

## ORIGINAL RESEARCH

## THE RELATIONSHIP BETWEEN PASSIVE GLENOHUMERAL TOTAL ROTATION AND THE STRENGTH OF THE INTERNAL AND EXTERNAL ROTATOR MUSCLES, A PRELIMINARY STUDY

Michael T. Cibulka, PT, DPT, OCS, FAPTA<sup>1</sup>

Geoff Enders, DPT<sup>1</sup>

Andrea Jackson, DPT<sup>1</sup>

Samantha Maines, DPT<sup>1</sup>

Jolynn Von der Haar, DPT<sup>1</sup>

Jack Bennett, PT, DPT, SCS, CSCS<sup>1</sup>

## ABSTRACT

**Background:** There is little research on how the amount of shoulder joint range of motion, specifically glenohumeral rotation, may be related to the muscle strength of the rotator cuff muscles. A long held belief is that a joint with excessive range of motion needs sufficient muscular strength for stability. However, no studies have examined this concept.

**Purpose:** The purpose of this study was to see if total arc of glenohumeral joint rotation (External rotation [ER]+ Internal rotation [IR]) could predict peak isometric muscle strength of the IR or ER muscles of the shoulder.

**Study Design:** Cross-sectional study design

**Methods:** Fifty-three participants (41 females, 12 males) participated in the study. Passive glenohumeral joint internal rotation and external rotation motion was measured for each participant with a standard goniometer. Isometric muscle force of the ER and IR muscles were tested using a handheld dynamometer in three positions: end range ER, neutral 0°, and end range IR. Data were analyzed using a non-parametric tree based regression method (CART) and then cross-validated.

**Results:** The results showed that those with an increased total arc of motion of glenohumeral rotation (greater than 165.0°) had less muscle isometric muscle strength in all tests positions than those with less glenohumeral rotation.

**Conclusion:** Decreased force of the ER and IR muscles of the shoulder was noted in those with increased total arc glenohumeral rotation (> 165.0°), specifically those with increased glenohumeral internal rotation (> 80.0°) when compared to those with glenohumeral rotation (< 165.0°) and glenohumeral internal rotation (< 80.0°). Future studies should include more males and attempt to develop strategies to assist those with larger excursions of shoulder rotation who may be at risk of developing shoulder problems.

**Level of Evidence:** Level 2

**Keywords:** Classification and regression tree, range of motion, rotator cuff, shoulder

## CORRESPONDING AUTHOR

Michael Cibulka

Maryville University

650 Maryville University Drive

St. Louis, MO 63141

E-mail: mcibulka@maryville.edu

<sup>1</sup> Maryville University, St Louis, MO, USA