Using Shape Memory Polymers to reduce knee moments and prevent ACL Injuries

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Pointers

- Remember the screen is much higher than the ground so there won’t be much opportunity to read off the slides
- Also the screen is far away so keep the font ~16 (like what this font is)
- Find clear pictures with little to no words on them

Let’s follow generally the same outline for the paper and we can prevent our own work
Anatomy and function[1]

- MCI, LCL: control turning in, out, and tibia movement
- ACL, PCL: stability in the coronal and sagittal plane
Background

- 80% of tears are due to non contact injuries[2].

- Risk factors[4][5]
  - Gender
  - Sport
  - Intercondylar notch
  - Hamstring strength
  - Prior ACL injury
Significance

- Total: 15,949,748 Injuries in Norwegian countries[2]
- Rehabilitation times 4-6 months[3].
- Potentially career ending injury
Areas of focus

- Factors in the tear [6][7]
  - Hamstring strength
  - Hip position upon landing
  - Foot and ankle position upon landing
  - Knee position upon landing
  - Movement direction
  - Weight distribution

https://www.youtube.com/watch?v=X8PJU4UzEbK
Conception

- Requirements:
  - Comfortable
  - Ease of movement [8]
  - Durability
  - Entire Leg segment
  - Feedback mechanism
  - Force Generation
Proposed Research

- Development of a full-body singlet
  - Improve hamstring contraction
  - Increase hip abductor strength
  - Improve hip flexion
  - Promote neutral knee alignment
  - Facilitate a toe-first landing
  - Help maintain a high range of ankle angles
Timetable

- Phase one: ~ 2 years
  - Research and development of prototype
- Phase two: ~ 2 years
  - Experimental Validation
- Phase three: ~ 1 year
  - Finalize design and bring singlet to market
Research Significance

- Provides improved compression garment to prevent ACL injury
- Investigates a randomized population’s risk of ACL injury
- Links data obtained from the suit to training programs
Conclusion

- Use Shape Memory Polymers embedded in a Singlet
- Integrate a Feedback control system
- Comfortable design similar to existing equipment
Questions?

● Cost?
  ○ Chip:~$50, material:~$300, material for actual clothes: $80

● Why not do training program?
  ○ No direct link of data between ACL Injuries and training programs

● Possibly damaging the system?
  ○ Smart placement on the body
References


