

00297 **Defining the Global and Functional Arc of Motion: An Improved Globe Model for the Quantification of Shoulder Joint Function**

*Brandon Yew<sup>1</sup>, Cheng Sheng Da Jowell<sup>1</sup>, Yew Khye Soon Andy<sup>2</sup>, Lie Tjiauw Tjoen Denny<sup>2</sup>*

<sup>1</sup>Duke-NUS Medical School, <sup>2</sup>Singapore General Hospital

**Aims:** The orthogonal system is inadequate for describing three-dimensional kinematics of the highly mobile shoulder joint. As a result, there is no system available for describing the true global range of motion (ROM) of the shoulder joint or for the objective quantification of shoulder joint function. Thus, the aim of this paper is to develop a novel three-dimensional globe model of the shoulder joint for the quantification of the shoulder global ROM and joint function termed the Global and Functional arc of motion (GAM and FAM) respectively.

**Methodology:** Thirty-three young, healthy male patients ( $23.7 \pm 1.5$  years) were recruited and tasked to perform eight activities of daily living (ADLs) and a circumduction action using their dominant arm, which represents shoulder function and global ROM respectively. Optical motion capture cameras were used to track thoraco-humeral motion. The GAM and FAM were generated by plotting the trajectories of the humerus on a spherical coordinate system during global ROM and the eight ADLs respectively. The area enclosed by the GAM and FAM were used to quantify shoulder ROM and function respectively.

**Result:** Overall, subject's GAM of the shoulder joint covered an area of  $4.64 \pm 0.48$  units<sup>2</sup> compared to only  $1.12 \pm 0.26$  units<sup>2</sup> for the FAM. Subjects only required  $24.4 \pm 5.7$  % of their global shoulder ROM for basic daily functioning.

**Conclusion:** The GAM and FAM serves as a tool to evaluate the shoulder joint's global ROM and function respectively. It provides, for the first time, a tool for the quantification of the true shoulder joint global ROM and the ability to quantify shoulder joint function. Using this method, we observed that the functional requirement of the shoulder joint compared to its global ROM was far lesser than what was previously reported.