Patellar Tendinopathy Rehabilitation
Wearable Device Feedback Mechanism

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Outline

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• Patellar Tendon Rehabilitation Device

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Patellar Tendon

- Patellar tendinopathy can be caused by a number of factors:
  - muscle imbalances in the quadriceps, such as weakness of the medial aspect and overuse/tightness in the lateral aspect
  - lack of an adequate warm-up and stretching prior to activity
  - lack of adequate rest period between activities
  - overuse of the tendon from frequent running/jumping/starting and stopping
Introduction

Patellar Tendon - Rehabilitation

- The main treatment is a program of eccentric decline squats
- Subjects in the studies on eccentric decline squats are encouraged to continue doing the exercises even with moderate pain
- One eccentric decline squat, the patient must stand on a decline board with the foot pointing to the down side of the board.
- While balancing on the injured leg the patient should squat downward slowly to about 60° of knee flexion.
Introduction - Gamification

- Game Mechanics and Logic applied to non-game processes to influence and incent:
  - Performance
  - Social Interaction
  - Behavior
- if you can make something more fun, and include notions of play, you can get people to do things they otherwise might not want to do.”
Patellar Tendon Rehabilitation Device
Patellar Tendon Rehabilitation Device

Hydraulic Lift Mechanism

LCD Screen

Arduino

MENU Push Buttons

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Patellar Tendon Rehabilitation Device

Gamification
Patellar Tendon Rehabilitation Device

Device at flat position (0 Degrees)

Device at 45 Degrees.

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Feedback Mechanism
Sensoria – Smart Socks

Sensoria Anklet (Bluetooth Connectivity)

Sensoria Anklet (connected to external power supply to operate at 3.7V / 300mA)

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Feedback Mechanism
Sensoria – Smart Socks

Standing Position: All three sensors are active

Sitting Position: Back Sensor is not measuring any pressure
Feedback Mechanism

Force Sensors & Arduino Uno

Force sensors were attached under patient's feet based on the previous experimental apparatus.
Feedback Mechanism
Force Sensors & Arduino Uno

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Conclusions

- A patellar tendon rehabilitation device was designed and implemented featuring a feedback mechanism and a motivation mechanism through gamification.
  - Patient benefits from motivation and feedback with gamification as it makes the game fun.
  - Feedback mechanism enables self-treatment by keeping the patient within the appropriate exercise regime thus optimizing the efficacy of the exercise.
  - Cost-benefit for the training as a professional might not be required to be always present.
  - Collection of data can be useful for the further decision making from the experts.
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