

## Reliability of scapular kinematics estimated with three-dimensional motion analysis during shoulder elevation and flexion

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### BACKGROUND

Knowing the reliability of three-dimensional motion analysis to evaluate scapular kinematics during upper limb movements is essential to plan further research dedicated to understanding scapulothoracic joint movements relative to the global shoulder motion.

### RESEARCH QUESTION

The aim of this study was to assess the intra-subject as well as intra- and interrater reliability of scapulothoracic joint angles during shoulder elevation in scapular plane and shoulder flexion.

### METHODS

Twenty healthy participants ( $26.6 \pm 3.5$  years) were asked to perform maximum shoulder elevation in scapular plane as well as shoulder flexion. Reliability was assessed using the intraclass correlation coefficient (ICC) and its 95% confidence interval of scapular kinematics (rotation, tilting, pro-retraction) at each degree of global motion (shoulder elevation or shoulder flexion) between  $0^\circ$  to  $150^\circ$ .

### RESULTS

ICCs above 0.60 were accepted as good indicators for reliability. Intra-subject reliability was found to be very high ( $>0.9$  for most part) for all scapulothoracic joint angles during both movements. Intra- and interrater reliability also showed good reliability being above 0.60 for the most part (except scapula tilting during shoulder elevation). Scapular kinematics showed low reliability during the respective first  $10^\circ$  and  $20^\circ$  of shoulder elevation and shoulder flexion. Furthermore, decreasing reliability was found above  $120^\circ$  of shoulder elevation or flexion.

### SIGNIFICANCE

This study generally showed good to high levels of reliability in the range of interest ( $20$ - $120^\circ$ ) in evaluating scapula kinematics in healthy adults during shoulder elevation and flexion; these results are important for future research

providing a better understanding of scapular kinematics.

<b>type</b>	journal paper/review (English)
<b>date of publishing</b>	10-09-2018
<b>journal title</b>	Gait Posture (66)
<b>ISSN electronic</b>	1879-2219
<b>pages</b>	267-272