



HAL
open science

Maximal amplitude postures of the scapula: simulations with the Anybody software

Benjamin Michaud, Arif Badrou, Mickaël Begon, Mickaël Duprey

► To cite this version:

Benjamin Michaud, Arif Badrou, Mickaël Begon, Mickaël Duprey. Maximal amplitude postures of the scapula: simulations with the Anybody software. 8th World Congress of Biomechanics, Jul 2018, DUBLIN, France. 2 p. hal-02092978

HAL Id: hal-02092978

<https://hal.science/hal-02092978v1>

Submitted on 8 Apr 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Title : Maximal amplitude postures of the scapula : simulations with the Anybody software

Authors : Benjamin Michaud², Arif BADROU¹, Mickaël BEGON², Sonia DUPREY¹

Affiliation :

1 Univ Lyon, Université Claude Bernard Lyon 1, IFSTTAR, LBMC UMR_T9406, F69622, Lyon, France

2 Laboratoire de simulation et de modélisation du mouvement, Département de kinésiologie, Université de Montréal, 1700, rue Jacques Tétrault, Laval, QC H7N 0B6, Canada

Abstract – Word Count = 420 (<450 words)

Context

Scapular dyskinesis is often associated to shoulder joint injuries. However, as stated by Kibler (2003), “no specific pattern of dyskinesis is associated with a specific shoulder diagnosis”. To better understand the pathomechanisms associated to scapular dyskinesis, the effect of scapular position and orientation still need to be investigated.

Methods

The scapulohumeral rhythm of one male participant with no shoulder pain history was measured (ethics 14-110-CERES-D, Université de Montréal, Canada). The participant was equipped with reflective markers attached to the thorax and upper limb skin and was asked to perform 25 poses (Michaud et al., 2017). These 25 poses resulted from the combination of 5 scapula poses (centered, elevated, lowered, protracted and retracted) and 5 arm elevations (0°, 45°, 90°, 135° and 180°). A scapula palpator was used to measure the reference scapular kinematics (angulus inferior, trigonum spinae and angulus acromialis). The trajectories of the reflective markers (on the skin and on the scapula palpator) trajectories were collected using an 18-camera Vicon™ optoelectronic motion analysis system (Oxford Metrics Ltd. Oxford, UK).

The registered kinematics was then transferred to the Anybody software (Anybody Technology, Aalborg, Danemark). A shoulder model from the Anybody repository was modified to include our marker set. Through optimisation (minimisation of the distances between the experimental and numerical markers), the model was first scaled and its kinematics was predicted. Secondly, inverse dynamics calculation provided the net glenohumeral forces. Finally, shoulder muscle forces were assessed through optimization. The magnitude and components of the glenohumeral forces generated for the five different scapula poses, and the shoulder predicted muscle forces were compared for each arm elevation through Wilcoxon signed rank tests.

Results

The statistical tests did not show any significant differences on the glenohumeral net forces ($p < 0.05$) but discrepancies appeared for the forces of the scapula elevator muscles.

Conclusion

The scapular position did not influence the glenohumeral net forces. This may signify that the glenohumeral reaction was actually not altered or that the Anybody calculations from motion capture data were not able to reproduce any alterations. The muscles attached to the scapula showed different activations depending on the scapular positions. These conclusions will need to be investigated by applying this methodology to a larger sample of participants and to a pathological population.

References

Kibler, B., 2003. Management of the scapula in glenohumeral instability. *Techniques in Shoulder & Elbow Surgery* 4, 89–98.

Michaud, B., Duprey, S. & Begon, M., 2017. Scapular kinematic reconstruction - Segmental optimization, multibody optimization with open-loop or closed-loop chains: which one should be preferred? *International Biomechanics*. 4(2):86-94.