Mobile assessment of the lower limb in healthy persons and patients with degenerative knee disorders: a systematic review

Peer-reviewed author version

VAN DER STRAATEN, Rob; DE BAETS, Liesbet; Jonkers, I. & TIMMERMANS, Annick (2016) Mobile assessment of the lower limb in healthy persons and patients with degenerative knee disorders: a systematic review. In: Gait & posture, 49(S2), p. 139-139.

DOI: 10.1016/j.gaitpost.2016.07.197
Handle: http://hdl.handle.net/1942/22649

Title

Mobile assessment of the lower limb in healthy persons and patients with degenerative knee disorders: a systematic review

Introduction:

Multiple studies report aberrant gait patterns in patients with degenerative knee disorders, based on objective laboratory measures [1,2]. However, knee biomechanics outside the laboratory environment are studied less. Inertial magnetic measurement systems (IMMS) provide a solution to monitor functional movements in everyday life settings. Through the assessment of activities of daily living, additional insights may be gained concerning the disease progression and compensation strategies that are adopted in daily life. Therefore, the objective of this systematic review is to investigate 1) which parameters are measured by IMMS for the assessment of the lower limb (i.e. hip, knee and ankle joints) and 2) which activities are reported for the assessment of degenerative knee disorders.

Research Question:

Which kinematic, kinetic and spatiotemporal parameters are measured by IMMS's at the lower limb in healthy persons and in persons with degenerative knee disorders and which activities are evaluated during the assessment?

Methods:

A systematic search was conducted in six electronic databases (ACM, CINAHL, EMBASE, IEEE, PubMed, Web of Science) until January 2016. Studies were included when they met all of the following criteria: an ambulatory motion analysis system (3D accelerometer and 3D gyroscope); kinematic and/or kinetic and/or spatiotemporal characteristics; the knee joint with one adjacent joint (i.e. hip or ankle joint); a healthy population or a population with knee osteoarthritis/replacement. Papers were excluded if they: use the IMMS for training purposes; describe other patient populations, included less than five participants; evaluated cadavers or animals. Data were analysed descriptively.

Results:

Fourteen studies were included. Studies were focussing on the lower limb (n=6), on full body joint angles (n=1), on the lower limb plus thorax/pelvis angles (n=1), on hip and knee joints plus upper extremities ((n=2), on knee and hip joints (n=2) and studies on knee and ankle joints (n=2). Eleven studies described the use of IMMS in a healthy population and 3 in a patient population. The kinematics included joint range of motion, minimum/maximum joint angles. Kinetics were reported as the magnitude of joint force and external joint moments. Spatiotemporal parameters addressed walking speed, cadence, step/stride length, stance time and joint trajectory. Activities that were evaluated included walking (n=11), stair climbing (n=4), squatting (n=1), forward/sideward stepping (n=1), running (n=1) and manual handling tasks (n=1).

Discussion:

No standardized practice for the assessment of functional movement is available and research focussing on the assessment of the lower limb biomechanics during movements other than gait is scarce. Future studies should evaluate the lower limb function in activities of daily living in the patient population to gain more insights in the progression of the disease and adopted compensation strategies.

References:

[1] Astephen, J Orthop Res, 2008;26:332-41
[2] Baert, Clinical Biomechanics, 2013;28:40-47