

# A Functional Electromechanical Dynamometer - Testing Isokinetic Shoulder Rotators Strength

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## Abstract

The torque in internal and external rotation of the shoulder is frequently utilized to suspected glenohumeral joint diseases or abnormalities, as well as to monitor the patient's condition and improve over a period of time. The teres major, pectoralis major, subscapularis, latissimus dorsi, and anterior deltoid are the key muscles that internally rotate the GH joint. The supraspinatus muscle is a pennate muscle that rotates and adducts the humerus externally. The infraspinatus muscle abducts and externally rotates the shoulder; it is a pennate muscle that performs best as a rotator in the prone position. Muscular growth and strength development is a multi-step physiologic process that necessitates both muscle activity and rest. While testing the strength of the internal and external shoulder rotator muscles concentrically provided early isokinetic normative values, researchers increasingly recognised the need to test the strength of the external shoulder rotator musculature eccentrically, which is the dominant mode of external shoulder rotator muscle activation during overhead motions. The shoulder rotator musculature was isokinetically tested concentrically, revealing that shoulder muscular imbalance is frequently caused by an adaptation to repeated overhead motions, resulting in bigger gains in concentric internal rotator strength than concentric external rotator strength. The major goal of this research was to find out how reliable internal and external shoulder rotators (concentric and eccentric) were in upright posture using Functional electromechanical dynamometry.

## INTRODUCTION

Researchers and practitioners often assess their patients' strength changes. Internally and externally rotation strength testing of shoulder is often used to (I) identify probable glenohumeral joint diseases or abnormalities, (II) evaluate success over progression of the suggested treatment, and (III) measure changes in muscle quality and strength over time. Medical experts ought to have access to accurate and trustworthy protocol tests that objectively assess changes in strength over time and accurately reflect the genuine gain or loss produced by the protocol measurement. Several tests for evaluating shoulder strength have been developed using a range of equipment, including manual muscle testing, portable dynamometers, and isokinetic devices. Because they allow you to estimate maximal dynamic force across the whole range of motion, isokinetic devices are indeed the benchmark in strength testing. The consistency of measurement techniques in isokinetic devices is influenced by many factors (robotic aspects, subject areas, joint capsules, and testing protocols), including the evaluation position, which includes shoulder posture and joint-axis alignment as well as position of the body (due to the biomechanics of the shoulder joint and its wide mobility that is sitting, supine, or upright posture and stabilization). Shoulder measurements between 60° and 240°/s are repeatable. When power assessment is required (the capacity to create moment quickly), higher velocities appear to be useful but less trustworthy. Faster velocities are more trustworthy for assessing shoulder rotator strength, according to some writers, whereas some claim that testing shoulder rotator strength at moderate speeds is more accurate. Functional electromechanical dynamometry is a novel multiple joint isokinetic dynamometry that has just emerged (FEMD). It enables us to evaluate a person's strength. The absolute power of shoulder rotator cuff muscles and hip abductor strength have both been researched using this technology; however, shoulder maximal dynamic strength is still to be investigated. When compared to other isokinetic devices, the FEMD gives a quantitative measurement of strength, is simple to use, and is less expensive. Unlike previous machines, this one generates linear isokinetic velocities, as well as dynamically forms (tonic, energetic, elasticity, inertial, cone) and statically forms (isometric, vibrating), enabling for evaluation as well as training with constant

and/or variable resistance/velocity. The study's objectives were to (i) verify the validity and internal consistency of a functional electromechanical dynamometer for measuring different isokinetic speeds, and (ii) calculate the real range of isokinetic speed achieved by FEMD for therapy response velocities. Average velocities were recorded continuously with FEMD and a constant speed detector in 15 trials at five isokinetic speeds (0.40, 0.60, 0.80, 1.00, and 1.20 ms across a range of motion of 40 cm) in two sessions that were identical<sup>4-10</sup>.

## DISCUSSION

The major goal of this research was to find out how reliable internal and external shoulder rotators (concentric and eccentric) were in upright posture using Functional electromechanical dynamometry. The current study indicates well to remarkable dependability, with ICC and CV readings varying between 0.81 to 0.93 and 6.31–8.27 percentage for IR and 0.89 to 0.98 and 5.12–6.91 percentage for ER. This was the first study that we were aware of that evaluated the reproducibility of shoulder power that changes with time testing done by Functional electromechanical dynamometry. The current study demonstrates well to outstanding dependability.

The study's second goal - analyze objective and subjective trustworthiness various the speeds for evaluating iso-kinetic evaluation. In literature, speed is a very well factor in iso-kinetic testing .

## REVIEWS

1.1, Angela Rodríguez-Perea<sup>1</sup>, Paola Barboza<sup>2</sup>, David Ulloa-Díaz<sup>2</sup>, Daniel Jerez-Mayorga<sup>3</sup>, Ignacio Chiroso<sup>1</sup>, Luis Javier Chiroso Ríos concluded in this research paper that All of the procedures undertaken had good to exceptional reliability levels. Based on the findings of this study, it is reasonable to infer that a standing evaluation at 0.6 m/s or 0.3 m/s is indicated in asymptomatic individuals due to practical applicability and bodily stabilization. Clinicians are advised to employ many procedures in order to get functional measures dependent on the patient's skills at the time of the examination. 11-18

2. L. L. Andersen, J. Vinstrup, M. D. Jakobsen, E. Sundstrup researched that although elastic resistance band test for shoulder muscular strength has great validity and repeatability, it consistently gives lower torque results than MVC. 19-24

3. John F. Kramer, PhD, Linda R. Ng, MSc The purpose of this study was to look into inter-relationships between strength measures and maximum torque multiplication and external/internal rotation ratios for static, vibrant, and dynamically eccentricity testing. 25-28

## LIMITATIONS

There are several limitations to this study that should be addressed so that we can consider them when analyzing our findings. We were unable to conduct an inter-rater reliability analysis, thus we are unable to determine how this variable influences assessments. We propose having the same assessor with the same patient for both physicians and coaches. Furthermore, because the study was conducted on asymptomatic active people, the results cannot be extended to other populations, such as the sedentary population or those with persistent shoulder discomfort. To normalize the results to any sort of population, more research into these variables is required.

## CONCLUSION

All of the procedures undertaken had well to exceptional reliability levels, according to the study's findings. Based on the findings of this study, it is reasonable to infer that a standing evaluation at 0.6 m/s or 0.3 m/s is indicated in asymptomatic individuals due to practical applicability and bodily stabilization. Clinicians are advised to employ multiple procedures in order to get functional measures dependent on person's abilities at time of examination .

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