

Effect of a Structured Weight Training Programme on Throwing Performance among Inter-Collegiate Basketball Players

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Abstract— This article examined the effect of a well-structured six-week weight-training program on basketball throwing performance among intercollegiate players. Twenty male basketball players of the District Stadium of Nagaur, Rajasthan, between 18 and 25 years, were randomly selected. These players are assigned to the experimental group ($n = 10$) and the control group ($n = 10$). The experimental group received training as suggested, while the control group continued with its regular activities without training. Before and after the treatment, Basketball throwing ability was measured. The analysis of covariance (ANCOVA) was used to compare the groups, controlling for their pre-test performance at a 0.05 significance level. There was no significant difference in the pre-test ($F=0.45$), suggesting initial homogeneity. Across-test ($F = 7.73$). Two adjusted post-test scores differed between groups: $F(1,17) = 9.18, p = .008$. Of the two groups, the intervention group's adjusted mean was 176.10 while that of the control was 165.47. The sums of squares reported yield a partial eta squared of 0.351. Based on the research findings, a structured program has resulted in a significant enhancement in the basketball throwing ability of the players.

Keywords—basketball, intercollegiate players, muscular strength, throwing performance, weight training.

I. INTRODUCTION

Basketball is a team game that uses high intensity. The technical execution of basketball depends on coordinated contributions of fitness, tactics, perception, and cooperation. To perform competitively, players have to repeatedly accelerate, decelerate, change direction, jump, and execute pass, shoot, rebound, and defend actions in a time-constrained environment. [1], [2].

Thus, muscular strength and power form the basis of basketball conditioning. Power comes from strong muscle mass and helps generate force quickly. Those who have power are explosive. Agility, speed, flexibility, endurance, and neuromuscular coordination work together to optimize movement in competition. [3]– [5].

The ability to throw accurately is especially relevant to long-range passing and the execution of the fast break, along with the movement of the ball on offense. When we throw an object, the lower limbs, trunk, shoulder girdle, arm, and wrist coordinate. Despite the necessity of technique, a sufficient level of strength may allow players to transmit force through the kinetic chain and maintain performance in passing on repeated efforts. [1], [5].

Structured resistance training has become popular for enhancing strength, power, and sport-specific performance. Research on athletes indicates that scientifically designed programs can enhance

physical abilities, provided that load, exercise selection, recovery, and progression are managed. Studies on basketball conditioning indicate that combined and compound training may improve specific selected fundamental skills and performance qualities. [6]– [9].

Although strength, sprinting, jumping, and overall basketball fitness have received a great deal of study, much less has been done in controlled studies of basketball throwing ability in intercollegiate players in regional training settings. The current study aimed to investigate the effect of a six-week structured weight training program on the throwing performance of male intercollegiate basketball players of Nagaur, Rajasthan. [1], [5], [6].

II. REVIEW OF RELATED LITERATURE

According to broader strength-training academic literature, muscular strength is a key quality that can affect power, speed, change-of-direction ability, and the ability to perform a sport-specific task. According to a meta-analysis of the literature, the effects of the training depend on the variables of the program. These include things like training status, intensity, volume, and progression. [4], [8], [9].

Supervised, properly designed resistance training improves the strength and functional performance of younger athletes, including children and adolescents.

There is a strong consensus in the literature on the use of progressive loading, qualified supervision and movement quality, rather than the indiscriminate application of heavy resistance. [7], [10].

According to Christou et al., resistance training along with sport practice improved strength and selected physical capacities in adolescent soccer players. While the sport is different from basketball, the results show that there are benefits to the

inclusion of structured resistance exercise with technical training for developing young athletes. [7]. Other sports research has also shown transfer from strength-focused exercise to performance variables. Azeem and Ameer reported gains in strength along with positive alterations of sprint and flexibility, Elsaywy reported benefits of functional strength training for physical and kicking variables in taekwondo, and Ibrahim found gains in arm strength and defensive performance among players of sitting volleyball. [12]– [14].

Configuration of training carries enormous significance. The way sets are completed was shown to affect adaptation (Izquierdo et al.), while adaptations in strength, power, and functional performance following strength training were documented (Hanson et al.). Fatuous et al. also showed that resistance training can be planned without interference to flexibility if planned appropriately. [15]– [17].

Current research offers more direct support for basketball-related research. A six-week compound training program led to enhanced basketball fundamental skills, according to in overo and Pagaduan. According to the reviews and application analyses of Oliver et al., Lockie and Jeffriess and Turner and Stewart, strength and conditioning is an important aspect in the physical preparation of basketball players. [1], [2], [5], [6].

Resistance training must still be well-balanced and technique-controlled. Kolber et al. indicated that shoulder problems could occur when resistance exercises are poorly selected or executed. The worry is especially pertinent to throwing tasks which place repeated load on the shoulder complex. Hence, the evidence that was reviewed supports structured and supervised training, but the lack of direct evidence of intercollegiate basketball throwing performance justifies the present study [11].

III. PURPOSE, OBJECTIVES & HYPOTHESES

A. Purpose of the Study: The study aimed to determine whether a planned six-week weight-training program would affect the basketball throwing ability of male intercollegiate players. The program emphasized upper-body routine exercises typically performed in strength and conditioning practices. [3], [5].

B. Objectives:

- 1) The goal of this study is to assess basketball throwing ability before and after the six-week intervention.
- 2) To determine the impact of organized weight training on the throwing performance of the experimental group.
- 3) To identify the difference between the post-test throwing ability of players who received intervention and players who continued regular activity.
- 4) To find out if the post-test difference in scores remained significant with the pre-test controlled.

C. Hypotheses H0: After adjustment for pre-test scores, there is no significant difference in basketball throwing ability between the experimental and control groups.

H1: After adjustment for pre-test scores, the experimental group demonstrates significantly better basketball throwing ability than the control group.

D. Delimitations: The scope of the study was confined to male inter-collegiate basketball players (18-25 years) of District Stadium, Nagaur, Rajasthan. The only performance testing of the dart thrower was done. It had a six-week intervention period.

IV. METHODOLOGY

A. Research Design and Participants: A control-group experiment with pre and post-tests was used. A sample of twenty male inter-collegiate basketball players was selected through simple random sampling. The subjects were randomly distributed into two equal groups, namely, the experimental group (n = 10) and the control group (n = 10). The participants were aged 18-25. It was checked whether the pre-test scores were comparable.

B. Training Program: Under the supervision of the investigator, the experimental group followed the six-week structured weight training program as depicted in Table I. The exercises included movements for the bench press, pull-down and pull-up, shoulder press and fly. All sessions had a 15-minute warm-up and a 10-minute cool down. The control group performed its normal physical activities and did not receive any weight-training intervention [3], [5].

TABLE I
SIX-WEEK STRUCTURED WEIGHT TRAINING PROGRAMME.

Weeks	Exercises	Sets and Repetitions	Recovery	Duration
Weeks I-II	Bench press, pull-down and pull-up, shoulder press, and fly	1 x 3 repetitions	1-minute rest	Approx. 30 minutes
Weeks III-IV	Bench press, pull-down and pull-up, shoulder press, and fly	1 x 4 repetitions	1-minute rest	Approx. 40 minutes
Weeks V-VI	Bench press, pull-down and pull-up, shoulder press, and fly	1 x 5 repetitions	1-minute rest	Approx. 1 hour 10 minutes

C. Instrument and Data Collection: The Basketball Throwing Ability Test was used as a measure of basketball throwing performance. The measurements of the pre-test were done before the start of the program, and the measurements of the

post-test were done after completion of six weeks. Both groups underwent the same testing procedure at every measurement occasion.

D. Statistical Analysis: ANCOVA or Analysis of Covariance was used to compare the post-test score of two groups while keeping a check on a pre-test score. The significance level was set at 0.05. Besides the F-ratio, we derived the p-value and partial eta squared from the reported ANCOVA values to provide information on treatment effect size and statistical significance.

V. RESULTS

The pre-test, post-test and adjusted post-test results are presented in Table II. The pre-test means were similar for the experimental and control groups, whereas the experimental group displayed a higher post-test and adjusted post-test mean after the intervention.

TABLE II
ANALYSIS OF COVARIANCE OF PRE-TEST, POST-TEST AND ADJUSTED POST-TEST MEANS FOR BASKETBALL THROWING ABILITY

Source of Variance	Test	Experimental Group Mean	Control Group Mean	Sum of Squares	df	Mean Square	F-ratio
Between Groups	Pre-Test	164.98	163.82	6.72	1	6.72	0.45
Within Groups	Pre-Test	—	—	268.94	18	14.94	—
Between Groups	Post-Test	176.72	164.85	704.42	1	704.42	7.73*
Within Groups	Post-Test	—	—	1640.36	18	91.13	—
Between Groups	Adjusted Post-Test	176.10	165.47	563.28	1	563.28	9.18*
Within Groups	Adjusted Post-Test	—	—	1041.96	17	61.29	—

*Significant at the 0.05 level. Required F value for $df(1,17) = 4.45$.

The pre-test F-ratio of 0.45 was below the critical value, indicating that the two groups did not differ significantly before training. At post-test, the F-ratio of 7.73 exceeded the critical value, demonstrating a

significant unadjusted difference following the intervention.

After adjustment for pre-test scores, the experimental group mean was 176.10 and the control group mean was 165.47. The adjusted F-ratio of 9.18 exceeded the critical value of 4.45. Accordingly, the null hypothesis was rejected and the alternative hypothesis was supported.

TABLE III
ADJUSTED ANCOVA SUMMARY FOR BASKETBALL THROWING ABILITY

Source of Variance	Sum of Squares	df	Mean Square	F-ratio
Between Groups (Adjusted)	563.28	1	563.28	9.18*
Within Groups (Error)	1041.96	17	61.29	—
Total	1605.24	18	—	—

*Significant at the 0.05 level. $F(1,17) = 9.18$, $p = .008$; partial eta squared = 0.351.

A. Principal Findings

- There was no significant pre-test difference between the experimental and control groups.
- The experimental group improved its basketball throwing score after six weeks of structured weight training.
- The post-test difference was statistically significant in favour of the experimental group.
- The adjusted post-test difference remained significant after controlling for pre-test performance.
- The calculated effect-size estimate indicates that a substantial proportion of adjusted outcome variance was associated with group membership.

VI. DISCUSSION

The study results indicate that a six-week structured weight training program can improve throwing ability.

Results reveal that the experimental group obtained a higher adjusted post-test mean compared to the control group. Based on the ANCOVA results, the difference was unlikely to be attributable to baseline variation. This result corresponds with the literature that has identified muscular strength as a necessary foundation for athletic performance and basketball conditioning. [1], [4], [6].

It is likely that repeated resistance exercise has improved their capacity to produce and coordinate force through the upper body. The bench press, shoulder press, pull-down, and fly exercises use musculature that controls shoulder stability, elbow extension, and force transfer during a pass and throw. Neural flexibility, enhanced coordination between muscles, and a stronger ability to exert force probably led to this progress. [3], [4], [15].

The evidence also agrees with basketball-related evidence that appropriately planned conditioning improves this skill and physical performance. The possession of strength does not guarantee the ability to throw. Execution, timing, coordination, and task familiarity are still crucial, and strength gains are most effective when combined with basketball practice. [1], [5], [6].

The findings of the study should be considered within its limitations. Only twenty male players from one training location were selected as the sample, and the intervention was of six-week duration with one throwing-ability test as the outcome. The findings of the research were, therefore, specific to the participating group but should not be generalized naively to female players, other age categories, elite populations or longer training cycles. It is crucial to monitor to prevent

increased shoulder stress due to unbalanced resistance programs. [10], [11].

VII. PRACTICAL APPLICATIONS

Coaches and physical education professionals may incorporate structured upper-body resistance exercises into basketball conditioning when the objective is to improve force production for passing and throwing. Programs should use progressive overload, correct technique, suitable recovery, and direct supervision. Strength work should be combined with technical throwing practice so that gains in force-production capacity translate into game-specific movement patterns. [3], [5], [10], [11].

VIII. CONCLUSION

Within the scope of the study, the experimental and control groups were comparable before training. Following the six-week intervention, the experimental group demonstrated significantly better basketball throwing ability than the control group. The adjusted ANCOVA result, $F(1,17) = 9.18$, $p = .008$, supported rejection of the null hypothesis. It was therefore concluded that the structured weight-training program had a positive effect on throwing performance among participating male intercollegiate basketball players.

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