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THE EFFICACY OF MEDICINE BALL TRAINING TO IMPROVE UPPER BODY STRENGTH AND THROWING ACCURACY AMONG SHOT PUT PLAYERS – A PILOT STUDY

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Abstract

This pilot study aims to evaluate the efficacy of medicine ball training in improving upper body strength and throwing accuracy among shot put players. The study involved 15 athletes (both male and female) from Parul University, aged between 19 to 25 years, who had at least 2 years of experience in competitive shot put. Over a period of 6 weeks, participants underwent medicine ball training for 3 sessions per week. Pre and post-assessment was conducted using measures such as the 1 RM bench press, medicine ball throw test, and the Functional Throwing Performance Index (FTPI). Results indicated a significant improvement in all outcome measures. The 1 RM bench press increased from 36.86 kg to 44.46 kg, the medicine ball throw distance improved from 19.06 ft to 26.00 ft, and the FTPI increased from 58.29% to 82.84%. These findings suggest that medicine ball training can effectively enhance upper body strength and throwing accuracy, making it a valuable training tool for shot put athletes.

Back ground & Purpose:

Medicine ball exercises, which are competent to closely mimic the sport-specific actions and movement patterns (i.e., sequential ballistic rotational movements) and are highly recommended

in rotational power sports, they have to show positive transfer effects on muscle strength and power in female handball players, shot putters.[1,2,3] The review of the one study suggested that periodized medicine ball training can significantly improve in functional performance, throwing velocity and strength of the upper extremity because of the medicine ball training permits complex sports – specific movement to be performed intensively with greater resistance than during regular sports competition in specific manner.[4] Also, another review of the study recommends that resistance training program with medicine balls can improve throwing distances in all applied medicine ball throw tests and improved peak power during bench and shoulder press at 30 and 50% of 1RM.[6,7]

So, the main purpose of the current study is to evaluate the effect of medicine ball training in improving upper body strength and throwing accuracy amidst shot put players, and the results of the study may help the shot-put players to know their throwing accuracy, upper body strength and improve the skill performance.

Aim of study:

To Evaluate the efficacy of Medicine ball training to improve upper body strength and throwing accuracy among Shot put Players.

Objectives of study:

- To determine the effect of medicine ball training on upper limb strength in shot put players.
- To determine the effect of medicine ball training on throwing accuracy in shot put players.

METHODOLOGY

- **Source of data:** Shot Put Players (Parul University)
- **Study Population:** Athletes of Parul University.
- **Study Duration**
  - ✓ Total Study Duration: 6 Months.

- ✓ Intervention Duration: 6 Weeks.

❖ **Inclusion criteria:**

Subjects are selected for the study based the following criteria:

1. Athletes 19 - 25 years of age.[8]
2. Participants will be given written informed consent.
3. Players has been playing shot put from last 3 years or Participant having experience of 2 competitive events in shot put. [9]
4. Participants of both male and female will be included.

❖ **Exclusion criteria:**

1. History of pain over shoulder joint in past 2 months.
2. Cervical spine pathology and or spinal deformity and glenohumeral joint subluxation or dislocation with in past 6 months in dominant & non dominant hand.
3. Subject is unable to give informed consent.
4. Previous surgical history for any injury, pathologies and history of recent fractures around a shoulder.
5. Corticosteroids injection in shoulder preceding 3 months.

➢ **Sampling Method:**

- ✓ **Sample Size**: - Total Number of Population (n) =15.

➢ **Selection of Sample**: Selective sampling who fits in inclusion criteria,

➢ **Method of data collection:**

- ✓ **Material Used :**
  - o Exercise Medicine ball (1 and 3 kg)
  - o Rubber ball
  - o Stop watch
  - o Measure tap

➢ **Outcome measures:** [10]

1) 1 RM Bench Press: In short, maximal strength of upper extremity was assessed using maximum 1-repetition successive eccentric–concentric bench press action 1RM BP. (ICC > 0.91) Bench press (elbow extension) was preferred as it involves some arm muscles that are specific to overhand throwing. The last acceptable extension with the highest possible load was determined as 1RM. In the bilateral concentric bench press (1RMBP) the bar was

positioned 1 cm above the subject's chest. The subject was instructed to maintain shoulders in a 90 abducted position to ensure consistency of the shoulder and elbow joints throughout the test movement. No bouncing or arching of the back was allowed. 3 to 4 trials were performed until the subject was unable to reach the full extension position of the arms. The last acceptable extension with the highest possible load was determined as 1RM. The rest between the actions was always 2 min.

2) Medicine Ball Throw Test: The one arm seated shot-put throw test was performed with the subject seating in a standard 45.72 cm chair without armrests, from which the subjects "put" a 6-lb medicine ball. Front legs of the chair were placed on a line made by the tester. The subjects seating in the chair with their feet and lower legs placed on another 45.72 cm chair, positioned just in front of their chair. This position resulted in the subject's hips, knees, and ankles being in a straight line parallel to the ground. The non-throwing arm placed across the chest and a strap was placed diagonally around the upper body to secure the subject to the chair. This position reduced use of legs and trunk while performing seated shot put. Participants instructed to "put" the medicine ball using an arm motion resembling that used by shot put athletes during this particular track and field event. Specific instruction not to "throw" the medicine ball in an overhead baseball type fashion was given. Prior to the record, four gradient self-selected sub-maximal to maximal warm-ups of 25%, 50%, 75% and 100% effort seated one arm shot put was perform. The participants then rested for two minutes, followed by 3 maximal effort puts. The recorder measures from the tapeline at the front of the subject's chair to the site where the ball first strikes the ground. Two minutes of rest was given before testing the opposite arm in the same manner as described above. The average distance of the 3 maximal effort for each arm

was used for the data analysis. [11]

3) Functional Throwing Performance Index (FTPI): The FTPI demonstrated good intra-session reliability (ICC = 0.86). Testing materials and methods consisting of a 1-ft by 1-ft square target placed 4 ft high on the wall. Subjects stand 15 ft away from the target square behind a line marked on the floor and attempted to throw a rubber ball (21-in circumference) within the target square as many times as possible in a 30-second time period. The subjects were instructed to throw with a natural overhand throwing motion, similar to that used by pitchers. The established protocol needed subjects to throw the ball under control as fast and accurately as possible, while also catching the thrown ball's rebound as quickly as possible. Each subject performed 3 graded sub maximal warm-up throws (25%, 50%, and 75% of maximal volitional effort) and then 3 30-second tests in which they throw the ball as many time as possible with control and accuracy. A 1-minute rest period was allowed between tests. The total number of throws, as well as the number of accurate throws landing within the target square, was counted. Throws landing within the target square (not on the line) was defined as accurate throws. Results were interpreted through dividing the number of accurate throws by the total number of throws, producing a percentage score. We calculated average percentage score from 3 trials. [12,26.]

- **Ethical clearance:**

As the study includes human subjects, ethical clearance was obtained from ethical committee of Parul University Institutional Ethics Committee for Human Research (PU – IECHR). Also written consent was taken from each subject who participates in study.

- **Procedure:**

The study was conducted with prior permission of the physical education and sports department, and after approval, the Shot Put Players were taken from Parul University.

Participants fulfilling the inclusion criteria were selected and assessed before starting the intervention. All selected players were informed regarding exercise performance, their effect and all other information like timing, duration and everything. The players who were voluntarily ready to participate in the exercise programme were taken under concern. After concern if players want to withdraw, they were allowed.

A written and informed consent about enrolment in the study and maintaining adequate privacy and confidentiality were taken from all participants included in the study. All confidential data are safe and never shared in public.

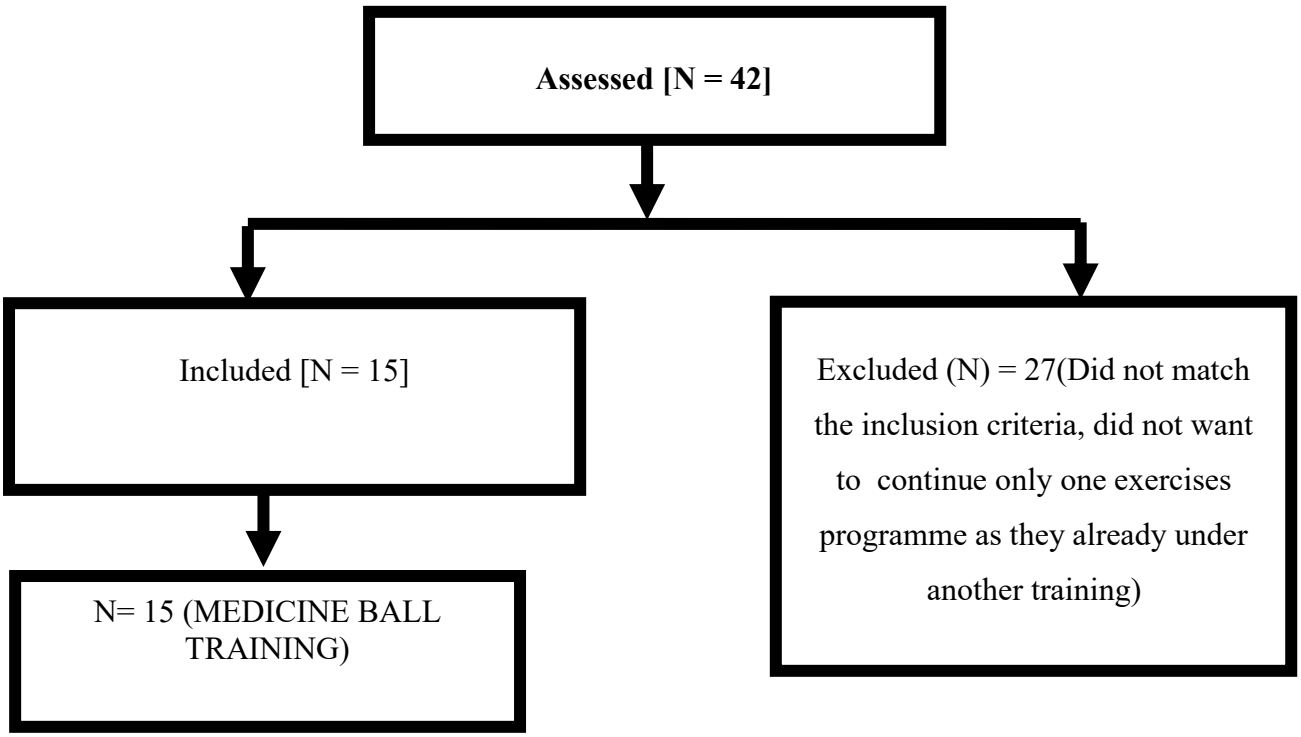
All participants were subjected to a standardized interview including details regarding the event. A clinical history and complete Physical and Functional Physiotherapy examination including hand dominancy according to (Edinburgh Handedness Inventory – short form) were done in each participant.

If participant agreed to participate in the study, he/she will be asked to sign the informed consent. Before starting the training program, Pre-test was done. The training period was 3 days per week for 6 weeks.

Selected players underwent 3 specific tests: 1 RM Bench Press, Medicine Ball Throw Test, and Functional Throwing Performance Index (FTPI).

These values were taken before intervention was started as baseline data and at the completion of intervention as outcome measures, which were re-evaluated at the end of 3 weeks and 6th weeks then pre and post scores were compared. All measures used are valid and shown to have acceptable reliability.

STUDY FLOW CHART: -



- **EXERCISE PROTOCOL:**

Selected players were assessed after all-inclusive criteria added. Subjects and therapist both were blinded for the grouping. Both male and female were taken under protocol.

- Before starting exercises, introduction about all exercises had been given.

Participants had 15 to 18 treatment sessions for 6 weeks. [13,14.]

There was 45 - 50 minute exercise protocol; which had 3 phases:

1) Warm up phase (5 – 10 minute)
2) Exercise phase (30 minute)
3) Cool down phase (5 – 10 minute)

- WARM UP PROGRAM (FOR BOTH GROUPS 5 – 10 MINUTES): [15,16,24]
  - Jogging 800 meters
  - Rotation exercises of Neck, Arms, Trunk (5 repetition)
  - Swing arm in circle & Across body (5 repetition)

- Legs in big swinging movement across the body, towards, front & back.

❖ PRECAUTIONS: [23]

1) Well hydrated
2) Exercises should not be done immediately after meal; there should be an hour gap before & after exercise.
3) If any kind of exercise cause hurt to the patient, immediately stop that exercise & inform the instructor.

After completion of specific training groups were received cool down training.

❖ COOL DOWN PROGRAM (FOR BOTH GROUPS 5 – 10 MINUTES) [17,18,22,27]

- Slow jogging 400 meters
- Static self-stretching – flexibility of upper body & Lower body muscles.

DATA ANALYSIS

✺ **Study Design:**

- In present study consisting of 15 Players were taken and Medicine ball Training.

✺ **Statistical Analysis:**

- The study shows effects of medicine ball training for strength and throwing accuracy among shot put players before intervention and after intervention for improve strength as well as functional throwing performance.
- All data passed the normality test with $P > 0.05$ and follow Gaussian distribution. All statistical analyses were calculated using alpha levels of 0.05.
- Normality of the data was checked by Shapiro-Wilk test.
- Descriptive statistic was used to analyze base line for demographic data.
- To analyze the effects on outcome measure Functional Throwing Performance Index (FTPI), medicine ball throw test and 1 RM bench press values pre and post value, Paired t-test was used.

EXERCISES GROUP: MEDICINE BALL TRAINING FOR SHOTPUT ATHLETES:

(After completion of warm up) [19,20,21,25]

TABLE 1. Detailed description of the Medicine Ball training program.

Weeks	1st	2nd	3rd	4th	5th	6th
Sets + Repetitions+ Load (kg)	3sets+ 6 Repetition+ 1kg	3sets+ 10 Repetition + 1kg	3sets+ 12 Repetition+ 1 and 3kg	3sets+ 12 Repetition+ 1 &3 kg	3sets+ 15 Repetition+ 1 & 3kg	3sets+ 15 Repetition+ 1 & 3kg

Rest (s) between sets	60 sec	60 sec	75sec	75 sec.	90 sec.	90 sec.
Rest (s) between repetition	5 - 10 sec	5 - 10 sec	5 - 10 sec	5 - 10 sec	5 - 10 sec	5 - 10 sec
Exercises (load)	SSP (1 kg)	SSP (1 kg)	SSP RH (1 kg)	SSP (1 kg)	SSP (1 kg)	SSP (1 kg)
	SSP RH (1 kg)	JSP (1 kg)	SSP LH (1 kg)	SSP (3 kg)	SSP (3 kg)	SSP (3 kg)
	SSP LH (1 kg)	SOT (1 kg)	SSP (3 kg)	JSP (1 kg)	SSP RH (3 kg)	SSP RH (3 kg)
	JSP (1 kg)	StSP (1 kg)	JSP RH (1 kg)	JSP (3 kg)	SSP LH (3kg)	SSP LH (3 kg)
	JSP RH (1 kg)	StSP RH (1 kg)	JSP LH (1 kg)	StSP RH (1 kg)	JSP (3 kg)	JSP (3 kg)
	JSP LH (1 kg)	StSp LH (1 kg)	JSP (3 kg)	StSP LH (1 kg)	JSP RH (3 kg)	JSP RH (3 kg)
	SOT (1 kg)	StO (1 kg)	StO (1 kg)	StSP (3 kg)	JSP LH (3 kg)	JSP LH (3 kg)
	StO (1 kg)	LOT (1 kg)	StO (3 kg)	StO (3 kg)	SOT (1 kg)	SOT (1 kg)
	LOT (1 kg)	LBT (1 kg)	SOT (1 kg)	LOT (1 kg)	SOT (3 kg)	SOT (3 kg)
	ST (1 kg)	ST (1 kg)	SOT (3 kg)	LBT (1 kg)	StO (3 kg)	StO (3 kg)
			ST (1 kg)	ST (1 kg)	LOT (1 kg)	LOT (1 kg)
			ST (3 kg)	ST (3 kg)	LOT (3 kg)	LOT (3 kg)
					ST (1 kg)	ST (1 kg)
					ST (3 kg)	ST (3 kg)
FULL FORMS:	SSP = standing shot put throw with both hands; SSP RH = standing shot put throw with right hand; SSP LH = standing shot put throw with left hand; JSP = jumping shot put throw; JSP RH = jumping shot put throw with right hand; JSP LH = jumping shot put throw with left hand; StSP = sitting shot put throw with both hands; StSP RH = sitting shot put throw with right hand; StSP LH = sitting shot put throw with left hand; SOT = standing overhead throw; JOT = jumping overhead throw; StO = sitting overhead throw; LOT = lying on the stomach overhead throw; LBT = lying on the back throw; ST = side throw.					

FIGURE: 3 MEDICINE BALL EXERCISES (Group A)

GROUP A: MEDICINE BALL TRAINING

RESULT

TABLE 1: Pre - Post Difference in FTPI

Variant	MEAN±SD		t value	P value	Result
	PRE	POST			
FTPI(IN %) GROUP A	58.29 ± 4.60	82.84 ± 2.53	- 24.52	0.00	HS

Table 1: Comparison of pre and post mean of functional throwing performance index (FTPI), Paired t-test was performed for analysis, Pre test Mean ± SD value of FTPI 58.29 ±

4.60, when it was compared with the post test Mean ± SD value of FTPI 82.84 ± 2.53 after 6 weeks of intervention; the obtained T – value was finding had showed that there was a highly significant difference in Functional performance in pre test and post test values. (P < 0.05)

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TABLE 2: Pre - Post Difference in MEDICINE BALL THROW TEST

Variant	MEAN±SD		t value	P value	Result
	PRE	POST			
MEDICINE BALL THROW TEST (IN FEET)	19.06 ± 4.43	26.00 ± 4.10	-16.99	0.00	HS

Table 2: Comparison of pre and post mean of Medicine ball throw test (MBT), Paired t-test was performed for analysis, Pre test Mean ± SD value of MBT 19.06 ± 4.43, when it was compared with the post test Mean ± SD value of MBT 26.00 ± 4.10 after 6 weeks of intervention ; the obtained T – value was finding had showed that there was a highly significant difference in Throwing performance in pre test and post test values. (P < 0.05)

TABLE 3: Pre - Post Difference in 1 RM BENCH PRESS

Variant	MEAN±SD		t value	P value	Result
	PRE	POST			
1 RM BENCH PRESS (IN KG)	36.86 ± 3.13	44.46 ± 2.47	-26.25	0.00	HS

Table 3: Comparison of pre and post mean of 1 Repetitive maximum Bench Press (1RMBP), Paired t-test was performed for analysis, Pre test Mean ± SD value of 1RMBP was 36.86 ± 3.13, when it was compared with the post test Mean ± SD value of 1RMBP 44.46 ± 2.47 after 6 weeks of intervention respectively; the obtained t – value was finding had showed that there was a highly significant difference in upper body strength in pre-test and post-test values. (P < 0.05).

CONCLUSION

Here, in this study Group A which received medicine ball training improved FTPI, MBT and 1RM BP with pre-test mean 58.29, 19.06, 36.86 to post-test 82.84, 26.00, 44.46 respectively

During the course of this study, it has been found that- medicine ball training have shown improvement in upper-body strength and throwing accuracy among shot put players.

LIMITATIONS

- Study was done in small area.
- Further follow up was not taken.
- Results are generalized not specified in terms of gender.

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