Using a Natural Interface Program to Support Patients to Complete Rehabilitation at Home Post Knee or Hip Replacement
Definition of Terms

- What is a natural interface program?
  - Human-computer interaction via natural, intuitive behaviour
  - Interaction is invisible or unobtrusive

- What is rehabilitation?
  - Healthcare dedicated to maintaining, improving or restoring physical strength and mobility
  - Post joint replacement aimed to strengthen bones and promote muscular healing
Conventional Rehabilitation Post Joint Replacement

- Post hip / knee replacement
  - **In hospital** exercise aimed to achieve minimal level of function for home
    - Ability to walk
    - Ability to access / leave home
    - Ability to transfer independently
  - **Post discharge** may receive home visits from treating physiotherapist, or be asked to attend outpatient clinic
Issues in Conventional Rehabilitation

- Compliance
  - Underperformance
  - Overperformance

- Relying on self report

- Inferring compliance from observed improvements in strength, balance, mobility, pain

- Evaluation of prescribed rehabilitation regimes
Telerehabilitation

- Equity of access to resources
- Travel
  - Distance / Cost / Inconvenience
  - Restrictions on travel post surgery
- Flexibility for patients undertaking rehabilitation
- Flexibility for physiotherapists monitoring patients
  - Synchronous feedback in real-time
  - Asynchronous feedback at convenient time for physiotherapist and patient
Harnessing Technology

- Support patient efforts
- Feedback on patient efforts
- Link patient and physiotherapist
- Capture data for review, consultation, advice from other experts
Design of NIP for Rehabilitation

- Concept
  - Theoretically feasible, physically difficult

- The need for a sustainable delivery method
  - Flexibility of control
  - Focal point for acquired data

- De-identified data delivery

- Two delivery methods
  - USB stick
  - Cloud solution
NIP Hardware

- The equipment needed to be
  - Easy to use
  - Easy to set up
  - Non tactile
  - Able to relay data and video

- The equipment chosen
  - Microsoft Windows
  - Kinect
Piloting

- Over-sensitivity of program
- Ease of set up of equipment
- Real-time review and feedback
- Utility and ease of interpreting data
Putting it together

- The software
  - Utilising the Microsoft libraries
  - Two components
    - Clinician
      - To view patient exercises and create exercise templates
    - Patient
      - To demonstrate the required exercise
      - To record patient completing exercises
      - To allow patient to review their exercise efforts
Process of Recording Templates

- Initial clinician screen
- Click and record
Analysing the acquired data

- Once the data have been retrieved the clinician can
  - View the data
  - Export set points to create progression graphs
  - See the patient’s movement.
Analysing Close Up

- There are four components to the analysing screen
The Patient Screen
Patient exercise screen

- What the patients see
After the exercise

- To CLOUD or NOT TO CLOUD ??
Where to from here?

- Patient testing
  - Conventional treatment versus conventional treatment plus NIP
  - All patients asked to record rehabilitation sessions in a simple diary
Hypotheses

- It is hypothesised that access to the NIP will:
  - Enhance adherence to recommended exercise programs
  - Link to functional outcomes
    - Improved strength
    - Improved balance
    - Improved mobility
    - Less pain reported