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Original Research Article

EFFECT OF AGING ON RANGE OF MOTION AND FUNCTION OF DOMINANT SHOULDER JOINT IN HEALTHY GERIATRIC POPULATION

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ABSTRACT

Introduction: Musculoskeletal problems are frequently perceived by the people as the first concrete sign of aging. Shoulder joint most frequently have musculoskeletal problems with declination of range of motion, function and strength. There is an increased emphasis on using subjective and objective outcome measures to characterize function in persons with dominant shoulder joint disorders. For dominant shoulder joint disorders, impairments most commonly measured include range of motion and functions. Different measurements are used to assess shoulder joint impairments, including range of motion and functions by goniometry and performance-based or self reported function test i.e. simple shoulder test (SST) respectively. To understand disablement, it is necessary to understand the relationship between age and impairments i.e. range of motion and functions in persons without any previous history of shoulder pathology. This study was conducted to find out the effect of aging on range of motion and function of dominant shoulder joint in healthy geriatric population.

Materials and Methods: The study was of an observational design, with 330 subjects, 153 were female, 177 were male, and all subjects were assigned according to criteria (inclusion & exclusion) and carried out at physiotherapy OPD of CSS Hospital, Meerut. Range of motion and Function of dominant shoulder joint was assessed by using goniometry and simple shoulder test (SST) respectively. The collected data were of mean and standard deviation of range of motion and function of dominant shoulder joint has been analyzed statistically using SPSS software. The study was done to find out the effect of aging on range of motion and functions of dominant shoulder joint in healthy geriatric population.

Results: The results showed that there was an age-related decline in range of motion and function of dominant shoulder joint in healthy geriatric population in the over 60 age category.

Conclusion: Study concluded that there was low declination in range of motion and function of dominant shoulder joint in healthy geriatric population without upper extremity problem.

KEY WORDS: Dominant shoulder joint ROM, goniometry, simple shoulder test.

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INTRODUCTION

No matter how healthy an individual is, as they age their joints will show some changes in mobility, due to changes in the connective tissues. As joint range of movement has a direct effect on posture and movement, this can result in marked alteration of function. Bony changes have a direct effect on joint mobility, influencing the joint surfaces to alter joint mechanics [1]. Subchondral bone (the layer directly below

the articular cartilage) undergoes reduction in thickness and density with increased age [2]. The shoulder complex shows the greatest changes in the upper limb, whereas no age-associated decline in ROM of the elbow or wrist has been noted [3].

Gender related differences in strength have been reported. More specifically, Hughes et al. have shown that men are stronger than women when controlling for age and weight [4]. The effects of age and dominance, however, are less well known. It has been suggested that, in the normal population, age is negatively associated with isometric shoulder strength and that some shoulder rotational strength measurements differ between dominant and non dominant sides [5]. Studies examining range of motion and its relationships with age, gender and dominance, unfortunately, have reported varied results [6]. Most studies have reported that only some shoulder motions decrease with age however, the specific shoulder ranges of motion affected by age are inconsistent between studies. As for gender-related effects, minimal differences between genders have been described by Murray et al., while Barnes et al. observed greater range of motion in women as compared to men [7]. Measures of function provide a broader view of patient status and are considered more patient centered. Several studies have examined the contribution of self-report questionnaire to disability assessment, or reported on their validity [8]. Unfortunately, very few studies have established normative values for these self-report scales [9]. Furthermore, those that have presented normative values have not included a determination of how self-reported function is related to strength and range of motion [10].

Recently, one of the upper-extremity functional performance tests, the simple shoulder test (SST) has been proposed by Martsen FA, Lippitt SB, et al. This standardized test was developed to assess functional performance for sustained shoulder joint activity. The Simple Shoulder Test (SST) can be used to aid the practitioner in evaluating the success of treatment in terms of shoulder function and specific activity intolerance [11]. It is important to establish a pre-treatment baseline and then periodically monitor the patient's progress and response to treatment. The SST may be given at the beginning of a shoulder treatment regimen and then at intervals throughout treatment, such as at re-examinations. The answers are then compared to assess the patient's response to treatment. The reliability and concurrent validity of the SST have been established in persons with shoulder disorders. It has been shown to discriminate between persons with and without shoulder disorders. Furthermore, the relation between the SST, range of motion and self-reported function has not been established for individuals without shoulder pathology [12].

MATERIALS AND METHODS

Outcome Measures

Simple Shoulder Test: The Simple Shoulder Test was developed by the University of Washington, Department of Orthopedics. It is a self-administered questionnaire designed to document the functional status of a symptomatic shoulder. It consists of 12 "yes" or "no" questions derived from common shoulder complaints. Each question focuses on shoulder function and a specific activity intolerance. Patients should answer all 12 questions. They should answer them as best they can without any assistance; the instrument is based on patient's evaluation of their shoulder function [12].

Goniometry: It is a technique in which using an instrument named as goniometer purports to measure accurately the movements present in a simple or composite joint. Actually a goniometer is used not so much to measure the exact number of degrees of the movement in a joint as to find out whether there is an increase or a decrease of such movements. In order to do this, it is desirable that a goniometry should provide an easy method of reference to the joint or joints being examined and also provide a fixed base- line point from which to measure any increase or decrease of movement [13].

Test Procedure

Self- report upper extremity function: The self-reported disability scale was employed to assess shoulder function. It consists of 12 "yes" or "no" questions derived from common shoulder complaints and with respect to time (2 to 3 minutes) to completion. The SST measures functional limitations of the affected shoulder.

The SST consists of dichotomous (yes [1] or no [0]) response options. For each question, the patients indicate that they are able or are not able to do the activity. The scores range from 0 (worst) to 12 (best).

Time to complete: 2–3 minutes.

Scoring: Original score: 0 = worst and 12 = best.

Transformed by: (number of "yes" items/number of completed items) × 100 = % "yes" responses.

Score interpretation. 0 = worst and 100 = best function in %

Range of motion: Active flexion, extension, abduction, internal and external rotation range of motion of dominant shoulder joint was assessed using a universal goniometer (in degrees). Flexion and abduction was measured in both supine and sitting positions respectively. Extension was measured in prone lying position. In flexion and extension, center of the humeral head or the lateral aspect of greater tubercle of humerus was used as axis of rotation. In abduction, the center of the humeral head near or close to the anterior aspect of acromion process was used as axis of rotation. External rotation was measured in both the sitting and supine positions, whereas internal rotation was only measured supine. For sitting external rotation, subjects were seated in a straight-backed chair with both feet flat on the floor. Measurements were taken during active motion with the humerus at 0° of abduction and elbow at 90° of flexion. The olecranon process was used as the axis of rotation. Supine external and internal rotations were measured passively with the humerus abducted in the frontal plane to 90° and the elbow flexed to 90°. The scapula was stabilized during internal rotation by the research assistant in order to avoid protraction of the shoulder girdle. The scapula was not stabilized in external rotation. The movement was stopped when the first resistance was felt.

Hypothesis

Experimental Hypothesis: There was significant difference in range of motion and function of dominant shoulder joint in healthy geriatric population without upper extremity problem.
Null Hypothesis: There was no significant difference in range of motion and function of dominant shoulder joint in healthy geriatric population without upper extremity problem.

Limitation of study: Research is done only among a particular age group. Only function and range of motion of dominant shoulder joint are measured.

Variables

Dependent Variables: SST score (in %) and goniometry score (in degrees).

Study Design: Single blind, randomized and observational in nature

Sample selection: According to the inclusion and exclusion criteria, the convenient sample of 330 subjects had randomly assigned in the study. This study was conducted in physiotherapy OPD of CSS Hospital, Subharti University Meerut.

Inclusion Criteria: Age above 60 yrs, Both Male and female without any pathology to dominant upper extremity,

Exclusion Criteria: Any previous pathology of dominant shoulder joint, Brachial plexus injury, Any pathology to cervical region, Axillary cyst on dominant side, Any previous pathology to elbow and wrist joint on dominant side

Instrumentation: Couch, Stool, Goniometer (Universal full circle), Stationary (Pen, Pencil), Consent Form, SST Questionnaire Form

Procedure: After getting their informed consent the subjects were randomly assigned. Subjects for research purpose were selected according to inclusion and exclusion criteria. According to the goniometry and SST questionnaire, the data of the range of motion and function were collected and table of selected variants was prepared and sorting of data was done.

Data analysis: All analysis was obtained using SPSS version 21.0. Demo graphic data of the patients including range of motion and function were summarized. The dependent variables for the statistical analysis were SST and goniometry. A base line data was taken and analyze.

RESULTS

A sample size of 330 subjects was studied individually for goniometry and SST score at base line. Table-1 & 2 represents the Mean & S.D. and standard error of Mean of goniometry and

SST score respectively. Graph 1 & 2 shows calculated mean and normal mean of goniometry score and SST score respectively.

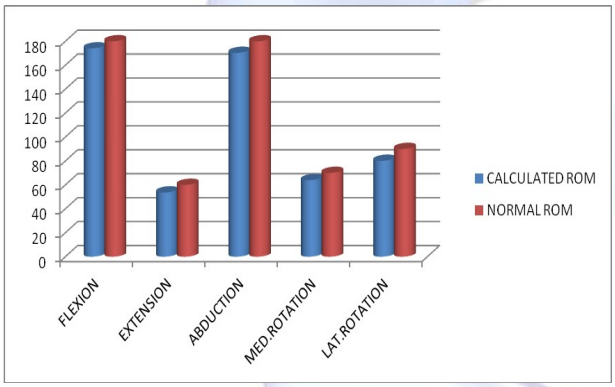
Table 1: Mean standard deviation (sd) and standard error of mean (sem) of goniometry score.

Variable	Movements	Mean	S.D	S.E.M
Goniometry	Flexion	174.07	2.49	0.45
	Extension	53.67	2.28	0.42
	Abduction	170.33	1.45	0.26
	Medial Rotation	63.97	2.19	0.4
	Lateral Rotation	80.13	3.22	0.59

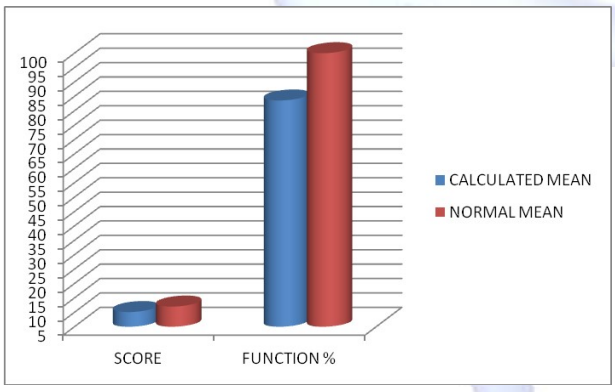
Table 2: Mean statndard deviation (sd) and standard Error of mean (sem) of sst score.

Variable		MEAN	S.D	S.E.M
Simple Shoulder Test	Score	10.1	0.84	0.15
	Function %	83.58	7.06	1.29

Graph 1: Mean score of goniometry (In degrees).



Graph 2: Mean score of SST.



DISCUSSION

This study provides data for range of motion and self-reported function in persons who state they have no shoulder pain or disorders on dominant side. The data is sparse for the over-60 group since it was difficult to find people in this age group who could fit the criteria. This reflects the high prevalence of shoulder problems in advancing age groups [14]. Random sampling to provide normative data from the population would be expected to include a high rate of people with shoulder pathology, therefore, the difference between unaffected and normative data should widen as the age of interest increases [15].

Results for shoulder range of motion and self-reported function were mostly consistent with the findings of several previous papers that tested range of motion and self- reported function, showing that on average, men are stronger than women. Some differences, however, were observed. In men, strength significantly decreased in the over-60 age category. This differs slightly from the findings of Hughes et al. who suggest that strength declines linearly with age [16]. One possible cause of the decline in strength with aging is a decreased muscle mass, which may affect men (who have typically more muscle mass) more than women.

Our data shows that there is a drop-off in range of motion and self-reported function above 60 years of age. An important finding of this study was that older persons had smaller ROM at certain joints than the ROM published in the AAOS Handbook. Although the results of their study were based on a small sample of 30 men and 30 women over 60 years of age, the general trends are supported by studies by Smith and Walker and Boone et al [16]. Overall, there was a reduction in range of motion and self reported function in the over-60 age category, while there was a less relationship between age, range of motion and self-reported function respectively. Our results are consistent with other studies that have shown that some shoulder range of motions and self-reported function decrease with aging.

CONCLUSION

This study yields several important facts about the relationship among range of motion and self-reported function in individuals with unaffected shoulders and can serve as a valuable clinical resource for comparison with a patient population. Measurement of 5 active motions and function of the dominant shoulder joint in 330 subjects showed that individuals above 60 years of age differ significantly and showed decline in ROM and self-reported function. Tests revealed significant differences in ROM and

self-reported function of the dominant shoulder joint in this age group. Substantive differences in active ROM values and self-reported function are measured in this study. First, there is indeed a decline in range of motion and self- reported function with aging. This decline, however, does not appear linear, but is notable over the age of 60. There is no significant relationship between self-reported function and range of motion over a narrow range of normal function in asymptomatic individuals. Clinicians may expect to observe decreased ROM and self-reported function in healthy older individuals.

Conflicts of interest: None

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