

## **Within day reliability of shoulder range of motion measurement with a smartphone**

Seung Han Shin, Du Hyun Ro, O-Sung Lee, Joo Han Oh, Sae Hoon Kim 2012 Within-day reliability of shoulder range of motion measurement with a smartphone. *Man Ther.* 17 (4):298-304

### **Introduction**

The research aims are to update our previously published systematic review and meta-analysis by subjecting the literature on shoulder physical examination. To present a new method for shoulder ROM due to the current query on the reliability of shoulder range of movement. This form of Measurement is suggested that it may be more “handy”.

The reliability of the InclinoMetric measurements have been reported to be superior or similar to that of the goniometer where reliability varies of goniometer – ICCs ranging (.26-.95)

### **Methods**

41 new patients with unilateral symptomatic shoulders 20 males, 21 females, Ages 19-79. Exclusion criteria were patients who suffered from an acute traumatic event or who had severe stiffness and could not reach past 90 degrees. 19 patients had impingement , 16 rotator cuff tear , 2 post traumatic stiffness, 2 superior Labral tear, 1 stiff shoulder , 1 anterior shoulder instability

Two orthopaedic resident doctors, one orthopaedic surgeon took the readings .All measurements were taken twice. They could not refer to first findings and had 30 mins interval breaks between measurements

Test method included a Double arm goniometer 0-360. The InclinoMetric – vertical side of patients forearm with a arm band (query patient use- one patient use, query the expense of patient bands) (query - the position of the goniometer- distally- inclined to flex elbow- inaccurate reading). Patient standing against a wall, once reached max level then goniometer was placed in position

Movement were performed in the following positions

Abduction: Coronal plane Flexion; Sagittal plane External rotation: 0 deg (on a table), 90 deg (on a table- with the scapula being stabilised) .The same method was used for the inclinometer by reading the values on the screen

### **Results**

Goniometric and Inclinatoric measurements both showed satisfactory inter-observer reliability. Intra-observer reliability was excellent with ICC values greater than .9 with flexion however this reduced with internal rotation at 90 degrees at .79-.89. Inclinatoric measurements compared to previous studies showed a slightly superior reliability. In the intra observer reliability the goniometric showed better results showing the measurement error was less with the smart phone. In the ICC analysis the Inclinatoric measurements again showed acceptable reliability however in all results between both forms of measurements were similar. When comparing the goniometer and the inclinometer the forward flexion had wider confidence intervals which may be due to elbow flexion as well as with internal rotation in may be due to scapula position.

They suggest that the accuracy of the inclinometer would improve if positions were standardised more and if the same person took the readings. The benefits of the inclinometer also are that the examiners hands are free to stabilise the arm which proved beneficial. It also gave exact readings instead of estimating. It proved beneficial for home use where the patient could get feedback on progress

### **Considerations**

Limitations to testing included internal rotation at the back of the shoulder or cross body adduction. Some Smartphone's can not be used as an inclinometer due to the lack of gyro-sensor system.

They suggested a study to show day to day reliability of the inclinometer in this study.

### **Opinion**

There has been no research done in comparing the inclinometer readings with that of the inclinometer on a Smartphone which flaws a lot of the research used. Most of the research used to compare with a goniometer was done using examples of an inclinometer not a smart phone inclinometer.