

Agreement of hip kinematics between two tracking marker configurations used with the CODA pelvis during ergonomic roofing tasks

Introductory Information

The anterior and posterior superior iliac spine markers are commonly used to define the pelvis, and these markers are predisposed to occlusion during three-dimensional motion capture. The occlusion of these markers leads to the use of various tracking marker configurations on the pelvis, which can create differences in kinematic results. The purpose of this investigation was to examine the agreement of CODA pelvis kinematic results when two different tracking marker configurations were used during ergonomic roofing tasks. Three-dimensional motion data was collected on seven male subjects while mimicking a standing and kneeling roofing task. Hip joint angles were computed using the CODA pelvis with two different tracking marker configurations, the Trochanter Tracking Method (TTM), and the Virtual Pelvis Tracking Method (VPTM).

Methods Collection:

Data Collection

- 7 male participants had markers placed on specific locations of their body and performed roofing tasks while being recorded by 14 Vicon MX cameras (capturing at sample rate of 100Hz).
- Each subject performed 3 trials of a standing roofing task on a flat roof platform (0°) and 3 trials of a kneeling roofing task on a 15° roof platform.
- All IRB and study protocols were followed including informed consent from participants.

Data Processing

- Marker trajectories from Vicon were processed in Visual3D.
- Using the anatomical and tracking markers, a right and left thigh segment and two CODA pelvis were molded in Visual3D.
- The two CODA pelvises used different tracking marker configurations, the Trochanter Tracking Method (TTM) and the Virtual Pelvis Tracking Method (VPTM).
- The TTM CODA pelvis used trochanter markers and posterior superior iliac spine markers to track the segment.

- The VPTM CODA pelvis used virtual markers located at origin of virtual hip joint centers created from a second ‘Kinematic Only’ CODA pelvis, the posterior superior iliac spine markers, and the anterior superior iliac spine markers to track the segment.
- Kinematic hip joint angles were computed in Visual 3D using the pelvis as the reference and the right/left thigh as the parent for each CODA pelvis on the same trials.
- All hip joint angle rotations were computed as three-dimensional Euler angles and an X-Y-Z Cardan sequence.

Citations – Publications based on the dataset

Moore K. D., Hawke A. L., Carey R. E., Wu J. Z., & Breloff, S. P., 2022. Agreement of hip kinematics between two tracking marker configurations used with the CODA pelvis during ergonomic roofing tasks. *Journal of Mechanics in Medicine and Biology* (2023) 2350015 (13 pages). <https://doi.org/10.1142/S021951942350015X>.

Acknowledgements

This work was supported by NIOSH.

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