Biomechanical Factors Associated with Knee Pain in Cyclists: A Systematic Review of the Literature

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This systematic review will focus on literature related to positioning on, or driving forces of the knee during cycling. For individuals who cycle with increased knee adduction angles, hills can cause repetitive forceful shearing at the knee. Peak virus forces decrease with 10 degrees of eversion of the foot. Cycling seated, using both 5 and 10 degrees of eversion of the foot, tibiofemoral compressive forces are more sensitive to knee flexion angles. Incorrect saddle position has a negative effect on knee biomechanics. A systematic review of the literature found that: Compressive forces are more sensitive to knee flexion angles. Cycling seated, using both 5 and 10 degrees of eversion of the foot, tibiofemoral compressive forces are more sensitive to knee flexion angles. Incorrect saddle position has a negative effect on knee biomechanics.

Methods

- Review Protocol
- Based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines
- Search Terms
- Knee injuries, knee pain, cycling, cyclist, and overuse
- Data Extraction
- Knee pain, cycling parameters, number of subjects, gender, EGM, activity, bike-fit, and limitations
- Grading the Evidence
- Downs and Black Questionnaire was used
- Consultation between all four researchers and faculty advisor to resolve discrepancies
- Risk of bias include lack of randomization and lack of level 1 evidence.

Results

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<td>Tamborindeguy AC, Rico Bini R.</td>
<td>2014</td>
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Discussion

- Difference between cyclists with and without knee pain
- Cyclists with prior history of injury may adapt a more medial knee position which reduces strain on the extensor mechanism.
- Greater disorientation observed in cyclists with history of injury during phase of pedal cycle where a knee flexor moment is found.
- Effects of different saddle and foot position
- Saddle
  - Backward saddle position increases tibiofemoral anterior shear force
  - Compression forces are more sensitive to knee flexion angles
- Foot position
  - Increased evasion may reduce patellofemoral force
  - Due to changes in muscle activation and patellar reduction in lateral patellar tracking
  - Increased pronation leads to increased tibial rotation and increased forces values at the knee
- Peak virus forces decrease with to degrees of evasion of the foot
- A more neutral foot and knee position is beneficial for reducing overuse knee injuries
- No ideal foot position noted in the literature to prevent most knee injuries
- Alterations in foot position may alleviate pain in cyclists with knee pain.

Limitations

- Limited experimental studies comparing cyclists with and without knee pain. Studies containing data on cyclists with knee pain but limited research regarding preventative measures in those without knee pain
- Few randomized control trials across the literature on the topic
- Low to moderate evidence per Downe and Black grading scale
- Little research regarding effects of positioning in cyclists with posterior or medial knee pain

Conclusions

- "Optimal" bike fit inconsistent across the literature
- No single configuration shown to decrease or prevent knee pain
- Inconclusive data regarding biomechanical differences in cyclists with and without knee pain
- Recommendation for further experimental research in manipulating various bicycle components to determine an optimal configuration to prevent or alleviate knee pain in cyclists

References


Fig. 1: Cycle Diagram

Fig. 2: Algorithm for Allleviating Knee Pain during Cycling