

*Title of the paper:* **Isokinetic fatigue protocol: assessment of shoulder rotator muscles**

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*Abstract text* **Introduction**

Up to now, resistance fatigue protocols were classically devoted to lower limb. Interestingly, it has been suggested that fatigue affects upper limb proprioception and entails impairment in movement accuracy [1]. Therefore, resistance fatigue assessment should also investigate shoulder muscle groups, which requires a methodological analysis. Shoulder isokinetic assessment is characterized by many possibilities of installation and protocols, without actual consensus into the literature.

#### Aim

To accurately design a protocol, our study aimed to clarify the influence of shoulder position on the isokinetic results, immediate and differed pain and cardiac frequency during isokinetic resistance fatigue evaluation.

#### Patients and methods

Twelve healthy male subjects (21.5 +/- 1 years old) sustained an isokinetic resistance fatigue assessment of the external (ER) and internal (IR) rotators of the dominant shoulder. Subjects were installed in lying supine position, the shoulder installed at 45° or 90° of abduction (Abd) in the frontal plane (order randomly assessed). The protocol consisted in 30 maximal contractions (range of motion - ROM = 120°) in the concentric mode at 180°/sec. Subjects also underwent Borg scale appraisal, shoulder ROM measurements, clinical tests and dolorimetry evaluation on shoulder muscles. The cardiac frequency was measured during the isokinetic test and during recovery.

#### Results

The total Work (Wt in J) developed by the IR was significantly higher ( $p < 0.001$ ) than Wt measured on ER, whatever positioning. The ER Wt increased at 90° Abd in comparison with 45° Abd (> 20 %). The ER/IR ratio was higher at 90° Abd but remained relatively constant during the 30 repetitions. There was no difference in the evolution of heart rate between both positions. The start level was recovered one minute after the end of the assessment. Exercise at 90° Abd only entailed some delayed side effects. Being more specific of sport gesture, 90° Abd position may be recommended for isokinetic fatigue protocol. Nevertheless, therapists have to be knowledgeable of possible side effects on shoulder status.

#### References

1. Myers et al. Proprioception and neuromuscular control of the shoulder after muscle fatigue. J Athl Train 34, 362-367, 1999.

*Topic:* Training and Testing

*Keyword I:* Fatigue

*Keyword II:* Shoulder

*Keyword III:* Isokinetic