

Preliminary validations: The knee exoskeleton for monitoring and supporting the rehabilitation therapy for knee disease.

Staffing: Two researchers will be involved in the experiment, one for operating the remote control software and the other is responsible for guiding participants and real-time monitoring.

Devices: Three knee devices will be used in the experiment, two of which are commercially available and the other one is self-developed.

Data: Embedded encoder measurements (rotation), motion capture data (rotation and translation), and training duration will be recorded.

Total duration: There will be a 15min break between each test, the total duration is estimated to be 180min (3 hours).

1. Try-on trials

Duration (est.): 20min

Purpose: Validating the usability of the developed exoskeleton in terms of 1) being easy to put on and take off by participants themselves.

Description: The researchers will first give instructions, and the participants will be asked to independently take the three devices on and off properly (time recorded).

2. Free motion tests

Duration (est.): 60min

Purpose: Validating the user-friendliness of wearing the exoskeleton: comfortability when compared to commercially available devices (two).

Description: Participants will be asked to perform daily lower limb movements (knee extension/flexion, squat, and walk) before and after wearing three knee devices.

Measurements: Embedded encoder measurements, motion capture data

3. Motion assistance trials

Duration (est.): 30min

Purpose: Evaluating the capability of the knee exoskeleton for providing motion assistance: static

leg lifting trial.

Description: Participants will be asked to wear the exoskeleton (self-developed) and sit on a chair of adjustable height, staying relaxed. Starting from the neutral position (approx. 90°), the exoskeleton will drive the knee joint to the full extension position (approx. 0°).

Measurements: Embedded encoder measurements, motion capture data

4. Questionary

Duration (est.): 10min

Purpose: Summarizing results with scoring-based questionnaires and identifying the underlying problems (prices, appearance, and other shortcomings).

Description: The pre-designed questionnaire contains approximately 10 questions.