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Foundations of Strength Testing: Techniques for Shoulder Flexion, Abduction and External Rotation

Tuesday May 21st, 2024

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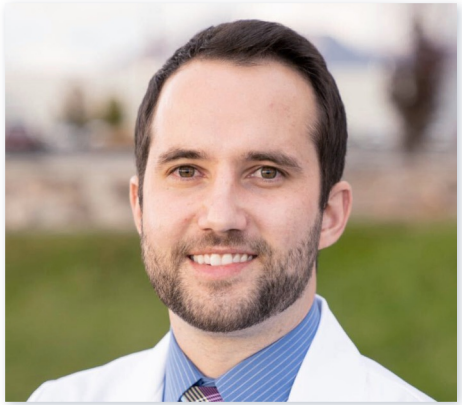
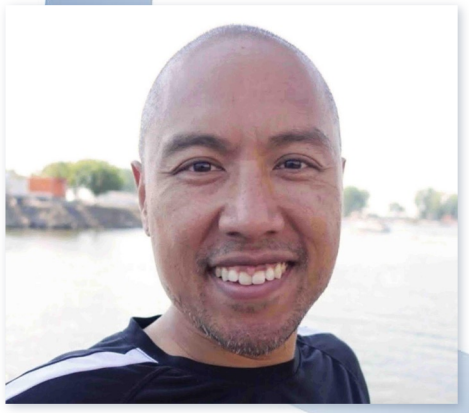
Introductions:



Dr. Daniel G. Stewart,

PT, DPT



Dr. Erson Religioso III,

DPT, MS, MTC, CertMDT, CFC, CertMST, CNPT, FAAOMPT

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Agenda

- Introduction to Shoulder Strength Testing: Shoulder Flexion, Abduction and External Rotation
- A study on ActivForce & MicroFet for shoulder testing
- Overview of how to test the shoulder
- Case Study: Shoulder Impingement
- Analyzing the data
- Possible rehab interventions

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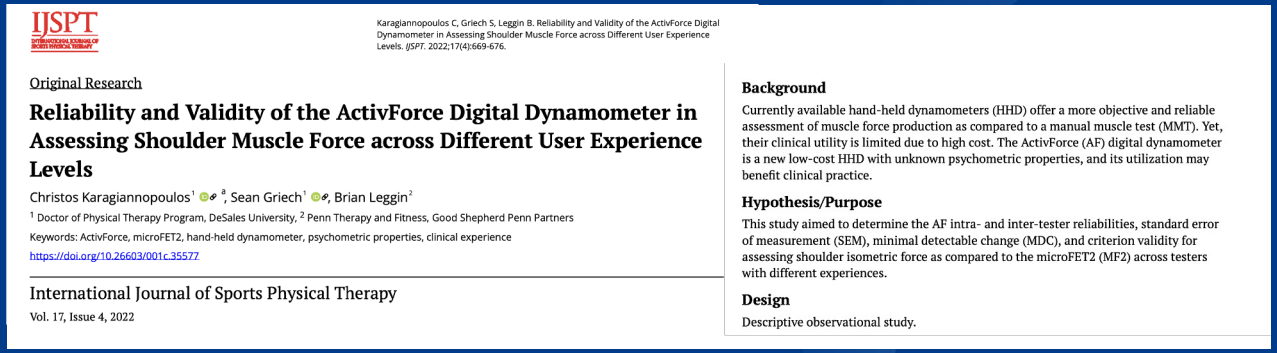
Case Study: Compares ActivForce & MicroFet on shoulder strength



IJSPT

Karagiannopoulos C, Griech S, Leggin B. Reliability and Validity of the ActivForce Digital Dynamometer in Assessing Shoulder Muscle Force across Different User Experience Levels. *IJSPT*. 2022;17(4):669-676.

Original Research

Reliability and Validity of the ActivForce Digital Dynamometer in Assessing Shoulder Muscle Force across Different User Experience Levels

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Keywords: ActivForce, microFET2, hand-held dynamometer, psychometric properties, clinical experience

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Background

Currently available hand-held dynamometers (HHD) offer a more objective and reliable assessment of muscle force production as compared to a manual muscle test (MMT). Yet, their clinical utility is limited due to high cost. The ActivForce (AF) digital dynamometer is a new low-cost HHD with unknown psychometric properties, and its utilization may benefit clinical practice.

Hypothesis/Purpose

This study aimed to determine the AF intra- and inter-tester reliabilities, standard error of measurement (SEM), minimal detectable change (MDC), and criterion validity for assessing shoulder isometric force as compared to the microFET2 (MF2) across testers with different experiences.

Design

Descriptive observational study.

- Methods: A convenience sample of 29 healthy adults were assessed twice by each of three testers (two experienced clinicians and a novice PT student) on shoulder external rotation (ER), internal rotation (IR) and forward elevation (FE) using both the AF and MF2 devices. Tester, HHD, and shoulder motion assignment orders were randomized. All testing was performed in a standardized seated position. ER and IR were tested with the shoulder fully adducted. FE was tested at 45° at the scapular plane. All testing and rest periods between testers and tested motions were standardized and monitored via a stopwatch.
- Results: Both devices had a high intra- [ER (.95-.98), IR (.97-.99), FE (.96-.99)] and inter-tester [ER (.85-.96), IR (.95-.97), FE (.88-.95)] intraclass correlation coefficient (ICC) with comparable intra- (1.68-1.80) and inter-tester (2.36-2.98) SEM, and intra- (4.64-4.97) and inter-tester (6.50-8.24) MDC values across all motions. Tester experience did not affect these values. High (.89-.93) statistically significant Pearson correlations were found between HHDs for all shoulder motions.
- Conclusion: Both the AF and MF2 HHDs were found to have high reliability levels across all shoulder motions regardless of tester clinical experience.

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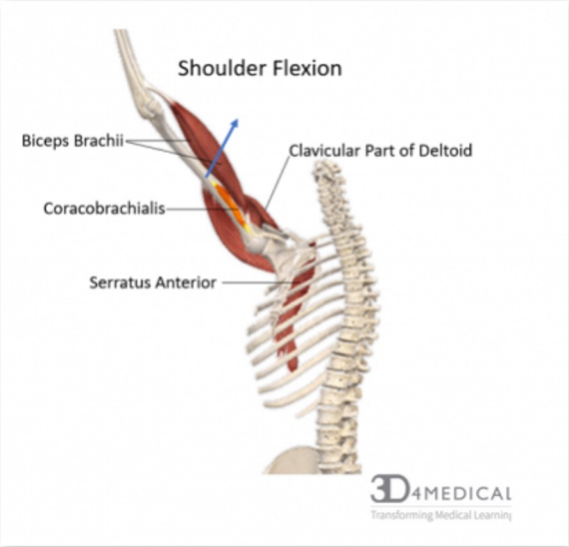
Shoulder Flexion



The main muscles that flex the shoulder are the **anterior deltoid, coracobrachialis** and the **pectoralis major.**

The **biceps brachii** also helps with this action.

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Shoulder Flexion

- Can test in **Standing, Supine, Prone, Sitting, Side Line**
- Testing at different angles: **Neutral, 90 degrees, End Range,** etc

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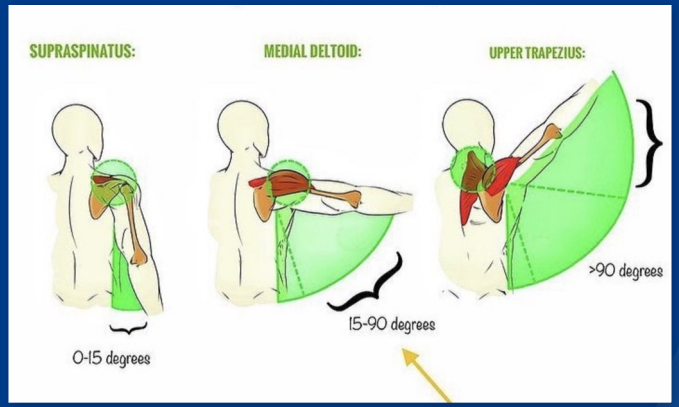
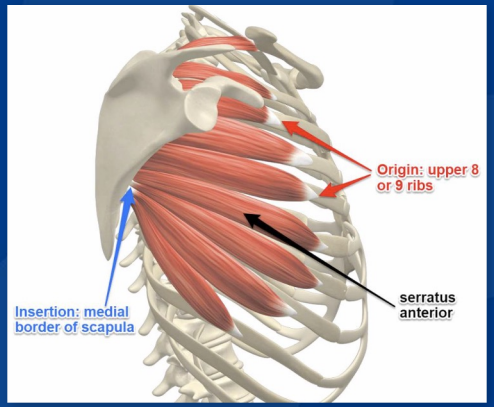
Shoulder Abduction





The primary muscles involved in the action of arm abduction include the **supraspinatus, deltoid, trapezius** and **serratus anterior.**

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Shoulder Abduction

- Can test in **Standing, Supine, Prone, Sitting, Side Line**
- Testing at different angles: **Neutral, 90 degrees, End Range,** etc

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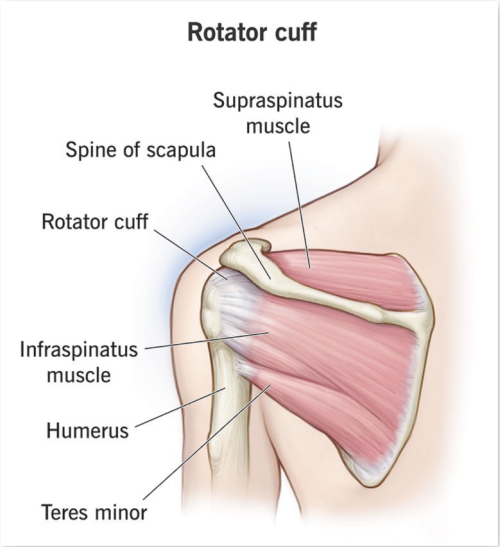
Shoulder External Rotation



The **infraspinatus** and **teres minor** are the main muscles that externally rotate the shoulder.

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Shoulder External Rotation

- Can test in **Standing, Supine, Prone, Sitting, Side Line**
- Testing at different angles: **Neutral, 45 degrees, End Range,** etc

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Case Study: Shoulder Impingement

17 Year Old Female Swimmer/Volleyball Player

- R shoulder pain with crawl, breast stroke, and serving only
- Limited in R shoulder IR, Extension, elevation, pain at end ranges
- Limited in cervical retraction and sidebending to the right
- Cervical retraction and SB to the right repeated loading “reset” R shoulder and serving and crawl motions were painful
- Also weak in seated shoulder flexion, ER

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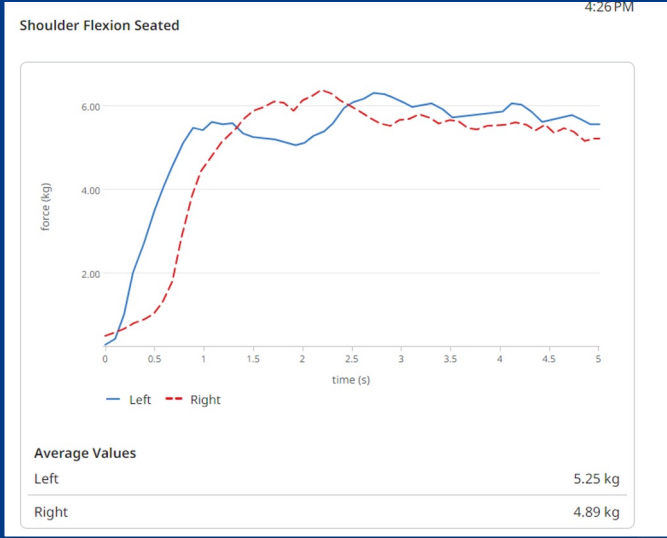
Case Study: Shoulder Impingement



Peak Force (kg)	
Left	6.28 kg
Right	6.36 kg
Strength Difference	0.07 kg
Percentage Difference	1.17%

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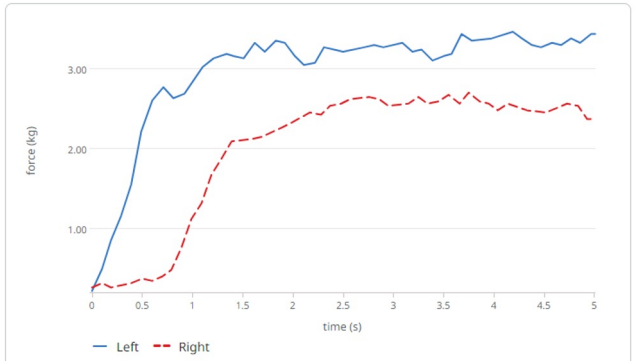
Case Study: Shoulder Impingement

Shoulder flexion end range seated



Average Values	
Left	3.01 kg
Right	2.02 kg

Peak Force (kg)	
Left	3.46 kg
Right	2.70 kg
Strength Difference	0.76 kg
Percentage Difference	24.71%

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Case Study: Shoulder Impingement

17 Year Old Female Swimmer/Volleyball Player

- Interventions
  - IASTM to Cervical spine
  - Cervical retraction and SB with traction in supine to obtain end range
  - Instruction to repeat this hourly for Recovery Plan (HEP)
  - General shoulder flexion and ER strengthening
- Final visit RP progressions
  - Overhead carries
  - End range flexion strengthening - reps to fatigue

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Thank you for listening.

We hope to see you again!