

## **EFFECT OF MODERATE LOAD TRAINING ON DEVELOPMENT OF THROWING VELOCITY AMONG MALE HANDBALL PLAYERS**

**R.Gowtham<sup>1</sup> S.F.Mariyam Farzana<sup>2</sup>**

<sup>1</sup>SRM College of Physiotherapy, Faculty of Medicine and Health Sciences, SRM Institute of Science and Technology, SRM Nagar, Kattankulathur-603 203, Kanchipuram, Chennai, Tamil Nadu, India.

, <sup>2</sup> ASSISTANT PROFESSOR, SRM College of Physiotherapy, Faculty of Medicine and Health Sciences, SRM Institute of Science and Technology, SRM Nagar, Kattankulathur-603 203, Kanchipuram, Chennai, Tamil Nadu, India.

Corresponding author

**S.F.Mariyam Farzana**

Assistant professor,

Mail id- [mariyamf@srmist.edu.in](mailto:mariyamf@srmist.edu.in)

### **ABSTRACT**

**BACKGROUND:** Handball is one of the Olympic Games demanding increased physical fitness of its players moderate load training is introduced to these players in order to increase efficiency performance especially throwing velocity. **OBJECTIVE:** This study was done to find out the effects of moderate load training in the development of throwing velocity among handball players. **METHOD:** This study is of the quasi experimental design and pre test&post test type and was trained with moderate load. **PROCEDURE:** The selected subjects were trained with 55%-75% load (moderate load) with Bench press for duration of 6 weeks the improvement in throwing velocity is to be noted. **OUTCOME MEASURES:** Functional throwing velocity index. **RESULTS:** The results of the study reveal that there is an improvement.

**KEYWORDS:** Handball, Moderate Load training, Bench press, throwing velocity

### **INTRODUCTION**

Handball is one of the most famous sports in Olympic Games played worldwide by both Men and Women. The sport involves a great deal of physical activities such as running, jumping, sprinting, throwing, hitting, blocking and pushing. Studies suggest that the players

have well developed aerobic and anaerobic fitness of their body. The main fundamental skill of this great sport is throwing. Throwing action requires two basic factors to influence the efficiency of shots such as Accuracy and throwing velocity. The defenders will have less time to save a goal when the speed of throwing the ball is faster than the wind. Researchers have determined that the velocity of the throwing factor is improved by improving the training technique, timing of movements, strength and power of the both upper and lower limbs.

Thus throwing performance is the key skill to the sport. The handball game involves numerous dynamic strategies. It includes stops, change in direction, throws, passes, jumps, and body tackle. The prime movements are observed in walking and standing. Sprint is seen only for smaller duration, i.e. 1-2% of the total playing time. In a handball team, the defense players have to move quickly between the 9 meters line in 6 minute time. The players are required to catch and pass the ball. A good throwing position needs to be enabled in order to achieve a powerful throw. During these movements, defensive and offensive players have to accelerate and decelerate as well as change their directions very quickly.

The significant time between offense and defense depends on specific agility<sup>5</sup>. A study suggests that maximal trunk and shoulder rotation velocity and their timing has a significant influence on throwing velocity<sup>3,4</sup>. Throwing performance is strongly related to an optimum throwing technique and less to trunk and throwing power. The overall performance of the team is determined by the individual performance of each player. Previous studies have concluded that elite male players have better specific agility when performing in offense and better throwing velocity when playing in defense compared to sub elite and non-elite players<sup>5</sup>. General Endurance and sprint training is to have general body fitness among handball players. The strength training program for handball players is important to develop strength. High ball velocity is essential due to higher performance of the goalkeeper.

Functional Throwing Performance Test Index (FTPI) is widely used to assess the throwing velocity of the players. Shoulder joint plays a major role in playing. Test trials performed on the players will improve the accuracy and power strength of the handball throw. In few

studies it is found that FTPI is more reliable in men than in women. The test target will be much smaller than the target goal in a game. Which sometimes leads to a disadvantage in the test trials. Most of the studies show that the throwing velocity is increased with progressive general weight training?

General training to the players can produce the greatest change in the muscles cross – sectional which typically enhances 70% of 1 repetition maximum (1RM). The use of moderate load will allow the player to attain a greater velocities and accelerations which leads to the potential transfer activities of a handball.

The strength of throwing velocity is increased with concentric exercises such as concentric Bench-press exercises. The exercise helps to improve the strength and power of the throwing velocity in the players with regular progressive training. Thus the velocity of the throwing is enhanced for the players to perform better in their sport. The main objective of the study was to measure the effect of moderate load training on development of throwing velocity among male hand ball players

## **MATERIALS AND METHOD**

It is a Quazi experimental study conducted in the year 2018 at SRM Institute of Science and Technology. 14 male handball players of age 18 -22 years ,both gender with a minimum 2 years of experience were recruited for the study. Participants with recent injuries of both upper and lower limb, joint instability, cardiac problems, smokers were excluded for the study. The subjects were selected based on inclusion and exclusion criteria. All participants were informed about the procedure and consent was taken. Pre test was done to measure the strength by and throwing velocity of the hand ball players at the beginning of the study. Post test was done to measure strength and throwing velocity after 10 weeks of moderate load training.

## **FUNCTIONAL THROWING PERFORMANCE INDEX**

The fuctional throwing performaanace of shoulder joint was assesd with the subject 4.57 meters from the target and 30.48x30.48 cm<sup>2</sup> on the wall at a height of 1.22 meters from the

floor. The main objective of the test was to throw the hand ball in to the target as many times as possible over a 30 seconds for both pre test and post test.

**BENCH PRESS**The maximal strength of the upper extremities was assessed using a maximum 1 repetition concentric bench press. The subjects were instructed to perform a purely concentric action from the starting position, maintaining the shoulders in a 90° abducted position to ensure consistent positioning of the shoulder and elbow joints throughout the test no bouncing or arching of the back was allowed.

Training: Moderate resistance was continued for 6 weeks

Each session included 2 exercises for the upper extensor muscles (bench press-Incline,Decline,Flat bench and pull over).

Subjects were trained at 55%–75% of their personal 1RM. They performed 6 repetitions per set and 4 sets of each exercise with 1-to 1.30-minute rest between sets, for 2days

## PROTOCOL

<b>S.no</b>	<b>Week</b>	<b>Bench press</b>
1	1 <sup>st</sup> week	1 <sup>st</sup> session 55% 1 RM 3 SETS AND 6 REPS
		2 <sup>ND</sup> SESSION 55% 1 RM 3SETS AND 6 REPS
2	2 <sup>ND</sup> WEEK	1 <sup>ST</sup> SESSION 60% 1 RM 3SETS AND 6 REPS
		2 <sup>ND</sup> SESSION 60% 1 RM 4 SETS 6 REPS
3	3 <sup>RD</sup> WEEK	1 <sup>ST</sup> SESSION 65% 1 RM 3 SETS 6 REPS
		2 <sup>ND</sup> SESSION 65% 1 RM 4 SETS 6 REPS
4	4 <sup>TH</sup> WEEK	1 <sup>ST</sup> SESSION 70% 1 RM 3 SETS 6 REPS
		2 <sup>ND</sup> SESSION 70% 1 RM 4 SETS 6 REPS
5	5 <sup>TH</sup> WEEK	1 <sup>ST</sup> SESSION 75% 1 RM 3 SETS 6 REPS
		2 <sup>ND</sup> SESSION 75% 1 RM 4 SETS 6 REPS
6	6 <sup>TH</sup> WEEK	1 <sup>ST</sup> SESSION 75% 1 RM 3 SETS 6 REPS
		2 <sup>ND</sup> SESSION 75% 1 RM 4 SETS 6 REPS

## RESULT

Data was analyzed using SPSS-16 with significance value set at  $p(0.05$  or less) after 6 weeks of the study. As shown in table 1 there was significant increase in the accurate throws of the players and also from table 2 a significant increase was identified with the total number of throws among the handball players.

After 6 weeks of the study there was a significant differences found with the functional throwing performance index scores of pre test and post test. The results lead to a clarification that bench press and pull over exercise showed improvement in throwing velocity of the hand ball.

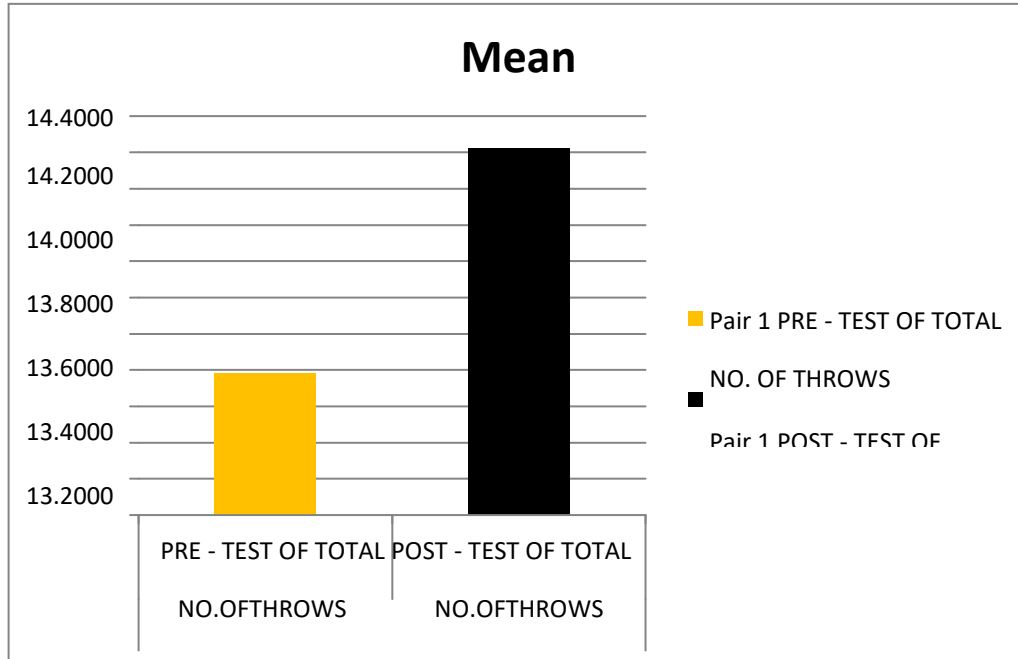
**TABLE I**  
**COMPARISON OF PRE TEST AND POST TEST VALUES OF TOTAL**  
**NUMBER OF THROWS**

		Mean	Mean Difference	Std. Deviation	Std. Error Mean	t	Sig
Pair 1	PRE- TEST OF TOTAL NO OF THROWS	12.97	-1.24286	1.509	.403	-3.639	0.003
	POST-TEST OF A TOTAL NO OF THROWS	14.22		1.396	.373		

$p < 0.05$

Table I shows significant ( $p=0.003$ ) difference between the pre test and post test values of total number of throws.

**GRAPH I**  
**TOTAL NUMBER OF THROWS**





**TABLE II**  
**COMPARISON OF PRE TEST AND POST TEST VALUES OF**  
**ACCURATE NUMBER OF THROWS**

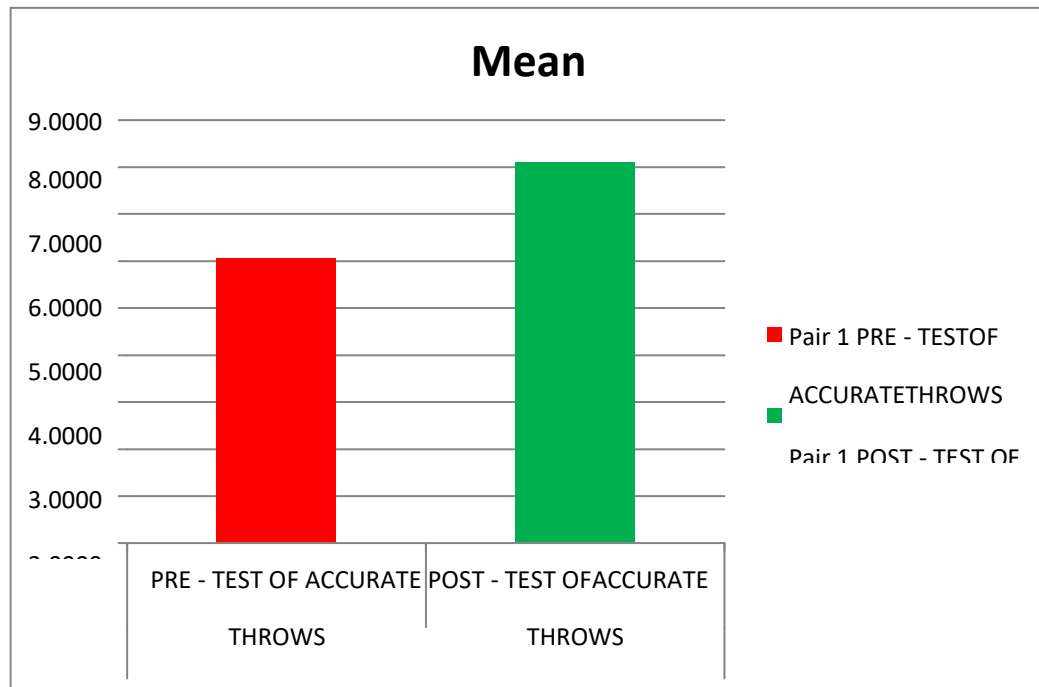
		Mean	Mean Difference	Std. Deviation	Std. Error Mean	t	Sig
Pair 1	PRE- TEST OF ACCURATE THROWS	6.05	-2.04286	1.300	.347	-6.012	0.000
	POST-TEST OF ACCURATE THROWS	8.09		1.417	.378		

$p < 0.05$

Table II shows significant ( $p=0.000$ ) difference between the pre test and post test values of accurate number of throws.

## GRAPH II

### ACCURATE NUMBERS OF THROWS



## DISCUSSION

The aim of the study is to measure the effect of moderate load training on development of strength and throwing velocity among male hand ball players. According to the results achieved in this study from the statistical analysis ,the mean value of pre test and post test of accurate throws has shown an increase in the value of pre test (6.05) to post test (8.09) and the pre test and post test of total number of throws has shown an increase in the value of pre test (12.98) to ( 14.22).

On comparing the pre test and post test value of number of throws and accurate throws it revealed that there was a statistically significant difference ( $p < 0.05$ ) in post test values in number of throws and in number of accuracy.

This result is supported by previous data which suggest that aspects of both muscle strength and power of the upper extremity and torso plays an important role in the ability to throw a ball in high velocity. Fleck et al observed that stronger correlations with peak torque during shoulder flexion ( $r=0.63, 300^\circ$  per second ) and elbow extension ( $r=0.63, 240^\circ$  per second ) ( $r=0.65, 300^\circ$  per second ) in a group of team hand ball players.

Bench press is very frequently used in resistance training programme in team hand ball. Another factor that could possibly contribute to the different outcomes between previous investigations with respect to the relationships between throwing velocity is the training and playing experience of participants.

Bench press is a exercise deemed to indicate upper body capabilities. It also should be noted that the average power output with loads of 46% and 62% of 1 RM bench throw were not significantly different from each other. Van den Tilaar et al investigated that the contribution of upper extremity, trunk, and lower extremity movements in over arm throwing in handball game.

Souhailhermassi et al stated that the combination of high velocity and accurate throws in handball are in accordance with several neurophysiologic factors such as isometric training, changes in intrinsic muscular properties and an increase in myosin adenosine triphosphatase activity. In the study it was concluded that heavy training was needed to ensure the fast twitch motor units which was sufficient to induce an adaptation.

A study physical & throwing velocity of elite & amateur male handball players showed higher efficiency in throwing velocity to elite players amateur with upper lower extremity power output capabilities whereas the study on female handball players depends more on maximal strength than on the capacity.

A study on entire physical fitness of hand ball players suggests the importance enlarge of knee.

Generally the players undergoing moderate load training program has significant neuromuscular and functional changes. This includes changing contractile and non contractile elements of muscle. The exercise induce mechanical stimuli act as primary mechanism which increase the number of sarcomere of the muscle since these neural adaptation may occur at excitation .contraction coupling pathway and these adaptation initially results with increase in muscle mass than muscle size. the training includes increased muscle force either by increase motor unit firing rate (resultant of additional motor). A study by kamer and kight sound a 15% increased motor unit. Firing rate of 6 week of training of quadriceps muscle.

Since the handball players requires good throwing position to achieve powerful throw change throw direction quickly, the strength of the muscle place a key role on their performance

Thus the throwing velocity is influenced by the improved strength of the muscle by moderate load training

## **CONCLUSION**

To sum up from this present study, through regular exercise program and continuous follow up session for 6 weeks for hand ball players showed a significant increase in the throwing velocity and also an increase in number of throws within a stipulated time. The study shows that there is a rise in the functional activities of the players even in off session period of the game. Hence this study proves that exercise program plays a major role in the performance of functional throwing velocity among handball players.

## **LIMITATIONS**

- Sample size was small.
- Study duration was less.
- Limited number of players

## **RECOMMENDATIONS**

- Sample could be larger
- Longer study duration is suggested
- More no of players from different sports setups can be taken
- Further studies can be done using radar gun & concentric bench press test

**CONFLICT OF INTEREST- NIL**

**SOURCE OF FUNDING-SELF FUNDING**

**ETHICAL CLEARANCE- INSTITUTIONAL ETHICAL COMMITTEE**

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