



# Correlation Between Scapular Dyskinesia And Hand Grip Strength In Elite Badminton Players.

1Ritu Jitendra Jain, 2Dr. Sonal Suresh Patole, 3Dr.Sucheta Golhar

1Intern, 2Associate Professor, 3Principal

1PES Modern college of physiotherapy,

2PES Modern college of physiotherapy,

3PES Modern college of physiotherapy

## ABSTRACT:

**Background:** Badminton being an overhead sport requires scapular stability and coordinated motion at the shoulder complex. It has been proven that muscle imbalance due to the overuse leading to instability is a major factor leading to scapular dyskinesia (SD). Proximal muscle imbalance may lead to distal affection as well which may affect the hand grip strength. Hand grip strength is an indicator of the total body strength. The quality and amount of strength are specifically essential in heavy weight sports. Proximal stability before distal mobility” which simply refers to the fact that we must first have good mobility and strength along our core (mid-line structures along our spine) before we can maximize our extremity function (distal mobility).

**Objectives:** Aims to find correlation between scapular dyskinesia and hand grip strength in elite badminton players.

**Methods:** Study had begun with the presentation of synopsis to the ethical committee in PES MCOP. An approval was granted from the ethical committee various elite badminton courts were visited in and around the city. 58 elite badminton players were selected on the basis of their inclusion and exclusion criteria. Lateral scapular slide test along with grip strength using handheld dynamometer was performed on the subjects and data analysis was done. Data entered and analysed.

**Results:** There is significant correlation ( $p$ -value=0.195) between scapular dyskinesia and handgrip strength. Correlation Coefficient observed is  $-0.18$  ( $t=-1.3117$ ) which shows that there is correlation between scapular dyskinesia and hand grip strength. Method used is Pearson Correlation.

**Conclusion:** The study concluded that there is significant correlation between scapular dyskinesia and hand grip strength which shows grip strength reduces with scapular dyskinesia.

Keywords: correlation, lateral scapular slide test, scapular dyskinesia, handgrip strength

## **INTRODUCTION**

The overall prevalence of scapular dyskinesia came to be 73%. 61% found to have Scapular dyskinesia on dominant playing side compared to non-dominant side<sup>[1]</sup>

Scapular dyskinesia is seen in 61% of the overhead athletes.<sup>[2]</sup>

Badminton being an overhead sport requires scapular stability and coordinated motion at the shoulder complex.<sup>[1]</sup>

It has been proven that muscle imbalance due to the overuse leading to instability is a major factor leading to scapular dyskinesia (SD).<sup>[2]</sup>

Scapular Dyskinesia is mostly seen in overhead or throwing athletes due to their heavy demand of work on unilateral upper extremity function.<sup>[1]</sup>

During throwing and overhead sports, the shoulder complex joints have an increased stress acting as a bridge that transfers power from lower limbs and trunk to the playing arm.<sup>[3]</sup>

Scapular stabilization is necessary for overhead sports as the demand of the sport is for the scapula to move in a coordinated manner to play well. The subject may be symptomatic or asymptomatic but the altered scapular motion has chances of shoulder related disorders in the future.<sup>[1]</sup>

Badminton is a racquet sport which has a structure characterized by motions of high intensity and short duration. Biomechanics of badminton is studied on the lines of power strokes, forehand overhead jump smash, backhand overhead strokes and forehand serves.<sup>[1]</sup>

The joint contributions made to the shuttlecock velocity during the smash contributed to 53% more usage of shoulder rotations. Higher angular velocities were reached by skilled badminton players.<sup>[1]</sup>

Scapular dyskinesia alters normal scapular role during coupled scapulohumeral motions which is associated with shoulder injury due to functional deficit.<sup>[1]</sup>

Muscle imbalance due to the overuse leading to instability may be alone factor leading to Scapular Dyskinesia.<sup>[1]</sup>

Motor skills can be defined as an activity or task that has a specific purpose or goal to achieve. One of the motor skills in racquet sports is hand grip strength It is reported that controlling the distal muscles appears to be important for achieving the accurate performance of the smash in badminton.<sup>[6]</sup>

Hand grip strength is an indicator of the total body strength. The quality and amount of strength are specifically essential in heavy weight sports.<sup>[6]</sup>

Proximal stability before distal mobility” which simply refers to the fact that we must first have good mobility and strength along our core (mid-line structures along our spine) before we can maximize our extremity function (distal mobility).

The intrinsic muscles of hand along with the thenar and hypothenar muscles are not the only muscles responsible for proper functioning of hand. The proximal muscles like flexors and extensors of wrist and fingers as well as the proximal joints- Elbow (Humeroulnar and Humeroradial), all 3 Radioulnar joints and all joints of shoulder girdle i.e Glenohumeral, Acromioclavicular, Scapulothoracic, and sternoclavicular are responsible for hand functions. <sup>(7)</sup>

The hand being the distal component a good grip might require adequate shoulder stability which will be dependent upon its musculature. <sup>(7)</sup>

A study showed that Trapezius muscles, rhomboids and serratus anterior has a significant correlation to grip strength which supports the purpose of this study for scapular dyskinesia is caused by dysfunction of scapular muscle. <sup>(7)</sup>

Grip strength is affected from many conditions. This suggest that when scapular position is affected Muscle strength is one of these factors. The synergistic action of flexor and extensor muscles and the interplay of muscle groups is an important factor in the strength of resulting grip. <sup>(7)</sup>

This suggest that one must assess for grip strength or when grip strength is affected one of the causes can be scapular position. <sup>(7)</sup>

As there are limited evidences available on these studies which highlight the importance of these two components in relation to each other and hence this study is being carried out.

## **NEED OF STUDY**

Continuous overhead activities which are seen in elite badminton players has been proven to be a major cause of scapular dyskinesia.

Scapular dyskinesia, or abnormal dynamic scapular control, is a condition that is commonly associated with shoulder pathology but is also present in asymptomatic individuals.

It is thought to be more common in overhead athletes due to their reliance on unilateral upper extremity function but the incidence within non overhead athletes is unknown.<sup>[2]</sup>

Hand grip strength plays a vital role in elite badminton players. Handgrip Muscle strength has been defined as the maximum force developed during maximal voluntary contraction under a given set of conditions. Hand grip strength is a general term used by strength athletes, referring to the muscular strength and force that they can generate with their hands.<sup>[3]</sup>

Proximal muscle imbalance may lead to distal affection as well which may affect the hand grip strength.

Therefore, it is important to assess this Co-relation between scapular dyskinesia and hand grip strength to prevent its contribution in any injuries.

So as there are limited evidences available on this, so study focuses on finding out the correlation between scapular dyskinesia and hand grip strength in elite badminton players.

## AIMS AND OBJECTIVES

AIMS: To find correlation of scapular dyskinesia with hand grip strength in elite badminton players.

### OBJECTIVES:

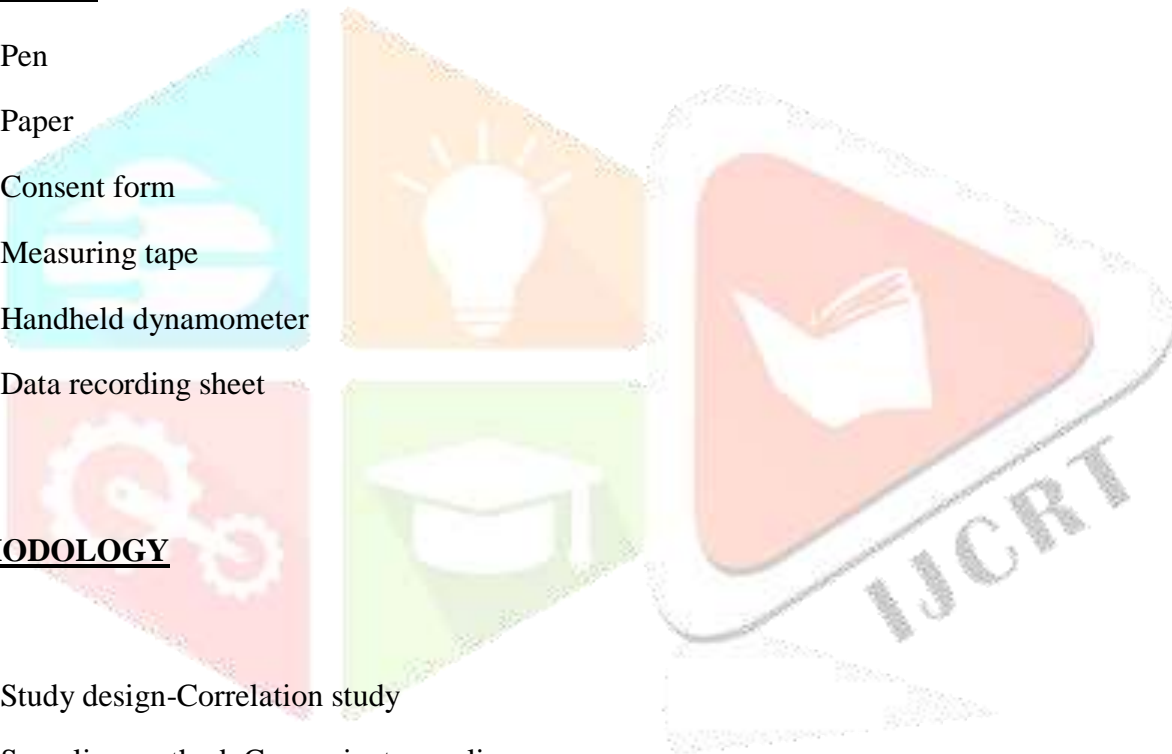
1. To assess scapular dyskinesia in elite badminton players Using lateral scapular slide test.
2. To assess hand grip strength in elite badminton players Using hand held dynamometer.
3. To study correlation between scapular dyskinesia and hand grip strength.

### MATERIALS

- Pen
- Paper
- Consent form
- Measuring tape
- Handheld dynamometer
- Data recording sheet

### METHODOLOGY

- Study design-Correlation study
- Sampling method: Convenient sampling
- Sample size: 58
- Study population: Both male and female
- Study duration: 6 months
- Study setting: Private badminton sports club in and around city



## **INCLUSION CRITERIA**

- Age group 18 -29 years <sup>[1]</sup>
- Gender: Both male and female <sup>[1]</sup>
- Playing badminton since 5 to 10 years <sup>[1]</sup>
- Elite Badminton players having an experience of playing at a competitive level for 5 to 10 years <sup>[1]</sup>
- No. of hours of practice: regular training of 1.5-2 hours per session with 4 sessions per week <sup>[1]</sup>
- Hand Dominance: playing hand Dominance.

## **EXCLUSION CRITERIA**

- Recreational badminton players <sup>[1]</sup>
- Those with previous injuries like Tennis elbow, Golfers elbow, Wrist tendonitis, Wrist strain, Rotator cuff tendinopathy, Rotator cuff injury, Ankle sprains, Jumpers knee<sup>[1]</sup>
- Restricted shoulder joint range of motion are excluded <sup>[1]</sup>

## **PROCEDURE**

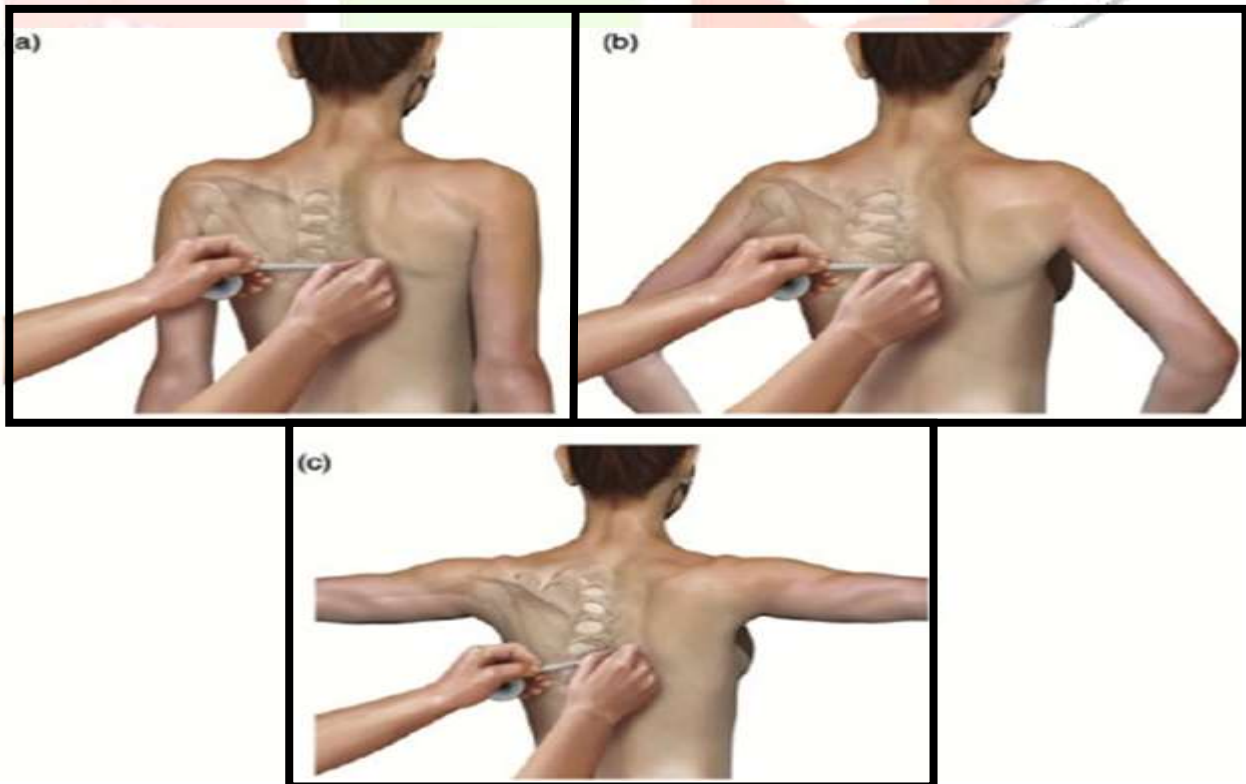
- The project began with the presentation of synopsis to the ethical committee of PES modern college of physiotherapy and ethical clearance was obtained.
- Participants were selected according to the inclusion and exclusion criteria
- The study was explained and consent was taken from the participants.
- Scapular dyskinesia was assessed using Lateral scapular slide test.
- Grip strength was assessed using hand held dynamometer.
- The data was recorded and analysed after the study.



## OUTCOME MEASURE

### 1) Lateral scapular slide test

- Using the ICC, good reliability appears to exist for using the LSST for test positions 1, 2, and 3 for subjects without pathology.<sup>[5]</sup>
- The test is done in 3 positions. With the arm abducted to 0, 45 and 90 degrees in the coronal plane.
- Position 1 involves placing the shoulder in neutral position, with the arms relaxed at the sides.
- Position 2 the humerus is placed in medial rotation and 45 degrees abduction, by positioning the patient's hands around the waist.
- Position 3 the humerus is placed in maximal medial rotation and 90 degrees abduction.
- The test is positive when there is a difference of 1.5 cm when measurements are compared bilaterally.[1][3]
- The examiner measures the distance from the base of the spine of the scapula to the spinous process of T2 or T3 [ most common], from the inferior angle of the scapula to the spinous process of T7 to T9, or from T2 to the superior angle of the scapula.
- The patient is then tested holding two or four other positions: 45' abduction [ hands-on waist, thumbs posteriorly] 90' abduction with medial rotation, 120' abduction, & 150' abduction.
- Devices & Dickoff Hoffman & Kibler stated that in each position, the distance measured should not be very more than 1 cm to 1.5 cm [ 0.5 inches to 0.75 inches] from the original measure.











## Grip Strength Ratings for Males (in kg)

AGE	Weak	Normal	Strong
10-11	< 12.6	12.6-22.4	> 22.4
12-13	< 19.4	19.4-31.2	> 31.2
14-15	< 28.5	28.5-44.3	> 44.3
16-17	< 32.6	32.6-52.4	> 52.4
18-19	< 35.7	35.7-55.5	> 55.5
20-24	< 36.8	36.8-56.6	> 56.6
25-29	< 37.7	37.7-57.5	> 57.5
30-34	< 36.0	36.0-55.8	> 55.8
35-39	< 35.8	35.8-55.6	> 55.6
40-44	< 35.5	35.5-55.3	> 55.3
45-49	< 34.7	34.7-54.5	> 54.5
50-54	< 32.9	32.9-50.7	> 50.7
55-59	< 30.7	30.7-48.5	> 48.5
60-64	< 30.2	30.2-48.0	> 48.0
65-69	< 28.2	28.2-44.0	> 44.0
70-99	< 21.3	21.3-35.1	> 35.1

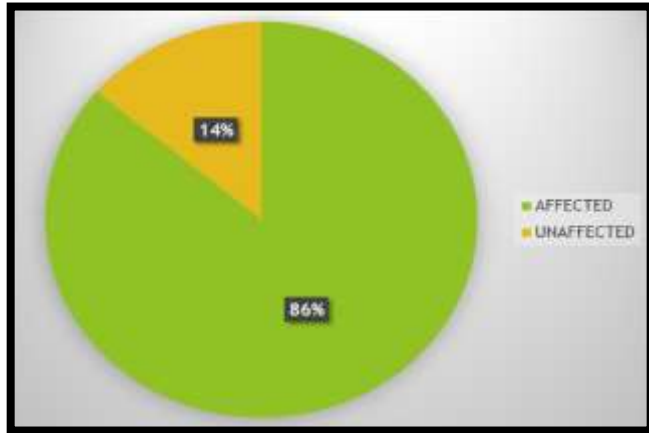
## Grip Strength Ratings for Females (in kg)

AGE	Weak	Normal	Strong
10-11	< 11.8	11.8-21.6	> 21.6
12-13	< 14.6	14.6-24.4	> 24.4
14-15	< 15.5	15.5-27.3	> 27.3
16-17	< 17.2	17.2-29.0	> 29.0
18-19	< 19.2	19.2-31.0	> 31.0
20-24	< 21.5	21.5-35.3	> 35.3
25-29	< 25.6	25.6-41.4	> 41.4
30-34	< 21.5	21.5-35.3	> 35.3
35-39	< 20.3	20.3-34.1	> 34.1
40-44	< 18.9	18.9-32.7	> 32.7
45-49	< 18.6	18.6-32.4	> 32.4
50-54	< 18.1	18.1-31.9	> 31.9
55-59	< 17.7	17.7-31.5	> 31.5
60-64	< 17.2	17.2-31.0	> 31.0
65-69	< 15.4	15.4-27.2	> 27.2
70-99	< 14.7	14.7-24.5	> 24.5

### DATA ANALYSIS

- TOTAL 58 ELITE BADMINTON PLAYERS OF AGE 18-29YEARS WITH SCAPULAR DYSKINESIA WERE SELECTED ACCORDING TO INCLUSION & EXCLUSION CRITERIA AND DATA ANALYSIS WAS DONE.

GRAPH 1-HAND GRIP STRENGTH AFFECTION

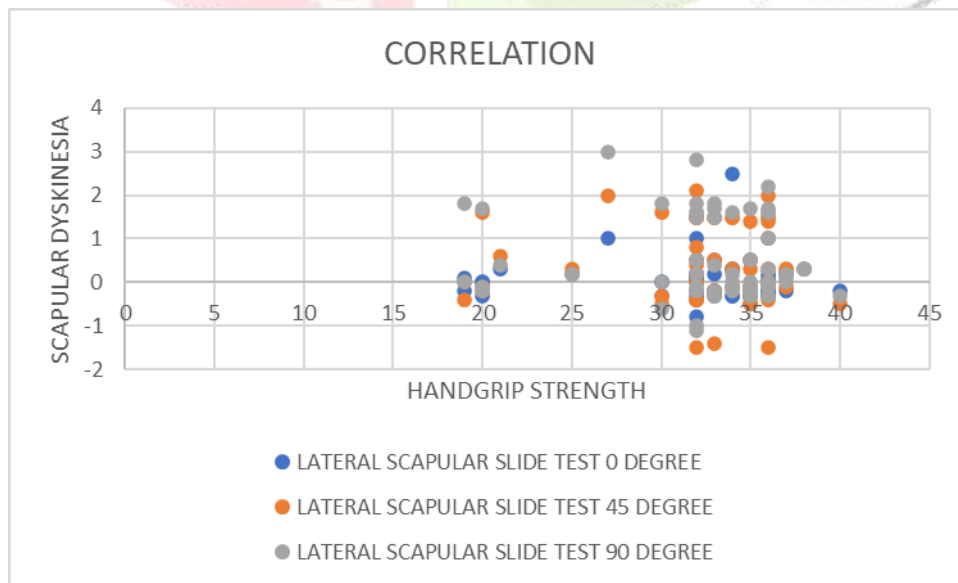


PARAMETER	AFFECTED	UNAFFECTED
HANDGRIP STRENGTH	50	08

This study includes 58 participants in which 50 has affected grip strength and 08 has unaffected grip strength.

**RESULT**

GRAPH NO.1-Correlation between scapular dyskinesia and handgrip strength.



There is significant correlation(p-value=0.195) between scapular dyskinesia and handgrip strength. Correlation Coefficient observed is  $-0.18$  ( $t=-1.3117$ ) which shows that there is correlation between scapular dyskinesia and handgrip strength. Method used is Pearson Correlation.

## DISCUSSION

The Aim of this study was to evaluate the correlation between scapular dyskinesia and hand grip strength in elite badminton players.

The age group of 18 to 29 were taken in this study with those having experience of playing from 5 to 10 years with regular training sessions.

58 badminton players were recruited in this study.

GRAPH 1-Depicts Pearson correlation test was used for this study which showed that hand grip strength is reduced with scapular dyskinesia.

Scapular Dyskinesia was commented upon by performing the LSST bilaterally.

Hand grip strength was commented upon by measuring the hand grip strength using handheld dynamometer.

Scapular dyskinesia basically is termed as alterations in scapular movement or alterations in dynamic scapular control.

Scapular Dyskinesia alters normal scapular role during coupled scapulohumeral motions which is associated with shoulder injury due to functional deficit.[5]

Muscle imbalance due to the overuse leading to instability may be alone factor leading to Scapular Dyskinesia.<sup>(6)</sup>

It has been proven that muscle imbalance due to the overuse leading to instability is a major factor leading to scapular dyskinesia (SD).<sup>(6)</sup>

Scapular Dyskinesia is mostly seen in overhead or throwing athletes due to their heavy demand of work on unilateral upper extremity function.

During throwing and overhead sports, the shoulder complex joints have an increased stress acting as a bridge that transfers power from the lower limbs and trunk to the playing arm .<sup>(4)</sup>

Proximal muscle imbalance may lead to distal affection as well which may affect the hand grip strength.

The hand being the distal component a good grip might require adequate shoulder stability which will be dependent upon its musculature.

A study showed that Trapezius muscles, rhomboids and serratus anterior has a significant correlation to grip strength which supports the purpose of this study for scapular dyskinesia is caused by dysfunction of scapular muscle.

Motor skills can be defined as an activity or task that has a specific purpose or goal to achieve. One of the motor skills in racquet sports is hand grip strength. It is reported that controlling the distal muscles appears to be important for achieving the accurate performance of the smash in badminton.

A study by A Mahale, R Bisen, K Kalra indicates that this study shows that SD is prevalent in elite badminton players on the dominant side where types 1 and 2 were observed amongst which type 1 was the commonest and the number of years of played had an effect on the prevalence of SD.



A study by Matthew B. Burn , MD, Patrick C. McCulloch, MD, David M. Lintner, MD ,Shari R. Liberman, MD, and Joshua D. Harris, MD indicates that this study shows Scapular dyskinesia was found to have a greater reported prevalence (61%) in overhead athletes compared with non-overhead athletes (33%).

A study by A Siddiqa, S Amjad, Y Tabassum - PalArch's which aimed to compare handgrip strength between left-handed and right-handed badminton players which concluded that there was significant difference between the mean score of hand grip strength of the left hand and right hand of badminton players

## **CONCLUSION**

- The study concluded that there is significant correlation between scapular dyskinesia and hand grip strength which shows grip strength reduces with scapular dyskinesia.

## **LIMITATION**

- Types of scapular dyskinesia is not correlated with hand grip strength.

## **FUTURE SCOPE**

- Types of scapular dyskinesia and handgrip strength can be correlated.

## **CLINICAL IMPLICATION**

In order to improve the performance in elite badminton players grip strength and good scapular stability and mobility is crucial.

My study shows a correlation between scapular dyskinesia and hand grip strength, so my study proves that along with grip strengthening scapular component should also be addressed.

So further, the protocol must contain grip strengthening exercises as well as scapular setting exercises in order to achieve better performance in elite badminton players.