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Correlation of Self-Reported and Performance-Based Measures In Patients With Non-Traumatic Stiff Shoulder Pathologies: An Observational Study

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ABSTRACT

Background: Self-reported measures represent patients' perspectives toward their disease, but their performance levels may vary. Performance-based measures mimic the patient's functional activity movement, which helps evaluate specific task components, including how the therapist approached the task. Both measures report the patient's functional level from the patient's or therapist's perspective. The study was done to determine the correlation between self-reported and performance-based measures outcomes in non-traumatic stiff shoulder pathologies.

Method: Self-reported outcome measure scores were recorded using the Shoulder Pain And Disability Index (SPADI), Disabilities of Arm, Shoulder, and Hand (DASH), and Patient Specific Functional Scale (PSFS). Performance-based measures scores of the shoulder were given using function-related tests of the shoulder: 1) Hand to the neck, 2) Hand to scapula 3) Hand to the opposite scapula.

Result: Inferential statistics were done using the Pearson correlation test, and the significance level was set at p<0.05. Pearson correlation test showed: 1) Weak statistically significant correlation between SPADI versus function-related test 1(r= 0.32), DASH versus Function-related test 1(r= 0.31), and function-related test 2(r= 0.31) and PSFS versus function-related test 1(r= 0.36). 2) Other correlations were Very Weak and non-significant.

Conclusion: As the correlation between all three self-reported measures and each of the three function-related tests has become weak, there is a need to include both self-reported and performance-based measures in assessing patients with non-traumatic stiff shoulder pathologies.

Keywords: Shoulder Pain And Disability Index, Disabilities of Arm Shoulder and Hand, Patient Specific Functional Scale, Function-related tests, Frozen shoulder, Painful arc syndrome.

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INTRODUCTION

The ability to perform daily activities is a global concept that includes a series of movements. For example, a function involving the use of the upper extremity gets affected due to pain, weakness, and stiffness. This leads to substantial functional disability expressed as an inability to carry out tasks of daily living like combing hair, reaching activities, pushing, overhead activities, pulling out an object from the back pocket, holding a glass, turning a steering wheel, tasks related to personal care, activities that use the arm to reach across the body, etc. Along with physical factors, the level of symptoms and disability is influenced by psychological factors too. The methods already used to document these functional impairments are patient questionnaires, physical performance measures, and complete musculoskeletal examinations [1].

Various self-reported measures used for shoulder pathologies include SPADI (Shoulder Pain and Disability Index), DASH (Disabilities of Arm, Shoulder, and Hand), and PSFS (Patient Specific Functional Scale) [2-5]. SPADI is considered a gold-standard scale for shoulder pathologies, with a reliability of 0.89. They represent the disability from the patient's perspective [6]. In other cases, clinicians rely on performance-based measures. They test the ability of the person to mimic their actual functional activity, evaluate discrete components of the movement, and focus on how the task was approached. They are more objective [7]. Different performance-based measures used for testing the shoulder include hand to the neck, hand to the scapula, and hand to opposite scapula [8].

In self-reported measures, patients tend to achieve the end goal, regardless of the movement mechanism behind achieving that position. Self-reported measures are also dependent on various factors, which can be psychological, environmental, social, or physical, and lead to perceptual differences [8]. Although they have good patient compliance, this can affect the further planning of rehabilitation protocol as the findings may not be accurate [6, 7]. Whereas, in performance-based measures, any compensatory movement being used by the patient is graded low by the therapist. These scales highlight the therapist's perspective based on scale grading towards the patient's functional impairments [8]. Some studies have used mainly self-reported outcome measures, while others advocate using performance-based measures to grade the severity of the patient's functional impairment. Very few studies have used both these measures for the same pathology [7, 9-11]. It has been seen that both patient and clinician-based outcome measures are valuable tools in clinics [12]. Hence, the study needed to find any correlation between the two scoring methods, whether one can be used instead of the other, or if there is a need to include both. The study aimed to find a correlation between self-reported and performance-based measures in patients with non-traumatic stiff shoulder pathologies.

METHODOLOGY

Study design:

It was an observational study conducted after receiving approval from the Institutional SubEthical Committee (Ethical Committee Number: DYPCPT/ISEC/18/2021).

Setting:

The study was conducted in the Physiotherapy Department of Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune.

Participants:

Ninety-three patients who met the inclusion criteria of orthopedically diagnosed non-traumatic stiff shoulder pathologies with a mean age of 48.9 years, both genders and those willing to participate, were included. Patients with recent shoulder joint fractures or previous episodes of shoulder dislocations, any neurological conditions affecting the shoulder, cervical spine radiculopathy, open wounds, or those who have taken a recent corticosteroid injection were excluded. After taking written informed consent, basic demographic data was collected.

Then the self-reported outcome measure scores were recorded using SPADI, DASH, and PSFS scales. Finally, the performance-based measures scores of the shoulder were recorded using function-related tests: 1) Hand to the neck, 2) Hand to scapula 3) Hand to the opposite scapula.

Outcome measures:

SPADI scale (Shoulder pain and disability index): It is a 13-item self-administered questionnaire that scores a patient's shoulder disability and pain. The two scales were averaged to produce a total score calculated in percent, with results ranging from 0(best) to 100(worst); the scale has a reliability of 0.89.

DASH scale (Disabilities of Arm, Shoulder, and Hand) is a 30-question patient self-reported questionnaire. The patient's symptoms and ability to perform certain activities per last week were scored with scores ranging from 0-100, where 0 indicated no disability. The scale reports a reliability of 0.96.

PSFS (Patient-specific functional scale): The patients were allowed to recall the three most difficult regular activities related to their shoulder performance. Each activity was graded from 0 to 10, with 0 indicating no difficulty and 10 for impossible tasks.

This scale has a reliability of 0.82.

Function-related tests of the shoulder:

Function-related tests of shoulder dysfunction reflect individual capabilities.

Three function-related tests specific to the shoulder are:

- Hand to the neck (shoulder flexion and external rotation)
- Hand to the scapula (shoulder extension and internal rotation)
- Hand to the opposite scapula (horizontal shoulder adduction)

This scale has a reliability of 0.83-0.90.

Study Size:

Assuming the correlation coefficient of 0.3 between SPADI and function-related tests, entering the data in Winpepi software at a 5% significance level and 80% power, the calculated sample size was 85.

RESULTS

Data were analyzed using the statistical package SPSS 22.0 (SPSS Inc., Chicago, IL), and the significance level was set at p<0.05. Inferential statistics were done using the Pearson correlation test. Table 1 shows a mean age of 48.9 years and male(40.8%) and female(59.2%) percent gender distribution for n=93. Pie chart 1 represents the percent distribution of various non-traumatic shoulder pathologies. Table 2 shows the correlation (r) between self-reported and performance-based measures. Results found a Weak positive but significant correlation for SPADI(Graph 1), DASH (Graph 2), and PSFS (Graph 3) for functional test F1; the same result was reported for functional test F2 and DASH. The correlation of F2 with SPADI, PSFS, and the Correlation of F3 with either of the three scales was found to be very weakly correlated.

Table 1: Demographic data of the subjects

Variable	Values
Age(Mean ± S.D)	48.91 ± 16.36
Gender Male (%) Female (%)	38 (40.8%) 55 (59.2%)

Pie chart 1: Pie chart representing non-traumatic shoulder pathologies distribution among n=93 subjects

Non Traumatic Shoulder pathologies

- FROZEN SHOULDER
- PAINFUL ARC SYNDROME
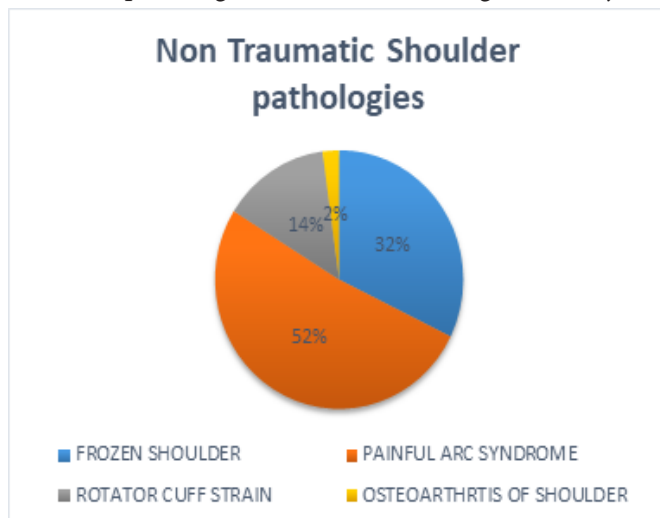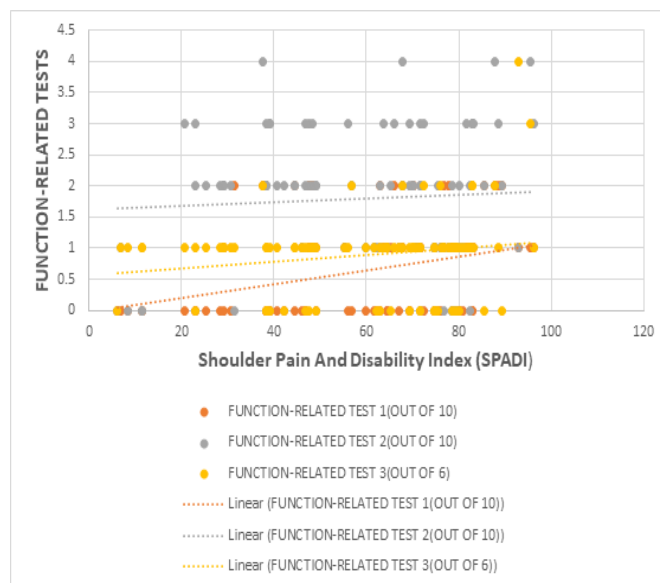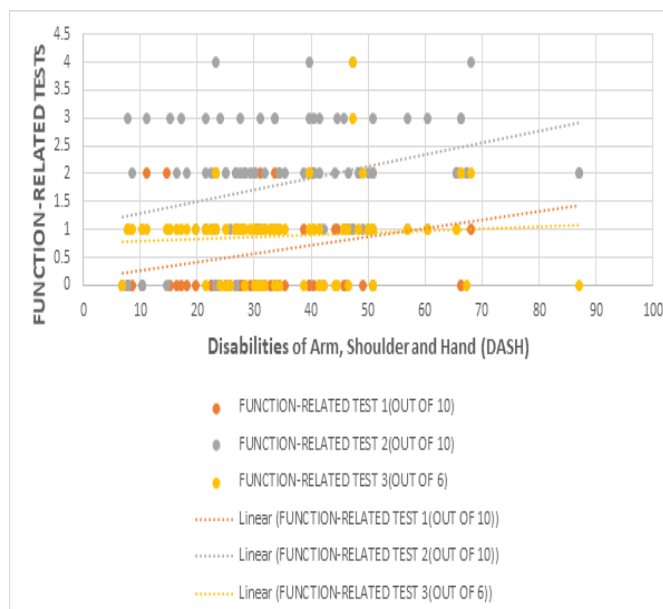- ROTATOR CUFF STRAIN
- OSTEOARTHRTIS OF SHOULDER

Table 2: Representation of r values for a correlation between Self-administered questionnaires and function-related tests using Pearson correlation test for n= 93

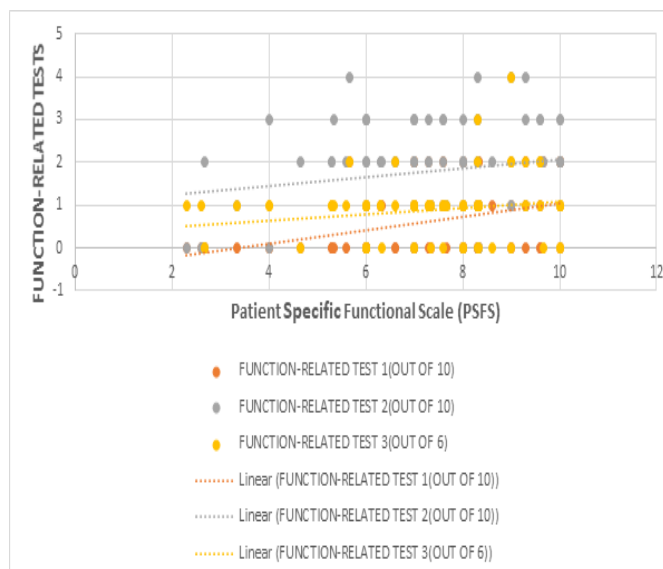| Function related test	Self-administered questionnaire		
	SPADI	DASH	PSFS
Hand to neck(F1)	0.32	0.31	0.36
Hand to scapula(F2)	0.05	0.31	0.17
Hand to opposite scapula(F3)	0.17	0.08	0.18

Graph 1: Represents correlation between Function-related tests and SPADI

- FUNCTION-RELATED TEST 1(OUT OF 10)
- FUNCTION-RELATED TEST 2(OUT OF 10)
- FUNCTION-RELATED TEST 3(OUT OF 6)
- Linear (FUNCTION-RELATED TEST 1(OUT OF 10))
- Linear (FUNCTION-RELATED TEST 2(OUT OF 10))
- Linear (FUNCTION-RELATED TEST 3(OUT OF 6))

Graph 2: Represents correlation between Function-related tests and DASH

- FUNCTION-RELATED TEST 1(OUT OF 10)
- FUNCTION-RELATED TEST 2(OUT OF 10)
- FUNCTION-RELATED TEST 3(OUT OF 6)
- Linear (FUNCTION-RELATED TEST 1(OUT OF 10))
- Linear (FUNCTION-RELATED TEST 2(OUT OF 10))
- Linear (FUNCTION-RELATED TEST 3(OUT OF 6))

Graph 3: Represents correlation between Function-related tests and PSFS

- FUNCTION-RELATED TEST 1(OUT OF 10)
- FUNCTION-RELATED TEST 2(OUT OF 10)
- FUNCTION-RELATED TEST 3(OUT OF 6)
- Linear (FUNCTION-RELATED TEST 1(OUT OF 10))
- Linear (FUNCTION-RELATED TEST 2(OUT OF 10))
- Linear (FUNCTION-RELATED TEST 3(OUT OF 6))

DISCUSSION

The study aimed to find a correlation between self-reported and performance-based measures in patients with non-traumatic stiff shoulder pathologies. Instead, the study found a weak positive but significant correlation between functional test-1 and all self-reported questionnaires, including Functional Test 2 and DASH. This highlights the need to include both measures during the assessment.

Patients presented with different symptoms for the various non-traumatic shoulder pathologies, but the chief complaint remained as pain and functional restrictions. These functional restrictions were more obvious with more range restrictions. Otherwise, the patient tends to complete an action using compensatory movements and overestimate their performance. In painful arc syndrome, pain is generally felt along the deltoid aspect of the arm and exacerbates with a little arc of movement, especially for overhead activities and at night [13]. In a frozen shoulder, they depend on the condition's stage; most activities that require abduction and rotations are hampered. This causes a significant impact on functional activities [14]. Osteoarthritis causes pain and stiffness in the shoulder due to wear and tear of the articular cartilage. The joint ranges become restricted due to the thickening of the joint capsule [15]. Subscapularis strain, maybe due to age, overuse, or trauma. It involves pain in front of the shoulder, especially at night, while performing any lifting activity, along with arm and shoulder weakness [16]. Supraspinatus tendinitis may result from repetitive overhead motions, leading to difficulty reaching above the shoulder and pain at night and during activity [17]. Hence, mainly all activities that require good shoulder flexion and external rotation range of motion and strength, especially overhead activities, were affected, like reaching for something on a high shelf, touching the back of the neck, using the arm to pull, etc. [8].

These activities are addressed as questions in self-reported questionnaires, and the patient grades them accordingly. This serves the same action as seen with the hand-to-neck movement. This can be why a positive correlation was reported between function-related test-1 (F1) and self-reported questionnaires. It implies that as the pain and disability on the SPADI scale increase, function-related test-1 shows a higher score with more significant restriction. Function-related test-2 (F2) assesses shoulder extension and internal rotation using the hand-to-scapula movement, which is used in various daily activities like washing back, removing something from a back pocket, other activities of personal hygiene, pulling open a refrigerator door, etc., are hampered in the pathologies mentioned above [8]. The results found correlation was weakly positive only with the DASH scale. It may be because questions asked in DASH included more ADL-oriented, specifically household-related tasks and sports-specific questions. Questions involving the same movement are asked in different ways depending on the daily activities, making it much easier for the patient to understand and mark themselves accordingly

[4]. Function-related test-3 (F3), which involves shoulder horizontal adduction, is not correlated with any of the self-reported questionnaires. It includes activities like pulling a seat belt, combing the opposite side of the hair, donning and doffing activities, reaching the opposite ear or axilla, etc. [8].

Also, the difference in the grading of self-reported questionnaires by patients and therapists is of concern. Patients may perceive their health status better but perform poorly during the test [18]. A study done by Kempen et al. (1996) has shown that less physical competency and more depressive symptoms can underestimate and influence self-reported measures as compared to performance-based measures [19]. Another study done by van Heuvelen MJ et al. (1997) in older adults found less validity of self-reported measures as predictors of performance-based measures for fitness. It is so because self-reported items didn't address all domains of physical fitness [20]. Self-reported measures, which includes multiple questions for grading one domain, are more accurate than single question [21]. Jin-Jang Yang et al. (2006) investigated the intratester and intertester reliability of a battery of function-related tests in patients with shoulder pathologies and associated reduced range of motion. This study indicates that function-related tests are reliable and can be used in clinical practice to document the reduced function of the shoulder. Each test measures different aspects of the shoulder with good reliability [8]. A study in low back pain patients found no strong correlation between self, performance, or psychological type of measures [22]. Another study performed in the general population after a concussion found no clear relationship between subjective and objective measures of balance impairment [23].

Performance-based measures, too require trained therapists and the use of equipment. However, it better predicts the risk of readmission after discharge from a short-stay unit [24]. This necessitates the inclusion of qualitative (self-reported) and quantitative (performance-based) measures and validates the irreplaceability of one with the other. Both measures serve to complement each other for the assessment of non-traumatic stiff shoulders.

CONCLUSION

Since the correlation between the three self-questionnaires and each of the three function-related tests have come out to be weak, the study concludes that there is a need to include both self-reported and performance-based measures in the assessment of patients.

Limitations

Like confounding factors, personality, age, and education level were not considered.

Future Scope

Further study can be done by grouping the pathologies under acute, sub-acute, and chronic stages. The study can only be done using samples of the same pathology or musculoskeletal condition. A pre-questionnaire with instructions can be prepared to avoid confounding during

data collection.

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