

Reliability of Shoulder Mobility Using A Goniometer In Patients With Rotator Cuff Tendinopathy

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Highlights:

- It was a cross sectional study in which data were collected from the patients of Central Park Teaching Hospital, Jinnah Hospital, Mayo Hospital and Doctors Hospital by using self-administered questionnaire.
- Rotator cuff tendinopathy angles were measured in fixed positions for 140 shoulder Joints (70 female patients) with Goniometer.
- Universal Goniometer is a reliable tool for the assessment of shoulder mobility in patients with rotator cuff tendinopathy. According to Inter class correlation coefficient, Cronbach's alpha showed excellent test re-test reliability for both shoulders; $\alpha=0.958$ for right shoulder whereas $\alpha=0.973$ for left shoulder.

Abstract:

Measurements of joint range of motion (ROM) were a part of a physical therapist's daily work. Activities of daily living and exercises were challenging to perform once computer memory was restricted, and counting on daily living stress, the shoulder joint needs different computer memory.

Objective: To find out reliability of shoulder mobility using a goniometer in patients with rotator cuff tendinopathy.

Methods: It was a cross sectional study in which data were collected from the patients of Central Park Teaching Hospital, Jinnah Hospital, Mayo Hospital and Doctors Hospital by using self-administered questionnaire. Rotator cuff tendinopathy angles were measured in fixed positions for 140 shoulder Joints (70 female patients) with Goniometer.

Results: The results exhibited that the Inter class correlation coefficient value of right shoulder

was 0.958 and mean value of mean of right shoulder reading was 31 ± 1.2 . The Inter class correlation coefficient value of left shoulder was 0.973, and the mean value of mean of left shoulder was 31.33 ± 1.36 . Inter class correlation coefficient test value of Cronbach's alpha for right shoulder was 0.958 hence it was stated that the reliability of goniometer for right shoulder was Excellent.

Conclusion: Goniometer is a reliable tool for the assessment of shoulder mobility in patients with rotator cuff tendinopathy. Inter Class Correlation Coefficient showed excellent reliability for both; left and right side of shoulder joint.

Keywords: Reliability, Goniometer, Mobility, Rotator Cuff Tendinopathy

Introduction:

Joint range of motion (ROM) assessment was a critical component of a physiotherapy examination. These square measures are critical to establishing a baseline, determining intended restrictions, and to monitor changes into the joint quality in response to treatment. Measuring read-only storage is prone to reveal imbalances and mobility limits and hence raising the risk for injuries. The gold standard for evaluation of clinical patients for a very long time is considered to be universal direction finder for read only storage. There are also few additional tools used in clinics and physiotherapy departments are inclinometer, laser and digital goniometer. Physical therapists use Universal goniometry very frequently in order to analyze the read only storage. UG is a very low cost, user friendly, portable and non-invasive tool. That's why physical therapists use it usually. U.G. was observed to have excellent intra-rater and inter-

rater reliability when used to measure read-only storage in the upper extremities. () While research evaluating the U.G.'s synchronal validity for the assessment of higher extremity read-only storage square measure is limited, the U.G. has frequently been used in validation studies for other read-only storage measurement devices. However, their square measure limitations are related to their use: the U.G. requires two hands to operate, is difficult to position precisely. It also requires exact visual evaluation and judgement to properly understand the alignment and measurement reading. The constraints may exacerbate mensuration mistakes. Thus, because of their low cost, simplicity, ease, and speed of use, various read-only storage evaluation instruments, such as smartphone applications, square measure gaining quality in treatment application settings. Numerous studies have been conducted to determine the reliability and validity of practical phone read-only storage applications. () The validity and reliability of an iPhone direction finder in measuring the read-only storage of active shoulder external rotation was done. They discovered that inter-rater reliability was between 0.92 and 0.94, while intra-rater reliability was in between 0.79 and 0.81. Coincidental validity was 0.93 to 0.94 when compared to universal goniometry. According to Johnson et al., a smartphone magnetometer-based direction finder is as reliable as a U.G. for passive shoulder abduction read-only storage. However, there was no mention of active shoulder read-only storage. The reliability of measurements across smartphones, on the other hand, has not been verified for a similar application-based method. This limitation merits consideration in light of the individual therapist's square measure to use their smartphone in the therapy situation to determine read-only storage instead of a clinic-provided tool. In addition to the absence of guidance systems for differentiating bone markers throughout activity may increase the

possibility of activity mistakes. In contrast to smartphone-based goniometers, hence the U.G., the laser-guided digital direction finder in which lasers pass via anatomical markers proximally and distally to the measuring joint. This function eliminates the need for the visual estimate required for sensible phone applications. As a result of the U.G.'s very short arms, there is now just one available device that uses lasers, a magnetic system, and accelerometers to facilitate alignment with anatomical landmarks (HALO, model HG1, HALO Medical Devices, Australia). In a single method investigation, on fifteen healthy patients, authors evaluated the validity and reliability of the HALO for active shoulder internal rotation (I.R.) and external rotation (E.R.). With the rapid growth of interest in equine rehabilitation, there is a corresponding demand for reliable and simple measures for evaluating the efficacy of rehabilitation modalities and coaching. Since rehabilitation interventions have typically focused on systemic difficulties, one essential aspect was joint motion assessment. It was frequently the case, since an Associate in an excellent Nursing range of motion may be necessary for best-intended quality in freelance everyday activities. Restriction of joint movement will result in changes in joint loading, resulting in additional impairment of function. As a result, the method may be effective for arthritis measurements. Thus, objective assessments of joint variation in motion (ROM) were critical for assessing joint health, as well as for developing and advancing treatment and rehabilitation regimens. Goniometry was the term used to describe the measurement of joint angles using a direction finder.() Therefore the study was done to analyze the reliability of Universal Goniometer in rotator cuff tendinopathy patients.

Methods:

It was a cross-sectional survey in which researchers used a non-probability convenient sampling technique. A separate investigator calculated a sample size of 70 online from Epitool

software (epitools.ausvet.com) through the single proportion method. Inclusion criteria were the addition of diagnosed rotator cuff tendinopathy female patients, with age range of 35-60 years individuals. Patients with history of trauma, other shoulder disorder i.e. adhesive capsulitis, shoulder arthritis, instability etc. were excluded. Data collection was accomplished from the patients of Central Park Teaching Hospital, Jinnah Hospital, Mayo Hospital, and Doctors Hospital by using a self-administered questionnaire. Rotator cuff tendinopathy angles were measured in fixed positions for 140 shoulder Joints (70 patients) with Goniometer. All the participants signed the consent forms before initiating the survey. The authors followed ethical rules, and the Institutional Review Board of the University of Lahore approved the study. Data was entered into SPSS version 20.0. Quantitative variables were presented as mean and standard deviation. Test re-test reliability was measured for both sides of shoulders through Inter Class Coefficient (ICC) at 95% confidence interval.

Results:

There were 70 patients of rotator cuff tendinopathy in this study. Patients had mean age of 45 ± 52.27 years in which minimum age was 35.00 years and maximum age was 60.00 years. Mean of set of measurements of right shoulder was 31.57 ± 1.27 whereas 31.33 ± 1.36 was mean of left shoulder (Table-1). According to Inter Class Correlation Coefficient (ICC) test, the value of Cronbach's alpha (α) for right shoulder was 0.958 and for left shoulder it was 0.973. Values of both shoulders were above 0.9 which was excellent. Hence, it was stated that the reliability of goniometer for both left and right shoulder was Excellent (Table-3).

Variables	Mean	Std. Deviation	Minimum	Maximum
Age	45	2.27	35.0	60.0
Height (feet)	5.34	0.24	4.9	5.8
Weight (kg)	66.44	10.50	49.0	89.0
Measurements of right shoulder (Extension)	31.59	1.28	28.0	34.0
Measurements of right shoulder (Flexion)	31.04	1.34	28.0	34.0
Measurements of left shoulder (Flexion)	31.33	1.36	28.0	35.0

Table 1: Descriptive statistics of Age.

Variables	Construct	Frequency	Percentage
Marital Status	Single	22	31.4%
	Married	48	68.6%
Job Status	Students	19	27.1%
	Job holders	18	25.7%
	House wives	33	47.1%
Pain location	Pain in Front and top of the Shoulder	10	14.3%
	Outer Part of the Upper arm	13	18.6%
	Pain in front & top of shoulder and Outer Part of the Upper arm	11	15.7%
	Swelling and tenderness in the front of shoulder	36	51.4%

Table 2: Frequency (%) of baseline characteristics

Cronbach's alpha for right shoulder	0.958
Cronbach's alpha for left shoulder	0.973

Table 3: Test re-test reliability of Universal Goniometry for right and left shoulder

Discussion:

According to the current study, the results exhibited that the Interclass correlation coefficient value of the right shoulder was 0.958, and the mean of measurements of the right shoulder was 31 ± 1.2 . The Interclass correlation coefficient value of the left shoulder observed was 0.973, and the mean measurement of the left shoulder was 31.33 ± 1.36 . Two assessors measured each action twice with each device (HALO and the U.G.) per shoulder in a previous study. The intra-class correlation coefficient (ICC) was calculated for reliability using a two-way mixed model with a 95% confidence interval. Forty-one patients (75 shoulder joints) were studied (seven Patients had only one shoulder evaluated). ICC values for intra-rater reliability ranged between 0.82-0.91 for the HALO and from 0.83-0.95 for the U.G. The

HALO had inter-rater reliability of 0.89 to 0.98, whereas the U.G. had inter-rater reliability of 0.90 to 0.98. The ICCs for agreement ranged from 0.79 to 0.99 when comparing the HALO digital goniometer to the U.G.

In another study, with the D.G. in neutral positioning and flexion of the fetlock on a sedated horse, relative radiographs were taken for inter-, and intra-tester reliability, and a survey was conducted on the user-friendliness of the devices. Intraclass correlation coefficient (ICC) with $p < 0.05$ and ANOVA was used to analyze data. The study showed significant differences in the range of motion for the carpus and fetlock joints. A 2–3° difference comparing measurements on a sedated horse with corresponding radiographs, a "fair" to "excellent" inter-tester reliability, and a "fair" to "almost perfect" intra-tester reliability, and the D.G. was easy to use than the U.G. In conclusion, the novel D.G. may serve as a simple tool for measuring joint motion in equine rehabilitation patients.

According to the current study, the mean age of patients was 45 ± 52.27 years with a minimum age of 35.00 and maximum age of 60.00 years. There were 70 (100%) females. The mean height of the patients was 5.34 ± 0.24 feet, and the mean weight of patients was 66.44 ± 10.50 kg. There were 19 (27.1%) students, 18 (25.7%) jobholders, and 33 (47.1%) housewives. There were 22 (31.4%) single and 48 (68.6) married participants in this study. There were 10 (14.3%) patients with pain in front and top of the shoulder, 13 (18.6%) patients had pain in the Outer Part of the Upper arm, 11 (15.7) patients had pain in both the front and top of the Shoulder & Outer Part of the Upper arm and 36 (51.4%) patients have swelling and tenderness in the front of the shoulder. The mean rotator cuff tendinopathy angles' measurement of the right shoulder in flexion was 31.04 ± 1.34 , and the mean shoulder reading in extension was 31.59 ± 1.28 . According to a recent study, fifty-eight healthy participants (29 men and 29 women aged 18–30 years) had their shoulder joint dorsiflexion and plantarflexion

measured using SGR and U.G. Two examiners determined the range of motion of the shoulder joint. Descriptive statistics and intraclass correlation coefficient (ICC) were used for descriptive and anthropometric variables of 58 samples. Both instruments demonstrated high inter-rater reliability for measuring shoulder dorsiflexion range of motion: the UG (ICC = 0.87) and the SGR (ICC = 0.89). The interrater reliability of both U.G. and SGR shoulder dorsiflexion instruments was outstanding (mean ICC = 0.91). Both instruments demonstrated high inter-rater reliability when evaluating shoulder plantar flexion: the UG (ICC = 0.76) and the SGR (ICC = 0.82). Interrater reliability was excellent for both UG (mean ICC = 0.85) and SGR (mean ICC = 0.82). Smartphone-based goniometers can be used to determine the active range of motion of the shoulder joint since they have a high degree of interrater and interrater reliability.

Conclusion:

Universal Goniometer is a reliable tool for the assessment of shoulder mobility in patients with rotator cuff tendinopathy. According to Inter class correlation coefficient, Cronbach's alpha showed excellent test re-test reliability for both shoulders; $\alpha = 0.958$ for right shoulder whereas $\alpha = 0.973$ for left shoulder.

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