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Evaluating the Effectiveness of the Thrower's Ten Program on Throwing Accuracy among Amateur Handball Players: A Single Group Study

Dr. Madhavi Sontakkey[1], Dr. Harsh Pradeep Jain[2], Dr. Nilesh Parmar[3], Dr. Krutarth Soman[4], Dr. Dhananjay Singh Panwar[5], Dr.Advita Neville Deepak[6], Dr. Bhavana Gadhavi[7]

Assistant Professor, PhD Scholar, Parul Institute of Physiotherapy, Parul University, Vadodara[1, 3]
MPT Scholar, Parul Institute of Physiotherapy, Parul University, Vadodara[2, 4, 5]
Professor, Parul Institute of Physiotherapy, Parul University, Vadodara[7]
Principal & Dean, Parul Institute of Physiotherapy, Vadodara[8]

Corresponding Author:

Dr. Advita Neville Deepak, Professor, PhD, Parul Institute of Physiotherapy

Limda, Waghodia, Vadodara Gujarat Pin: 391760

Email Id: advita.deepak@paruluniversity.ac.in

Phone: 8320655918

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Abstract

Handball is a high-intensity team sport that requires strength, speed, coordination, and precision, with throwing accuracy being a key determinant of individual and team performance[1,2]. Amateur players often lack structured shoulder conditioning programs, which may result in compromised biomechanics and increased risk of injury. The Thrower's Ten Program is a well-established strengthening protocol designed for overhead athletes to enhance shoulder stability and neuromuscular control. The present study aimed to evaluate the effectiveness of the Thrower's Ten Program on throwing accuracy among amateur handball players. A single-group pre–post experimental study was conducted among 20 male amateur handball players aged 18–26 years. Participants underwent a supervised 4-week Thrower's ten exercise program. Throwing accuracy was assessed before and after the intervention using the Functional Throwing Performance Index (FTPI). Data were analysed using the Wilcoxon signed-rank test. The pre-intervention mean FTPI score was 2.2 ± 0.79, which improved to 4.2 ± 1.37 post-intervention. The difference was statistically significant ($p = 0.001$). The findings indicate that the Thrower's Ten Program effectively enhances throwing accuracy in amateur handball players and may be incorporated into regular training programs to improve performance.

INTRODUCTION

Handball is characterized by explosive movements and high-velocity overhead throwing actions[1]. Accurate throwing is essential for scoring and tactical execution[2]. Performance in handball depends on biomechanical efficiency and coordinated upper limb function.[3, 4]

Throwing involves a complex kinetic chain integrating trunk rotation, scapular control, and shoulder stability[5],[6]. Inadequate conditioning of the rotator cuff and scapular stabilizers may reduce accuracy and increase injury risk[7],[8]. Amateur athletes are particularly vulnerable due to limited access to structured training programs[3].

The Thrower's Ten Program, described by Wilk et al.[9], is a progressive strengthening protocol designed to improve shoulder stability and functional performance in overhead athletes. It targets the rotator cuff, deltoid, scapular stabilizers, and forearm musculature[10]. Previous studies have shown improvements in throwing performance and upper extremity function following structured shoulder strengthening programs[11].

Despite its widespread use in baseball and volleyball athletes, limited research has examined its effect on handball players[12]. Handball throwing incorporates rotational power and rapid release mechanics[13], requiring sport-specific neuromuscular coordination[14].

Throwing accuracy in this study was measured using the Functional Throwing Performance Index (FTPI), a reliable and validated assessment tool (ICC = 0.81–0.89)[16]. The FTPI evaluates the ratio of successful throws to total attempts within 30 seconds at a standardized distance of 4.57 m from a 30.48 × 30.48 cm target positioned 1.22 m above the floor[16].

This study aimed to evaluate the effectiveness of the Thrower's Ten Program on throwing accuracy among amateur handball players[15].

METHODOLOGY

This single-group pre–post experimental study was conducted after obtaining ethical clearance from the Parul University Institutional Ethics Committee for Human Research (PU-IECHR) and registration under the Clinical Trial Registry of India (CTRI/2024/08/073789). A total of 20 male amateur handball players aged between 18

and 26 years were recruited using convenience sampling. Participants were screened based on predefined inclusion and exclusion criteria. Male non-elite handball players with normal vision who were willing to provide written informed consent were included in the study. Participants with any neurological disorders, congenital abnormalities, cardiovascular diseases, recent upper limb fractures, or musculoskeletal impairments affecting the upper limb were excluded.

Baseline demographic data were collected prior to assessment. Throwing accuracy was evaluated using the Functional Throwing Performance Index (FTPI)[16]. The test was conducted at a standardized distance of 4.57 meters from a square target measuring 30.48 × 30.48 cm fixed at a height of 1.22 meters on a wall. Participants were instructed to throw a standard leather handball at the target and catch the rebound continuously for 30 seconds. Each participant performed three trials with short rest intervals to minimize fatigue. The FTPI score was calculated as the ratio of successful throws to the total number of throws attempted during the trial[16]. All assessments were conducted by a single trained investigator to ensure consistency.

Following baseline assessment, participants underwent the Thrower's Ten exercise program[9] for a duration of 4 weeks under supervision. The program consisted of progressive resistance exercises targeting the rotator cuff muscles, scapular stabilizers, deltoid musculature, and forearm muscles. Exercises were performed as per standardized guidelines, focusing on controlled movements and proper biomechanics. At the end of the 4-week intervention, FTPI was reassessed using the same standardized protocol.

Data were entered into Microsoft Excel and analysed using IBM SPSS version 27. Descriptive statistics including mean and standard deviation were calculated. The Wilcoxon signed-rank test was applied to compare pre- and post-intervention scores, with the level of significance set at $p < 0.05$.

Statistical Analysis

Data were analyzed using IBM SPSS version 27. Mean and standard deviation were calculated. The Wilcoxon signed-rank test was applied. Significance level was set at $p < 0.05$.

Age distribution	Total
18-20	7
20-22	11
22-24	1
24-26	1

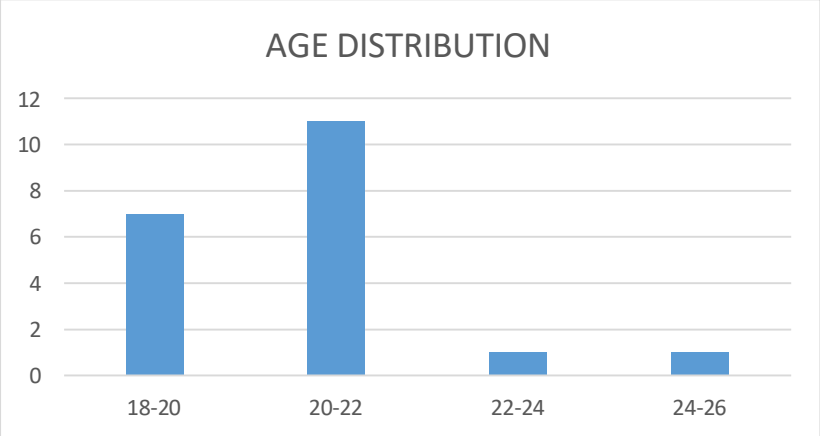
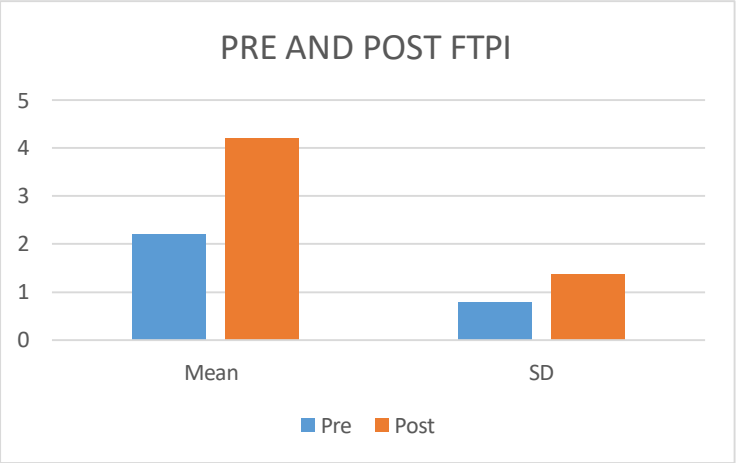


TABLE 2: PRE AND POST MEDICINE BALL THROW TEST

Mean and SD for pre is 2.2 and 0.79 respectively and for post 4.2 and 1.37 respectively. The P value is 0.001 which is significant.

	Mean	SD	P-value
Pre	2.2	0.79	0.001
Post	4.2	1.37	



DISCUSSION

The present study demonstrated a statistically significant improvement in throwing accuracy following a 4-week Thrower's ten intervention program. The FTPI mean score increased from 2.2 ± 0.79 to 4.2 ± 1.37 ($p = 0.001$), indicating enhanced precision and efficiency of throwing performance. These findings suggest that structured shoulder strengthening and stabilization exercises positively influence functional throwing ability in amateur handball players.

Throwing in handball is a highly coordinated activity requiring optimal integration of the kinetic chain, including trunk rotation, scapular control, and glenohumeral stability[5,6]. The shoulder joint relies heavily on dynamic stabilizers such as the rotator cuff and scapular musculature to maintain joint congruency during high-velocity movements. Weakness or poor neuromuscular control in these muscles can compromise throwing mechanics, leading to decreased accuracy and increased injury risk[7]. The Thrower's Ten Program specifically targets these muscle groups, thereby enhancing dynamic stability and neuromuscular coordination[9].

The improvement observed in this study may be attributed to enhanced scapular stabilization and rotator cuff strength. Strengthening these muscles improves proximal stability, which is essential for distal mobility and precision. According to Wilk et al.[9], structured shoulder programs enhance muscular endurance and control during repetitive overhead tasks. Improved muscle activation patterns likely contributed to better control during the acceleration and release phases of throwing, thereby increasing accuracy.

Previous research supports these findings. Kibler et al.[4] emphasized that scapular dysfunction negatively impacts overhead athletic performance, and rehabilitation programs targeting scapular stability significantly improve functional outcomes. Similarly, Escamilla et al.[11] reported improved shoulder muscle performance following structured strengthening programs in overhead athletes. Although most prior research has focused on baseball and volleyball players, the biomechanical principles underlying overhead throwing are similar in handball, particularly regarding shoulder loading and rotational mechanics[13].

Handball throwing differs slightly from other overhead sports due to its dynamic in-game context, rapid execution, and frequent directional changes[13]. Nevertheless, shoulder stability remains a fundamental requirement for accurate ball release. By improving muscular coordination and joint stability, the Thrower's Ten Program may enhance energy transfer through the kinetic chain, leading to more efficient and controlled throwing motion[6].

Another important implication of the findings relates to injury prevention. Amateur athletes often lack structured conditioning, making them susceptible to overuse injuries of the shoulder[7]. Strengthening dynamic stabilizers not only improves performance but may also reduce the mechanical stress placed on passive structures of the shoulder joint. Edouard et al.[13] highlighted that muscular imbalance and inadequate shoulder strength are risk factors for upper extremity injuries in handball players. Therefore, incorporating the Thrower's Ten Program into regular training may serve both performance enhancement and preventive roles.

The magnitude of improvement observed within a relatively short duration (4 weeks) suggests that neuromuscular adaptations may occur early in structured strengthening programs. Initial improvements are often attributed to enhanced motor unit recruitment and improved coordination rather than purely hypertrophic changes. This supports the feasibility of integrating such programs into short training cycles for amateur athletes.

However, this study has certain limitations. The absence of a control group limits the ability to attribute changes solely to the intervention. The sample size was small and restricted to male players, limiting generalizability. Additionally, only throwing accuracy was measured; parameters such as throwing velocity, power, and endurance were not assessed. Future research should employ randomized

controlled designs, include larger and more diverse samples, and evaluate multiple performance variables to establish comprehensive evidence.

Overall, the findings of this study contribute to the growing body of literature supporting shoulder stabilization programs in overhead sports. The results indicate that the Thrower's Ten Program is an effective, practical, and accessible intervention for improving throwing accuracy in amateur handball players

CONCLUSION

The Thrower's Ten Program significantly improves throwing accuracy in amateur handball players after 4 weeks of training. Incorporating structured shoulder strengthening exercises into amateur training programs may enhance performance and reduce injury risk.

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