A STUDY TO FIND THE EFFECTIVENESS OF THROWER'S TEN EXERCISE PROGRAM ON SHOULDER PERFORMANCE AMONG NOVICE BADMINTON PLAYERS

Dissertation

Submitted to

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In partial fulfillment for the degree of

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(SPORTS PHYSIOTHERAPY)

271650121

CHERRAAN'S COLLEGE OF PHYSIOTHERAPY

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CERTIFICATE

The work embodied in the thesis entitled **''A STUDY TO FIND THE EFFECTIVENESSOF THROWER'S TEN EXERCISE PROGRAM ON SHOULDER PERFORMANCE AMONG NOVICE BADMINTON PLAYERS''** submitted to the **Tamilnadu Dr. MGRMedical University, Chennai** in the partial fulfillment for the degree **of Master of physiotherapy (sports physiotherapy)**, was carried out by candidate bearing register number of 271650121 at Cherraan's college of physiotherapy, Coimbatore under my supervision. This is an original work done by her and has not been submitted in part or full for any other degree/diploma at this or any other university/institution. The thesis is fit to be considered for evaluation for award of the degree of Master of Physiotherapy.

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Signature of Supervisor
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Date:…….

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Internal Examiner

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External Examiner

Project work evaluated on…….

DECLARATION

I hereby declare and present my project work entitled "**A STUDY TO FIND THE EFFECTIVENESS OF THROWER'S TEN EXERCISE PROGRAM ON SHOULDER PERFORMANCEAMONG NOVICE BADMINTON PLAYERS**''The outcome of the original research work undertaken and carried out by me, under the guidance of Professor. **Mr.Chinnachamy, MPT (Sports),** Cherraan's college of physiotherapy, Coimbatore.

I also declare that the material of this project work has not formed in anyway the basis for the award of any other degree previously from the Tamilnadu Dr. MGR Medical University.

…….. ……

Signature of Supervisor **Signature of Student**

(Mr.A.Chinnachamy MPT (Sports) **M.Amalan Antony Godwin**

Date:

Place

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ABSTRACT

A STUDY TO FIND THE EFFECTIVENESS OF THROWER'S TEN EXERCISE PROGRAM ON SHOULDER PERFORMANCE AMONG NOVICE BADMINTON PLAYERS

OBJECTIVES:

To find out the effectiveness of thrower's ten exercise program in throwing distance among badminton players , to find out the effectiveness of thrower's ten exercise program in throwing accuracy among badminton players

BACKGROUND:

Badminton is a sport that requires a lot of overhead motion.with shoulder in abduction/external rotation.Analysing the badminton smash shot biomechanically has revealed that during this phase there is a powerful inward rotation of the arm,followed by inward rotation of forearm and lastly a flexion of the hand.

METHOD:

Thrower's ten program incorporates throwing motion specific exercises and movement patterns performed in a discrete series by using variables of Throwing distance & Throwing accuracy and administered by functional throwing performance index , medicine ball throw test & Thrower's ten exercise program.

CONCLUSION:

The study was conducted to investigate the effectiveness of throwers ten exercise program and throwing accuracy and throwing distance among badminton players

CHAPTER I

INTRODUCTION

Badmiton is a sport that requires a lot of overhead motion, with shoulder in abduction / external rotation. Analysing the badminton smash shot biomechanically has revealed that during this phase there is a powerful inward rotation of the arm, followed by inward rotation of forearm and lastly a flexion of the hand. The impact with the shuttle occurs high and slightly in front of the body **(Tang 1995).**

The overhead motion such as throwing, serving in tennis, javelin and badminton etc are highly skilled movements. Such movements require flexibility, muscular strength, co-ordination, synchronicity and neuromuscular control of arm **(Keith 2000)**

Shoulder injuries amongest badminton players are extremely common. Badminton places a high and very sport specific demand to the sporting shoulder. In mechanical terms the shoulder has to deliver highly repetitive arm actions, performed at high speed and high force. This is also combined with reaching for the shuttle which may place the arm, shoulder girdle and trunk at extreme ranges of movement which may place the shoulder at increased risk of injury **(Jorgensen 1987).**

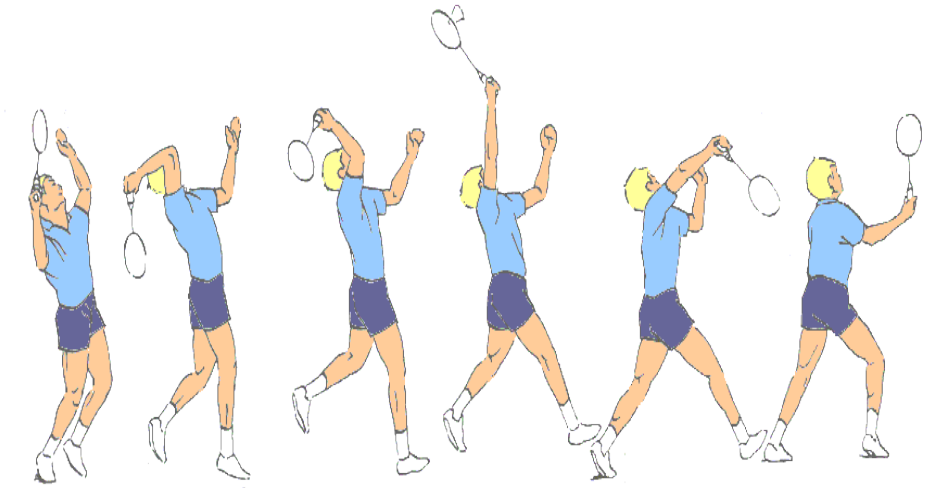
Musculoskeletal injuries are common among badminton players . Certain studies reported shoulder injuries as the primary upper limb injury in Malasian badminton players. Rotator cuff tendinopathy, Biceps tendinopathy,Musclestrains of deltoid,trapezius and triceps, Acromioclavicular joint strains are the commenest shoulder injuries to the badminton players **(Sharif 2009).**

Muscle power is considered as an important parameter responsible for successful rapid movements performed with maximum effort, such as throwing. The Thrower's ten exercise programe is designed to exercise the major muscles necessary foe throwing. All exercises included are specific to the thrower and are designed to improve strength,power and endurance of the musculature of the shoulder complex (**Newton 1995).**

Exercises used in Thrower's ten programe are most effective in activating the muscle important to the throwing motion and may be beneficial for athlete's pre-throwing warm up routine **(Myers et-al 2005).**

Overhead throwing motion is a high velocity, extremely stressful athletic movement. Its repetitive nature places tremendous demands on the entire body, frequently resulting in injury to the throwing shoulder. Such injuries whether managed non-operatively or surgically, require a multiphased approach begining with exercises to restore muscle strength and proprioception and advancing to more demanding exercises to improve power,endurance and dynamic control. Thrower's ten programe incorporates throwing motion specific exercises and movement patterns performed in a discrete series, utilizing principles of co-activation, high level neuromuscular control, dynamic stabilization, muscular facilitation, strength, endurance and co-ordination which all serve to restore muscle balance and symmetry in overhead athletes **(Wilk 2008).**

Figure 1: over head performance in badminton players



1.1 Statement of the study :

A study to find out the effectiveness of thrower's ten exercise programe in shoulder performance among badminton players.

1.2 Objectives of the study :

To find out the effectiveness of thrower's ten exercise programe in throwing distance among badminton players.

To find out the effectiveness of thrower's ten exercise programe in throwing accuracy among badminton players.

1.3 Need of the study :

This study was aimed to introduce thrower's ten exercise programe in shoulder performance among badminton players. The other motive was to popularize this technique among physiotherapy population.

1.4 Hypothesis :

It is hypothesised that there may be significant difference in throwing accuracy followed by thrower's ten exercise programe among badminton players.

It is hypothesised that there may be significant difference in throwing distance followed by thrower's ten exercise programe among badminton players.

It is hypothesised that there may not be significant difference in throwing distance and throwing accuracy followed by thrower's ten exercise programe among badminton players.

1.5 Operational definition :

Thrower's ten exercise programe

The thrower's ten exercise programe has been designed to exercise the major muscles necessary to return to throwing. The programe's goal is to be an organised and precise exercise programe specific to the thrower to improve strength, power, and endurance of the shoulder musculature.**(Walter 2003).**

Functional throwing performance index

It is used to assess the functional ability of the shoulder joint. The object of the test was to throw a rubber playground ball into the target as many times as possible over three 30-second trials. Before testing the subjects performed 8 throws as warm up. FTPI was used to measure throwing accuracy.**(Davies 2009).**

Medicine ball throw test

Medicine ball throw test was used to assess upper-body explosive power. Many athletic skills also involve generating or transfering explosive power through the upper extremities and trunk musculature. **(Barry 2001).**

CHAPTER II

REVIEW OF LITERATURE

Section A-Studies on throwers ten exercise programe among over head atheletes.

Section B-Studies on functional throwing performance index.

Section C-Studies on medicine ball throw test.

Section A-Studies on throwers ten exercise programe among over head atheletes:

Natalie(2015) conducted a comparitive study on effect of a sustained muscle contraction resistive training(thrower's ten programe) to a more traditional exercise training protocol to determine if increases in shoulder muscular strength and endurance in an otherwise healthy population. Fifty healthy participants were enrolled in this study, of which 25 were randomized into the traditional training group and 25 were randomized to the thrower's ten group. The results showed traditional and thrower's ten groups both significantly improved torque and angular impulse on the both the dominant and non-dominant arms by 10-14%.

Hardik(2014) conducted a study on efficacy of scapular retractor strength training Vs thrower's ten exercise programe in recreational over head athletes. In this study 25 over head recreational athletes aged between 20 to 26 years were selected through simple random sampling. The subjects selected in group A given scapular retractor strengthening and group B were given thrower's ten exercise programe. The results revealed a significant improvement in joint position error, throwing accuracy, throwing distance with group A and group B respectively.

Donald(2013) conducted a study on effects of overload training on velocity and accuracy of throwing. 21 male baseball players at the University of Maryland were randomly placed in three groups of equal size. Two groups supplemented a baseball throwing program by specific overload training. One group threw weighted baseball while the other thrower's ten program. Training was carried out for 6 week period. Both training groups experienced significant with in group increases in throwing velocity as a result of training.

Escamilla(2012) conducted a study on comparison of three baseball-specific 6 week training programes on throwing velocity in baseball players. The three training groups were selected are thrower's ten exercise programe, keiser pneumatic exercises and plyometric exercises. Throwing velocity is assessed and the values shows significant increase in throwing velocity values(1.7 % in thrower's ten exercise programe).

Donald(2007) Conducted a study on the effect of thrower's ten exercise programe on shoulder mobility in over head athletes. The study hypothesised that thrower's ten exercise programe result in greater improvement of mobility in FMS (functional movement screening). The study concluded that there is significant amount of evidence supporting FMS tests and thrower's 10 regime as effective at improving throwing performance in overhead atheletes. Many athletic trainers and physical therapists have incorporated throw 10 in their rehabilitation treatment with positive results.

Myers(2005) conducted a study to find out the effectiveness of 12 rubber tubing resistance exercises commenly used by throwers in activating the shoulder muscle important for throwing. The result suggested that these exercise are most effective in activating the muscle important for throwing motion and may be beneficial for throwers during their pre-throwing warmup routine.

Section B- Studies related on functional throwing performance index:

Mohondro(2014) conducted a study on six week functional training programe on performance outcomes in softball players. The study was a 2x2 factorial design with group(experiental and control) and time(pre and post).21 healthy subjects were selected and distributed into two groups. Throwing accuracy was measured using functional throwing performance index(FTPI). The throwing accuracy testing showed a significant group interaction($p=0.033$). There was a large effect size between groups in favour of the experimental group.

Patel(2014) conducted a study on open kinematic chain exercises for sick scapula in competitive asymptomatic over head athletes for 3 weeks. 20 participants were received open kinematic chain exercise protocol for 4 sessions per week for 3 weeks. Functional throwing performance index were assessed. Results shows mean FTPI pre intervention was 44.04+- 9.71, where as intervention after was 51.19+- 9.42. the p value by unpaired t test was significant($p<0.05$).

Wassinger(2007) conducted a study on proprioception and throwing accuracy in the dominant shoulder after cryotherapy.22 physically physically active college students were selected. The functional ability of the shoulder was assessed by FTPI. The subject stood 4.57 m from a target, a 30.48- X 30.48- cm square on the wall at a height of 1.22 m from the floor. The object of the test was to throw a rubber ball as many times as possible with in 30-second trials. FTPI was calculated as the number of throws with in the target divided by number of throws. As a pilot study, he performed a reliability analysis for the tester measuring the reliability of the FTPI. Good reliability was shown for FTPI (ICC [3,1]=.81).

Padua(2004) conducted a study on the effect of select shoulder exercise on strength, active angle reproduction, single-arm balance, and functional throwing performance in healthy individuals. 57 physically active college-age men and women volunteered participation. The functional throwing performance index served as an indicator of subjects functional performance levels. The FTPI demonstrated good intrasession reliability, which is in agreement with previous research reporting thr FTPI to be reliable in healthy subjects. The results shows there was a significant group-by-test interaction($p=0.15$).

Davies(1993) conducted a study on neuromuscular testing and rehabilitation of shoulder complex. He stated that FTPI is a very practical, low cost, easily administrated, space-efficient test. It is reliable and provides a general indication of one's functional performance capabilities following an injury or surgery. The reliability study done by Quincy et-al performed an FTPI reliability study which demonstrated that the test-retest reliability of 25 male subjects performing the FTPI was .91.

Section C- Studies on medicine ball throw test:

Mallory (2014) conducted a study on reliability and validity of medicine ball throw tests as clinical measures of core strength. A total of 20 healthy physically active individuals participated. Average peak torque during strength testing and the average distance of medicine ball throw were analyzed. The interclass correlations (ICC) were calculated to determine the reliability. Significant ICC's were observed (ICC=0.835; $p<0.001$). The results illustrate that medicine ball throw tests have excellent reliability.

Joanne (2010) conducted a study on the concurrent validity of the overhead medicine ball throw as a test of explosive power in adolescents. 47 adolescents (22 boys, 25 girls) performed the with a 3kg medicine ball. Power output was determined using a force platform and linear position transducer. These results suggest that the throw distance was significantly improved ($p=0.01$). These results suggest the concurrent validity of overhead medicine ball throw.

Davis (2008) conducted a study to establish validity and reliability of medicine ball throw test. 105 subjects were selected. For the medicine ball throw each subjects sat on the floor before throwing the ball forward like a chest pass three times. The estimates over the acceptable level of 0.80. The reliability scores were positively related with height and weight. In conclusion, the medicine ball throw test seems to be a valid and reliable measure of upper body strength.

Stockbrugger (2001) conducted a study on validity and reliability of a medicine ball explosive power test. 20 competitive sand volleyball players performed a medicine ball throw and a standard counter movement vertical jump. Validity was assessed using the best score for both the throw and the jump, and reliability was assessed using the best score from each session. The test-retest reliability for medicine ball throw was 0.993 ($p<0.01$). These findings suggest that the medicine ball throw test is a valid and reliable test for assessing explosive power.

Haennel (2001) conducted a study to evaluate the reliability and validity of medicine ball explosive power test. 20 competitive volleyball players(10 male,10 female) performed a medicine ball throw and a standard countermovement vertical jump. The results shows there was a strong correlation between distances of the

medicine ball throw and the power index for the vertical jump. The test-retest reliability for medicine ball throw was 0.996($p<0.01$). The results suggest the medicine ball throw test is a valid and reliable test.

CHAPTER III

MATERIALS AND METHODOLOGY

3.1 Study setting:

The study was done in out patient department, Cherran's College of Physiotherapy, Coimbatore.

3.2 Selection of subjects:

20 Subjects were randomly selected who fulfilled the inclusion criteria.

3.3 Variables:

3.3.1 Dependent variables

- Throwing distance
- Throwing accuracy

3.3.2 Independent variables

- Thrower's ten exercise program

3.4 Measurement tools:

Variables	Tools
Throwing distance	Medicine ball throw test
Throwing accuracy	Functional throwing performance index

3.5 Study design:

The study design used was pre-test and post-test experimental design.

3.6 Inclusion criteria:

- Males
- 15-25 years
- Novice badminton players
- Subjects being engaged in sport that required athletes arm to be above shoulder height on a repetitive basis during throwing.
- Duration of sporting activities for 2 year with at least 6 months a year and a frequency of minimum 40 minutes thrice a week.

3.7 Exclusion criteria:

- History of upper limb fracture with in past two months
- Shoulder or neck musculoskeletal surgery in past 6 months
- Rotator cuff tears
- Cervical spine pathology
- Spinal deformity
- Glenohumeral subluxation
- Glenohumeral dislocation

3.8 Orientation to the subjects:

Before collection of data, all the subjects were explained about the purpose of the study. The investigators have given a detail orientation to the various test procedures, such as FTPI to measure throwing accuracy and medicine ball throw test to measure throwing distance. The concern and full cooperation of each participants was sought after complete explanation of the condition and demonstration of the procedures involved in the study.

3.9 Materials used:

- Data collection sheet
- Evaluation chart
- Thera band
- Dumbbell
- Medicine ball
- Measuring tape
- Rubber ball
- Client concern chart

3.10 Test administration:

Functional Throwing Performance Index (FTPI)

Functional ability of the shoulder joint was assessed using FTPI. The subject stood 4.57 m from a target, a 30.48 x 30.48 cm square on a wall at a height of 1.22m from the floor. The object of the test was to throw a rubber playground ball into the target as many times as possible over 30 second trials. Before testing, subjects performed 8 throws as a warm-up. Test began immediately after the warm up and consisted of the subject throwing the ball into the target, catching the rebound of the wall, and repeating as many times as possible within 30 seconds. The FTPI was calculated as the number throws within the target divided by total number of balls thrown. To avoid any discrepancies in judgements, the same examiner determined the accuracy of all throws.

Medicine ball throw test

Medicine ball throw test was used to assess upper-body explosive power. Many athletic skills also involve generating or transfering explosive power through the upper extremities and trunk musculature. Throwing distance was measured by using the medicine ball throw test. In this test, participants were instructed to throw a medicine ball as far as they could, in a kneeling position on the floor, holding the ball overhead with the dominant hand. The medicine ball used had a mass of 2 kg and diameter 56 cm. each subjects performed five trials with one minute rest between trials. The distance in meter to which the subject threw the medicine ball was measured with a measuring tape. The best of five trials was taken and used for further analysis.

3.11 Procedure:

Thrower's ten exercise program

The thrower's ten exercise program is designed to exercise the major muscles necessary for throwing.The program's goal is to be an organized and concise exercise program.All exercises include are specific to the thrower and are designed to improve strength, power and endurance of the shoulder complex musculature.

Figure 2: diagonal pattern D2 extension

Figure 3: diagonal pattern D2 flexion

Figure 4: external rotation at 0 degree abduction

Figure 5: internal rotation at 0 degree abduction

3.12 Collection of data

10 subjects were performed thrower's ten exercise program thrice a week for four weeks. The training volume ranges from 8 to 10 repetitions per set including 3 sets of all exercises per session followed by a 30 second rest period in between set of exercises. Before and after the intervention, throwing accuracy was evaluated by FTPI and throwing distance was evaluated by medicine ball throw test and recorded.

3.13 Statistical technique

The collected data were analyzed by paired 't' test to find out significant difference between pre-test and post-test values.

CHAPTER IV

DATA ANALYSIS AND RESULT

4.1Data analysis

This chapter deals with the systemic presentation of the analyzed data followed by the interpretation of the data.

a) Paired 't' test

$$\bar{d} = \frac{\sum d}{n}$$

$$S = \sqrt{\frac{\sum d2 - \frac{(\sum d)2}{n}}{n-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d - Difference between pre test and post test values

$\bar{d} = \frac{\sum d}{n}$ Mean difference between pre test and post test values

n - Total number of subjects

s - Standard deviation

Table 1

The table shows mean value, mean difference, standard deviation and paired 't' value between pre-test and post-test scores of throwing accuracy among badminton players.

Variable	Mean	Mean Difference	Standard deviation	Paired 't' value
Pre-test	0.46			
		0.13	0.033	12.10*
Post-test	0.59			

*0.005 is the level of significant

The calculated paired 't' value is 12.10 and 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than 't' table value. The above value shows that there is significant difference in throwing accuracy following Thrower's ten exercise program among badminton players.

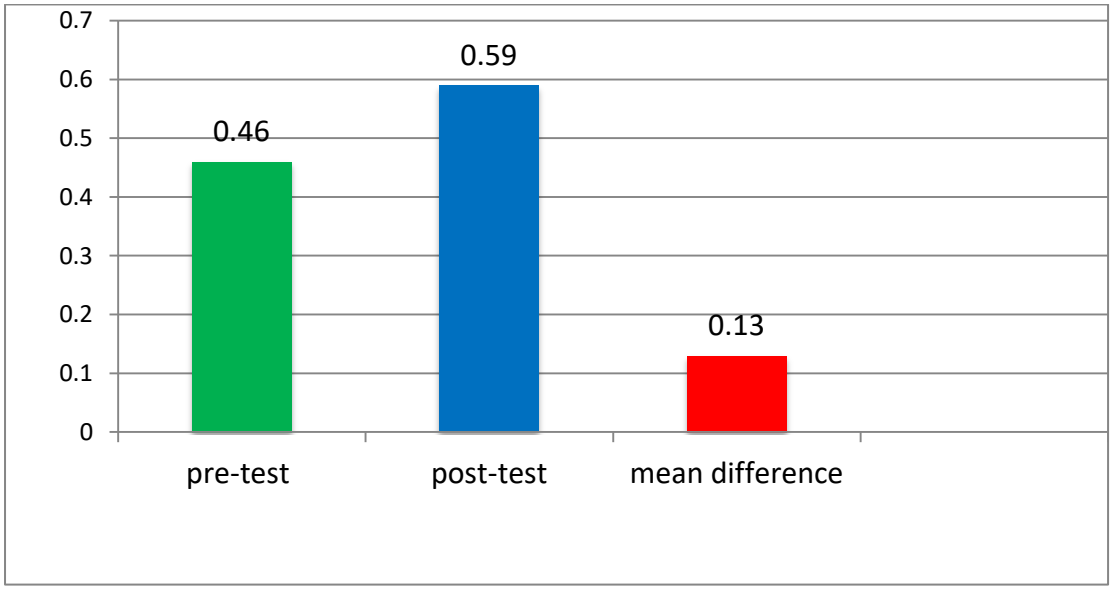


Figure 6:shows the graphical representation of pre-test and post-test mean values of throwing accuracy.

Table 2

The table shows mean value, mean difference, standard deviation and paired 't' value between pre and post test scores of throwing distance among badminton players.

variable	mean	Mean difference	Standard deviation	Paired 't'value
Pre test	6.42	0.56	0.14	12.45*
post test	6.98			

*0.005 is the level of significant

For the throwing distance the calculated paired 't' value is 12.45 and 't' table value is 3.250 at 0.005 level. Since the calculated t' value is more than 't' table value. The above value shows that there is significant difference in throwing distance following thrower's ten exercise program among badminton players.

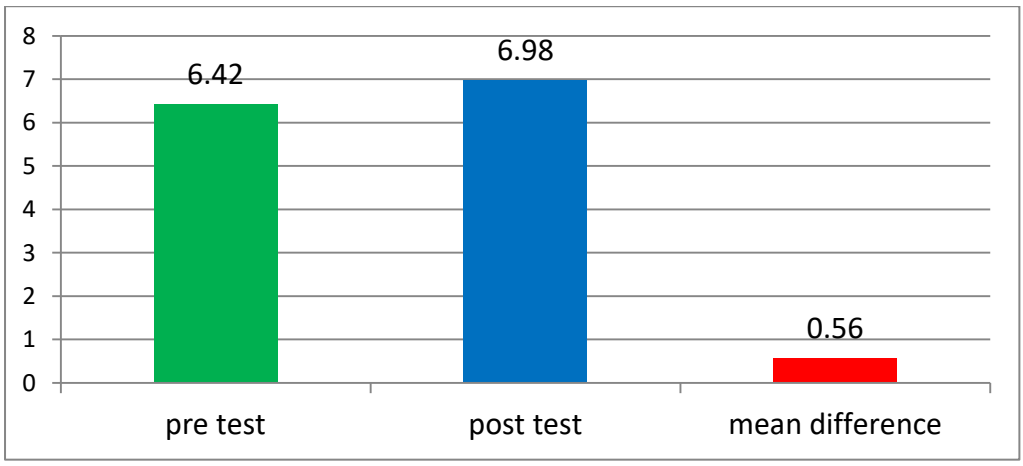


Figure 7: shows graphical representation of pre and post mean values of throwing distance among badminton players.

4.2 Results

Ten no-vice badminton players were taken for the study. The subjects were received thrower's ten exercise program. The throwing accuracy and throwing distance were measured before and after the treatment.

Analysis of dependant variable throwing accuracy, the calculated paired 't' value is 12.10 and the 't' table value is 3.250. Since the calculated 't' value is more than 't' table value, there is significant difference in throwing accuracy following thrower's ten exercise program among badminton players.

Analysis of dependent variable throwing distance, the calculated paired 't' value is 12.45 and the paired 't' table value is 3.250. Hence the calculated 't' value is greater than 't' table value. There is significant difference in throwing distance following thrower's ten exercise program among badminton players.

CHAPTER V

DISCUSSION

The thrower's ten exercise programe has been designed to exercise the major muscles necessary to return to throwing. The programe's goal is to be an organised and precise exercise programe specific to the thrower to improve strength, power, and endurance of the shoulder musculature.The aim of the study was to assess the effectiveness of thrower's ten exercise program in components of shoulder performance such as throwing accuracy and throwing distance among badminton players. 10 badminton players selected for the study and received thrower's ten exercise program.

The result of the present study shows that there is significant difference in throwing accuracy and throwing distance. Newton (1995) stated that muscle power is considered as an important parameter responsible foe successful rapid movements performed with maximum effort, such as throwing. All exercises included are specific to the thrower and are designed to improve strength,power and endurance of the musculature of the shoulder complex. Kevin E Wilk(2008) stated that thrower's ten programe incorporates throwing motion specific exercises and movement patterns performed in a discrete series, utilizing principles of co-activation, high level neuromuscular control, dynamic stabilization, muscular facilitation, strength, endurance, and co-ordination which all serve to restore muscle balance and symmetry in overhead athletes.

CHAPTER VI

CONCLUSION

The study was conducted to investigate the effectiveness of thrower's ten exercise program on throwing accuracy and throwing distance among badminton players.

10 no-vice badminton players were included in the study and received thrower's ten exercise programs for six weeks. The throwing accuracy was measured before and after by Functional Throwing Performance Index (FTPI) and throwing distance was measured before and after by Medicine Ball Throw Test.

From the statistical results, it can be concluded that there is significant difference in throwing accuracy and throwing distance among 10 badminton players.

6.1 Limitations

- Sample size of subjects was small
- Lack of investigator findings
- Follow up was not done, so this study cannot comment on long term result
- The study was done for short period

6.2 Suggestions

- A large sample size in highly suggested to make the study more reliable
- Research can be conducted for various age groups
- Duration of the study should be increased

CHAPTER VII

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CHAPTER VIII

ANNEXURES

ANNEXURE I

PHYSIOTHERAPY ASSESSMENT CHART

Subjective assessment

Name :

Age :

Address :

Occupation :

Chief complaints :

Medical History :

Associated problems :

Pain assessment:

Site of pain :

Type of pain :

Duration of pain :

Nature of pain :

Relieving factors :

Other if any :

Objective assessment:

Built :

Posture :

Skin changes :

Bony and soft tissue counters :

Attitude of limb :

Muscle wasting :

Skin changes :

Edema :

Gait :

Deformity :

On palpation

Tenderness :

Swelling :

Muscle spasm :

Warmth :

Other if any :

Shoulder range of motion :

Moment	AROM	PROM
Flexion		
Extension		
Internal rotation		
External rotation		
Abduction		
Adduction		

Diagnosis :

Functional throwing performance index

Medicine ball throw test

ANNEXURE II

THROWER'S TEN EXERCISE PROGRAM

I.(a) Diagonal extension (D2)

Inolved hand will grip theraband overhead and out to the side. Pull the theraband done across your body to the opposite side of leg. During the motion lead with thumb.

(b) Diagonal flexion (D2)

Gripping in the hand of involved arm, begin with the arm out from side 45 degree and palm facing backward. After turning palm forward, proceed to flex elbow and bring arm up and over involved shoulder. Turn palm down and reverse to take arm to starting position.

II.(a) External rotation at 0 degree abduction

Stand with the involved elbow fixed at the side, elbow at 90 degree and involved arm across front of body. Grip the theraband while other end is fixed. Pull out the arm, keeping elbow at side. Return slowly and controlled.

(b) Internal rotation at 0 degree abduction

Standing with elbow at side fixed at 90 degree and shoulder rotated out. Grip Thera band while other end is fixed. Pull arm across body keeping elbow at side. Return slowly and controlled.

(c) External rotation at 90 degree abduction

Stand with the shoulder abducted 90 degree. Grip Thera band while other end is fixed straight ahead, slightly lower than the shoulder. Keeping shoulder abducted, rotate shoulder back keeping elbow at 90 degree. Return hand to start position.

(d) Internal rotation at 90 degree abduction

Stand with shoulder abducted to 90 degree, externally rotated 90 degree and elbow bend to 90 degree. Keeping shoulder abducted, rotate shoulder forward, keeping elbow bent at 90 degree. Return hand to start position.

III. Shoulder abduction to 90 degree

Stand with arm at side, elbow straight, and palm against side. Raise arm to the side, palm down, until arm reaches 90 degree (shoulder level). Hold 2 seconds and lower slowly.

IV. Scaption with external rotation

Stand with elbow straight and thumb up. Raise arm to shoulder level at 30 degree angle in front of body. Do not go above shoulder height. Hold 2 seconds and lower slowly.

V. (a) Prone horizontal abduction- neutral

Lie on the table, face down, with involved arm hanging straight to floor, palm facing down. Raise arm to the side, parallel to the floor. Hold two seconds and slowly lower.

(b) Prone horizontal abduction (full ER, 100 degree abduction)

Lie on table, face down, with involved arm hanging straight to the floor, thumb rotated up. Raise arm up to the side slightly in front of shoulder parallel to the floor. Hold two seconds, lower slowly.

VI. Press-ups

Seated on the chair or on a table, place both hands firmly on the sides of the chair or table, palm down and fingers pointed outward. Hands should be placed equal with shoulders. Slowly push downward through the hands to elevate your body. Hold for two seconds and lower the body slowly.

VII. Prone rowing

Lying on stomach with your involved arm hanging over the side of the table, dumbbell in hand and elbow straight. Slowly raise arm, bending elbow, and bring dumbbell as high as possible. Hold for two seconds and lower slowly.

VIII. Push ups

Start in the down position with the arms in a comfortable position. Place hands shoulder width apart. Push up as high as possible, rolling shoulders forward after elbows are straight. Start with a push-up on the wall, progress to table top and gradually progress to the floor as tolerable.

IX.(a) Elbow flexion

Standing with the arm against side and palm facing inward, bend elbow upward turning palm up as you progress. Hold two seconds and lower slowly.

(b) Elbow extension

Raise involved arm overhead. Provide support at the elbow from uninvolved hand. Straighten arm overhead. Hold two seconds and lower slowly.

X. (a) Wrist flexion

Supporting the forearm and with palm facing up, lower the weight in hand as far as possible and then curl up and far as possible. Hold for two seconds and return to start.

(b) Wrist extension

Supporting the forearm and with palm facing down, raise the weight in hand as far as possible. Hold two seconds and lower slowly.

ANNEXURES III

TABLE: 3

Pre test and post test values of Functional Throwing Performance Index (FTPI) among badminton players.

SL. No	Pre-test	Post-test
1	0.42	0.56
2	0.38	0.50
3	0.56	0.72
4	0.30	0.46
5	0.53	0.69
6	0.64	0.78
7	0.46	0.59
8	0.38	0.47
9	0.56	0.65
10	0.46	0.56
11	0.37	0.43
12	0.42	0.54
13	0.39	0.51
14	0.42	0.56
15	0.55	0.67
16	0.51	0.63
17	0.39	0.47
18	0.49	0.63
19	0.33	0.45
20	0.61	0.74

ANNEXURE IV

TABLE 4

Pre test and post test values of medicine ball throw test among badminton players.

SL.NO	Pre-test	Post-test
1	5.7	6.1
2	6.3	6.8
3	6.6	7.2
4	6.9	7.3
5	7.6	8.1
6	6.1	6.8
7	5.4	6.2
8	5.6	5.8
9	7.7	8.2
10	6.9	7.3
11	7.2	7.9
12	6.2	6.8
13	5.3	5.8
14	4.3	4.9
15	7.1	7.7
16	6.3	6.6
17	5.5	5.9
18	6.5	6.9
19	4.8	5.4
20	5.1	5.5

ANNEXURE-V

PATIENT CONSENT FORM

I……Voluntarily consent to participate in the research named on "**A STUDY TO FIND OUT THE EFFECTIVENESS OF THROWER'S TEN EXERCISE PROGRAME ON SHOULDER PERFORMANCE AMONG NOVICE BADMINTON PLAYERS ".**The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient **Signature of researcher**

Signature of witness

Place:

Date: