Physiotherapy Section

Correlation between Performance-based and Self-reported Outcome Measures in Individuals with Frozen Shoulder: A Cross-sectional Study

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ABSTRACT

Introduction: Frozen shoulder is characterised by the development of dense adhesions, capsular thickness, and capsular restrictions. Due to restrictions in shoulder movement, individual with frozen shoulder face difficulties in activities of daily living. Shoulder Pain and Disability Index (SPADI) is 13-item self-reported measure containing subscale of pain and disability, with total score of 130. Performance-based measure include three functional related tests of shoulder: hand to neck, hand to scapula, and hand to opposite scapula. In self-reported measures, factors like environmental, physical, social, and psychological aspects can lead to perceptual differences, while in performance-based measures, scoring is based on therapist point of view regarding patient functional impairment. So need for present study to examine any correlation between these two different outcome measures, determining whether both measures are required or if one can be used instead of other for individuals with frozen shoulder.

Aim: To find correlation between performance-based and self-reported outcome measures in individuals with frozen shoulder.

Materials and Methods: A cross-sectional study was conducted from November 2023 to January 2024 at the Apollo Institute of Physiotherapy in Ahmedabad, Gujarat, India. The study was conducted in different physiotherapy clinics of Ahmedabad. Total 69 participants aged of more than 40 years, comprising both male and female gender, with pain predominantly in one shoulder and limitations of passive movements at Glenohumeral joint compared to unaffected side, individual with or without diabetes mellitus who could read and write in Gujarati were also included. After taking written informed consent, basic demographic data, including name, age, and gender, were collected. Then self-reported outcome measure scores were recorded using SPADI Gujarati (G) version. Performance-based measure scores were recorded using three function-related tests. Spearman's rank correlation was used to determine the correlation between SPADI-G and the functional-related tests of shoulder. The level of significance was set at $p \leq 0.05$.

Results: A total of 69 participants were included, with 42 males and 27 females. Result shows that hand to neck test (r-value=0.35, p-value=0.003) and hand to opposite scapula test (r-value=0.29, p-value=0.014) exhibited a weak positive significant correlation with SPADI. Whereas hand to scapula shows weak positive correlation (r-value=0.18, p-value=0.136) but was not significant.

Conclusion: The present study showed a weak positive correlation between performance-based and self-reported outcome measures in individuals with frozen shoulder. This study concludes that assessment for individuals with frozen shoulder must incorporate both performance-based and self-reported measures.

INTRODUCTION

Frozen shoulder, also called as adhesive capsulitis, in that there is formation of dense adhesions, capsular thickness, and capsular restrictions, mostly in the dependent folds of the capsule. Mostly, there is insidious onset of frozen shoulder and generally occurs between the age of 40 to 60 years. When frozen shoulder occur without any apparent cause, it is known as idiopathic or primary frozen shoulder. Frozen shoulder occurs due to some other conditions like rheumatoid arthritis, osteoarthritis, trauma, or immobilisation, it is known as secondary frozen shoulder [1].

There are three different stages of idiopathic frozen shoulder: freezing (stage of pain), frozen (stage of stiffness), and thawing (stage of recovery) [1,2]. The condition is aggravated by systemic problems like diabetes mellitus, cardiovascular disease, and reflex sympathetic dystrophy. In frozen shoulder, there is painful restriction of both active and passive shoulder movements [2]. Prevalence of frozen shoulder is 2-5% in the general population [3].

Due to restrictions in shoulder movements individual with frozen shoulder face difficulties in activities of daily living like dressing (putting on a jacket or coat, or in case of women, fastening undergarments behind their back), reaching into back pocket of pants, self-grooming (hair, brushing teeth, washing face), difficulty lifting heavy objects, such as dishes into cupboard [1]. In addition to self-reporting function, function-related testing for shoulder dysfunction capture individual capacities [4]. The three function-related tests of shoulder are: 1) Hand to Neck (F1 - shoulder flexion and external rotation), scoring from 0 to 4; 2) Hand to Scapula (F2 - shoulder extension and internal rotation), scoring from 0 to 4; and 3) Hand to Opposite Scapula (F3 - horizontal shoulder adduction), scoring from 0 to 3 [4]. This scale has reliability of 0.83–0.90 [4].

The SPADI is considered the gold standard self-reported outcome measure used for shoulder pathologies [5-7]. The reliability of SPADI scale is 0.89, while the reliability of Gujarati version of the SPADI scale is 0.99 [6,7]. In self-reported measures, factors like environmental, physical, social, and psychological influences can lead to perceptual differences. In contrast, performance-based measures scoring regarding patient's functional impairment is

dependent on therapist's point of view. So, need of study is to find any correlation between these two different outcome measures, determining whether both measures are required or if one can be used as an alternative of other for individuals with frozen shoulder. The present study was aimed to correlation between performance-based and self-reported outcome measures in individuals with frozen shoulder.

MATERIALS AND METHODS

A cross-sectional study was conducted from November 2023 to January 2024 at the Apollo Institute of Physiotherapy in Ahmedabad, Gujarat, India. The data was collected from four different physiotherapy clinics in Ahmedabad. Ethical approval was taken from the Institutional Ethical Committee (IEC) (APC/IEC/CR-M/2023-24/01). A total of 69 individuals with frozen shoulder were included in the study, as it was a time-bound.

Inclusion criteria: Individual more than 40 years of age, both male and female gender, pain predominantly in one shoulder, limitations of passive movements at Glenohumeral joint compared to unaffected side, individual with or without diabetes mellitus, and individuals who were able to read and write in the Gujarati language were included in the study.

Exclusion criteria: Individuals with cervical radiculopathy, supraspinatus tendinitis, rotator cuff tear, bursitis, post-breast cancer surgery, post-Coronary Artery Bypass Graft (CABG), peripheral nerve injury, and traumatic shoulder pathology were excluded from the study.

Study Procedure

Participants were selected by purposive sampling technique according to inclusion and exclusion criteria. The study procedure was explained to participants. After taking written informed consent, basic demographic data name, age, and gender, was collected. Permission for the Gujarati version of the SPADI scale was taken from the author [6]. Participants were selected according to selection criteria, and after taking written informed consent, basic demographic data was collected. Then self-reported outcome measure score were recorded using Gujarati version of SPADI scale. Performance-based measure scores were recorded using three function-related tests.

Outcome measures:

The SPADI scale: It is a 13-item self-administered questionnaire that consists of two dimensions: one for pain and other for functional activities. The pain dimension consists of five questions regarding the severity of an individual's pain. Functional activities are assessed with eight questions designed to measure the degree of difficulty an individual has with various activities of daily living that require upper-extremity use. The two scales are averaged to produce a total score calculated as a percentage, with results ranging from 0 (best) to 100 (worst) [5,7].

Function-related tests of the shoulder [4]: Function-related tests of shoulder dysfunction reflect individual capabilities.

- **Hand to Neck (shoulder flexion and external rotation) (F1) [4]:**
  0   The fingers reach the posterior median line of the neck with the shoulder in full abduction and external rotation without wrist extension.
  1   The fingers reach the median line of the neck but do not achieve full abduction and/or external rotation.
  2   The fingers reach the median line of the neck, but with compensation by adduction in the horizontal plane or by shoulder elevation.
  3   The fingers touch the neck.
  4   The fingers do not reach the neck.

- **Hand to Scapula (shoulder extension and internal rotation) (F2) [4]:**
  0   The hand reaches behind the trunk to the opposite scapula or 5 cm beneath it in full internal rotation, with the wrist not laterally deviated.
  1   The hand almost reaches the opposite scapula, 6-15 cm beneath it.
  2   The hand reaches the opposite iliac crest.
  3   The hand reaches the buttock.
  4   Subject cannot move the hand behind the trunk.

3) **Hand to opposite scapula (shoulder horizontal adduction) (F3) [4]:**
  0   The hand reaches the spine of opposite scapula in full adduction without wrist flexion.
  1   The hand reaches to the spine of the opposite scapula in full adduction.
  2   The hand passes the midline of the trunk.
  3   The hand cannot pass the midline of the trunk.

STATISTICAL ANALYSIS

Data were analysed using the statistical package Statistical Packages of Social Sciences (SPSS) version 26.0. A total of 69 participants were included, comprising 42 males and 27 females. Kolmogorov-Smirnov test was used for normality. Data was not normally distributed, the Spearman rank correlation test was used. Significance level was kept at $p \leq 0.05$. The Spearman's correlation coefficient ranges from -1 to +1; a positive value indicates a positive correlation, while negative value indicates a negative correlation. The interpretation for the correlation coefficient is as follows: 0.00-0.10=negligible correlation, 0.10-0.39=weak correlation, 0.40-0.69=moderate correlation, 0.70-0.89=strong correlation, and 0.90-1.00=very strong correlation.

RESULTS

The age of participants ranged from 40 to 80 years, with a mean age of 58.78 ± 7.97 years [Table/Fig-1,2]. Gender distribution is shown in [Table/Fig-1].

Variables	n (%)
Age (years) (mean±SD)	58.78±7.97
Gender	
Male (%)	42 (61%)
Female (%)	27 (39%)

**[Table/Fig-1]:** Demographic details of participants.
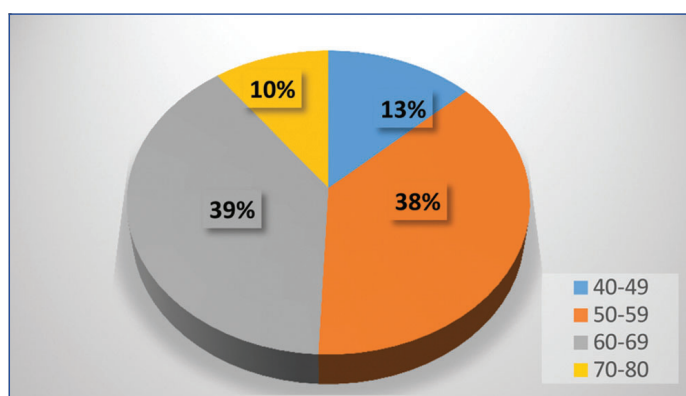
[Table/Fig-2]: Age distribution (years of participants) (N=69).

Hand to Neck" (F1) shows a statistically significant weak positive correlation with the score of the SPADI. "Hand to Scapula" (F2) demonstrates a statistically non significant weak positive correlation with the score of the SPADI. Hand to opposite scapula (F3) shows

statistically significant weak positive correlation with score of SPADI [Table/Fig-3-6].

| Function-related test	Shoulder Pain and Disability Index (SPADI)	
	r-value	p-value
Hand to neck (F1)	0.35	0.003
Hand to scapula (F2)	0.18	0.136
Hand to opposite scapula (F3)	0.29	0.014

[Table/Fig-3]: Representing r-values and p-values for correlation between SPADI scale and functional-related tests.
(r=correlation coefficient, p=level of significance p≤0.05
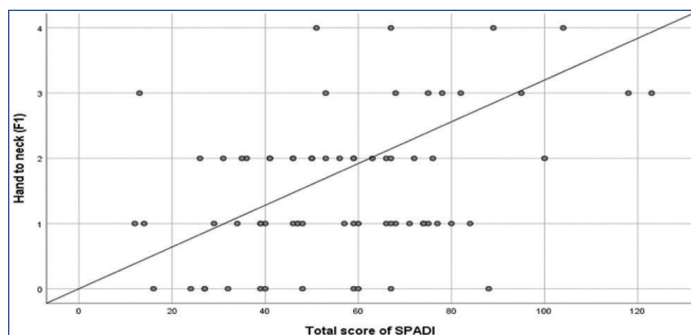
[Table/Fig-4]: Correlation between Function-related test (F1) and SPADI.
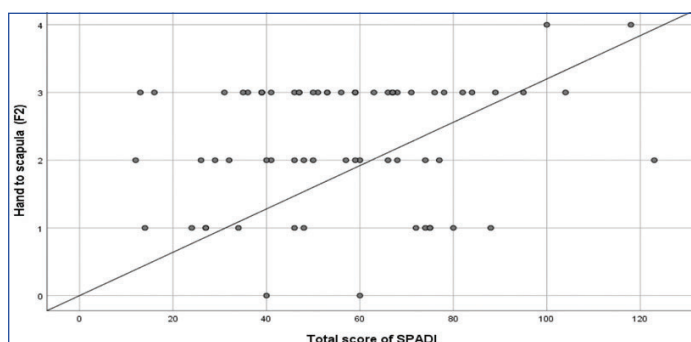
[Table/Fig-5]: Correlation between Function-related test (F2) and SPADI.
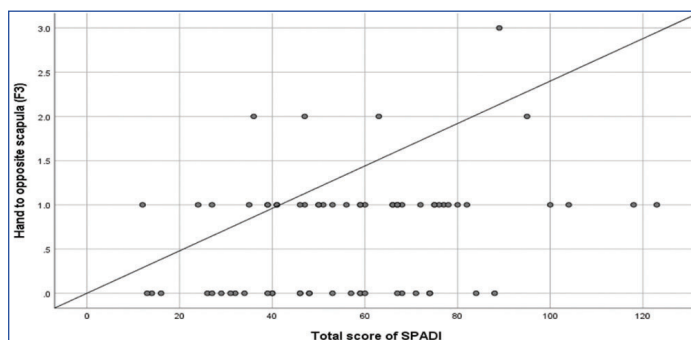
[Table/Fig-6]: Correlation between Function-related test (F3) and SPADI.

DISCUSSION

The present study was aimed to find the correlation between performance-based and self-reported measure in individuals with frozen shoulder. This study found weak positive correlation between scores of SPADI and all three function-related test. Authors found a significant correlation between SPADI and function-related test F1 (Hand to Neck), and also between SPADI and F3 (Hand to Opposite Scapula). Frozen shoulder limits the range of daily activities that require good shoulder abduction, external rotation, flexion, and horizontal adduction, such as reaching over the head, reaching up to things on high shelves, touching the back of the neck, pulling the seatbelt, combing hair on the opposite side, and touching the opposite ear or axilla.

Amita A et al., found a correlation between self-reported and performance-based measures in patients with non traumatic shoulder pathologies. Their results indicated that both self-reported

and performance-based measures should be used in assessment of patients with non traumatic shoulder pathologies [7]. Zdravkovic A et al., compared patient and clinician-reported outcome measures in low back rehabilitation, an improvement or decline in the clinician-reported outcome measures did not serve as an indicator for what patients reported about their perceived functioning or pain [8]. The new method presented in this work to assess individual "performance scores" within a patient can effectively identify critical success factors and non responders in the rehabilitation process in a simple and user-friendly way [8].

We found no significant correlation between SPADI and Functional related test F2 (Hand to Scapula). Cyriax defined capsular pattern as greater limitation of external rotation than abduction, with less limited internal rotation [9]. Due to the lesser limitation of shoulder internal rotation, there is no significant correlation between F2 test and SPADI. The SPADI scale's functional dimension contains only two activities which require shoulder internal rotation. So due to that, function-related test (F2) is not significantly correlated with SPADI scale.

Preuper HS et al., found relationship between psychological factors and performance-based and self-reported disability in chronic low back pain. Results show no strong correlation between psychological, performance, or self-reported measures [10]. Inness EL et al., conducted a study on general population after concussion. The result shows there is no clear relationship between self-reported and performance-based measures of balance impairment [11].

Clinically, use the both self-reported as well as performance-based outcome measures to assess the patient because the patient's perspective towards pain and function is different from functions assessed by therapist. Further, study can be done by grouping the individuals under different stages of the frozen shoulder.

Limitation(s)

A small sample size was one of the limitations of the present study, and stages of frozen shoulder were not demarcated.

CONCLUSION(S)

The present study showed a weak positive correlation between performance-based and self-reported outcome measures in individuals with frozen shoulder. The present study concludes that assessment of individuals with frozen shoulder must incorporate both performance-based and self-reported measures.

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