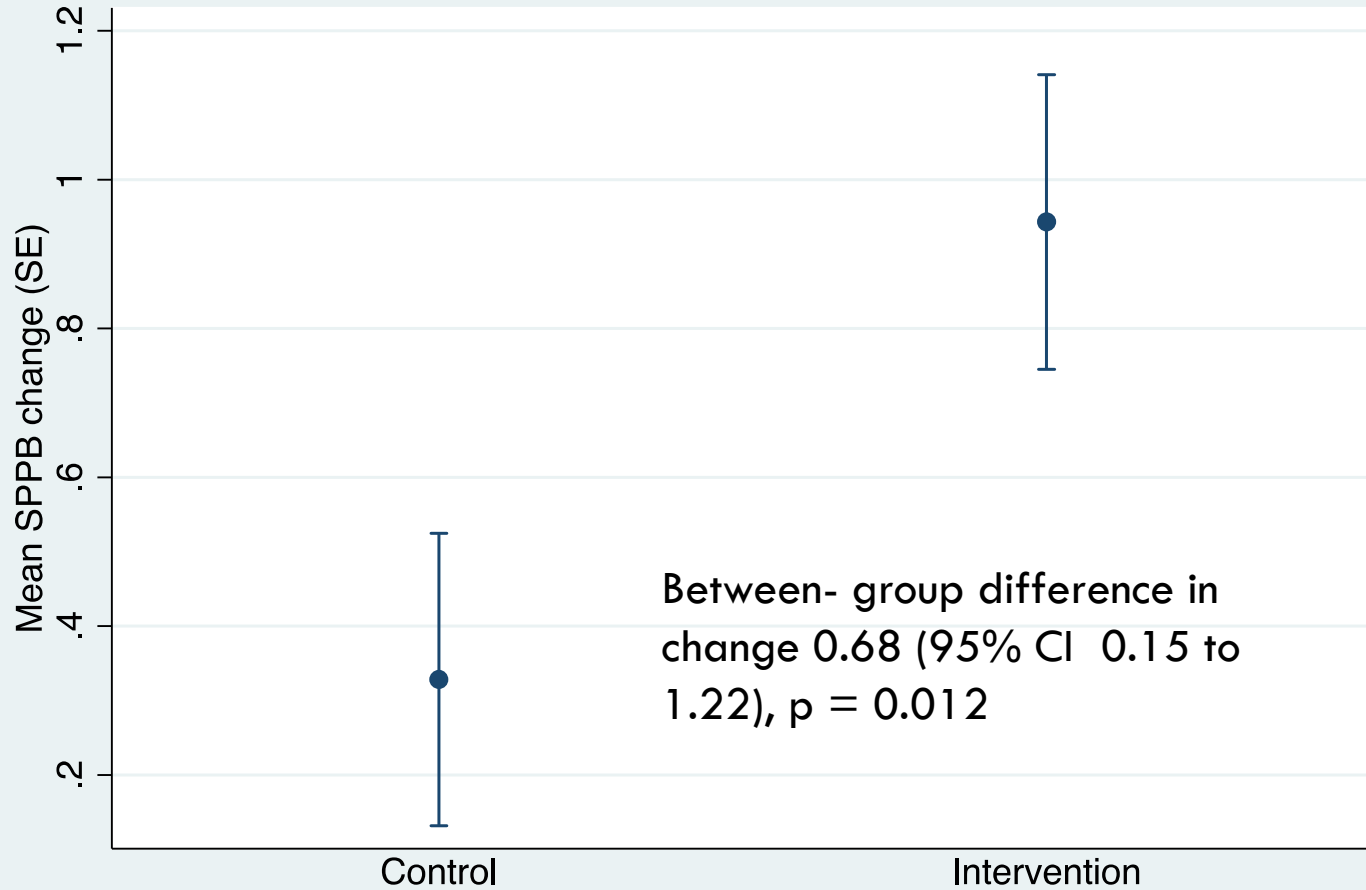| Characteristic (n=336)	Mean (SD), range or %
Age	78 (9), 59-99 years
Gender	76% female
Fracture	58% hip; 10% pelvis; 12% ankle
Fall in last year	66%
3+ falls in last year	12%
SPMSQ	9.6 (0.9), 6 to 10
Co-morbidities at baseline	8 (3), 0 to 21
Medications at baseline	6 (4), 0 to 21
SPPB at baseline	7.5 (3), 2 to 12

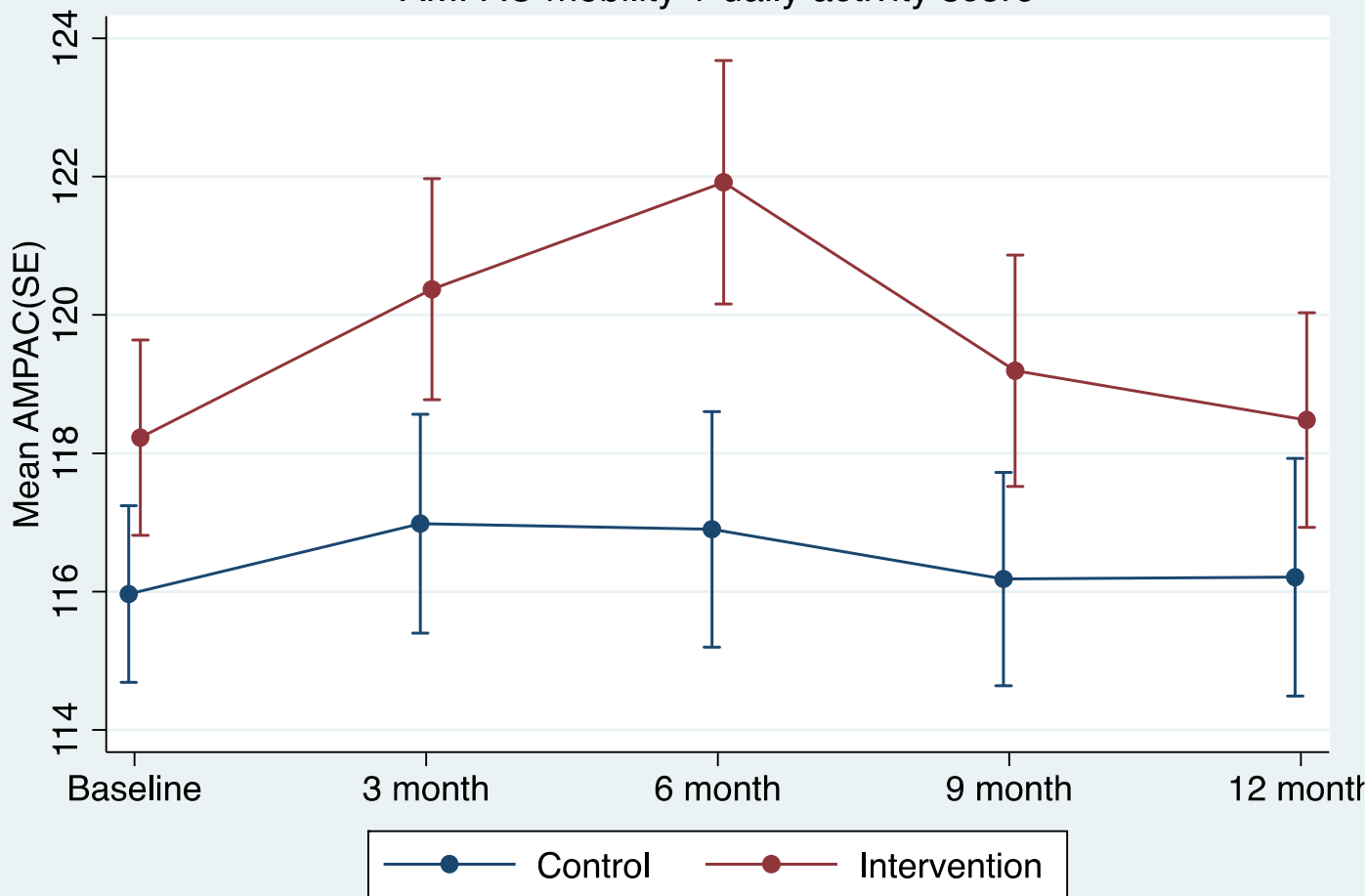Falls by group

IRR 1.04 (0.75 to 1.44), p = 0.83

Lower Extremity Summary Performance Score change 12 months

Between-group difference in SPS change = 0.07 (95% CI -0.02 to 0.16), p = 0.147

SPPB change 12 months

Between- group difference in change 0.68 (95% CI 0.15 to 1.22), p = 0.012

AMPAC mobility + daily activity score

Conclusions

- No impact of the intervention on primary outcomes
- Significant impacts on secondary outcomes
- Greater impact on some measures in faster walkers
- Possible to teach a safe home exercise program to older people up to two years after fall-related fracture
- Falls and community participation may require more specific interventions
- ? Impact of more supervised intervention

Individualised technology prescription by physiotherapists to enhance function in rehabilitation settings

Prof Cathie Sherrington
School of Public Health

Amount

Activity and MObility UsiNg Technology rehabilitation trial

Associate Investigators: Prof Kirsten Howard, A/Prof Bert Bongers, A/Prof Stephane Heritier, Prof Leanne Togher, Dr Maggie Killington, Dr Simone Dorsch, Mr Daniel Treacy, Ms Siobhan Wong, Mr Ross Pearson, Dr Kate Scrivener, A/Prof Maree Hackett.

Research team: Dr Leanne Hassett, Dr Maayken van den Berg, Ms Sakina Chagpar, Ms Heather Weber, Ms Siobhan Wong, Ms Ashley Rabie, Ms Areti Dakopoulos, Ms Fran Moran, Ms Cath Kirkham, Ms Melani Boyce, Ms Anna Miles, Ms Janine Vargas, Ms Liz Lynch, Ms Linda Roylance, Mr Tarcisio Folly, Ms Caitlin Hamilton
Protocol paper: Hassett L et al, 2016, *BMJ Open*

The University of Sydney

Amount
Activity and MObility UsiNg Technology rehabilitation trial

Primary research question

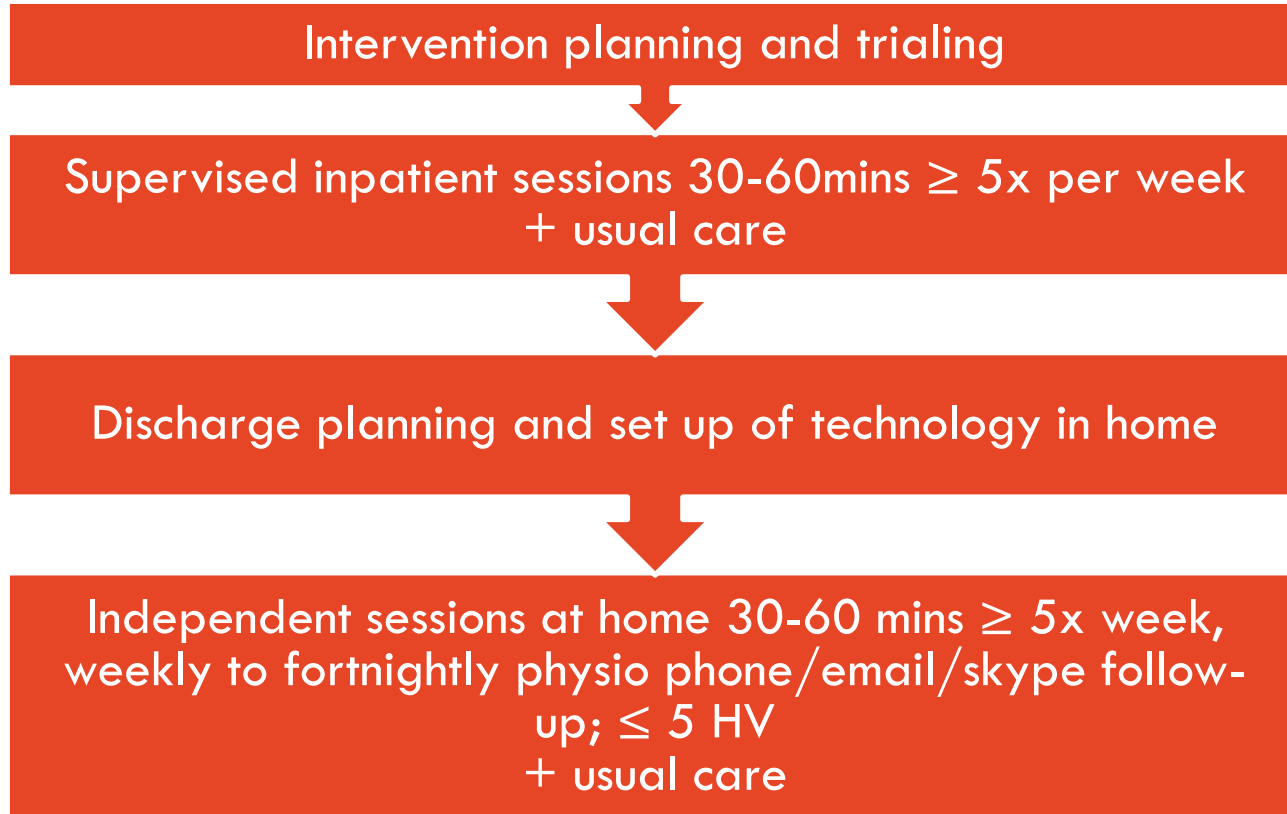**Population:** people with mobility limitations admitted to inpatient aged and neurological rehabilitation units

Intervention: addition of affordable technology to usual care

Control: usual care alone
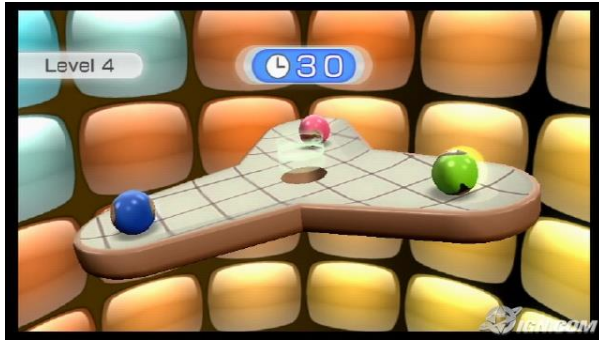
Outcome: physical activity and mobility

Time: 6 months after randomisation

Intervention overview: 6 months

Intervention planning and trialing

Supervised inpatient sessions 30-60mins ≥ 5x per week + usual care

Discharge planning and set up of technology in home

Independent sessions at home 30-60 mins ≥ 5x week, weekly to fortnightly physio phone/email/skype follow-up; ≤ 5 HV + usual care

Included technologies: recreational commercially available

Xbox Kinect

Nintendo Wii Fit

Smartphone physical activity apps

Fitbit

The University of Sydney

Included technologies: rehabilitation specific
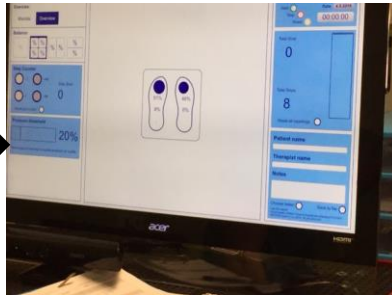
Humac

iPad & *iPhone* apps

UTS stepping tiles

Fysiogaming

Prescription protocol task example: standing up

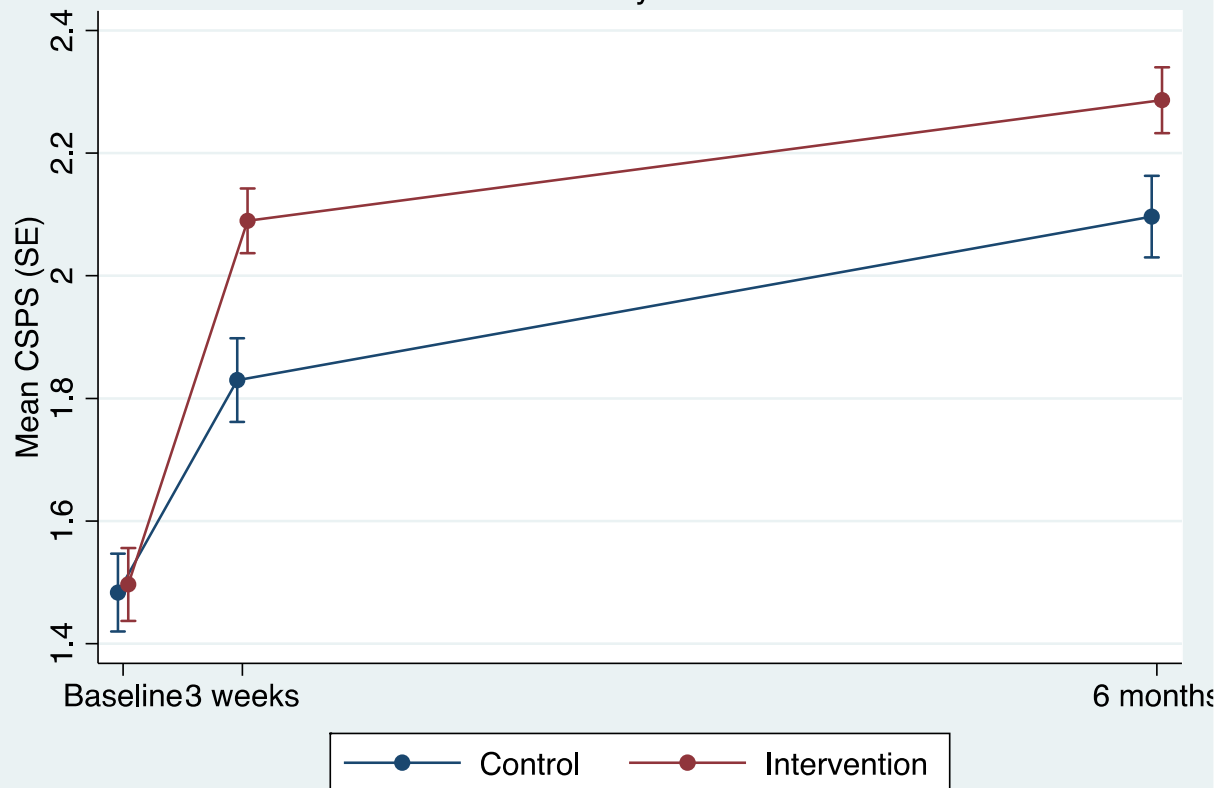| Adaptive behaviour/problem	Set-Up	Easy	Medium	Hard
Weight borne principally through intact side	Intact leg forward, on block, height of chair	**Humac:** scale **Fysiogaming:** sit to stand (level 1-10); Assessment Centre **Stepping tiles:** loading the leg in sitting; reaching in sitting; sit to stand **iPAD App: AMOUNT** preparation for standing up; low difficulty **T-Rex** exercises in sitting	**Humac:** scale **Fysiogaming:** sit to stand (11-20) **iPAD App: AMOUNT** standing up; medium difficulty **Stepping tiles:** sit to stand	**Humac:** Force vs. Time **Fysiogaming:** sit to stand (21-30) **iPAD App: AMOUNT** standing up; high difficulty **Stepping tiles:** sit to stand

Prescription protocol technology example: Nintendo Wii

Maintaining a standing position						
Software game	**Game length**	**Description**	**Movement/ Feedback**	**Progress/ Motivation**	**Issues/ Additional demands**	**Rehabilitation modifications**
WiiFit Balance/* Tightrope tension	≤ 2mins game stops if fall off	The player is required to step on the spot and move weight (SLS) between their legs on the balance board to walk along the tightrope, semi-squat then extend to avoid objects	ML direction/ does not allow error, KOR distance walked before fall, time taken to complete	In game / leaderboard	Performance was better with SLS	Can perform as step touch exercise to block infront

Participant characteristic	Intervention n=149	Control n=151
Age (yr), mean (SD); range	70 (18); 18-101	73 (15); 21-95
Sex, male, n (%)	77 (52)	74 (49)
Neurological condition, n (%)	80 (54)	82 (54)
Cognition (MMSE); mean (SD), range	27 (3); 15-30	27 (3); 17-30
Number of co-morbidities; mean (SD)	5 (3)	5 (3)
Walking status prior to hospitalisation, n (%)		
- did not walk	0 (0)	1 (1)
- indoor walker only	17 (11)	20 (13)
- community walkers	132 (89)	130 (86)
Technology use in month prior to hospitalisation, n (%)		
-computer	60 (40)	63 (42)
-tablet	44 (30)	35 (23)
-smartphone	55 (37)	52 (34)
-gaming console	6 (4)	1 (1)
-activity monitor	7 (5)	2 (1)

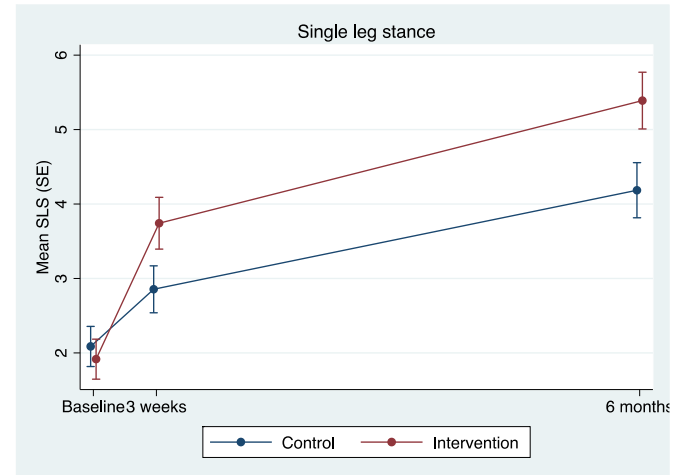# Primary mobility outcome: CSPS (0 to 3)
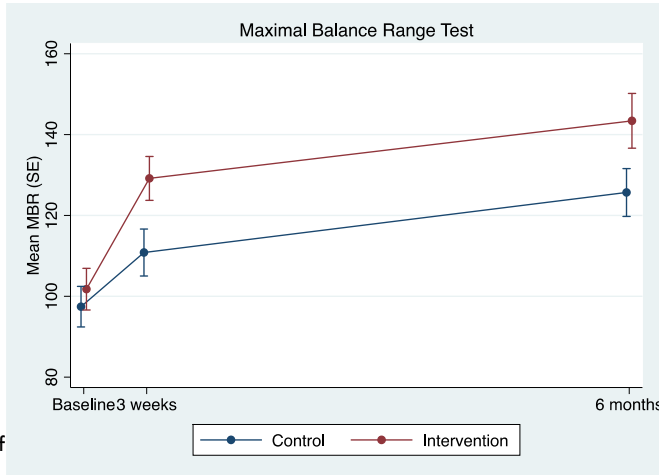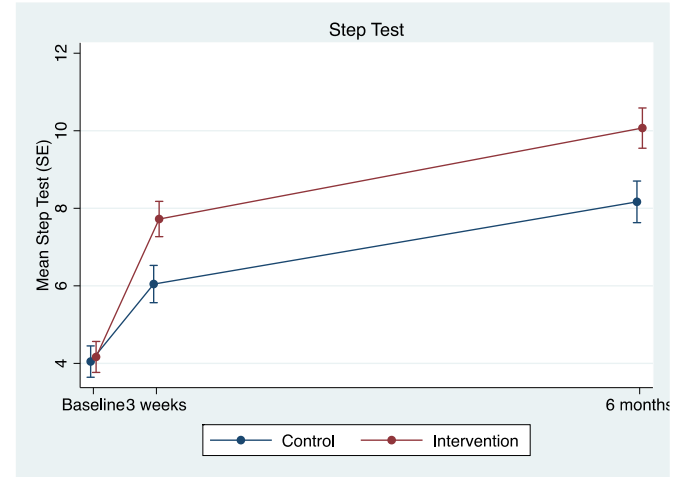

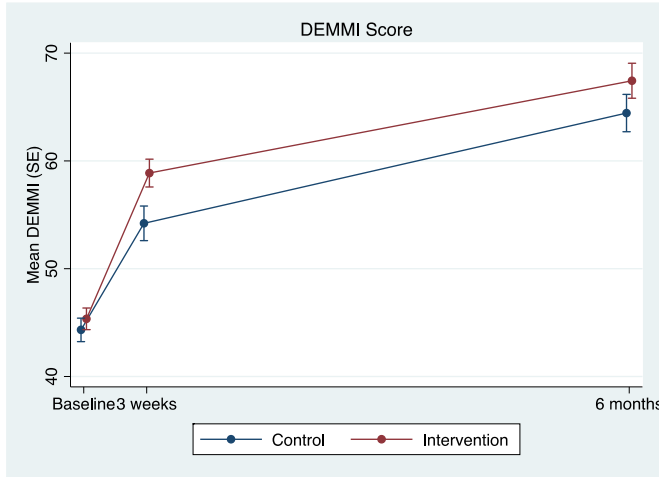Continuous Summary Performance Score

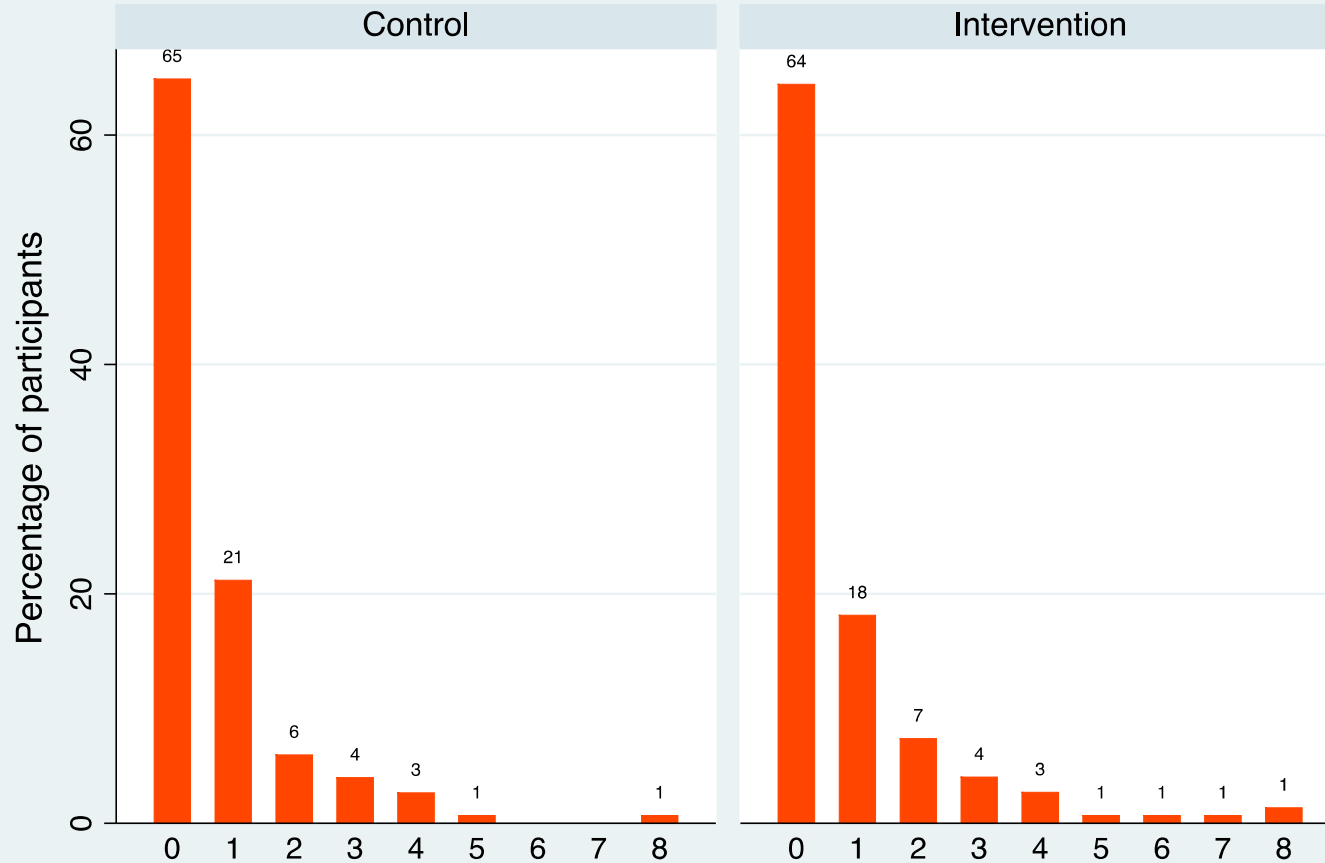0.3 points greater improvement in intervention group 0 to 3 weeks (95% CI 0.2 to 0.4, p< 0.01)

0.2 points greater improvement in intervention group 0 to 6 months (95% CI 0.1 to 0.3, p< 0.01)

Differential effect by baseline mobility (p<0.01)

Secondary mobility outcomes

Falls by group

Conclusions (thus far)

Tailored intervention using technology, targeting specific mobility limitations and promoting physical activity, in addition to usual rehabilitation

- feasible (with physiotherapy support)
- enjoyable for participants (with physiotherapy support)
- improved mobility and some aspects of physical activity
- appears to have greater impacts in younger people (<76)
- most improvements occurred with more intense inpatient intervention, but maintained with less intense community intervention
- no impact on falls

Amount
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Overall conclusions

- Can safely improve mobility with physiotherapy-prescribed "functional" exercise in these two high risk groups
- Does not appear that we can prevent falls in rehabilitation populations with home exercise plus fall prevention advice

Acknowledgements

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King George V Building, Royal Prince Alfred Hospital