Knee medial and lateral contact forces in a musculoskeletal model with subject-specific contact point trajectories

A. Zeighami, R. Aissaoui, R. Dumas

PII: S0021-9290(18)30042-3
DOI: https://doi.org/10.1016/j.jbiomech.2018.01.021
Reference: BM 8537

To appear in: *Journal of Biomechanics*

Accepted Date: 14 January 2018

Please cite this article as: A. Zeighami, R. Aissaoui, R. Dumas, Knee medial and lateral contact forces in a musculoskeletal model with subject-specific contact point trajectories, *Journal of Biomechanics* (2018), doi: https://doi.org/10.1016/j.jbiomech.2018.01.021

Knee medial and lateral contact forces in a musculoskeletal model with subject-specific contact point trajectories

A. Zeighami[1*], R. Aissaoui[1], R. Dumas[2]

1. Laboratoire de Recherche en Imagerie et Orthopédie (LIO), École de Technologie Supérieure (ÉTS), Centre de Recherche du CHUM, Montréal, Québec, Canada
2. Université Lyon, Université Claude Bernard Lyon 1, IFSTTAR, UMR_T9406, LBMC, F69622, Lyon, France

Ali Zeighami*: zeighamiali87@gmail.com, ali.zeighami.1@ens.etsmtl.ca

Address: Imaging and Orthopaedics Research Laboratory (LIO), École de Technologie Supérieure
The CHUM Research Centre, Viger tower, 900 St-Denis, Room R11.322, Montréal, (QC) H2X0A9, Canada
Tel: +1 (514) 890-8000, ext. 30964
Raphaël Dumas: raphael.dumas@ifsttar.fr

Rachid Aissaoui: rachid.Aissaoui@etsmtl.ca

Type of manuscript: original article.

Running title: A musculoskeletal model with subject-specific contact point trajectories

Word count: 3599.

Abstract

Contact point (CP) trajectory is a crucial parameter in estimating medial/lateral tibio-femoral contact forces from the musculoskeletal (MSK) models. The objective of the present study was to develop a method to incorporate the subject-specific CP trajectories into the MSK model. Ten healthy subjects performed 45 second treadmill gait trials. The subject-specific CP trajectories were constructed on the tibia and femur as a function of extension-flexion using low-dose bi-plane x-ray images during a quasi-static squat. At each extension-flexion position, the tibia and femur CPs were superimposed in the three directions on the medial side, and in the anterior-posterior and proximal-distal directions on the lateral side to form the five kinematic constraints of the knee joint. The Lagrange