

# Optimal Joint Loading Strategies to Lessen Cartilage Changes after ACL Reconstruction Differ Throughout the Postoperative Recovery

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Study performed at the University of Kentucky

# Disclosure

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- I and/or my coauthors have nothing to disclose

# Background

- Both under- and overloading the joint after anterior cruciate ligament reconstruction (ACLR) have been reported to impact early postoperative cartilage changes
- Despite the lack of consensus, conflicting rehabilitation programs are being developed to promote either increasing or decreasing joint loading at different time points after surgery



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# Purposes

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- To help inform postoperative rehabilitation, the purposes of this systematic review were to:
  1. Determine whether relative under- or overloading is associated with imaging and/or biochemical biomarkers of cartilage degradation after ACLR
  2. Determine whether these associations differ over time

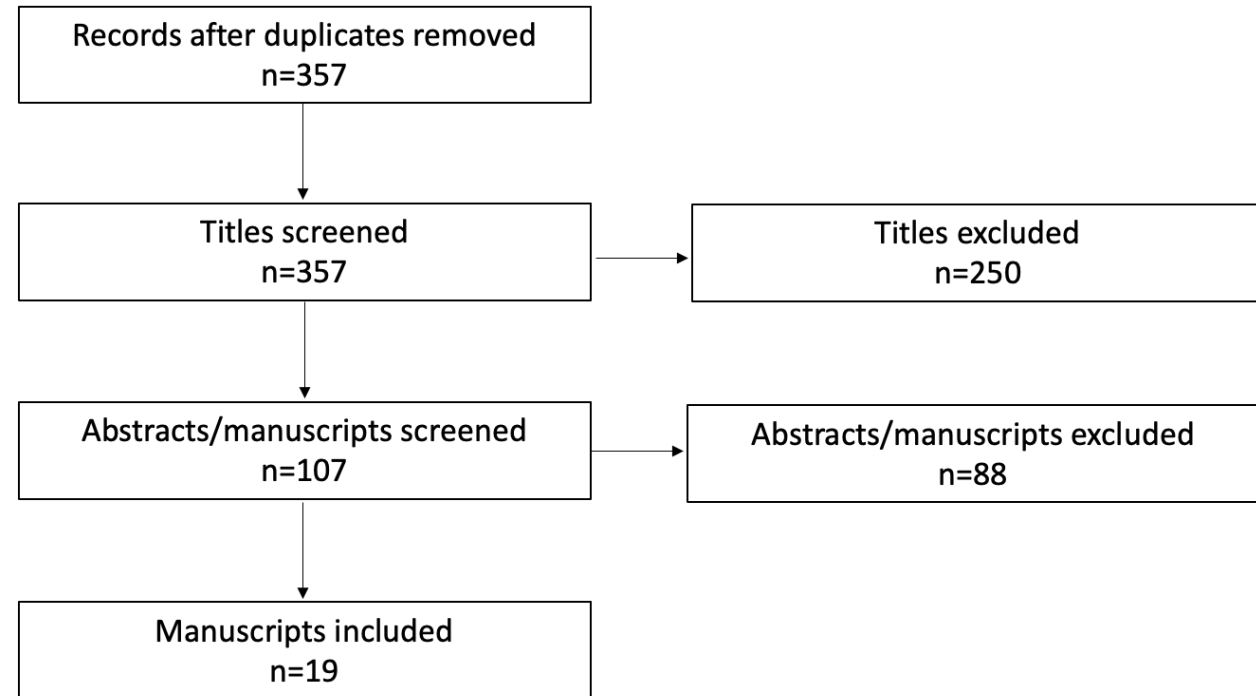
# Methods

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- A literature search was conducted using the PubMed database to identify studies of ACL-reconstructed patients that reported knee joint moments and/or vertical ground reaction forces and at least one imaging or biochemical biomarker of cartilage degeneration.
- The initial search produced 357 publications for consideration of which 15 studies (510 patients) satisfied the inclusion criteria.
- We then recorded the method of cartilage degeneration measurement, whether increased or decreased joint loading was associated with imaging and biochemical biomarkers of cartilage degradation, and the time point when joint loading and cartilage changes were assessed.

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  - **Overloading** was defined as either vertical ground reaction forces or joint moments that were **GREATER** on the operative side than the nonoperative contralateral limb
  - **Underloading** was defined as either vertical ground reaction forces or joint moments that were **LESS** on the operative side than the nonoperative contralateral limb

# Results

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- There was no clear trend in whether cartilage degradation was associated with relative under vs. overloading in the early postoperative period.
  - 3 studies reported underloading was associated with cartilage degradation
  - 2 studies reported that overloading was associated with cartilage degradation
- On the contrary, much more consistent results were seen at later time points. Between 18 months and 8 years after ACLR, overloading was consistently associated with degenerative cartilage changes when using either MRI or ultrasound imaging biomarkers (7/7 studies, 287 patients).



# Results

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- Two studies (49 patients) reported that decreased joint loading 2 years or later after ACLR was associated with increased serum and/or plasma biomarkers of cartilage degradation
- While underloading compared to the contralateral limb was associated with serum and plasma cartilage biomarkers at later time points, it remains unclear if systemic biomarkers are evidence of increased cartilage remodeling in either the involved or uninvolved limb

# Discussion

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- Both relative under- and overloading 6 months after ACLR were associated with biomarkers of early cartilage degradation whereas overloading was consistently associated with imaging biomarkers of cartilage changes 18 months or more after surgery
- The under-rehabilitated knee continues to threaten long-term joint health, and the current results suggest that rehabilitation strategies are needed to both promote optimal loading in the early postoperative period while also avoiding overloading 18 months or more after ACLR

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