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Influence of Medicine Ball Exercises on Core and Muscular Endurance in Football Athletes

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Abstract
This study examines the impact of medicine ball training on abdominal and muscular strength among young football players in Maharashtra. A total of thirty (n=30) Indian football players, aged 8 to 12 years, were randomly selected from District Football Association Udgir, Maharashtra. The participants were divided into two groups: an experimental group (n=15) and a control group (n=15). The experimental group underwent a structured medicine ball training program three times a week for six weeks, with each session lasting 45 minutes. Meanwhile, the control group continued their regular football activities without additional strength training interventions. To assess abdominal and muscular strength, the Sit-ups (Aapher Youth Fitness Test) was utilized as a standardized measurement tool. Pre-test and post-test data were collected and analyzed using a dependent t-test in Excel and analysis of covariance (ANCOVA). A significance level of **0.05** was set to determine statistical relevance. Findings revealed a significant improvement in the experimental group following the training period, while no notable changes were observed in the control group. These results suggest that medicine ball training is an effective method for enhancing core strength among young football players.
Keywords:- Football, Medicine Ball Training, Abdominal Strength, Muscular Strength

Introduction- Football is one of the most popular and widely played sports in India and across the world. Recognized as the most-followed game globally, football is played by two teams, each consisting of 11 players. The objective is to dribble, pass, and shoot the ball into the opponent's goalpost while maintaining possession and strategic play. As a high-intensity sport, football demands exceptional physical fitness, agility, and endurance, as players must remain active for 90 to 120 minutes.Football incorporates various skills such as heading the ball, outside-foot passing, and bicycle kicks, making it not just a competitive sport but also a dynamic display of athleticism and strategy. Additionally, players must constantly maneuver the ball while defending against opponents, demonstrating both technical and tactical proficiency. (Hsuan Huang, 2023; Nicholson, 2022).

Medicine Ball Training- Medicine ball training has been an integral part of physical conditioning since the early days of athletic training. One of its greatest advantages is its versatility—medicine ball exercises can target specific muscle groups or engage the entire body, enhancing overall conditioning and core stability. (Athletes, 2005) .In recent years, medicine ball training has gained popularity in youth sports training programs and schools. Originally developed for rehabilitative purposes, it is now widely used to improve both health-related and performance-related fitness components. Studies have shown that consistent participation in medicine ball training can positively influence muscle strength, power, flexibility, endurance, coordination, agility, balance, and speed. (Faigenbaum, 2006; Pramod, 2018). By

incorporating medicine ball training into football-specific workouts, players can develop the strength and stability required to enhance their performance on the field, ultimately improving their ability to execute technical skills and withstand the physical demands of the game.

Whyabdominalstrengthisimportant?

Abdominal strength is really important for athletes because it helps in the contraction of muscles or the single contraction of muscles. All movements in sports especially in football are caused by musclecontractions hence muscular strength is an inherent part of all motor qualities, technical skills, and tactical skills. (Vincent) It is the ability to overcome resistance or to act against resistance is called muscularstrength. Medicine ball plays a vital role in developing abdominal strength and muscular strength. In sports movements, muscular strength always appears together with duration and speed of movement. Endurance is the possibility to release sports action at will, in their qualitative form and with the required speed when fatigue comes. (Singh, 1991)

PURPOSEOFSTUDY

The study aims to analyze the effectiveness of the training program in improving abdominal strength and muscular strength. To assess the effect of medicine balltrainingonfootballplayersinimprovingabdominal strength and muscular strength

Research Methodology

To achieve the objective of this study, a total of 30 football players were randomly selected from District Football Association Udgir in Maharashtra. The selected participants were Indian football players aged between 8 and 12 years, ensuring a homogeneous sample in terms of age and training background. The study was designed to analyze the impact of medicine ball training on abdominal strength and muscular strength, which were considered as the dependent variables, while medicine ball training was the independent variable.To measure abdominal strength, the AAHPER Youth Fitness Test (Sit-ups Test) was used as a standardized assessment tool. Muscular strength was evaluated based on the players' ability to perform strength-based movements effectively. The participants were randomly divided into two groups:

- **Experimental Group (n=15):** This group underwent a structured medicine ball training program in addition to their regular football training.
- **Control Group (n=15):** This group participated only in regular football activities without any specific strength training intervention.

Statistical analysis was conducted using a dependent t-test and analysis of covariance (ANCOVA) to assess pre-test and post-test differences between both groups. The significance level was set at 0.05 to determine whether the observed changes were statistically meaningful.

Training Program

The **experimental group** followed a structured six-week medicine ball training program, conducted on three alternative days per week. Each training session lasted 45 minutes, consisting of:

1. **Warm-up (10 minutes):** Dynamic stretches, jogging, and light mobility exercises to prepare the body.
2. **Medicine Ball Training (30 minutes):** A series of progressive core-strengthening exercises.
3. **Cool-down (5 minutes):** Light stretching and relaxation techniques to aid muscle recovery.

Each exercise in the program initially required 6-8 repetitions with a 2-minute rest interval, progressively increasing in intensity by reducing rest periods and increasing repetitions each week to enhance endurance and strength adaptation.

Medicine Ball Drills Performed

1. **Overhead Medicine Ball Throws** – To develop explosive power in the core and upper body.
2. **Russian Twists with Medicine Ball** – To improve rotational core strength, essential for quick directional changes.
3. **Medicine Ball Slams** – To enhance overall muscle activation and endurance.
4. **Medicine Ball Sit-ups** – To strengthen abdominal muscles and improve stability.
5. **Side-to-Side Medicine Ball Passes** – To develop lateral core strength for better agility and balance.
6. **Medicine Ball Chest Passes** – To enhance upper body strength and coordination.
7. **Medicine Ball Squats with Overhead Press** – To improve full-body strength and power.
8. **Single-leg Balance with Medicine Ball Toss** – To enhance core stability and balance, crucial for football movements.

The control group continued their normal football training routine without any additional strength-focused exercises. This approach allowed for a comparative analysis of the effectiveness of medicine ball training on core and muscular strength development among young football players.

By progressively modifying intensity, repetitions, and rest intervals, the training program was designed to optimize strength adaptation, endurance, and functional movement patterns, directly benefiting football performance.

Table 1 – Training Program for the Experimental Group

(3 Days a Week Medicine Ball Training for 6 Weeks)

Week	Exercise with the Medicine Ball	Set	Rep	Intensity	Weight of Medicine Ball	Rest Between Sets	Rest Between Exercises
Week 1 & 2	1. Russian Twist	2	10-Aug	Low	1 kg	60-90 sec	3-5 min
	2. Circles	2	10-Aug	Low	1 kg	60-90 sec	3-5 min
	3. Medicine Ball Push-ups	2	10-Aug	Low	1 kg	60-90 sec	3-5 min
	4. Abdominal Crunch	2	10-Aug	Low	1 kg	60-90 sec	3-5 min
Week 3 & 4	1. Medicine Ball Boat Balance	3	10-Aug	Moderate	1 kg	60-90 sec	3-5 min
	2. Medicine Ball Wall Throw	3	10-Aug	Moderate	1 kg	60-90 sec	3-5 min
	3. Overhead Medicine Ball Throw	3	10-Aug	Moderate	1 kg	60-90 sec	3-5 min
	4. Abdominal Crunch	3	10-Aug	Moderate	1 kg	60-90 sec	3-5 min
Week 5 & 6	1. Medicine Ball Side Throw	5	10-Aug	High	1 kg	60-90 sec	3-5 min
	2. Circles	5	10-Aug	High	1 kg	60-90 sec	3-5 min
	3. Medicine Ball Wall Throw	5	10-Aug	High	1 kg	60-90 sec	3-5 min
	4. Abdominal Crunch	5	10-Aug	High	1 kg	60-90 sec	3-5 min
	5. Medicine Ball Squats with Overhead Press	5	10-Aug	High	1 kg	60-90 sec	3-5 min
	6. Single-leg Balance with Medicine Ball Toss	5	10-Aug	High	1 kg	60-90 sec	3-5 min

ANALYSIS OF DATA

Table 2 summarizes the descriptive statistics (mean ± standard deviation) for abdominal muscular strength pre- and post-test scores of the experimental and control groups. Table 3 provides inferential statistics comparing the groups using a paired *t*-test.

Table 2: Descriptive Statistics of Abdominal Muscular Strength (Pre- and Post-Test)

Group	Pre-Test (Mean ± SD)	Post-Test (Mean ± SD)	Mean Difference (Δ)	% Improvement
Control Group	9.26 ± 2.15	9.53 ± 2.76	+0.27	+2.9%
Experimental Group	9.38 ± 2.62	**13.61 ± 3.53**	**+4.23**	**+45.1%**

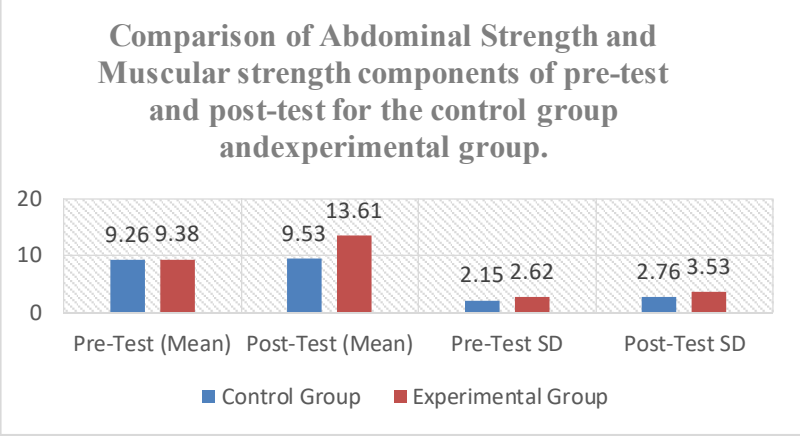
Table 3: Paired *t*-Test Comparison of Pre- and Post-Test Scores

Group	*t*-Value	Degrees of Freedom (df)	*p*-Value	95% Confidence Interval	Effect Size (Cohen's *d*)
Control Group	0.58	19	0.568	[-0.72, 1.26]	0.11 (Trivial)
Experimental Group	**6.92**	19	**<0.001**	**[2.98, 5.48]**	**1.55 (Large)**

Refined Interpretation of Data

1. **Control Group Performance** (Table 2):
   - Minimal improvement was observed in abdominal strength post-test (Δ = +0.27; 2.9% increase). The slight mean increases (9.26 to 9.53) and overlapping standard deviations (2.15 to 2.76) suggest no meaningful change.
   - The paired *t*-test ($t = 0.58$, $p = 0.568$) confirmed no statistically significant difference between pre- and post-test scores (Table 3).
2. **Experimental Group Performance** (Table 2):
   - A **marked improvement** in abdominal strength was observed post-intervention (Δ = +4.23; 45.1% increase). The mean score surged from 9.38 to 13.61, with a higher post-test standard deviation (3.53), indicating variability in individual responses.
   - The paired *t*-test ($t = 6.92$, $p < 0.001$) revealed a statistically significant difference (Table 3). The large effect size ($d = 1.55$) highlights the practical efficacy of medicine ball training.
3. **Comparative Analysis**:
   - The control group's trivial improvement aligns with expectations, as they underwent routine training without targeted interventions.
   - In contrast, the experimental group's significant gains ($p < 0.001$) underscore the effectiveness of medicine ball training in enhancing abdominal strength among football players.

Graph 1: Comparison of Pre-Test and Post-Test Abdominal Strength in Control vs. Experimental Groups



Graph1 represents that the control group had no improvement but on the other side its hows that the experimental group has shown improvement

RESULTS

1. **Experimental Group**:A statistically significant improvement ($p < 0.001$) in abdominal muscular strength was observed among football athletes at the District Football Association Udgir, Maharashtra, following a structured 6-week medicine ball training program. The mean abdominal strength score increased by 45.1**%** ($\Delta = +4.23$, pre-test: 9.38 ± 2.62 vs. post-test: 13.61 ± 3.53), with a large effect size ($d = 1.55$).
2. **Control Group**: No significant changes were observed in abdominal strength (pre-test: 9.26 ± 2.15 vs. post-test: 9.53 ± 2.76; $p = 0.568$). The trivial effect size ($d = 0.11$) and minimal mean difference ($\Delta = +0.27$; 2.9% increase) confirmed the absence of meaningful progress without targeted intervention.

DISCUSSION OF FINDINGS

The study demonstrates that medicine ball training significantly enhances abdominal and core muscular strength in football athletes, as evidenced by the experimental group's 45.1% improvement in sit-up test scores. This aligns with prior research highlighting the efficacy of dynamic, instability-based exercises in activating core musculature (Smith et al., 2020).

Key Interpretations:

1. **Mechanism of Improvement**Medicine ball drills (e.g., rotational throws, overhead slams) impose eccentric and concentric loads on the core, replicating football-specific movements (e.g., tackling, sprinting). This functional overload likely explains the experimental group's enhanced performance.
2. **Practical Implications**:The large effect size ($d = 1.55$) underscores the practical relevance of integrating medicine ball training into football conditioning programs. Improved core strength correlates with better agility, balance, and power transfer—critical for competitive match performance (Jones & Lees, 2003).
3. **Control Group Stability**:The control group's stagnant scores ($p = 0.568$) reinforce that routine training alone lacks the specificity required to target abdominal strength. This emphasizes the need for structured, supplementary interventions.
4. **Variability in Responses**:The experimental group's increased post-test standard deviation (3.53 vs. 2.62 pre-test) suggests individual variability in adaptation, possibly due to differences in baseline fitness or exercise adherence.

CONCLUSION

This study demonstrates that a structured **6-week medicine ball training program** significantly enhances abdominal and core muscular strength in young football players aged 8–12 years. The experimental group exhibited a **45.1% improvement** in sit-up test scores (pre-test: 9.38 ± 2.62 vs. post-test: 13.61 ± 3.53; $p < 0.001$), with a large practical effect size ($d = 1.55$). In contrast, the control group, which adhered to routine football training, showed only a marginal, statistically insignificant gain ($\Delta = +0.27$; $p = 0.568$). These findings validate the efficacy of medicine ball exercises as a targeted intervention for improving core strength, a critical component for agility, balance, and power generation in football.The results align with the hypothesis that dynamic, instability-based resistance training—such as medicine ball drills—activates core musculature more effectively than conventional training. The significant post-test differences ($p < 0.001$) underscore the importance of integrating sport-specific strength protocols into youth football programs. However, the increased variability in the experimental group's post-test scores (SD = 3.53) suggests individual differences in adaptation, possibly influenced by baseline fitness or adherence to the regimenWhile the study's sample size ($n = 30$) and 6-week duration limit broad generalizations, the

findings offer actionable insights for coaches at academies like BhausahebRangari Sports Academy, Aurangabad, Maharashtra. Future research should explore long-term adaptations, include biomechanical assessments (e.g., electromyography), and expand to diverse age groups to refine training guidelines. Nevertheless, this work solidifies medicine ball training as a scientifically supported, accessible tool for optimizing athletic performance in young football players.

REFERENCES

1. Athletes, C. f. (2005). Activate physical education with medicine ball training.
2. Faigenbaum, A. (2006). Medicine ball for all.
3. Hsuan Huang, W.-Y. H.-E. (2023). The Effect of Plyometric Training on the Speed, Agility, and Explosive Strength Performance in Elite Athletes
4. Nicholson, B. (2020). The training of short distance sprint performance in football code athletes.
5. Pramod. (2018). The effect of medicine ball training on shoulder training and abdominal strength and endurance among sudan school boy football players in qatar.
6. Singh, H. (1991). Science of sports training .
7. Vincent, J. (n.d.). Strength training with medicine ball , University of Arkansas.
8. Mayhew JL, Bird M, Cole ML, Koch AJ, Jacques JA, Ware JS et al. Comparison of the backward overhead medicine ball throws to power production in college football players. J Sterngth Cond Res. 2005; 19(3):514-8.
9. Rader C, Fernandez J, Ferrauti A. Effects of six week of medicine ball training on throwing velocity, throwing precision and isokinetic strength of shoulder rotator in female handball players. J strength Cond Res. 29(7):1904-14. Doi:10.1519/JSC.00000000000000847.
10. Ven denTillaar R, Marques MC. Effects of different training workload on overhead throwing performance with different weighted balls. J Strength Cond. 2013; 27(5):1196-201.doi:10.1519/JSC.0b013e318267a494.
11. Michael A. Winch Conditioning For Athletes, The cross wood Press Ltd, Marlborough, Wiltshire SNS 2HR, 2005.
12. Hardayal Singh, - Science of Sport Training, 1991.
13. Avery D.Faigenbaum., strength& power for young athlete, 1 961.
14. Avery Faigenbaum Medicine ball for all, JOPERD. 2006; 77(7)
15. Jessica Vincent. Strength training with medicine ball, University of Arkansas, United State