Review

Alterations of musculoskeletal models for a more accurate estimation of lower limb joint contact forces during normal gait: a systematic review

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Alterations of musculoskeletal models for a more accurate estimation of lower limb joint contact forces during normal gait: a systematic review

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Abstract

Musculoskeletal modelling is a methodology used to investigate joint contact forces during a movement. High accuracy in the estimation of the hip or knee joint contact forces can be obtained with subject-specific models. However, construction of subject-specific models remains time consuming and expensive. The purpose of this systematic review of the literature was to identify what alterations can be made on generic (*i.e.* literature-based, without any subject-specific measurement other than body size and weight) musculoskeletal models to obtain a better estimation of the joint contact forces. The impact of these alterations on the accuracy of the estimated joint contact forces were appraised.

The systematic search yielded to 141 articles and 24 papers were included in the review. Different strategies of alterations were found: skeletal and joint model (*e.g.* number of degrees of freedom, knee alignment), muscle model (*e.g.* Hill-type muscle parameters, level of muscular redundancy), and optimisation problem (*e.g.* objective function, design variables, constraints). All these alterations had an impact on joint contact force accuracy but it was not possible to highlight any trend defining which alteration had the largest impact.