Safely improving mobility in high risk groups: results of RESTORE and AMOUNT trials

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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

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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
**RESTORE intervention**

- 10 home visits and 5 phone calls from a physiotherapist to prescribe an individualised exercise program with motivational interviewing
- 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)
<table>
<thead>
<tr>
<th>Characteristic (n=336)</th>
<th>Mean (SD), range or %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>78 (9), 59-99 years</td>
</tr>
<tr>
<td>Gender</td>
<td>76% female</td>
</tr>
<tr>
<td>Fracture</td>
<td>58% hip; 10% pelvis; 12% ankle</td>
</tr>
<tr>
<td>Fall in last year</td>
<td>66%</td>
</tr>
<tr>
<td>3+ falls in last year</td>
<td>12%</td>
</tr>
<tr>
<td>SPMSQ</td>
<td>9.6 (0.9), 6 to 10</td>
</tr>
<tr>
<td>Co-morbidities at baseline</td>
<td>8 (3), 0 to 21</td>
</tr>
<tr>
<td>Medications at baseline</td>
<td>6 (4), 0 to 21</td>
</tr>
<tr>
<td>SPPB at baseline</td>
<td>7.5 (3), 2 to 12</td>
</tr>
</tbody>
</table>
Falls by group

IRR 1.04
(0.75 to 1.44),
p = 0.83
Between-group difference in SPS change = 0.07 (95% CI -0.02 to 0.16), p = 0.147
Between-group difference in change 0.68 (95% CI 0.15 to 1.22), p = 0.012
AMPAC mobility + daily activity score

Mean AMPAC(SE)

Baseline  3 month  6 month  9 month  12 month

Control  Intervention
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

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**Funding:** National Health and Medical Research Council Project Grant  APP1063751

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**Protocol paper:** Hassett L et al, 2016, BMJ Open
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

1. Intervention planning and trialing
2. Supervised inpatient sessions 30-60 mins ≥ 5x per week + usual care
3. Discharge planning and set up of technology in home
4. 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

Nintendo Wii Fit

Xbox Kinect

Fitbit

Smartphone physical activity apps
Included technologies: rehabilitation specific

**Humac**

**iPad & iPhone apps**

**UTS stepping tiles**

**Fysiogaming**
### Prescription protocol task example: standing up

<table>
<thead>
<tr>
<th>Adaptive behaviour/problem</th>
<th>Set-Up</th>
<th>Easy</th>
<th>Medium</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight borne principally through intact side</td>
<td>Intact leg forward, on block, height of chair</td>
<td><strong>Humac:</strong> scale&lt;br&gt;<strong>Fysiogaming:</strong> sit to stand (level 1-10); Assessment Centre&lt;br&gt;<strong>Stepping tiles:</strong> loading the leg in sitting; reaching in sitting; sit to stand&lt;br&gt;<strong>iPAD App:</strong> AMOUNT preparation for standing up; low difficulty <strong>T-Rex</strong> exercises in sitting</td>
<td><strong>Humac:</strong> scale&lt;br&gt;<strong>Fysiogaming:</strong> sit to stand (11-20)&lt;br&gt;<strong>iPAD App:</strong> AMOUNT standing up; medium difficulty&lt;br&gt;<strong>Stepping tiles:</strong> sit to stand</td>
<td><strong>Humac:</strong> Force vs. Time&lt;br&gt;<strong>Fysiogaming:</strong> sit to stand (21-30)&lt;br&gt;<strong>iPAD App:</strong> AMOUNT standing up; high difficulty&lt;br&gt;<strong>Stepping tiles:</strong> sit to stand</td>
</tr>
</tbody>
</table>
## Prescription protocol technology example: Nintendo Wii

### Maintaining a standing position

<table>
<thead>
<tr>
<th>Software game</th>
<th>Game length</th>
<th>Description</th>
<th>Movement/Feedback</th>
<th>Progress/Motivation</th>
<th>Issues/Additional demands</th>
<th>Rehabilitation modifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>WiiFit Balance/*</td>
<td>≤ 2mins</td>
<td>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</td>
<td>ML direction/does not allow error, KOR distance walked before fall, time taken to complete</td>
<td>In game / leaderboard</td>
<td>Performance was better with SLS</td>
<td>Can perform as step touch exercise to block infront</td>
</tr>
<tr>
<td>Tightrope tension</td>
<td>game stops if fall off</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant characteristic</td>
<td>Intervention n=149</td>
<td>Control n=151</td>
<td></td>
<td></td>
<td></td>
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<td>---------------------------------------------------</td>
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<tr>
<td>Age (yr), mean (SD); range</td>
<td>70 (18); 18-101</td>
<td>73 (15); 21-95</td>
<td></td>
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<tr>
<td>Sex, male, n (%)</td>
<td>77 (52)</td>
<td>74 (49)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Neurological condition, n (%)</td>
<td>80 (54)</td>
<td>82 (54)</td>
<td></td>
<td></td>
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<tr>
<td>Cognition (MMSE); mean (SD), range</td>
<td>27 (3); 15-30</td>
<td>27 (3); 17-30</td>
<td></td>
<td></td>
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<tr>
<td>Number of co-morbidities; mean (SD)</td>
<td>5 (3)</td>
<td>5 (3)</td>
<td></td>
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<tr>
<td>Walking status prior to hospitalisation, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>- did not walk</td>
<td>0 (0)</td>
<td>1 (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- indoor walker only</td>
<td>17 (11)</td>
<td>20 (13)</td>
<td></td>
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<tr>
<td>- community walkers</td>
<td>132 (89)</td>
<td>130 (86)</td>
<td></td>
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<tr>
<td>Technology use in month prior to hospitalisation, n (%)</td>
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<td></td>
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<tr>
<td>- computer</td>
<td>60 (40)</td>
<td>63 (42)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- tablet</td>
<td>44 (30)</td>
<td>35 (23)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>- smartphone</td>
<td>55 (37)</td>
<td>52 (34)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- gaming console</td>
<td>6 (4)</td>
<td>1 (1)</td>
<td></td>
<td></td>
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<tr>
<td>- activity monitor</td>
<td>7 (5)</td>
<td>2 (1)</td>
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</tbody>
</table>
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

**DEMMI Score**

**Step Test**

**Maximal Balance Range Test**

**Single leg stance**
Falls by group

Control

Intervention

Percentage of participants

0 1 2 3 4 5 6 7 8

0 1 2 3 4 5 6 7 8

0 1 2 3 4 5 6 7 8

0 1 2 3 4 5 6 7 8
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
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

• NHMRC salary and project funding
• Colleagues, staff, students, study participants