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<AT>Influence of outdoor running fatigue and medial tibial stress syndrome on accelerometer-based loading and stability
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<ABS-HEAD>Abstract► 246► Body of text: 3496► Acknowledgments► This project was funded through the internal BOF funding of the KU Leuven. The authors would like to thank the group of bachelor students involved with recruitment and data collection, as well as Karen Ven for her contributions.
<ABS-HEAD>Highlights► Accelerometry assessed the influence of MTSS with in-situ running fatigue ► Running speed was added in subsequent model as a continuous covariate. ► Dynamic loading measures were not higher with running fatigue in MTSS. ► In MTSS only, running fatigue was associated with decreased ML sample entropy. ► Overall, symmetry decreased while shock attenuation increased with running fatigue.
<ABS-HEAD>ABSTRACT
<ABS-P>Medial tibial stress syndrome (MTSS) is a common overuse running injury with pathomechanics likely to be exaggerated by fatigue. Wearable accelerometry provides a novel alternative to assess biomechanical parameters continuously while running in more ecologically valid settings. The purpose of this study was to determine the influence of outdoor running fatigue and MTSS on both dynamic loading and dynamic stability derived from trunk and tibial accelerometery. Runners with (n=14) and without (n=16) history of MTSS performed an outdoor fatigue run of 3200m. Accelerometer-based measures averaged per lap included dynamic loading of the trunk and tibia (i.e. axial peak positive acceleration, signal power magnitude, and shock attenuation) as well as dynamic trunk stability (i.e. tri-axial root mean square ratio, step and stride regularity, and sample entropy). Regression coefficients from generalised estimating equations were used to evaluate group by fatigue interactions. No evidence could be found for dynamic loading being higher with fatigue in runners with MTSS history (all measures $p>0.05$). One significant group by running fatigue interaction effect was detected for dynamic stability. Specifically, in MTSS only, decreases mediolateral sample entropy i.e. loss of complexity was associated with running fatigue ($p<0.01$). The current results indicate that entire acceleration waveform signals reflecting mediolateral trunk control is related to MTSS history, a compensation that went undetected in the non-fatigued running state. We suggest that a practical outdoor running fatigue protocol that concurrently captures trunk accelerometry-based movement complexity warrants further prospective investigation as an *in-situ* screening tool for MTSS individuals.
<KWD>Keywords: Accelerometer; Running; Overuse Injury; Fatigue; Body-worn sensor; Complexity

<H1>1 Introduction
Medial tibial stress syndrome (MTSS) is a debilitating overuse injury of the tibia prevalent in runners and military recruits. MTSS is a primary running-related musculoskeletal injury with a prospective incidence rate up to 20% [1], and a multi-factorial aetiology involving numerous extrinsic and intrinsic factors. The former includes training shoes, surface, interval training and intrinsic factors while the latter includes higher body mass index, fatigability, female gender, running experience, previous MTSS, and faulty biomechanics [2,3].