

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

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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.

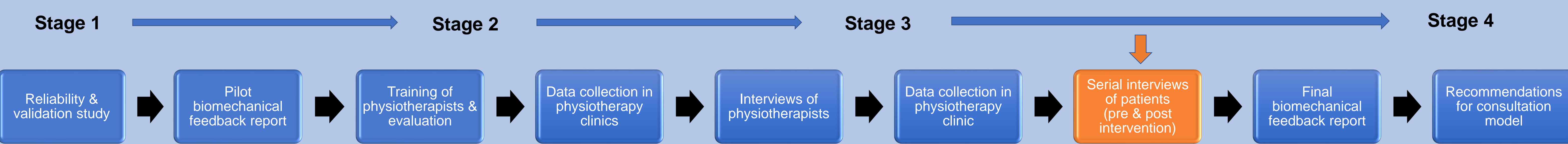


Figure 1. Flowchart showing research stages



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



Figure 2. functional tasks

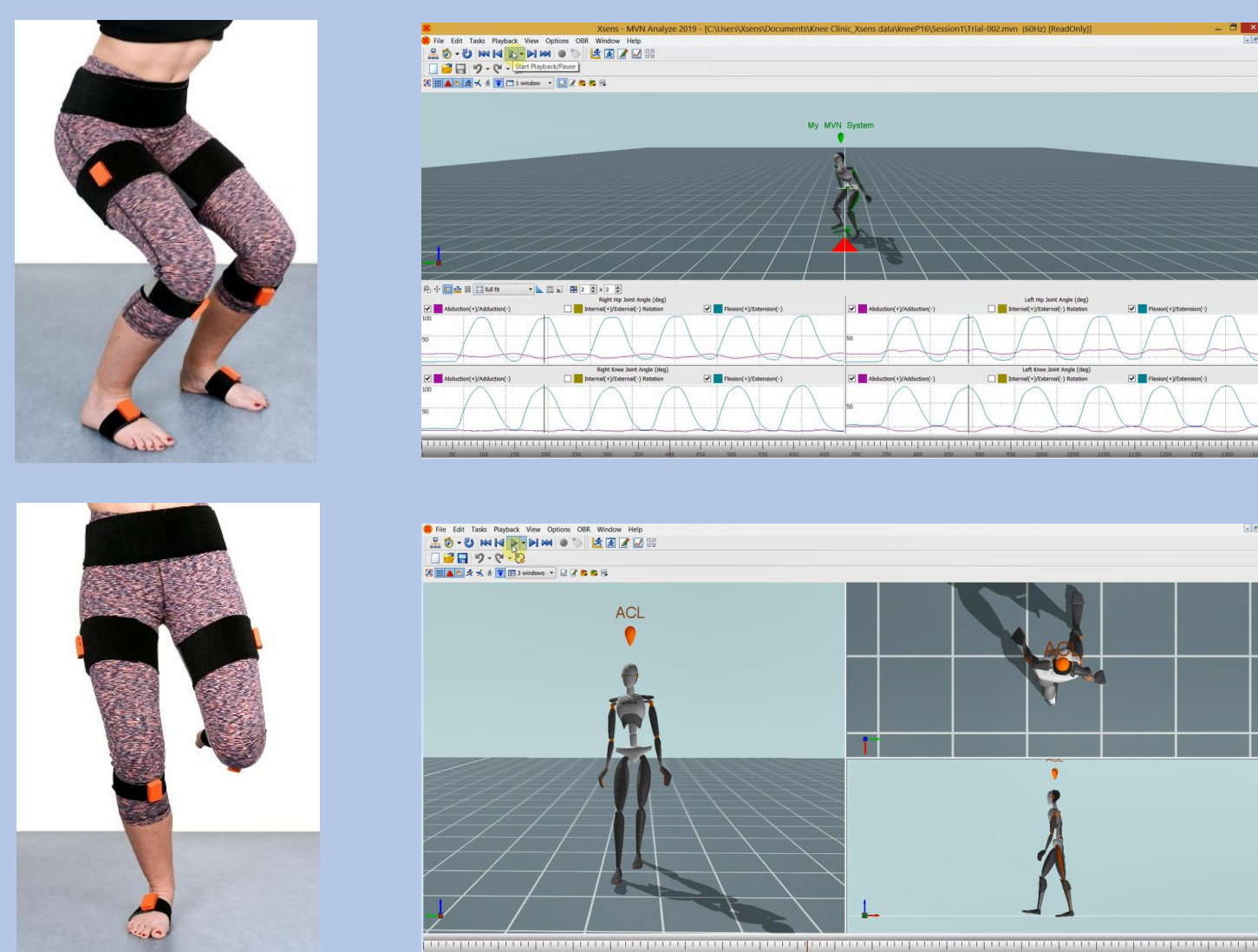


Figure 3. Biomechanical feedback

Stage 2. Training and data collection

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

Results

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

PRE-SENSOR FEEDBACK EXPERIENCE		
Themes	Subthemes	
Use of technology in the patient population.	'Lifestyle' using technology in daily life	
	'Application' of technology in daily life	
	Technology use for physical exercise	
	Reasoning and attitudes for using technology	
Strategies for technology use and engagement.	Knowledge of technology	
	Use of web-based resources	
	Psychological & internal factors	
	Social & external factors	
	Behaviour modification	
	Treatment monitoring	
Insights to the future of movement feedback using wearable sensors in physiotherapy.	Web-based resources	
	Wearable technology and its use in healthcare	
	Using objective data	
	Barriers to technology use	
	Future design and service provision	
Multifaceted role of the physiotherapist.	Physiotherapist providing feedback	
	Physiotherapy consultation	
	Physiotherapist as a coach and educator	

'So who hasn't got a social media account these days?'

'You can't trust anything off the internet, can you?'

'It's always changing. It's trying to keep up with that trend?'

'If I didn't have the help, I wouldn't have a clue of what I was doing?'

'It can be overwhelming, I guess'

'It motivates you. Even if your leg is not doing as good as it should'

'more longer sessions that are more detailed but less frequent'

POST-SENSOR FEEDBACK EXPERIENCE	
Key Themes	Sub-themes
Feedback in physiotherapy practice	Benefits of objective sensor-based feedback
	Role of the physiotherapist in providing feedback
	Value of visual feedback in rehabilitation
	Optimising engagement during rehabilitation
	Usability of sensor-based feedback
Use of technology in the clinical setting	Understanding and interpretation of sensor-based feedback report
	Increased understanding of rehabilitation and movement
	Personalising treatment in rehabilitation
	Sensor Technology - Usability
	Monitoring and directing a change in treatment
Future perspectives towards development of sensor-based technology into physiotherapy practice	Recognition of movement patterns/highlighting compensation strategies
	Attitudes to using sensor technology
	Feedback design recommendations
	Service considerations for sensor-based feedback
	Service considerations in the wider healthcare setting

Conclusions

- Patients already use various forms of technology, including sensor technology, to assist with exercise.
- 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.