



Influence of Patient Factors on Joint Work Symmetry while Running in Service Members with Knee Pain



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INTRODUCTION

- Joint work, the mechanical energy produced/absorbed during activity, is a common metric used in biomechanical running analyses
- Gap in Literature:* It is unknown if patient demographic or anthropometric characteristics or self-reported factors, such as pain or kinesiophobia, can help explain the asymmetrical loading seen in runners with knee pain

Objectives: 1. To determine whether patient-reported outcomes, pain, and demographics are associated with positive and negative knee joint work symmetry during running in service members with knee pain
2. To quantify the unique contributions of psychological, functional, and pain-related variables to variance in knee joint work symmetry using regression and commonality analyses.
3. To assess side-to-side differences in positive and negative knee joint work to better understand asymmetrical loading patterns in runners with knee pain.

METHODS

- 50 Service members (SMs) with knee pain during running were included in this study
 - 34 male / 16 female
 - Height = 1.7±0.01 meters
 - Mass = 79.0±15.1 kilograms
 - Age = 32.3±8.0 years
 - SMs underwent a running biomechanical analysis
 - Mean joint work (joint moment x angular velocity) over time during concentric (positive) or eccentric (negative) phases of knee motion
 - Symmetry calculated: involved:uninvolved
- Patient reported outcomes:*
- Numeric pain rating scale
 - Pain at rest
 - Peak pain with running
 - Lower Extremity Functional Scale
 - Tampa Scale of Kinesiophobia

STATISTICAL ANALYSIS

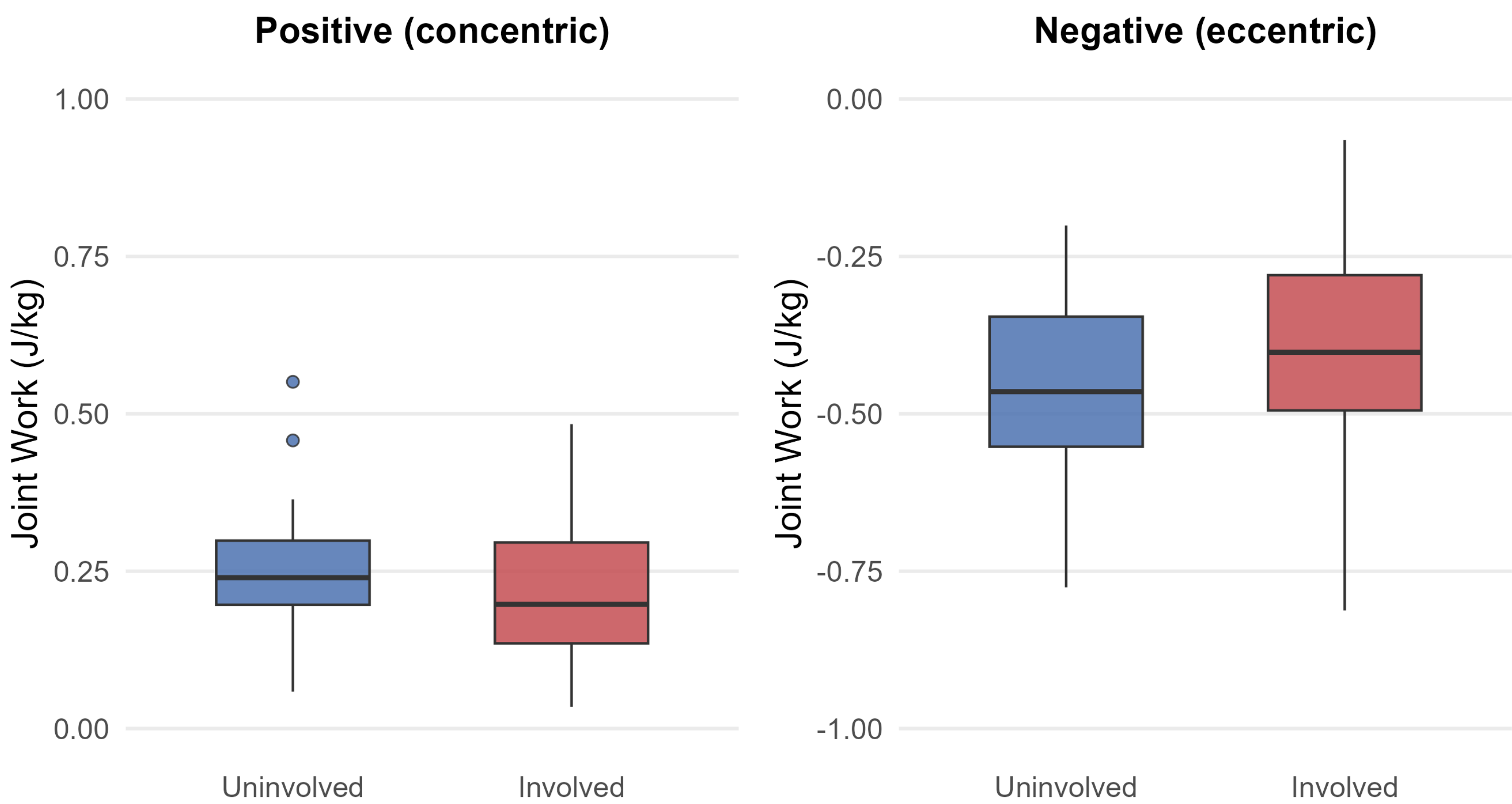
- Regression analyses examined if patient factors or PROs could predict positive and negative knee joint work symmetry
- Commonality analyses determine the unique proportion of explained variance

DESCRIPTIVES

Patient Reported Outcome	Mean Score ± Standard Deviation
NPRS- Pain at Rest	0.9 ± 1.4
NPRS- Peak Pain with Running	4.2 ± -2.1
Lower Extremity Functional Scale	59.6 ± 13.2
Tampa Scale of Kinesiophobia	37.0 ± 6.2
Knee Work Symmetry	Mean Score ± Standard Deviation
Positive Knee Work Symmetry	88.5±32.4%
Negative Knee Work Symmetry	87.9±25.4%

Knee Joint Work During Running: Involved vs. Uninvolved Limb

Service members with knee pain (n = 50)



RESULTS

- Regression Analyses:*
- Positive knee work symmetry **could be predicted** from patient factors and PROs
 - Adjusted R²=0.30; P= 0.04
 - Independent Predictors:
 - Height: P=0.05
 - Mass: P=0.03
 - Negative knee work symmetry could **not** be predicted from patient factors and PROs
- Commonality Analyses:*
- Positive knee work symmetry: **height** and **mass** accounted for the largest proportions of total explained variance (30%)
 - Unique contribution:
 - Height = 9.9%
 - Mass = 3.6%
 - Negative knee work symmetry: **no** single factor nor combination contributed a substantial proportion of variance
 - Each variable < 2% contribution to variance

CONCLUSIONS

- Height and mass predicted positive knee work symmetry
- Suggesting anthropometrics influence concentric loading patterns in runners with knee pain
- Despite **moderate pain, low self-reported function**, and **high kinesiophobia**, PROs did not contribute meaningfully
- Negative knee work symmetry was not explained by any variable
 - Indicates eccentric loading may depend on unmeasured neuromuscular factors
- These findings highlight distinct mechanisms underlying positive joint work and suggest biomechanics-based interventions may benefit from considering individual physical characteristics
- Supported by the wide variability in joint work symmetry in this population

DISCLAIMER

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