Validity of the MaxTraq 2D Motion Analysis Software

The purpose of this analysis was to validate angles calculated with the Maxtraq 2D motion analysis software. One subject participated in this evaluation. Retroreflective markers were placed unilaterally on the segments of the rearfoot, shank and thigh. Three-dimensional (3D) data were collected using a 6-camera Qualisys motion analysis system. A standing calibration trial was collected. The subject then walked along a 60-foot walkway at a comfortable speed. 3D kinematic data was sampled at 120 Hz. Three footstrikes were collected and averaged. The 3D coordinates of each marker were reconstructed using a direct linear transformation method. The reconstruction errors in a volume of approximately 1m X 1m X 2m are typically 1.0 mm. The 3D coordinates were filtered using a 2nd order recursive Butterworth filter with an 8 Hz cutoff frequency. These data were then used to calculate relative 3D lower extremity joint angles in an anatomical reference frame. This was achieved via transformation matrices between the local and global coordinate systems. Simultaneously, video was acquired with a 30 hz off the shelf Sony camera (model number) and digitized with MaxTRAQ 2D software. The anatomical markers used in the standing calibration portion of the 3D data collection were used as tracking markers in the MaxTRAQ software. Selected sagittal plane angles were compared between 2D and 3D calculations. In addition, frontal plane rearfoot angle was evaluated. Table 1 documents the average values for 2D and 3D measures. In general, there were minimal differences between the angles calculated in MaxTRAQ and Qualisys/Move3D. The smallest difference was found at heel strike in the sagittal plane at the knee, while the largest difference was found just after heel strike in the sagittal plane at the ankle.

Table 1.   Mean Values in Degrees of Selected Angles during Gait at the Hip, Knee and Ankle.

	Qualisys	MaxTRAQ	Difference
ANKLE			
Peak plantarflexion	12.5	15.8	3.3
Peak dorsiflexion	4.7	11	6.3
Inversion at heelstrike	8.6	6.8	1.8
Peak eversion	1.1	3.2	2.1
KNEE			
Flexion at heelstrike	1.4	1.7	0.3
Flexion at footflat	11.4	13.3	1.9
HIP			
Flexion at heelstrike	11.3	7.7	3.6
Extension at toe off	20	14.5	5.5

Dr. Blaise Williams III, Ph.D., MPT
East Carolina University
Dept. of Physical Therapy
williamsdor@mail.ecu.edu