



LITERATURE REVIEW ON EFFECTS OF BALLISTIC SIX PLYOMETRIC TRAINING IN OVERHEAD ATHLETES.

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ABSTRACT

BACKGROUND

The powerful performance exhibited by the athletes involved in overhead sports, depends on the athlete's endurance and the strength of upper limb musculature. Ballistic Six involves plyometric exercises to improve upper extremity strength and muscle performance requiring a pre-stretch of the involved shoulder musculature, which activates the stretch-shortening cycle. The ballistic six exercises consisting of eccentric, amortization and concentric phases of stretch-shortening cycle was created after analysing the biomechanics and physiology behind a throwing action by the athletes.

This study aims to evaluate the current research to examine the effectiveness of Ballistic six plyometric exercises in improvement of shoulder muscle strength, endurance and performance in overhead athletes.

METHODS: The search engines such as Google scholar, PubMed and Cochrane library, were searched. There were no restrictions on the data applied to review articles. Data were sort by title, study design, outcome measure, results and were arranged in sequential order.

RESULTS

Amongst the 10 articles, 3 articles showed that ballistic six exercises when combined with off season training is more effective than off season training alone. In 4 studies, only ballistic six exercises were given and did not have the control group. 1 study showed that ballistic six plyometric training when combined with traditional warm-up and dynamic exercises is effective than traditional warm-up alone. 2 studies showed that ballistic six plyometric training is more effective when compared with techniques like free weights and theraband exercises.

CONCLUSION

This literature review analysed the effects of Ballistic six plyometric exercises in overhead athletes. The wide range of reviews used to demonstrate that Ballistic Six Plyometric Exercises can be a choice of protocol to improve performance in overhead athletes and it significantly important to have evidences based on these exercises. The suggestions given in this study will help us to determine the efficacy of Ballistic six plyometric exercises to improve performance in overhead athletes.

KEYWORDS: Ballistic Six plyometric training, overhead athletes, performance.

INTRODUCTION

The performance and prevention of injury and further damage to the limb in overhead athletes depends on the shoulder muscles strength especially the rotator cuff. The physical demand imposed on the upper extremity for a good pitch or throw is high and is considered as an important aspect in the conditioning program for a better performance.¹

Ballistic Six exercises, introduced by Ryan Pretz, is intended to improve and enhance upper extremity's muscle strength and performance. The ballistic six exercises which depend on the kinetic chain principle, are advised to improve strength and endurance in overhead-throwing athletes. The Ballistic Six involves 6 commonly used upper limb exercises which are performed with fast and high- powered movements tends to activates both agonists and antagonist muscles. These agonists and antagonists work in coordination to allow eccentric contraction followed by concentric contraction¹

The Ballistic six exercises consist of stretch shortening phases which involves eccentric, amortization, and concentric phase is found to be efficient in improving the throwing activity as well as to improve the strength and endurance of the rotator cuff for a powerful throwing action to prevent injury and further damage to shoulder joint.²

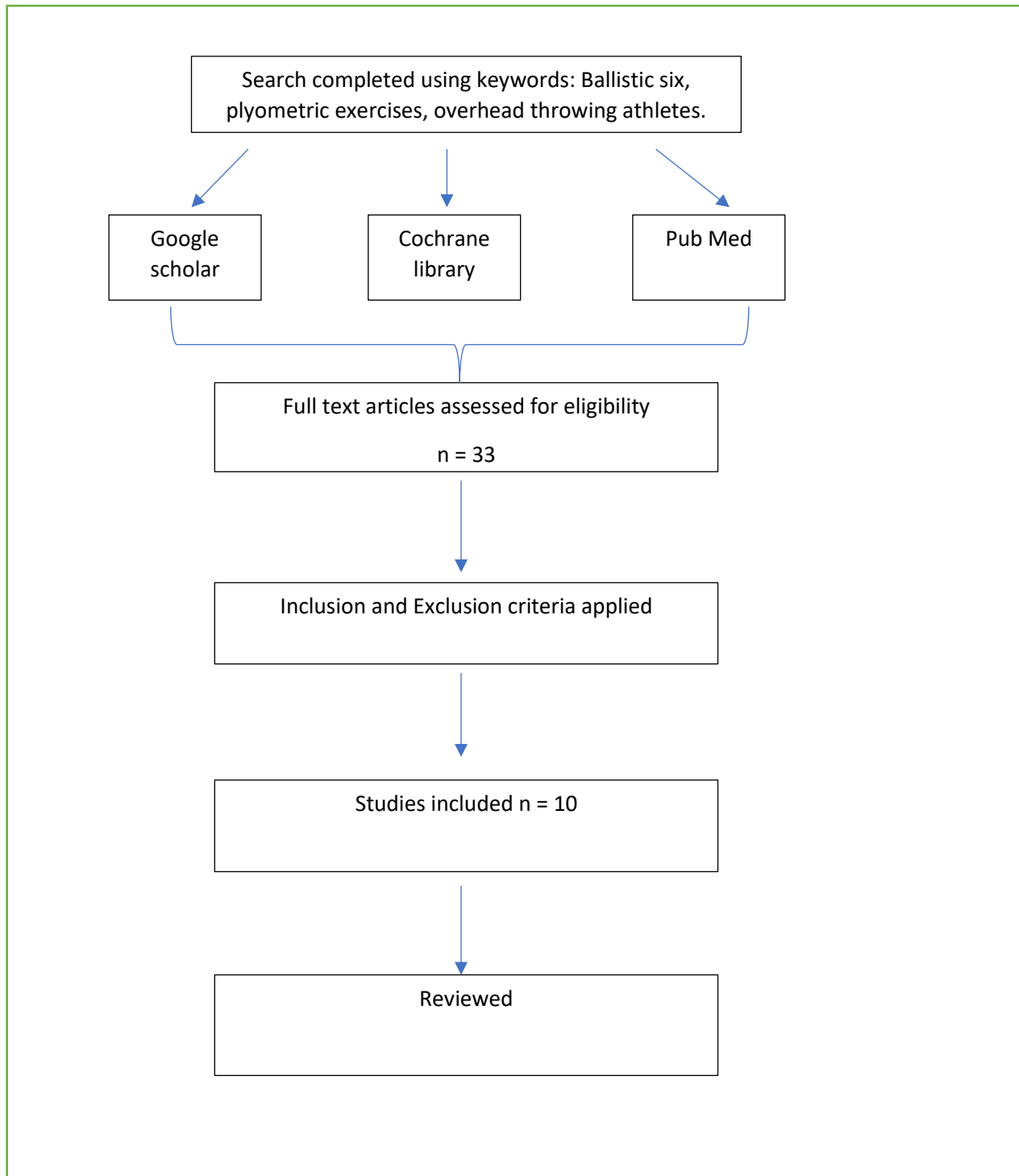
During an overhead throw the muscles of upper limb are highly active during the three phases i.e., cocking phase, the deceleration phase, and the follow-through phases. Inadequate motor control and co-ordination of the rotator cuff during a powerful throw can be a reason for most of the injuries.²

Some research found that combining routine exercises with ballistic six exercises lead to the improvement in peak performance. Thus, providing evidences on ballistic six exercise to be a beneficial way in improving neuromuscular performance, strength and endurance in an athlete.

Objective of the Study:

- To evaluate the current literature to examine the effectiveness of Ballistic six plyometric exercises in improvement of shoulder muscle strength, endurance and performance in overhead athletes.

METHODOLOGY



Method: The search engines like Google Scholar, Pub Med, Cochrane library were used to collect the articles. The articles were collected in full text. A total of 33 articles were identified and 10 out of 33 articles were selected based on the inclusion criteria.

Source: A comprehensive search on PubMed, Google Scholar, Cochrane library and science direct, clinical keys database using keywords Ballistic six plyometric exercises, overhead throwing athletes. Database which are evidence based were utilized for assessment.

Study Selection and Data extraction: Data was sort by title, study design, outcome measure, results and were arranged in sequential order

Inclusion criteria: 1. Articles that are published in English; 2. Ballistic six plyometric exercises; 3. Overhead athletes 4. Peer review journal published articles only; 5. Studies involving human participants.

Exclusion criteria: 1. Editorials expert opinion; 2. Other than English Language

Literature Evaluation: The results of the research varied widely. From 33 articles, 10 articles were selected according to the inclusion criteria. There were no restraints to the dates applied to the review article. The studies were grouped into 6 Experimental studies, 2 pilot studies, 1 RCT, 1 NCT.

S. No	Author s	Year and journal	Study design	Outcome measures	Results
1	Andrew B. Carter et al.	2007 & Strength and Conditioning Research journal ³	NCT	Primary Outcome measure: Increase in throwing velocity. Secondary Outcome measure: Subject compliance.	Increase in velocity by 2 mph in plyometric group whereas slight increase in velocity by 0.27 mph in control group.
2	Matthew J. Somma	2011 & international journal of Athletic Therapy & training ⁴	Pilot study	Hand-held dynamometry for supraspinatus strength	Improved Supraspinatus muscle power after ten weeks of plyometric training protocol.
3	Ertugrul Gelen	2012 & Journal of Sports Science and Medicine ⁵	Experimental	Tennis Serve performance test.	Dynamic and high volume upper extremity plyometric warm up exercises are beneficial for the serving speed.
4	Amrinder Singh	2014 & Saudi Journal of Sports Medicine ⁶	Experimental	Bowling velocities (using Radar Gun) was recorded pre and post training program.	Increases in the bowling velocity and performance.
5	Ujwal L Yeole	2017 & International Journal of Current Advanced Research ⁷	Experimental	Serving speed recorded using radar gun 6pre and post intervention	“Ballistic Six” is effective in improving the serving speed in tennis players.
6	Elif Turgut	2017 & Journal of Strength and Conditioning Research ⁸	Experimental	Medicine ball throw test, Push up performance test, Reaction time test.	Ballistic Six exercises showed improvement in overhead medicine ball throw distance, push-up performance and reaction time.
7	P. Sathya	2017 & IRF International Conference ⁹	Experimental	Medicine ball put test	Ballistic six exercise showed better improvement in shoulder power as compared to free weight exercise.
8	Simran Narang and Deepali Patil et al	2021 & Journal of Pharmaceutical Research International ¹⁰	RCT	Sitting medicine ball throw test, closed kinetic chain upper extremity stability test, plate tapping test and Kerlan Jobe Orthopaedic Clinical Score.	Significant increase in mean values in both group but Group A showed more improvement than Group B.
9	Simran Narang	2022 & Journal of medical pharmaceutical and allied sciences ¹¹	Pilot Study	Sitting medicine ball throw test, Closed Kinetic Chain Upper Extremity Stability Test, Speed Plate tapping test, Kerlan Jobe Orthopaedic Clinical Shoulder & Elbow Score	Significant improvement was seen in agility balance and speed of the player.

10	Mona Ebada	2022 & Science Movement and Health ¹	Experimental	Medicine ball throw test, Grip Strength test, Strength & accurate serve	Increase in arm power, Grip Strength and improvement in Strength & serve accuracy after 7 weeks of ballistic six exercises.
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RESULTS: Out of 10 articles, 3 articles showed that ballistic six exercises when combined with off season training is more effective than off season training alone. In 4 studies, only ballistic six exercises were given and did not have the control group. 1 study showed that ballistic six plyometric training when combined with traditional warm-up and dynamic exercises is effective than traditional warm-up alone. 2 studies showed that ballistic six plyometric training is more effective when compared with techniques like free weights and theraband exercises.

DISCUSSION:

In this review, total 10 articles were included. Out of these 10 articles 6 were Experimental studies, 2 pilot studies, 1 RCT, 1 NCT. The results of the studies were promising. Of the 10 articles, all the studies showed favourable results in terms of ballistic six exercises being the choice of protocol for overhead athletes. Not only in baseball players but also in sports like volleyball and other racquet sports.

The present literature review revealed that Ballistic Six exercises can increase upper limb strength, endurance & performance in overhead athletes. Two studies showed that ballistic six exercises when compared with free weights exercises using dumbbells and theraband exercises shows more improvement in shoulder muscle power than the compared group. Two pilot studies done on baseball players (for 10 weeks) and badminton player (6weeks) showed that ballistic six plyometric training is effective in increasing supraspinatus muscle strength and enhancing badminton overhead simple stroke efficiency respectively. In Two studies, Group A performing off season training and the other combining ballistic six with their off- season training, the group with ballistic six exercises showed significant increase of performance than Group A.

In a study done by Mona Ebada et al, group A was given ballistic six exercises and group B is the control. The study showed a significant difference in the values of medicine ball throw test, grip strength test and accuracy in serve after post-test in experimental group. One study done by Ertugul Gelen et al. showed that Dynamic exercises when combined with high volume upper extremity plyometric training is likely to be advantageous in enhancing serving speed of elite junior tennis player. Four studies only had the experimental group and no control group. The studies showed improvement in performance on post assessment after ballistic six plyometric training.

Taken all together of the above-mentioned studies, Ballistic six plyometric exercises when performed alone or combined with other techniques or when compared with other techniques and control group indeed have beneficial improvement on shoulder muscle strength, endurance and performances in overhead athletes. This Ballistic six plyometrics can be a promising method of training the overhead athletes for enhancing their performance. Due to the paucity of researches, future research needs to be done on this technique.

CONCLUSION:

This literature review analysed the effects of Ballistic six plyometric exercises in overhead athletes. The wide range of reviews used to demonstrate that Ballistic Six Plyometric Exercises can be a choice of protocol to improve performance in overhead athletes and it is significantly important to have evidences based on these exercises. The suggestions given in this study will help us to determine the efficacy of Ballistic six plyometric exercises to improve performance in overhead athletes.

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