Increasing physical activity in stroke survivors using STARFISH, an interactive mobile phone application

Dr Lorna Paul, Prof S Wyke, Prof S Brewster, Dr Aleksandra Dybus, Danny Rafferty, Dr Jason Gill, Gill Alexander, Dr Cindy Gray
STARFISH

• STARFISH is a smart phone app designed as a behavioural change intervention to encourage physical activity.
• The sensors within a standard smart phone record the number of steps taken per day by the individual.
• Each person is represented by a fish within a fish tank.
• When the participant is active their fish blows bubbles and swims faster.
• As the participant reaches their target number of steps per day, their fish’s fins and tail grow.
Key features - Social facilitation and targets

• STARFISH is undertaken in groups of four

• Each fish is distinguishable by colour thus each participant gets feedback on the activity of each member of the group
Key features

- Physical activity targets are individual
- Each person can access their daily or weekly step counts

**Welcome to Starfish**

- Current Goal: 100
- Today's Steps: 587

**Your Team**
- Steve
- Julie
- Lorna
- John

**Play Audio**
- Turn Audio On

**Your Walking History**
- Tuesday: 5141
- Monday: 0
- Sunday: 12587
Physical activity targets - Individual

- Each week the fish fins grow if the person achieves their daily target
- Physical activity targets are individual
- Individualised feedback for motivation
- If individual reaches their step count target it is increased by 5% for the following week
• Each week a new creature comes to swim in the tank if the group achieve their target on 5 of 7 days in the week (seahorse, octopus, final creature is a Starfish)

• Group reward for motivation
Phase 1 (co-design)

- 4 stroke survivors were recruited from Stobhill Hospital, Glasgow
- They took part in co-design sessions, where they had the opportunity to express their views on the STARFISH application
- The accelerometer within the mobile phones was also calibrated for stroke gait
- The existing STARFISH application was adapted by
  - screen scheme colour changed,
  - text and tick boxes enlarged,
  - progress bars added
  - sensitivity of the touch screen reduced
24 stroke survivors (13 females and 11 males; mean age 55.2 (SD 9.7) time since stroke: 4.2 ± 4.0 years) were recruited from stroke support groups in Glasgow, Scotland and allocated to intervention (n=16) or control group (n=8)

**Inclusion criteria:**
- single unilateral stroke
- discharged from rehabilitation
- the ability to walk independently, with or without using an aid or orthosis
- the ability to comprehend instruction

**Exclusion Criteria:**
- a history of serious cardiac disease
- uncontrolled blood pressure
- significant neurological or musculoskeletal conditions in addition to stroke
Phase 2 (intervention)

• **Outcome measures taken before and after the intervention:**
  - Physical activity levels over 7 days (ActivPAL)
  - Fatigue Severity Scale (FSS),
  - Instrumental Activities of Daily Living Scale (IADL),
  - Stroke Specific Quality of Life Scale (SS-QOL),
  - Psychological General Well-Being Index (PGWBI)
  - The Ten-Meter Walking Test (10 MWT)
Phase 2 (intervention)

- the intervention group followed the STARFISH programme for six weeks

- week 1 target - the mean number of steps per day recorded on the phone during the baseline period plus 10%

- daily step targets reviewed each week and increased by 5% for the following week if users had achieved their step count target on 5 of 7 days, if they had not achieved their target the previous week it was unchanged

- at week 3 participants attended the CRF for informal discussion and review of targets
Phase 2 (Control)

- **Control participants**
  - usual care for six weeks
  - completed the same outcome measures as the intervention group
  - following the control period they were given the opportunity to follow the STARFISH programme for six weeks
## Results

<table>
<thead>
<tr>
<th></th>
<th>Intervention Group (n=15)</th>
<th>Control group (n=8)</th>
<th>Group/Time Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Week 6</td>
<td>Baseline</td>
</tr>
<tr>
<td>Step count</td>
<td>3993 (2384)</td>
<td>5774 (2926)</td>
<td>3640 (3498)</td>
</tr>
<tr>
<td></td>
<td>0.005*</td>
<td></td>
<td></td>
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<tr>
<td>Sedentary time† (hrs)</td>
<td>19.48 (1.81)</td>
<td>18.54 (2.16)</td>
<td>19.94 (1.78)</td>
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<tr>
<td></td>
<td>0.705</td>
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<tr>
<td>10MWT (m/s)</td>
<td>0.36 (0.19)</td>
<td>0.42 (0.18)</td>
<td>0.37 (0.26)</td>
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<tr>
<td></td>
<td>0.967</td>
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<tr>
<td>SSQoL</td>
<td>171.3 (36.3)</td>
<td>185.4 (35.4)</td>
<td>169.0 (50.1)</td>
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<tr>
<td></td>
<td>0.313</td>
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<tr>
<td>IADL</td>
<td>5.3 (1.9)</td>
<td>5.3 (1.4)</td>
<td>4.8 (2.3)</td>
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<td></td>
<td>0.090</td>
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<tr>
<td>PGWBI</td>
<td>76.7 (17.7)</td>
<td>79.8 (15.0)</td>
<td>79.4 (14.8)</td>
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<tr>
<td></td>
<td>0.961</td>
<td></td>
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</tr>
<tr>
<td>FSS</td>
<td>3.6 (1.4)</td>
<td>3.1 (1.4)</td>
<td>4.1 (1.4)</td>
</tr>
<tr>
<td></td>
<td>0.003*</td>
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</tbody>
</table>

10MWT= Ten Meter Walking Test, SSQoL=Stroke Specific Quality of Life scale, IADL=Instrumental Activities of Daily Living Scale, PGWBI= Psychological General Well-being Index, FSS= Fatigue Severity Scale.
Examples of quotes from focus groups

- It gave you something to look forward to
- Have done a lot more walking than I have done before
- Its surprising how many steps you are actually doing in the house
- We live in sheltered accommodation.... They were like “Hi [name] have a seat” and I was “sorry I have to do my steps”
- You can sit all day watching TV but now we’re in a team so there’s motivation
- I was looking at the tails to see if I can have the biggest one
- ..my hips don’t get sore when I’m walking now... I’ve lost a bit of weight as well
What’s next? STARFISH in Stroke RCT

• STARFISH appeared to be a fun way to improve physical activity and health outcomes in people after stroke

• Grant secured from Chest, Heart and Stroke Scotland for fully powered randomised controlled trial
• 58 people in each arm of the study: intervention vs control
• 4 month intervention with 2 months follow up
• Anyone interested in being involved contact

Lorna.Paul@glasgow.ac.uk
0141 330 6876