Imperial College London

Kinematics subassembly of a biomechanical rehabilitative device for long COVID

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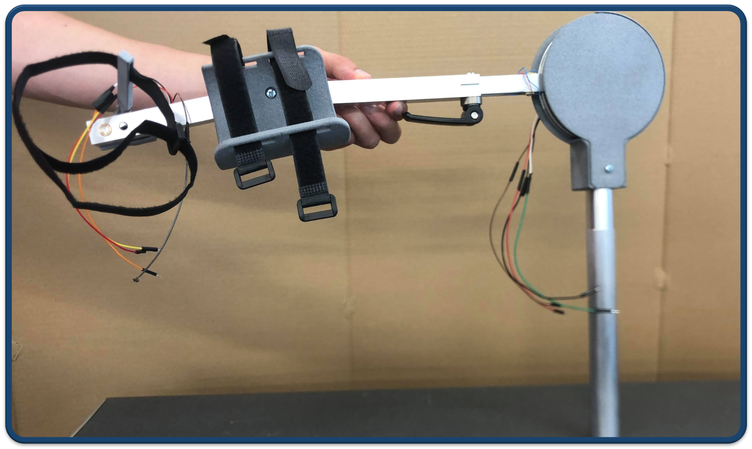
Objective: Design and manufacture a shoulder exoskeleton to assist those suffering from long COVID

Long COVID

- **1/20 likely** to suffer from long COVID.
- Symptoms: extreme tiredness, shortness of breath, joint pain and fatigue (1)

Key Features

- **Performance**: assisted flexion range of motion 0°-160°
- **User adjustability**: 5% to 95% upper arm length and circumferences
- **Materials**: all manufacture parts recyclable
  - Plastic parts additively manufactured
- **Weight**: 720g (from testing)
- **Development Cost**: £1612
- **Service Life**: 2-year total product life
- **Maintenance life**: 2-year maintenance life

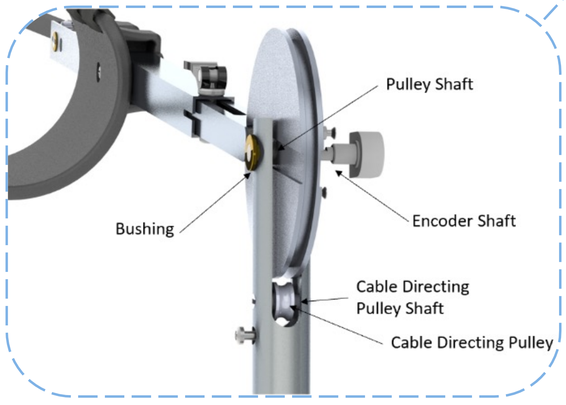


Manufactured Prototype

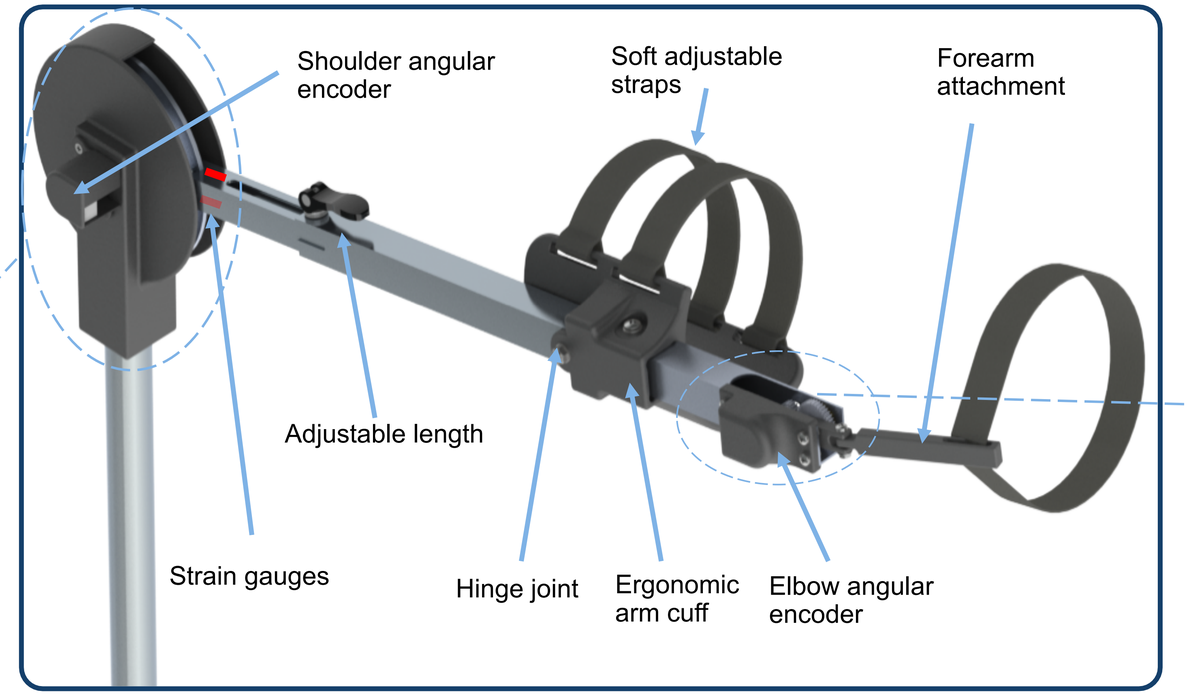
Whole Assembly Layout

Subassembly Functions:

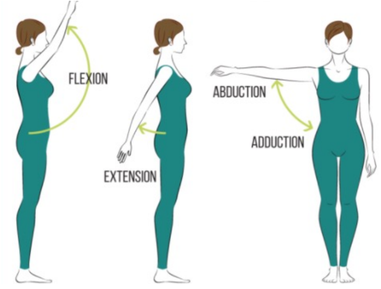
- **Actively assist** user to raise their arm in front of them (flexion)
- **Unrestricted motion** in all other planes of motion
- **Measure angles** of shoulder and elbow to inform control system
- **Measure force** applied to the cuff to infer user's desired motion

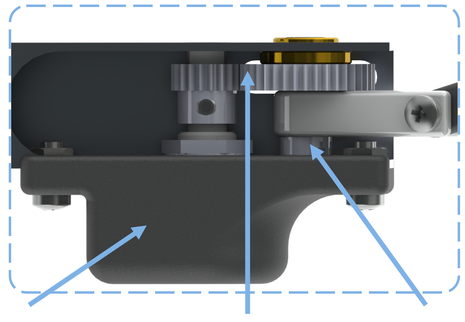


Internals of shoulder subassembly



Kinematics Sub-assembly





References:
[1]: Long-term effects of coronavirus (long COVID) - NHS. Available from: https://www.nhs.uk/conditions/coronavirus-covid-19/long-term-effects-of-coronavirus-long-covid/.