

Development of a bespoke movement analysis protocol for routine clinical use in orthopaedics

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Assessment of progress and outcome of orthopaedic interventions are often carried out using subjective observational methods. These may not be the most accurate or sensitive way to assess patient progress (Ong et al. 2008). In contrast, motion capture is currently the gold-standard for measuring human movement (Gage 1993; Cook et al. 2003) and the equipment cost is decreasing, making routine clinical use a possibility. However, current movement analysis protocols and setups are not suited for routine clinical use as they are time consuming and complex. Therefore, the aim of this study was to develop a protocol which could be easily adopted by the orthopaedic community and provide more sensitive outcome measures in routine clinical practice.

A bespoke, cluster based marker model (CM) was developed. Kinematics were calculated using the Grood and Suntay (1983) method and the kinematic output was compared to the current clinical gold-standard (Vicon Plug in Gait; PiG). Ten healthy volunteers wore a comprehensive marker set comprised of CM and PiG and performed 10 over-ground walking trials. Hip and knee flexion, abduction and rotation were compared along with ankle dorsi/plantar flexion. T-tests determined any significant difference between models.

The cluster based marker set was quick and easy to apply. When comparing the kinematic output between CM and PiG, there were some small but statistically significant differences. Differences were more likely to occur in rotations out with the sagittal plane.

CM provides a kinematic output comparable to that of the current clinical gold-standard. Differences in output may be due to different methods for estimating joint centres and calculating kinematics. In conclusion, CM is tailored for clinical use and should be considered the preferred option in routine clinical practice. Using the methods described, a gait test can be conducted in 10 minutes in the clinic by a physiotherapist or nurse.

Keywords: bespoke movement; kinematics; orthopaedic intervention

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