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Isolated and combined effects of traditional training and medicine ball exercises on strength and shot-put performance in college men

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Abstract
To achieve this purpose, sixty subjects from the Faculty of General & Adapted Physical Education and Yoga, Ramakrishna Mission Vivekananda Educational and Research Institute, Coimbatore, Tamil Nadu, were selected. The subjects' age ranged between 18 and 25 years. They were divided into four groups: Group I – Traditional Training Group (TTG), Group II – Medicine Ball Exercises Training Group (MBETG), Group III – Combined Training Group (CTG), and Group IV – Control Group (CG). All three training groups participated in their respective training programmes involving traditional exercises, medicine ball exercises, and a combination of both, while the control group did not participate in any training other than their regular routine work. The training period lasted for twelve weeks, conducted from 6.30 a.m. to 7.30 a.m. The selected criterion variables were strength, assessed using the push-up test, and shot - put performance, assessed using the shot-put throw. The data collected before and after the training period were treated using ANCOVA, with the level of confidence fixed at 0.05.
The results of the study showed that all training groups improved in the selected criterion variables. However, the Combined Training Group showed superior improvement compared to the Traditional Training Group, the Medicine Ball Exercises Training Group, and the Control Group. The Control Group did not show any improvement in the selected criterion variables.

Keywords: Traditional training, medicine ball exercises, strength and performance

Introduction
Sports performance during the past few years has a huge and significant progress with scientific and cognitive progress in various sports sciences and its branches such as psychology, sociology, sports medicine, physiology, chemistry and anatomy, training science, and biomechanics, where trainers and employees in the field of planning and rationing of loads training and academic athletes, make a great efforts to develop training and teaching curricula, methods, techniques, programs, and various tools in order to reach players and students to the best physical, skill, planning, and psychological levels (Khanday *et al*, 2018) [6]
Strength development plays a crucial role in enhancing athletic performance across various sports disciplines, particularly in power-oriented events such as shot-put. Shot-put performance is highly dependent on multiple physical components, including muscular strength, explosive power, coordination, and the efficient transfer of kinetic energy through the upper and lower body segments (Young, 2006) [13]. Among college men, structured strength-training programmes are essential for improving these performance characteristics, especially when preparing athletes for competitive athletic events.
Traditional strength training has long been recognized as a fundamental approach for enhancing muscular fitness. It typically involves systematic, progressive overload using bodyweight and resistance-based exercises designed to improve maximal strength, muscular endurance, and neuromuscular efficiency (Kraemer & Ratamess, 2004) [5]. Exercises such as push-ups, squats, lunges, and resistance drills form the core of traditional training and contribute significantly to the development of force production capabilities required in shot-put.
In contrast, medicine ball training has gained prominence as an effective modality for improving explosive power, coordination, and dynamic strength. Medicine ball exercises incorporate functional, sport-specific movements such as overhead throws, chest passes, rotational throws, and plyometric-style activities that mimic the biomechanics of shot-put techniques (Faigenbaum & Mediate, 2006) [4]. Because these exercises enhance both upper-body and core power, they are believed to directly contribute to improved throwing distance and overall athletic performance.
Recent studies have increasingly emphasized the importance of combined training approaches. The integration of traditional strength training with medicine ball exercises offers a comprehensive method that targets both maximal strength and explosive power simultaneously (Cronin & Owen, 2010) [3]. Combined training programmes are thought to produce superior improvements by activating multiple muscle groups, enhancing coordination, and facilitating neuromuscular adaptations essential for shot-put performance. Such an approach may provide an additive or synergistic effect, resulting in greater performance enhancements compared to isolated training methods.
College athletes, particularly those engaged in physical education or sports-related academic programmes, often represent an ideal population for examining the effectiveness of various training modalities. Their developmental stage, physical maturity, and adaptability allow for significant improvements in strength and skill-related parameters within a structured intervention period (Bompa & Haff, 2009) [2]. Understanding the relative effectiveness of isolated versus combined training methods in this population will help physical educators, coaches, and

trainers design evidence-based programmes that enhance performance outcomes in shot-put and related activities.

Despite the established benefits of both traditional and medicine ball training, limited research has directly compared their isolated and combined effects on strength and shot-put performance among college men. Most existing studies tend to focus on single-modal training approaches, leaving a gap in understanding the comparative efficacy of integrated training strategies. Therefore, examining these training modalities collectively is essential for determining the most effective interventions to enhance athletic performance in educational and competitive settings.

Training using medicine balls is one of the modern, unconventional training methods which appeared as a direct result of the scientific renaissance in the sports field in order to bringing players to the top of sports achievement through the use of medicine balls in pushing, throwing, and passing exercises that can be performed individually, in pairs or collectively, and other different situations and forms, whether it is standing, kneeling, sitting, lying or hanging, as Savithiri, 2016 [8], indicated that training using medicine balls contributes greatly to developing physical capabilities related to muscle strength, speed, agility and balance Ameerali & Antony, 2017 [1], showed that the performance of throwing and pushing motions using medicine balls achieves an improvement in the explosive force and the strength characterized by speed and the strength bearing of the upper end of the body as a plyometric exercises. (Pramod & Divya, 2019) [7].

The present study aims to investigate the isolated and combined effects of traditional training and medicine ball exercises on strength and shot-put performance in college men. By evaluating the improvements produced by each training method and comparing them with a combined approach, this study seeks to provide evidence-based recommendations for optimizing performance training strategies among young adults.

Methodology

To achieve this purpose, sixty subjects from the Faculty of General & Adapted Physical Education and Yoga, Ramakrishna Mission Vivekananda Educational and Research Institute, Coimbatore, Tamil Nadu, were selected. The subjects' age ranged between 18 and 25 years. They were divided into four groups: Group I – Traditional Training Group (TTG), Group II – Medicine Ball Exercises Training Group (MBETG), Group III – Combined Training Group (CTG), and Group IV – Control Group (CG). All three training groups participated in their respective training programmes involving traditional exercises, medicine ball exercises, and a combination of both, while the control group did not participate in any training other than their regular routine work. The training period lasted for twelve weeks, conducted from 6.30 a.m. to 7.30 a.m. The selected criterion variables were strength, assessed using the push-up test, and shot- put performance, assessed using the shot-put throw. The data collected before and after the training period were treated using ANCOVA, with the level of confidence fixed at 0.05

Traditional Training Program

Weeks 1–4: Foundation Phase (3 sets)
Weeks 5–8: Overload Phase (4 sets)
Weeks 9–12: Peak Phase (5 sets)
Rest: 30 sec (reps) | 60 sec (sets)
Frequency: 5 days/week
Session: 60 minutes/ Day

Exercise	Week 1–4 (Foundation)	Week 5–8 (Progressive Overload)	Week 9–12 (Peak)
Push-Ups	3 sets × 10–15 reps	4 sets × 16–20 reps	5 sets × 22–30 reps
Bench Dips	3 × 10–15	4 × 16–20	5 × 22–28
Overhead Press	3 × 8–12	4 × 12–15	5 × 15–20
Squats	3 × 10–15	4 × 16–20	5 × 22–30
Lunges	3 × 8/leg	4 × 10/leg	5 × 12/leg
Standing Long Jump	3 × 5	4 × 6–8	5 × 10–12
100 m Running	3 × 100 m	4 × 100 m	5 × 100 m
Trunk Rotation	3 × 15	4 × 20	5 × 25–30
Shot-Put Standing Throws	3 × 5–7	4 × 8–10	5 × 10–12
Shot-Put Glide Drills	3 × 5–7	4 × 8–10	5 × 10–12

Medicine ball exercises training Program

Exercise	Week 1–4 (Foundation)	Week 5–8 (Overload)	Week 9–12 (Peak)
Medicine Ball Chest Pass	3 × 10–15	4 × 16–20	5 × 22–30
Overhead Throw	3 × 10–12	4 × 14–18	5 × 20–25
Rotational Throw	3 × 10–12	4 × 14–18	5 × 20–25
Side Throw	3 × 10–12	4 × 14–18	5 × 20–25
Scoop Throw	3 × 8–12	4 × 12–16	5 × 18–25
Medicine Ball Slams	3 × 10	4 × 15	5 × 20–25
Push Press (Med Ball)	3 × 10–12	4 × 14–18	5 × 20–25
Squat Throw	3 × 8–12	4 × 12–16	5 × 18–25
Backward Overhead Throw	3 × 10	4 × 12–15	5 × 18–22
Rotational Core Twist	3 × 15	4 × 20	5 × 25–30

Combined Training Program

Exercise	Week 1–4 (3 sets)	Week 5–8 (4 sets)	Week 9–12 (5 sets)
Push-Ups	10–15 reps	16–20 reps	22–30 reps
Bench Dips	10–15	16–20	22–28
Overhead Press	8–12	12–15	15–20
Squats	10–15	16–20	22–30
Lunges	8/leg	10–12/leg	12–15/leg
Standing Long Jump	5–7 jumps	8–10 jumps	10–12 jumps
100 m Running	3 × 100 m	4 × 100 m	5 × 100 m
Trunk Rotation	15 reps	20 reps	25–30 reps
Shot-Put Standing Throws	5–7 throws	8–10 throws	10–12 throws
Shot-Put Glide Drills	5–7 drills	8–10 drills	10–12 drills
Med Ball Chest Pass	10–12 throws	14–18 throws	20–25 throws
Med Ball Overhead Throw	10–12	14–18	20–25
Med Ball Rotational Throw	10–12	14–18	20–25
Med Ball Side Throw	10–12	14–18	20–25
Med Ball Scoop Throw	8–12	12–16	18–25
Med Ball Slams	10	15	20–25
Med Ball Push Press	10–12	14–18	20–25
Med Ball Squat Throw	8–12	12–16	18–25
Med Ball Backward Overhead Throw	10	12–15	18–22
Med Ball Core Twist	15 reps	20 reps	25–30 reps

Results

Table 1: Analysis of covariance on strength of traditional training group (ttg), medicine ball exercises training group (mbetg), combined training group (mbtg) and control group

Test		TTG	MBETG	CBTG	CTG	Source	Sum of Squares	df	M.S	F	Sig
Pre	Mean	23.53	23.93	23.86	23.06	Between	7.067	3	2.356	0.770	0.516
	S. D	0.60	0.45	0.72	0.61	With in	171.33	56	3.060		
Post	Mean	25.66	28.06	30.0	22.80	Between	435.267	3	145.089	38.205	0.00*
	S. D	0.65	0.79	0.83	0.62	With in	212.667	56	3.798		
Adju	Mean	25.7	27.8	29.86	23.07	Between	370.70	3	123.588	40.326	0.00*
						With in	168.557	55	3.065		

* Significant .05 level of confidence.
(The table values required for significance at .05 level of confidence with DF 3 and 56 and 3 and 55 were 2.76 and 2.77 respectively).

It is clear from the table -I that the pre-test (F = 0.770, p > 0.05) showed no significant difference in strength performance of the college men. However, post test (F = *38.205*, p < 0.05) and adjusted post test (F = 40.326, p < 0.05) value showed significant difference. The covariate is significant, indicating that strength after various traditional with medicine ball exercises training had a significant altered after 12 weeks of training.

Table 2: Scheffe's test for the difference between the adjusted post-test paired means of strength of college men

Adjusted Post-test Means				Mean Differences	Confidence Interval
Traditional Training Group	Medicine Ball Training Group	Combined Training Group	Control Group		
25.7	27.8	-	-	2.1*	1.74
25.7	-	29.86	-	4.16*	
25.7	-	-	23.07	2.63*	
-	27.8	29.86	-	2.06*	
-	27.8	-	23.07	4.73*	
-	-	29.86	23.07	6.79*	

* Significant at 0.05 level of confidence

The table-II shows the adjusted post-test mean difference of strength between traditional training and medicine ball exercise training groups, traditional and combined training and traditional with control groups and Medicine ball exercises training with combined training group, combined training with and control groups are 2.1, 4.16, 2.63, 2.06, 4.73, and 6.79 respectively, which were greater than 1.74 at level of confidence.

The results of the study showed that, traditional training group has significantly differed on strength when compared to medicine ball exercises training, medicine ball training and combined training, combined training with control group. Traditional training group medicine ball exercises training also significantly differed on strength when compared to control group. Hence it was concluded from the results that traditional training and medicine ball exercises training was better method to improve the strength. Among the trainings combined training was much better than traditional and medicine ball exercises training for improve the strength of college men.

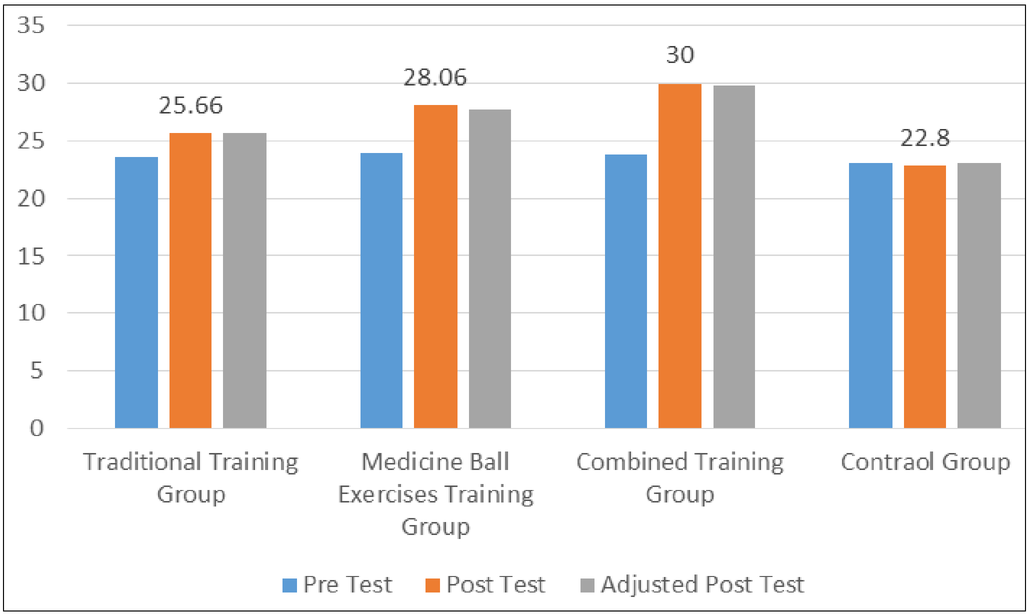

Fig 1: The bar diagram showing pre-post and adjusted mean values of traditional, medicine ball exercises training combined training and control group of strength of college men

Table 3: Analysis of covariance on shot put performance of traditional training group (ttg), medicine ball exercises training group (mbetg), combined training group (mbtg) and control group

Test		TTG	MBETG	CBTG	CTG	Source	Sum of Squares	df	M.S	F	Sig
Pre	Mean	5.31	5.32	5.30	5.29	Between	0.003	3	0.001	0.003	
	S. D	2.50	1.66	1.35	1.16	With in	20.593	56	0.368		1.0
Post	Mean	5.72	5.78	6.26	5.28	Between	7.241	3	2.414	4.371	
	S. D	1.95	2.34	2.10	1.08	With in	30.919	56	0.552		0.008*
Adju	Mean	5.73	5.77	6.25	5.27	Between	7.207	3	2.402	4.618	0.006*
						With in	28.612	55	0.520		

* Significant .05 level of confidence.
(The table values required for significance at .05 level of confidence with DF 3 and 56 and 3 and 55 were 2.76 and 2.77 respectively).

It is clear from the table -III that the pre-test (F = 0.003, p > 0.05) showed no significant difference in Shot put performance of the college men. However, post test (F = 4.371, p < 0.05) and adjusted post test (F = 4.618, p < 0.05) value showed significant difference. The covariate is significant, indicating that shot put performance after various tradition with medicine ball exercises training had a significant altered after 12 weeks of training.

Table 4: Scheffe's test for the difference between the adjusted post-test paired means of sHOT-PUT PERFORMANCE of college men

Adjusted Post-test Means				**Mean Differences**	**Confidence Interval**
Traditional Training Group	**Medicine Ball Training Group**	**Combined Training Group**	**Control Group**		
5.73	5.77	-	-	0.04	0.71
5.73	-	6.25	-	0.52	
5.73	-	-	5.27	0.46	
-	5.77	6.25	-	0.48	
-	5.77	-	5.27	0.50	
-	-	6.25	5.27	0.98*	

* Significant at 0.05 level of confidence

The table-IV shows the adjusted post-test mean difference of shot-put performance between traditional training and medicine ball exercises training group and combined training group, traditional and medicine ball exercises training, combined training and control groups and combined training and control groups are 0.98 respectively, which were greater than 0.71 at level of confidence.
The results of the study showed that, combined training group has significantly differed on shot put performance when compared to traditional training, medicine ball exercise training group and control groups. Combined training group also significantly differed on shot put performance when compared to control group. Hence it was concluded from the results that combined training group was better method to improve the shot-put performance of college men.

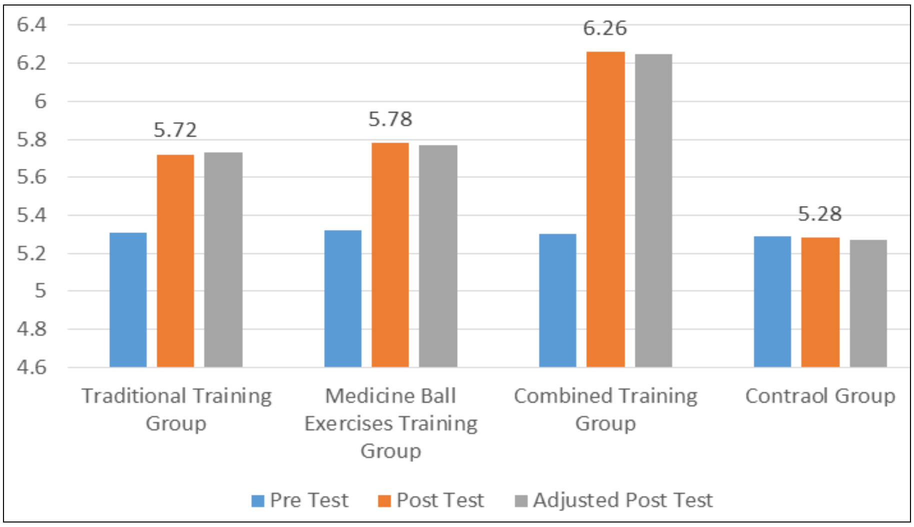

Fig 2: The bar diagram showing pre-post and adjusted mean values of traditional, medicine ball exercises training combined training and control group of shot-put performance of college men

Discussion on Findings

The training program in which the experimental groups persisted for twelve weeks was beneficial for the development of specific strength and shot-put athletic performance of college men. The training schedule employed more beneficial for athletes. The results of the study line with that the effect of medicine ball training on shoulder strength and abdominal strength and endurance among Sudan school boy's football players (Pramod R, Divya K 2019) [7], Effect of Pilates exercise training and medicine ball training on speed and explosive strength variables among men inter collegiate football players, (Ameerali PA, Antony AM 2017) [1], Effect of medicine ball training on bio motor variables of adolescent boys (Savithiri C, Kumaresan G 2016) [8]. Circuit training with and without medicine ball on selected motor ability components (Soloman, Emerson 2018) [9]. Effect of Preseason Over-Weighted Medicine Ball Training on Throwing Velocity (Szymanski JM *et al.*, 2011) [10]. Muscular Strength, Body Composition and Performance of an Elite Shot Putter (Terzis *et al.*, 2012) [12]. The effect of a proposed training program using medicine balls on some physical variables and the digital achievement of throwing events in athletics for students of physical education (Salameh, Hamed. 2020) [11].

Conclusions

1. The results of the study showed that all training groups improved in the selected criterion variables strength and shot-put performance of college men. However, the Combined Training Group showed superior improvement compared to the Traditional Training Group, the Medicine Ball Exercises Training Group, and the Control Group.
2. The Control Group did not show any improvement in the selected criterion variables.

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