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RESEARCH ARTICLE

Influence of Hand Dominance on Shoulder Range of Motion in Young Non-Athlete Women

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ABSTRACT

The shoulder joint is one of the most commonly injured joints. Handedness is most often not a standard question of the musculoskeletal assessment form. But it may have an impact on developing musculoskeletal injury, especially in upper limb injury. There is paucity in studies correlating handedness and shoulder range of motion in young non athlete women. The aim of this study was to determine whether handedness influences active shoulder range of motion in young adult non athlete women. In this observational study, hundred healthy non athlete females of age group 18-24 were selected. Bilateral shoulder range of motion on all three planes for each female was measured by a qualified physiotherapist using a universal goniometer. The collected data was put into statistical analysis using paired t test.

Keywords: Shoulder range of motion, hand dominance, nonathlete adult women.

INTRODUCTION

The preference of hand usage while performing a particular task is referred to as hand dominance [1]. The functional ability and the performance of activities of daily living is greatly impacted by the hand dominance of the extremities, especially the upper extremity [2,3].Since the dominant hand is usually used for so many daily activities and for recreational activities, hand dominance is an important factor to be considered in motor skill performance [4]. Due to extensive practice and associated experience of using the dominant hand most often, better skill development and motor learning happens. This in turn results in superior speed, co-ordination and precision of the dominant hand over the non-dominant hand [1].Most often handedness is not a standard question featuring in the assessment form.

But it has to be understood that it has a definite impact on posture and risk of developing musculoskeletal injuries [5,6]. Muscle imbalance may result from repetitive movements, injuries, or habitual movement patterns. It may also result from surgeries and incomplete injury rehabilitation [5].Hand dominance could further impact these imbalances. A right-handed person can have inefficient posture that runs the length of the kinetic chain, from the hand to the foot. A right-handed person's stance will typically show a lower right shoulder with an adducted scapula, lateral pelvic tilt with adducted and medially rotated right hip joint and maybe even right foot pronation [5].

The shoulder is a joint that is designed to move. The proximal humerus and the humeral head articulate with the glenoid fossa of the scapula in the glenohumeral joint, which is part of the shoulder joint.Scapulothoracic joint is formed by the articulations of the scapula, humerus and the ribs. The shoulder joint being a ball and socket joint is capable of performing a variety of movements which includes flexion, extension, adduction, abduction, external and internal rotation. Hence it is a joint built for multidirectional mobility [7].

The ligamentous joint capsule and rotator cuff muscles that surround the glenohumeral joint are responsible for the joint's stabilisation. All gross shoulder motion is followed by scapula motion around the ribs as an accessory motion. Dominant arm is subjected to more constant stress in sports person when compared to non-dominant arm. Since an active person's dominant arm presents a different therapeutic challenge than a sedentary person's non-dominant shoulder, hand dominance is critical in treatment recommendations [8]. Gleno-humeral joint measurements are important for the prevention and the rehabilitation of the shoulder injuries. Measuring treatment progress and setting treatment goals is mostly dependent on range of motion measurements as far as health care of musculoskeletal disorders is concerned.

Some authors have hypothesized that there is a natural difference between the dominant and non-dominant sides [9,10]. If this is true, then using the opposite side as an estimate of preinjury ROM is inappropriate. This rationale for differences existing from side to side is related to usage. The idea is that the overuse of some joints could lead to overstress of the joint and, consequently, the development of micro injuries. These micro injuries would increase the deposit of scar tissue in the area leading to a decrease in the ROM, most commonly on the dominant side [11]. Though some authors have attempted determining the range of motion difference between body sides [12,13,14], at present the available literatures are insufficient, contradictory and mostly confusing. There is a paucity of literature in determining the clinical usage of hand dominance in the assessment of ROM of shoulder and in present available literature it is contradictory and confusing whether there is a significant difference between body sides exist. Therefore, this study is to verify the influence of hand dominance on shoulder range of motion (ROM) in nonathlete women to make reasonable protocols or preventive strategies in females who play a major role in the development of the society.

MATERIALS AND METHODS

This is an observational study. Hundred healthy non athlete women between the age group of 18-24 years who were all right dominant were selected. Care was taken in including only those who were not participating in any repetitive activities with upper limbs at the time of the study and not having any shoulder injury or pathology. The assessment was performed with a standard universal goniometer, for each subject by the same examiner. Flexion, extension and abduction movements were taken with the subject in standing position, the adduction (horizontal adduction) movements with the subject in sitting position and internal rotation (IR) and external rotation (ER) in lying position. The means of dominant and non-dominant sides were assessed using paired *t* test.

Data Analysis

One hundred females of age 20.25±1.59 were selected with a BMI of 21.45±3.63. The active range of motion (ROM) of right and left shoulders were assessed using a universal goniometer and the means of dominant and nondominant sides were assessed using paired *t* test. The mean ROM for right shoulder flexion was 172.15±7.080 and 175.25±7.862 for the left. The mean ROM for right shoulder extension was 49.00±7.035 and 49.80±6.192 for the left. Mean ROM for right shoulder abduction was 173.90±7.268 and 177.15±7.291 for the left side. Mean ROM for right shoulder adduction was 95.10±9.898 and 96.25±8.539 for the left. Mean ROM for right shoulder internal rotation (IR) was 70.05±10.766 and 71.85±9.578 for the left. Mean ROM for right shoulder external (ER) rotation was 87.15±8.536 and 88.30±8.652 for the left side. It was found that there was a significant difference between right and left side flexion (0.001) and also for abduction (0.001). There was no significant difference for extension (0.155), adduction (0.77), internal rotation (0.55) and external rotation (0.70).

RESULTS AND DISCUSSION

It was found that there was difference between right and left side flexion (0.001) and also for abduction (0.001). There was no statistically significant difference for extension (0.155), adduction (0.77), internal rotation (0.55) and external rotation (0.70). But there was minimal clinical significance as far as the ROM measurement was concerned. Available studies have mostly concluded that some ROM differences exist between body sides and when they exist, they are minimal and not clinically significant [4,15].

In this study though the flexion and abduction ROM was different between sides, the difference was minimal (less than 10 %). Hence the results of this study support the practice of using opposite side of the body as an indicator of normal or pre-injury ROM.As the dominant arm is subjected to more constant stress as compared to the non-dominant arm, hand dominance is important for treatment recommendations because the dominant shoulder of an active individual provides a different therapeutic challenge than the non-dominant shoulder of a sedentary individual.

CONCLUSION

Hand dominance should be considered when shoulder flexion and abduction is evaluated in nonathlete young adult women. But in general, there is not much of a difference between the ROM of the other movements of shoulder between dominant and non-dominant sides. These results lead to the conclusion that, although there was a significant difference between sides for some motions, the differences between sides are small and therefore probably clinically insignificant.

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Table 1. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FlexionR	172.15	100	7.080	.708
	FlexionL	175.25	100	7.862	.786
Pair 2	ExtensionR	49.00	100	7.035	.704
	ExtensionL	49.80	100	6.192	.619
Pair 3	AbductionR	173.90	100	7.268	.727
	AbductionL	177.15	100	7.291	.729
Pair 4	AdductionR	95.10	100	9.898	.990
	AdductionL	96.25	100	8.539	.854
Pair 5	Internal RotationR	70.05	100	10.766	1.077
	Internal RotationL	71.85	100	9.578	.958
Pair 6	External RotationR	87.15	100	8.536	.854
	External RotationL	88.30	100	8.652	.865

Table. 2. Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	FlexionR – FlexionL	-3.100	6.620	0.662	-4.414	-1.786	-4.683	99	0.000
Pair 2	ExtensionR – ExtensionL	-.800	5.583	0.558	-1.908	.308	-1.433	99	0.155
Pair 3	AbductionR – AbductionL	-3.250	5.430	0.543	-4.327	-2.173	-5.986	99	0.000
Pair 4	AdductionR – AdductionL	-1.150	6.430	0.643	-2.426	.126	-1.789	99	0.077
Pair 5	InternalRotationR – InternalRotationL	-1.800	9.280	0.928	-3.641	.041	-1.940	99	0.055
Pair 6	ExternalRotationRExternalRotationL	-1.150	6.271	0.627	-2.394	.094	-1.834	99	0.070