A qualitative evaluation of patient acceptability of a clinical sensor-based approach to movement feedback rehabilitation

K. Nicholas 1, 2, 3, M. Al-Amri 1, 2, K. Hamana 1, J. L. Davies 1, 2, V. Sparkes 1, 2, and K. Button 1, 2, 3

1 School of Healthcare Sciences, Cardiff University, UK; 2 Versus Arthritis, Biomechanics and Bioengineering Centre, Cardiff University, UK; 3 Physiotherapy department, Cardiff and Vale University Health Board, UK; 4 RCBC Wales FIR Fellowship, Welsh Government, UK.

Background

- The identification and assessment by physiotherapists of movement adaptations during functional tasks in people following a knee injury are subjective, relying on observational skills to detect potential risk factors.
- It is challenging to identify movement patterns in both lower limbs at three joints, each with six planes of movement whilst performing tasks. Technology exists to improve the objective identification of compensation strategies through using wearable biomechanical sensors in the clinic.
- An intervention is being developed that provides the treating physiotherapist and patient with a movement feedback report1, based on the assessment using sensors. In providing objectivity, there is potential to provide reassurance in understanding biomechanics related to sub-optimal recovery and re-injury presented in a format that the physiotherapist and patient can understand.
- Personalised and tailored treatment approaches can be developed to target the movement adaptations associated with the ACLR patient population.
- Physiotherapist acceptability and usability have been explored as part of the development of a new biomechanically informed movement feedback intervention. 2
- This study aimed to evaluate patient experience and acceptance of the sensor-based movement feedback during rehabilitation.

Methods

- There are 4 stages to this mixed methods study (Figure 1). This study focuses on stage 3 – The patient experience.

Stage 1. Wearable biomechanical sensor technology is suitable for clinical movement analysis in clinical practice
- Proven to be reliable and valid3

Stage 2. Training and data collection
- 1. Training sessions of physiotherapists introducing the sensor technology and biomechanical feedback have taken place across 5 physiotherapy departments in the local health board.
- 2. Kinematic and tempo-spatial data have been collected from ACLR patients receiving physiotherapy.
- 3. Subjects performed up to six functional tasks in the clinical environment (Figure 2).

Stage 2. Data collection and Feedback

Results

- Themes and subthemes from pre-sensor feedback experience are represented in table 1 and post-experience in table 2.

<table>
<thead>
<tr>
<th>Table 1: Pre-sensor feedback experience</th>
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<tbody>
<tr>
<td>Themes</td>
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<tr>
<td>Use of technology in the patient population.</td>
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<td>Strategies for technology use and engagement.</td>
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<td>Insights to the future of movement feedback using wearable sensors in physiotherapy.</td>
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<td>Multi-faceted role of the physiotherapist.</td>
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<tr>
<td>- Provider providing feedback</td>
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<td>- Therapist consultation</td>
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<td>- Coach and educator</td>
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<td>- Personalising treatment in physiotherapy practice</td>
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<td>- Benefits of objective sensor-based feedback</td>
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<td>- Service considerations for sensor-based feedback</td>
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<td>- Service considerations in the wider healthcare setting</td>
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</tbody>
</table>

Conclusions

- Patients already use various forms of technology, including sensor technology, to assist with exercise. 4
- Sensor-based biomechanical feedback is usable and acceptable to ACLR patients.
- Data saturation and biomechanical terminology present a challenge to patient understanding.
- Quantifiable data has the potential to motivate and educate patients using a digital format.

- Patients were receptive to feedback combined with their rehabilitation to monitor and inform treatment.
- The physiotherapist is crucial in interpreting and applying sensor-based feedback findings.
- A plan for integrating sensor-based movement feedback into rehabilitation defining the provider, nature, setting, frequency and amount is proposed, guided by the TiDIEr framework.

References