Exercise for falls prevention in Hull – an update

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Background

- Amputees fall over more than age-matched, able-bodied individuals (Miller et al., 2001)

- Several studies have identified biomechanical differences between able-bodied fallers vs. non-fallers (Kerrigan et al., 2000, 2001, 2003; Melzer et al., 2004)

- Few studies have explored this in lower limb amputees (LLAs) (Vanicek et al., 2009a, 2009b, 2010, 2015)

  - Evidence-based recommendations for exercises ...... but they need validating
Mobility goals
Evidence-based clinical guidelines

- British Association of Chartered Physiotherapists in Amputee Rehabilitation (BACPAR)


5.5 Coping Strategies Following Falls

Evidence

Three articles relevant to this section were found. Kirkami et al in 1998\(^\text{17}\) reported an increased risk of falls following amputation in a cross-sectional study of 164 lower limb amputees. However, this study did not include a comparison group and gives only limited evidence. Miller & Drath\(^\text{28}\) examined balance confidence in 245 unilateral lower limb amputees over a two year follow up period and found that the incidence of falling was 52% in their study population compared to a fall rate of 32% in their control group of community dwelling elders.

There was conflicting evidence regarding whether transtibial amputees are at significantly higher risk of falling than the transtibial population\(^\text{29,30}\).

Recommendations

5.5.1 All parties involved with the patient should be made aware that the risk of falling is increased following lower limb amputation. (C)\(^\text{31}\)

5.5.2 Rehabilitation programmes should include education on preventing falls and coping strategies should a fall occur. (C)\(^\text{32,34}\)

5.5.3 Instructions should be given on how to get up from the floor. (C)\(^\text{35}\)

5.5.4 Advice should be given in the event that the patient is unable to rise from the floor. (C)\(^\text{36}\)

5.5.5 All patients should be asked if they have a fear of falling and, if indicating that they do, further therapy incorporating balance work should be considered (C)\(^\text{37}\)

5.5.6 Where a reduction in the individual’s balance confidence is observed all of the Prosthetic MDT should be made aware of the issue and, where indicated, further therapeutic input provided to address modifiable factors. (C)\(^\text{38}\)

Local implementation:
The BACPAR endorsed ‘Guideline for the prevention of falls in lower limb amputees’ (2008)\(^\text{39}\) may help guide the clinician with recommendations suggesting what a holistic falls prevention programme should encompass.
Guidelines for the Prevention of Falls in Lower Limb Amputees

To be revised April 2011

Objective

This guideline is based on current best evidence for the prevention of falls in amputee patients. Due to the paucity of evidence specific to amputees some information has been extrapolated from literature regarding falls in the elderly.

Definition of a Fall

An unintentional event which results in a person coming to rest on the ground, floor or other lower level, other than as a consequence of loss of consciousness, overwhelming external force, sudden onset of paralysis, stroke or epileptic seizure.

Incidence

Studies found 20% – 53% of amputees experienced at least one fall a year.

Risk Factors

- Presence of Co-morbidities
- Increasing age
- Poor Balance
- Reduced muscle strength
- Medication
- Environmental hazards
- Gait deficiencies
- Reduced confidence / fear of falling
- Level of Amputation
- Poor functional ability
- Low levels of activity
- Sensory deficits
- Decreased flexibility
- Length of hospital stay
- Female gender
- Previous Falls

Multi-factorial Falls Prevention Programmes

These should include:

- MDT approach
- Environmental modifications
- Exercise
- Medication review
- Gait training and provision of walking aid
- Education
- Treatment of any acute illness
- A comfortable fitting prosthesis

Overall Grade of Recommendation = B

Other Interventions

Education of healthcare professionals regarding risk factors, safe use of prosthesis and environmental hazards.

Tapering and discontinuing of psychotropic medications.

Using a strap across the inlet of a walking frame to prevent the patient stepping too close to the front of the frame.

Overall Grade of Recommendation = B

Future Research

The current available evidence suggests that a multi-factorial approach with an emphasis on exercise, in particular balance exercises is most effective in reducing falls. Further high quality, large scale studies, specific to amputees, are required to determine:

- The most appropriate clinical balance tool for this population.
- The most appropriate type, amount and specificity of exercise in reducing falls.
- The ideal intensity, frequency and duration of exercise programmes.
- The relative value of different components of falls prevention programmes.
- Specific interventions to assist in improving balance confidence and therefore quality of life among this population.

Overall Grade of Recommendation = B

Additional Good Practice Points

- Teach patients how to get up off the floor in the event of a fall.
- Exercise programmes should include adequate intensity, frequency and duration, with monitoring of compliance.
- Measures to prevent injury should be taken in all patients with a high risk of falling e.g. stump protectors.

Target Users of Guidelines

Multi-disciplinary team directly involved in amputee rehabilitation.
Previous work recommendations

• “Falls prevention and prosthetic rehabilitation programmes should focus on improving knee muscle strength of the prosthetic limb, and eccentric ankle and hip strength of the intact limb, to improve stability and progression, particularly during weight transfer onto single support of the prosthetic limb”

• High variability in prosthetic swing duration in fallers

(Vanicek et al., 2009a)
Previous work findings

• Limb preference changes over time following rehabilitation (LLAs may be malleable to change in first year following amputation)

• Exploit intact limb more than affected limb

• “eccentric lowering mechanism and concentric raising mechanism of the knee extensors within the affected limb would benefit stepping down and stepping up gait respectively.”

(Barnett et al., 2014)
Current work

• To date, no study has quantified the musculoskeletal benefits of an exercise programme in LLAs
  – Systematic reviews exploring exercise programmes in LLAs (quality assessment suggested high risk bias)
  – Gait speed, temporal-spatial kinematics, clinical measures data were measured

• A pilot study to quantify the effects of a “supervised group wellness exercise programme”
Aim

To evaluate the effects of an individualised exercise programme on functional performance measures in a group of community-dwelling LLAs

- Biomechanics
- Quality of life
- Clinical outcome measures
### Participants

**Table 1.** Mean (SD) participant demographics

<table>
<thead>
<tr>
<th></th>
<th>Exercise Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td>M = 4  F = 3</td>
<td>M = 7  F = 1</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td>60 (12)</td>
<td>65 (16)</td>
</tr>
<tr>
<td><strong>Height (cm)</strong></td>
<td>172 (10)</td>
<td>174 (13)</td>
</tr>
<tr>
<td><strong>Body Mass (kg)</strong></td>
<td>92 (15)</td>
<td>95 (25)</td>
</tr>
<tr>
<td><strong>Cause of Amputation</strong></td>
<td>Vascular = 3  Trauma = 1</td>
<td>Vascular = 2  Trauma = 4</td>
</tr>
<tr>
<td></td>
<td>Other = 3</td>
<td>Other = 2</td>
</tr>
<tr>
<td><strong>Level of Amputation</strong></td>
<td>TFA = 5  TTA = 2</td>
<td>TFA = 5  TTA = 3</td>
</tr>
<tr>
<td><strong>Time since Amputation (years)</strong></td>
<td>10.3 (17.3)</td>
<td>19.1 (19.9)</td>
</tr>
</tbody>
</table>
Supported exercise programme

• 12-week programme
  – Supervised group session twice-weekly in lab
    • 1 hour in length
    • Circuit-based exercises
    • Strength, stamina/endurance, balance, flexibility
    • Examples include: picking bean bags off of the floor, intact limb calf raises, balancing on Hedgehogs
  – 1x weekly home-based exercises, progressing to 2x weekly
    • Each participant received an individualised programme of 5 to 6 exercises
    • Examples include: hip musculature strengthening, strengthening of abdominal/oblique muscles
Supported exercise programme
Falls

• The exercise and control groups had an average of 12.1 (±14.8) and 2.75 (±2.3) self-reported falls, respectively, in the two years prior to study enrolment.

• Between baseline and 6 months post-baseline testing exercise group participants reported no falls and an average of 4.75 (±3.0) falls were self-reported in the control group.

• Between baseline and 12 months post-baseline testing exercise group and control group participants self-reported an average of 0.25 (±0.5) and 6.75 (±5.12) falls, respectively.
Gait analysis

- 3D motion capture system
  - 10-camera (Oqus 400, Qualisys, Sweden)
  - 2 force plates (model 9286AA, Kistler, Switzerland)
  - 10 walking trials across 10m level walkway
Gait analysis

• Variables:
  – Temporal-spatial
  – Joint angles
  – Ground reaction forces
  – Joint moments & powers

• A repeated measures general linear model ($P<0.05$)

• Standardised effect size is reported as Cohen’s $d$
## Results: Clinical Measures

### Table 2: Group mean (SD) 6MWT (metres) pre- and post-intervention

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>Change</th>
<th>P-Value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>139.6 (186.8)</td>
<td>297.1 (136.4)</td>
<td>+157.5</td>
<td>0.009*</td>
<td>0.98</td>
</tr>
<tr>
<td>Control</td>
<td>202.2 (230.5)</td>
<td>239.4 (189.2)</td>
<td>+37.2</td>
<td>0.453</td>
<td>0.18</td>
</tr>
</tbody>
</table>

* Denotes statistically significant (p<0.05).

Cohen’s d>0.5 represents a medium effect size, d>0.8 represents a large effect size.

### Table 3: Group mean (SD) TUG scores (seconds)

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>Change</th>
<th>P-Value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>13.9 (4.5)</td>
<td>11.7 (3.1)</td>
<td>-2.2</td>
<td>0.048*</td>
<td>0.58</td>
</tr>
<tr>
<td>Control</td>
<td>14.1 (6.1)</td>
<td>13.7 (5.9)</td>
<td>-0.4</td>
<td>0.716</td>
<td>0.07</td>
</tr>
</tbody>
</table>
### Results: Temporal-spatial gait parameters

#### Table 4. Group mean (SD) for gait speed (m/s)

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>Change</th>
<th>P-Value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>0.77 (0.25)</td>
<td>0.98 (0.21) ◊</td>
<td>+0.21</td>
<td>&lt;0.001*</td>
<td>0.91</td>
</tr>
<tr>
<td>Control</td>
<td>0.84 (0.31)</td>
<td>0.82 (0.28)</td>
<td>-0.02</td>
<td>0.586</td>
<td>0.07</td>
</tr>
</tbody>
</table>

◊ Denotes a significant (p<0.05) Group*Time interaction
* Denotes statistically significant (p<0.05).

$d>0.5$ represents a medium effect size, $d>0.8$ represents a large effect size.
Results: Temporal-spatial gait parameters

Table 5. Group mean (SD) for cadence (steps/minute)

<table>
<thead>
<tr>
<th>Group</th>
<th>Limb</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>P</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>Intact</td>
<td>96.8 (20.0)</td>
<td>109.4 (8.3)</td>
<td>0.030*</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>Prosthetic</td>
<td>77.6 (15.5)</td>
<td>87.6 (15.9)◊</td>
<td>0.068</td>
<td>0.64</td>
</tr>
<tr>
<td>Control</td>
<td>Intact</td>
<td>98.7 (10.0)</td>
<td>101.5 (8.2)</td>
<td>0.566</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Prosthetic</td>
<td>86.8 (15.6)</td>
<td>81.7 (12.1)◊</td>
<td>0.302</td>
<td>0.37</td>
</tr>
</tbody>
</table>

◊ Denotes a significant (p<0.05) Group*Time interaction
* Denotes statistically significant (p<0.05).
d>0.5 represents a medium effect size, d>0.8 represents a large effect size.
## Results: Temporal-spatial gait parameters

### Table 6. Group mean (SD) for double support (% of gait cycle)

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>Change</th>
<th>P-Value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>31.4 (7.0)</td>
<td>27.0 (3.7)</td>
<td>-4.4</td>
<td>0.066</td>
<td>0.82</td>
</tr>
<tr>
<td>Control</td>
<td>30.9 (9.8)</td>
<td>30.1 (6.5)</td>
<td>-0.8</td>
<td>0.699</td>
<td>0.10</td>
</tr>
</tbody>
</table>

* Denotes statistically significant (p<0.05).

*d > 0.5 represents a medium effect size, d > 0.8 represents a large effect size.*
Results: Joint angles

Table 7. Group mean (SD) for joint angles (degrees)

<table>
<thead>
<tr>
<th></th>
<th>Peak Hip Extension</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>Limb</td>
<td>Baseline</td>
<td>Post-Intervention</td>
<td>P</td>
<td>d</td>
</tr>
<tr>
<td>Exercise</td>
<td>Intact</td>
<td>9.2 (9.1)</td>
<td>22.2 (4.5)</td>
<td>0.006*</td>
<td>1.91</td>
</tr>
<tr>
<td></td>
<td>Affected</td>
<td>9.5 (14.0)</td>
<td>23.5 (3.1)</td>
<td>0.003*</td>
<td>1.64</td>
</tr>
<tr>
<td>Control</td>
<td>Intact</td>
<td>12.8 (9.9)</td>
<td>18.6 (6.7)</td>
<td>0.138</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>Affected</td>
<td>12.9 (7.9)</td>
<td>19.5 (6.5)</td>
<td>0.085</td>
<td>0.92</td>
</tr>
</tbody>
</table>

* Denotes statistically significant (p<0.05).

d>0.5 represents a medium effect size, d>0.8 represents a large effect size.
Results: Intact limb vertical GRF

$P = 0.014$
$d = 1.24$
Results: Intact limb vertical GRF
Results: Intact limb anterior-posterior GRF

\[ P = 0.018 \]
\[ d = 1.25 \]

- Exercise Group, Baseline
- Exercise Group, Post-Intervention
Results: Intact limb anterior-posterior GRF
Results: Joint powers

Table 8. Group mean (SD) for A2 ankle plantarflexor power generation in pre-swing

<table>
<thead>
<tr>
<th>Group</th>
<th>Limb</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>$P$</th>
<th>$d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>Intact</td>
<td>1.49 (0.60)</td>
<td>2.81 (0.29)◊</td>
<td>&lt;0.001*</td>
<td>2.97</td>
</tr>
<tr>
<td></td>
<td>Prosthetic</td>
<td>0.48 (0.29)</td>
<td>0.50 (0.27)</td>
<td>0.868</td>
<td>0.07</td>
</tr>
<tr>
<td>Control</td>
<td>Intact</td>
<td>1.72 (0.60)</td>
<td>1.80 (0.75)</td>
<td>0.772</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Prosthetic</td>
<td>0.81 (0.52)</td>
<td>0.65 (0.39)</td>
<td>0.280</td>
<td>0.35</td>
</tr>
</tbody>
</table>

◊ Denotes a significant (p<0.05) Group*Time interaction
* Denotes statistically significant (p<0.05).

$d>0.5$ represents a medium effect size, $d>0.8$ represents a large effect size.
Results: Joint powers

Table 9. Group mean (SD) for H3 hip flexor power generation in pre-swing

<table>
<thead>
<tr>
<th>Group</th>
<th>Limb</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>$P$</th>
<th>$d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>Intact</td>
<td>0.60 (0.33)</td>
<td>0.99 (0.32)</td>
<td>0.023*</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>Affected</td>
<td>0.36 (0.19)</td>
<td>0.87 (0.57)◊</td>
<td>0.009*</td>
<td>1.34</td>
</tr>
<tr>
<td>Control</td>
<td>Intact</td>
<td>0.70 (0.34)</td>
<td>0.74 (0.35)</td>
<td>0.795</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Affected</td>
<td>0.72 (0.30)</td>
<td>0.40 (0.23)</td>
<td>0.099</td>
<td>1.21</td>
</tr>
</tbody>
</table>

◊ Denotes a significant ($p<0.05$) Group*Time interaction
* Denotes statistically significant ($p<0.05$).

d>0.5 represents a medium effect size, d>0.8 represents a large effect size.
Postural control with NeuroCom Smart Balance Master

- Sensory Organisation Test (SOT) & Motor Control Test (MCT)

1. Equilibrium score
2. Strategy score

Weight symmetry

Forward/Backward Translations
Results: SOT

Table 10. Group mean (SD) Equilibrium scores (out of 100) and Strategy scores (100= 100% ankle strategy) for dynamic Conditions 4-6 of the SOT.

<table>
<thead>
<tr>
<th>EQUILIBRIUM SCORE</th>
<th>PRE</th>
<th>POST</th>
<th>PRE</th>
<th>POST</th>
<th>PRE</th>
<th>POST</th>
</tr>
</thead>
<tbody>
<tr>
<td>EO, Sw-Ref Sup</td>
<td>74.8 (33.4)</td>
<td>89.8 (3.7)</td>
<td>39.4 (32.3)</td>
<td>69.3 (6.8)</td>
<td>44.5 (35.0)</td>
<td>61.5 (18.9)</td>
</tr>
<tr>
<td>SOT Condition 4</td>
<td>86.0 (7.0)</td>
<td>86.2 (6.6)</td>
<td>41.9 (24.3)</td>
<td>53.1 (12.6)</td>
<td>52.9 (31.6)</td>
<td>61.7 (17.7)</td>
</tr>
<tr>
<td>EO, Sw-Ref Sup &amp; Sur</td>
<td>48.0 (33.5)</td>
<td>65.7 (14.2)</td>
<td>48.0 (33.5)</td>
<td>65.7 (14.2)</td>
<td>58.7 (17.6)</td>
<td>60.2 (29.9)</td>
</tr>
<tr>
<td>SOT Condition 6</td>
<td>83.1 (7.4)</td>
<td>80.7 (11.3)</td>
<td>48.6 (14.5)</td>
<td>46.9 (19.3)</td>
<td>58.7 (17.6)</td>
<td>60.2 (29.9)</td>
</tr>
</tbody>
</table>

Shaded areas indicate significant improvements over time

EO=Eyes open; EC= Eyes closed; Sw-Ref Sup= Sway-referenced support surface; Sw-Ref Sup & Sur= Sway-referenced support and surround

\[ P=0.012; \; d=1.53 \]

\[ P=0.028; \; d=0.98 \]
Results: MCT

Group mean (SD) weight symmetry on the MCT

<table>
<thead>
<tr>
<th></th>
<th>PRE M-Back</th>
<th>POST M-Back</th>
<th>PRE L-Back</th>
<th>POST L-Back</th>
<th>PRE M-Fwd</th>
<th>POST M-Fwd</th>
<th>PRE L-Fwd</th>
<th>POST L-Fwd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>-27 (18)</td>
<td>-16 (12)</td>
<td>-25 (19)</td>
<td>-19 (8)</td>
<td>-25 (19)</td>
<td>-16 (9)</td>
<td>-25 (21)</td>
<td>-16 (10)</td>
</tr>
<tr>
<td>Control</td>
<td>-32 (25)</td>
<td>-35 (30)</td>
<td>-27 (26)</td>
<td>-35 (32)</td>
<td>-23 (21) **</td>
<td>-34 (29) **</td>
<td>-26 (23) **</td>
<td>-35 (29) **</td>
</tr>
</tbody>
</table>

** Indicate a trend (0.05<p<0.10) towards change

More negative values indicating greater intact limb response strength, and thus more weight asymmetry, at the onset of (medium, large, backwards, forwards) perturbations. Weight symmetry score of 0=perfect symmetry.

$P=0.055$ and $P=0.087$

d=0.64 and d=0.58
## Results: Questionnaires

### ABC (out of 100%)

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>Change</th>
<th>P-Value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>62.1 (26.2)</td>
<td>68.1 (15.7)</td>
<td>+6</td>
<td>0.453</td>
<td>0.29</td>
</tr>
<tr>
<td>Control</td>
<td>75.1 (19.9)</td>
<td>77.1 (16.2)</td>
<td>+2</td>
<td>0.779</td>
<td>0.11</td>
</tr>
</tbody>
</table>

### LCI-5 (out of 56)

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>Change</th>
<th>P-Value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>40.0 (10.0)</td>
<td>42.4 (9.7)</td>
<td>+2.4</td>
<td>0.484</td>
<td>0.24</td>
</tr>
<tr>
<td>Control</td>
<td>49.6 (5.9)</td>
<td>50.0 (5.9)</td>
<td>+0.4</td>
<td>0.898</td>
<td>0.07</td>
</tr>
</tbody>
</table>

### Houghton (out of 12)

<table>
<thead>
<tr>
<th>Group</th>
<th>Baseline</th>
<th>Post-Intervention</th>
<th>Change</th>
<th>P-Value</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>8.0 (2.9)</td>
<td>8.9 (3.1)</td>
<td>+0.9</td>
<td>0.309</td>
<td>0.30</td>
</tr>
<tr>
<td>Control</td>
<td>9.1 (2.2)</td>
<td>9.0 (2.4)</td>
<td>-0.1</td>
<td>0.872</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Discussion: Clinical outcomes

• Substantial reduction in falls sustained in the one year period following the exercise intervention

• Clinically and statistically significant improvements in the 6MWT and the TUG test, indicative of changes in physical mobility, gait speed and gait endurance (Resnik et al., 2011)

• This has not translated to an increase in perceived prosthetic confidence, balance confidence or locomotive capabilities
  – Are subjective measures sensitive enough to objective change?
Discussion: Gait

- Clinically meaningful increase in gait speed
  - Exercise group achieved gait speed consistent with literature (1.0-1.2 m/s) (De Asha and Buckley, 2015, Vanicek et al., 2009a, Wong et al., 2015)

- Increased power generation at the intact ankle during gait
  - Validated recommendations from Vanicek et al., 2009a

- Increased power generation at the hip, at pre-swing, bilaterally, whilst the control group decreased on the affected side
  - Adds energy to the swinging limb (Eng and Winter, 1995)
Discussion: Postural Control

• Exercise group likely benefitted from balance exercises performed on compliant surfaces that emphasised training of the somatosensory system and challenged dynamic balance

• Appropriate balance exercises could reduce reliance on visual input (Fernie & Holliday; 1978)

• More weight asymmetry in the control group

• Targeted balance training has the potential for increasing strength on the affected (prosthetic) limb
Take-home message

• ‘...much more relaxed way to do exercises, a very enjoyable experience...’

• ‘I feel fitter, lost weight, feel more confident...’

• ‘Have enjoyed it all, especially meeting others with missing legs...’
Next stage ....

• Qualitative study to explore motivators and barriers to exercise

• Focus group sessions
  – Conducted as 3 groups (physically active vs. not physically active LLAs, and healthcare providers)

• Meaningful information about how to implement an exercise programme within the community
Qualitative Research

- Understand/obtain current views among clinicians
- Any current unanswered questions?
- Informing clinical practice
Thank you

Acknowledgements

- Amy Tinley, Amanda Hancock, Hannah Foulstone and Vicki Russell - Hull Artificial Limb Unit
- Dr John Perry, Uni of Hull
- BACPAR research grant funding

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