

# Association of Knee Adduction Moment with Pain Irritability in People with Knee Osteoarthritis

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## Summary

In individuals with severe knee osteoarthritis, a larger knee adduction moment impulse was associated with higher pain intensity, suggesting load exposure is associated with constant and intermittent pain. Higher pain irritability was noted in severe compared to less severe structural disease.

## Introduction

In knee osteoarthritis (KOA), the association between pain and external knee adduction moment (KAM) is unclear. The literature shows positive (1), negative (2), and no association (3) between these variables. Structural joint damage may confound this association. Previous literature shows that radiographically severe KOA showed both positive (3) and negative relationships (4) between KAM and pain intensity. No work has considered pain frequency and irritability (change in pain intensity after a task) with these variables. The primary aim was to determine the associations of KAM with pain intensity, frequency, and irritability across varying radiographic KOA severities. The secondary aim was to study differences in pain between these severity groups.

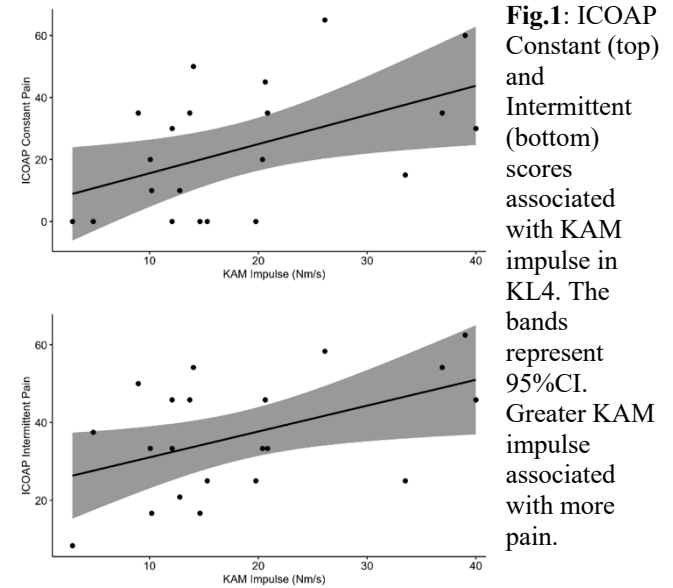
## Methods

Data from 93 participants with clinical KOA (59 females, age  $64.5 \pm 6.4$  years, BMI  $29.8 \text{ kg/m}^2$ ; 34 males, age  $66.1 \pm 5.7$  years, BMI  $28.6 \text{ kg/m}^2$ ; 0 other sex) were collected. To characterize disease severity, Kellgren-Lawrence (KL) grades were scored by an experienced radiographer from x-rays acquired in a standardized weight-bearing position. 3D gait data were collected using a force plate sampling at 1000 Hz synchronized with five Optotrak Certus banks sampling at 100 Hz. KAM was computed over 5 barefoot walking trials at a self-selected speed. The pKAM ( $\text{Nm/kg}$ ) and KAM impulse ( $\text{Nm}\cdot\text{s}$ ) were extracted and averaged. Pain measures included intensity (Numeric Pain Rating Scale (NPRS)), frequency (Intermittent and Constant Osteoarthritis Pain (ICOAP) questionnaire) and irritability. Pain irritability was the change in NPRS before and after the 6-minute walk test (6MW). For the primary aim, a series of regressions were completed separately for the following KL grades: KL0/1, KL2, KL3 and KL4. Pain measures were the dependent variables. After adjusting for age, sex, and gait speed, KAM was entered in the model. For the secondary objective, an ANCOVA compared pain variables, adjusted for baseline pain scores, between KL grades.

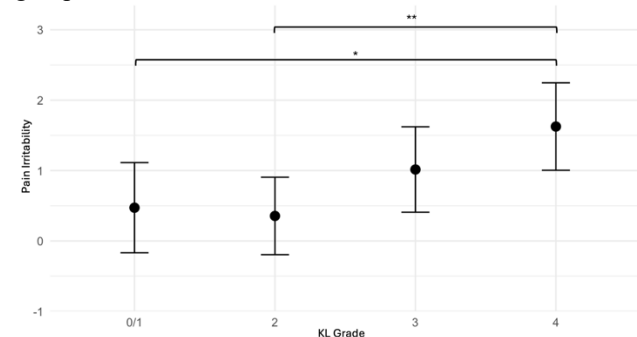
## Results and Discussion

A range of radiographic OA severity was observed: KL0/1  $n=21$ , KL2  $n=29$ , KL3  $n=23$ , and KL4  $n=20$ . KAM impulse was positively associated with ICOAP constant pain ( $p = 0.02$ ) and intermittent pain ( $p = 0.03$ ) in KL4 (Fig. 1). KAM

impulse was not associated with any pain measure in KL0/1, KL2 or KL3 groups. pKAM was not associated with ICOAP scores or pain irritability.



After adjusting for baseline NPRS, pain irritability was greater in KL4 compared to KL2 ( $p = 0.004$ ) and KL0/1 ( $p = 0.02$ ) (Fig. 2). No other pain measure was different between groups.



## Conclusion

This work adds novel data on the association of joint loading with pain irritability in KOA. KAM impulse was associated with greater ICOAP constant and intermittent pain in KL4, suggesting greater loading exposure associates with constant and intermittent pain in severe KOA. Pain irritability was higher in severe compared to less severe structural disease.

## References

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