



## EFFECT OF CLOSED KINETIC CHAIN UPPER EXTREMITY STABILITY TEST (CKCUEST) ON STABILITY, FUNCTIONAL PERFORMANCE AND PAIN IN PROFESSIONAL SHOOTERS

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### ABSTRACT

**Background and Purpose:** Shooting athletes may benefit greatly from physical therapy. Additionally, biomechanical anomalies and acute/chronic muscular abnormalities play a significant role in physical therapy evaluations of posture, flexibility, strength and stability. Soreness in the shoulders of shooting athletes may also occur during or after prolonged periods of shooting.

**Materials & Methods:** Permission was taken from the academy, a group of 30 shooters was approached and a written consent was taken from them, explaining the aim and objectives of the study. The participants were tested for enhancing the power, strength and removing their pain in shoulder joint. They were divided into two groups, Group A was trained with upper limb plyometric and Group B was controlled and trained with ergonomics. The duration of study was 45 days. The data was collected on initial (0 day), 3 weeks and 6 weeks. At the beginning and the end of sessions, their performance was assessed using closed kinetic chain upper extremity test, this test was selected as the functional test of the upper extremity that demonstrates a high-test reliability, and the purpose of the study is to check the improvement in strength and removing their pain in shoulder joint.

**Results:** Results of the research reveal that the pre- and post-test scores of the Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) for Group A were 22.120.981 for pre-test and 42.720.982 for post-test for Group A, respectively. Because there was a significant difference between the two groups, the p value for each was less than 0.05. Results from Group A were better than those from Group B, indicating that the impacts were greater in Group A. The VAS score is more pronounced in Group A than in Group B.

**Conclusion:** Using Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) for shooter shoulder discomfort and strength was shown to be a successful treatment in this research. Plyometric training outperforms ergonomic training in terms of effectiveness.

### INTRODUCTION

It takes a lot of focus and stamina to shoot consistently for long periods of time. As a result, this may cause muscular spasm, knots, and misalignment of the joints. It is also common practice to shoot from one side alone. The connective tissue of the upper arm and thorax called the shoulder

complex. This elaborately designed system has four joints. A "floating joint" called the Scapulothoracic Joint also exists, as does the GH Joint, AC Joint, and Sternoclavicular Joint (ST Joint).(1). In spite of the shoulder's extensive range of motion, the glenohumeral joint's spheroid structure puts it at risk for injury and other complications. To keep the arms and hands attached to the skeleton, the GH, AC, and SC joints are located in the thorax(2). It is possible to glide the scapula over the thoracic wall contours thanks to the ST joint. All four joints work together to achieve proper shoulder girdle movements. There is a complex dynamic interplay between muscle forces, ligament constraints, and bone articulations in the movement of the shoulder complex(3). There are articular structures in the shoulder complex that are designed to allow us to move and position our hands in the widest possible range of motion, giving us with more mobility than any other joint in our bodies(4).

Because of the complex anatomical and functional architecture of the shoulder complex and the trade-off between mobility and stability, the shoulder complex is particularly prone to dysfunction and instability (and hence to injury). Dynamic Stabilization refers to the shoulder's unique functional balance between mobility and stability through active forces. Instead of passive stability via articular surface design, capsule, or ligaments, Dynamic Stabilization relies on active forces or dynamic muscle control. To summarise, the shoulder complex is held together by muscle forces, which act to stabilise the shoulder girdle relative to the thorax and support upper extremity movements(5). There is a lot of fatty tissue in the shoulder area. Joint capsules, labrums, ligaments, bursae, tendons, and muscles are all part of the body's connective tissue network. Dynamic and non-contractile tissues must work together to maintain shoulder stability, as the complex is so mobile(6).

When it comes to the shoulder joint, we may say that it is a synovial joint. When two bones come together, they produce this joint: the glenoid (the shoulder blade) and the humerus (the arm bone) (upper arm bone). The humerus and scapula have a relatively limited contact area because of the looseness of the joint capsule, making it the most mobile joint in the human body.(7). The humerus and scapula create a ball-and-socket joint at the shoulder. Even though the glenoid fossa is quite shallow, the glenoid labrum acts as an enlargement. The glenoid labrum connects the glenoid cavity's cartilaginous fibres to the bone. Attachment of the biceps brachii tendon is accomplished by the use of the ring on this arm. The humeral head is forced into the glenoid cavity by the shoulder's rotator cuff muscles, which have a high tensile strength.(8). Glenoid cavities grow deeper and more stable when the labrum is present. The shoulder joint has an unsupported range of motion of 120 degrees, making it the most mobile joint in the human body.(9).

It is possible to get additional flexibility by employing scapulohumeral rhythm, which explains how it moves in relation to the humerus as it travels back and forth. If the scapula is moved in any way, its range may change. There may be a problem with the scapula because the large trapezius muscles that stabilise it are underdeveloped. Because of a forward head carriage, the range of motion of the shoulder may also be compromised.

Exercises in which the muscles exert their maximum force for a limited amount of time are known as Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) , jump training, or plyos, and are used to enhance one's power (speed-strength)(10). With this kind of training, for example, you'll learn how to quickly and "explosively" transition between muscle extension and contraction. In order to boost their performance, athletes, including martial artists, sprinters, and high jumpers, employ Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) . Strength and endurance may be boosted by doing plyometric exercises, which employ rapid movements to engage the muscles' elasticity and responsiveness. Since Soviet Olympians began wearing it in the 1950s, athletes from over the globe have adopted it. Many sports, including basketball, badminton, squash, and volleyball, use plyometric training. Fred Wilt invented the word "Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) " after seeing Soviet athletes train for track and field competitions. A public relations campaign featuring Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) expert Michael Yessis was established.(11).

Since the 1980s, two distinct forms of plyometric training have arisen. The shock technique was invented by Russian physicist Yuri Verkhoshansky. The athlete would feel a "shock" when they descended from their high altitude. The athlete leapt in order to do this by first contracting their legs ferociously and then concentrically. The landing and takeoff were accomplished in 0.1–0.2 seconds, which is a tremendous achievement. Verkhoshansky coined the term "explosive Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST)" to characterise his training approach. The depth jump proved to be the most effective training method for simulating landing and takeoff forces.(12).

Muscle fibre cross-sectional area and recruitment intensity are the determinants of a person's physical power. Type I slow-twitch muscle fibres make you weaker than fast-twitch muscle fibres, yet each contraction may last for a long time. Because to the use of performance-enhancing medicines, there is no limit to one's strength improvements.

Muscle biopsies may provide information on a person's individual fibre ratios. All of these parameters are taken into account when determining an athlete's performance, including leg length, joint angle, and muscle fibre activation. Strength training has been shown to be more effective in lifters with shorter arms and legs. When it comes to gaining muscle, a person's genetics, gender, age, health, and food all play a part. One repetitions maximum testing is the only way to correctly measure peak muscle strength.

## **REVIEW OF LITERATURE:**

**JEFFREY M. WILLARDSON et al 2007** - Core stability training and related subjects were thoroughly examined in order to uncover practical applications for sports conditioning programmes. According to the most current research, recommendations for core stability workouts should vary based on the health and stage of training of the athlete. Exercises that increase core strength and power while standing on a solid platform are recommended during the preseason and throughout the mesocycle. These free weight exercises are especially developed to address the core stability demands of sports-related talents due to the high levels of force production and mild degrees of instability. Swiss ball exercises using isometric muscle movements, small weights, and long tension durations are recommended to build core endurance in the off-season and post-season. Exercises such as balance boards and stability discs, as well as plyometric workouts, are recommended to enhance proprioceptive and reactive abilities.(13)

**Daniel J. Gehri et al 1998** - The key goals of this research were to increase vertical jump height, elastic energy usage, and positive energy generation. Comparisons of pre- and post-training data were performed using ANOVA. People (N = 28) were divided into three groups: the control group, training for depth leaps (N = 12), or counter-motion (N = 8) based on performance. In each group, participants performed squat leaps, counter-motion jumps, and depth jumps. After the 12-week training regimen, both training groups saw substantial increases in vertical jump heights. Each of the three leaps had a substantial increase in vertical jump height for the deep jump group. Elastic energy improvement efforts have met with utter failure. Dynamic stretch-shortening activities performed better by drop jump training than by countermovement jump training.(14)

**Maamer Slimani et al 2016** - Team sport players' physical fitness has been widely investigated by researchers using plyometric training. Short-term physical training may help children and young people improve their leaping, sprinting, and agility abilities. Despite this, it seems that top-level male athletes need more than six to seven weeks of training to significantly improve their physical ability. According to available studies, water, grass, or sand-based PT may produce the same benefits in jumping, sprinting, and agility as regular PT for short-term PT. Additional plyometric exercises, such as bilateral and unilateral leaping, may be required to enhance these skills. Pure

physical therapy had a greater impact on 30-meter sprint and vertical leap performance than physical therapy coupled with vertical jump/strength training, according to a recent study. In this study, researchers found that a well-designed and sport-specific PT programme may help athletes improve their leaping and sprinting abilities.(15)

**Vasileios Drouzas et al 2020** - Among one group, people received training in both bilateral and unilateral plyometric exercises. There were three groups: one with unilateral plyometric training, the other with bilateral plyometric training, and a control group of 22 people. During each 15-minute session, the plyometric training groups alternated between unilateral and bilateral exercises of the same volume. The drills were soccer-specific, of course. During the competitive season, athletes received plyometric training twice weekly for a total of ten weeks. Before, during, and after the surgery, the quadriceps and hamstrings were tested for their maximum isometric strength, as well as for their countermovement leaps. Unilateral lower-limb plyometric exercise was more beneficial to pre-adolescent soccer players than bilateral training or just playing the sport itself.(16)

**Kenneth Stakset Dahl et al 2021** - Outfield handball players were tested to see whether they could enhance their shot accuracy using sling-based training that emphasised rotational motions, and if these improvements in performance were linked to improvements in core strength and rotational velocity. With and without the help of the run-up, 25 female outfield handballers tried shots from 7 metres, including jump shots. People were tested for their maximal ball velocity, trunk rotation velocity, and 1RM in a core strength test after an eight-week training programme. The plyometric/sprint training was done three times a week for eight weeks, while the sling training was done once a week (control). A shift in timing or power transfer between segments might be to blame for the higher ball velocity after sling-based training.(17)

**Rajal B. et al 2019** - Six weeks of plyometric training and Bent Leg Raise (BLR) stretching were compared and contrasted in terms of their impact on basketball players' vertical jump height (VJH) as well as agility (IAT). A total of 126 college and high school students were randomly allocated into three groups. Only 20 people were allowed in each group. Groups 1 through 3 were all given plyometric exercise; group 4 received BLR stretching and strength training for comparison. Six weeks of training and a three-day exercise regimen per week were provided to each participant. Both the VJH and the IAT were employed as outcomes in this study. At the commencement of the programme, and at the conclusion of the third and sixth weeks, measurements were obtained. Plyometric, BLR, and strength training for six weeks boosted vertical jump height (VJH) and agility in young basketball players, according to the findings.(18)

**AJANAW TENAW et al 2019** - Plyometric training at secondary schools in Kamashi woreda was tested to see whether it improved the physical fitness of male pupils. This research was conducted using a quasi-experimental approach. Randomly chosen 16-18-year-old football players from Kamashi and Engginer Tigire were used in this study. Squat jump, bounding speed, and Illinois agility exercises were performed twice weekly by the experimental group (n=20) for three months, but the control group (n=20) did not participate in these activities.

There was no difference in the instruction given to the two groups. Both groups were tested before and after the experiment and passed both times. Athletes were tested in slalom 30 metres, speed dribbling, and power shooting during the football skill tests. The data was analysed using the arithmetic mean, standard deviation, and paired T-test. Plyometric training has been shown to have a significant influence on student performance in football skill assessments. Football skills in male students may be enhanced by plyometric exercise.(19)

**Andrea C. Brown, et al 2007** - When it came to improving dancers' capacity to leap, both plyometric training and regular weight training were compared. A total of 18 Skidmore College female dancers consented to take part in the research. Each of the contestants had taken at least one intermediate or advanced ballet or modern lesson. Six persons from the plyometric group and six from the normal weight training group made up each of the two groups. Those in the control group, which included six others, were all self-selected. The plyometric group practised four lower-body exercises for eight repetitions three times a week: They did three sets of six to eight repetitions of four lower body isotonic movements two times each week. No strength training of any type was permitted for the control group. Each participant continued to go to her usual dance sessions throughout the six-week intervention period. After the six-week training period, all individuals were retested. Plyometric exercise or frequent lower-body weight training, according to the findings of the study, may improve dance-related attributes. Short-term dance instruction may not have an effect on these factors, according to research.(20)

**Nicole J. Chimera et al 2004** - This study was done to discover how plyometric training impacts lower-extremity muscle activation strategies and performance. There were a total of 20 female Division I college athletes. The vastus medialis and vastus lateralis, the medial and lateral hamstrings, as well as the hip abductors and adductors, may be evaluated by surface electromyography (EMG). The VERTEC and infrared timing devices were used to measure the athletes' vertical jump height and sprint pace. Increasing adductor activity and coactivation of the abductor and adductor are preprogrammed motor strategies during plyometric training, according to study. The stability of the joints in the lower limbs of female athletes may be improved by plyometric exercise. (21).

**David G. Behm et al 2010** - For athletes, nonathletes, and those recuperating from injury, stability training is the emphasis of this study. The anatomical core of the human body is made up of the axial skeleton and the soft tissues that surround it. Spinal stability can only be maintained if the brain and muscles work together. There must be a destabilising component in training programmes to prepare athletes for a broad range of postures and external stressors. High-level athletes should not utilise unstable machines as a major way of increasing hypertrophy, absolute strength, or power. While they may help with back problems and soft tissue sensitivity. Workouts that use free weights on the ground and include a modest amount of instability are good for building core strength. If you don't have the desire or access to ground-based free-weight exercises, you may benefit from including unstable resistance exercises in your routines. (22)

**Eduardo Sáez-Sáez de Villarrea et al 2009** - The goal of this meta-analysis was to see whether plyometric training may increase strength performance. The impact of PT on strength was studied using data from 15 trials with a total of 31 effect sizes (ES). Regardless of one's fitness level, plyometric workouts may provide training benefits. All fitness levels may benefit from plyometric workouts, regardless of their physical state, and both sexes enjoy equal strength improvements following PT. To maximise performance increases in less than ten weeks of training, high-intensity training programmes with at least 40 jumps each session are recommended (p 0.05). To get the most bang for your plyometric buck, mix and match a range of Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) with weight training instead of sticking with one kind (p 0.05). (23)

**CHRISTOS KOTZAMANIDIS 2006** - The goal of this study was to see whether prepubescent guys' RV and squat jump could be enhanced by plyometric activity (SJ). 15 boys finished an eight-week plyometric training programme (aged 11.1-6.5"). (The JUMP team.) There was also a control group of 15 boys, ranging in age from 10.9 months to 6 years. They just followed the physical education curriculum from their primary school (CONT group). In order to evaluate the training program's effectiveness, participants were asked to run a series of tests across a range of distances

ranging from 0–10 metres to 20–30 metres. Each week, the total jumps per session increased from 60 to 100 over the course of 10 weeks. According to the findings, prepubescent males who do plyometric workouts may have improved SJ and RV. Only the maximum velocity phase was affected by this programme, but not the acceleration phase. (24)

**PAUL E. LUEBBERS et al 2003** - Training regimens with same volume were investigated to see whether anaerobic and vertical jump performance improved following a four-week break from training. Physically active male college students will be given either a 4-week or 7-week curriculum. This test was used to determine vertical leap height, anaerobic power before (PRE), after (POST), and four weeks later (POST) of training. a. Margaria Stair Test (POST-4). There were no significant differences between the two training groups, according to the findings. When followed by a four-week rest period, both the four-week and seven-week plyometric programmes improve vertical jump height, vertical jump power, and anaerobic power. If the recovery phase is overlooked, a 4-week programme may not be as beneficial as a 7-week programme... (25)

**Hams et al 2019** - The study's major goals were to assess participants' proprioception and shoulder strength while submerged. Improved athletic performance has been linked to shoulder strength, range of motion, and proprioceptive acuity in the past. A coach rating system that had previously been used to evaluate a soccer player's kicking ability was utilised to analyse the subjective expert opinions of coaches on the throwing mechanics, velocity, and accuracy of players. It was hypothesised that athletes with better shoulder strength and range of motion had better throwing accuracy, thus researchers tested this hypothesis by using an AMEDA device to measure proprioception acuity both in water and on land. When it comes to preseason evaluations, water polo players' proprioception acuity has been shown to have an influence on their throwing performance, and this might be used as an additional metric. (26)

**Ana Filipa Silva et al 2019** - This research set out to conduct a study of its own to see whether plyometric training enhances volleyball players' performance. According to the PRISMA criteria, a systematic search was undertaken using PubMed, SciELO and SPORT Discus, Medline, Scopus, Academic Search Complete and CINAHL. There were no limitations placed on the included sample. The major emphasis of this analysis was on studies in which athletes were subjected to plyometric exercise. There were five extra items added to the initial 1831 haul based on information gleaned from a variety of sources. 21 articles remained after eliminating duplicates and re-reading the titles and abstracts of each. Volleyball players' vertical leap, strength, horizontal jump, flexibility, and agility/speed seem to be improved with plyometric training, according to the findings of the study. (27)

**Bent R. Ronnestad et al** - Strength training and Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) were compared in professional soccer players to see which produced the best power-related qualities. For the sake of everyone's comfort, the intervention team was separated into two independent groups. The six to eight soccer games that the group ST (n = 6) played each week were supplemented with strength training exercises. The 8 individuals in the ST+P group (n=8) received plyometric training in addition to their ST training. Soccer games were played six to eight times a week on average by the C (control) group (n = 7). It was determined that participants' peak power in half squats was measured using the four-bound test (4BT), as well as their acceleration and velocity in the 40-meter sprint as well as their overall duration in the 1RM half squat and the counter movement jump (CMJ). According to the findings of this research, soccer players who lift weights and do plyometric training six to eight times each week appear to benefit the most. There is a big difference between professional soccer players and amateurs when it comes to strength training. (28)

**Emilija Stojanovic et al 2016** - Plyometric training has been shown to improve vertical jump (VJ) performance in female athletes at all levels of competition, according to a systematic review and meta-analysis. Six web databases were searched by our team. Training state, training mode, and the kind of outcome data were all used to classify the studies included. Methodological quality was assessed using the physiotherapy evidence database grade. Plyometric exercise had impacts ranging from insignificant to very big on VJ performance when utilising the following pre-post effect size thresholds: small to moderate to large to extremely large. VJ performance may benefit with plyometric training for female athletes, according to the research presented. Increased vertical jump performance is linked to increased plyometric training duration (C10 weeks). (29)

**Heather K. Vincent et al 2019** - One of the main goals of this article was to shed light on the musculoskeletal stresses placed on the upper extremities when playing lacrosse, as well as the prevention and treatment of such injuries. In sports requiring overhead throwing, such as lacrosse, prehabilitation of the upper extremities should be a component of general musculoskeletal training and injury prevention. To do this you'll need an upper limb that's well-developed and a coordinated energy transfer from the lower body to the trunk. As part of a preventative exercise programme for the upper limbs, strengthening and mobility exercises should be performed for the shoulders and elbows, and for the upper and lower body as a whole. Using data from our own lab's overhead athletes, we've come up with this theory. (30)

**Karl Scott Smith 2015** - As a viable treatment for overhead athletes, this research looked at MFD's immediate impact on shoulder range of motion and strength in both internal and external rotation (EROT). The research also attempted to find out whether MFD is a feasible therapy option for the general population for shoulder injuries. It is planned to employ 30 volunteers for both the control and experiment groups. The study employed one-way ANOVAs for repeated measurements. There was just one meeting, which lasted between 20 and 30 minutes. After a ten-minute pause, subjects in the control group were tested for their range of motion and strength. The experimental group had a second round of testing, and the findings were compared. External rotation seems to have significantly improved as a consequence of these findings. (31)

**Robert W et al 2002** - The goal of this research was to see whether plyometric training had an effect on lower leg muscle and tendon stiffness when running (MTS). Our study evaluated 17 male runners for their lower leg MTS, maximum isometric force, force generation rate (FGR), 5-bound distance test (5BT), counter movement jump (CMJ) height, RE and V O<sub>2</sub>max and 3-kilometer time before and after the research.. As a result of the study, participants were separated into experimental (E) and control (C) groups, with the experimental group receiving plyometric exercise. With plyometric training, three-kilometer running speeds increased by six weeks. Some believe that an increase in MTS is to responsible for the recent growth in Renewable Energy (RE). Performance in 3-kilometer running improved despite the fact that V O<sub>2</sub>max and Thla didn't change.(32)

**EDUARDO SA´EZ DE VILLARREAL et al 2012** - They were interested in finding out how much plyometric training affected sprint times and what other factors influenced those results. This research comprised studies where PT was utilised, and researchers had adequate data to determine how much of an impact PT had (ES). 26 studies met the inclusion criteria and included 56 ES, according to the findings. There seems to be an increase in the chance of statistically higher improvement in sprint performance when training for at least 10 weeks, a minimum of 15 sessions, and high-intensity programmes with.80 combined jumps each session. Improve your sprinting abilities with the use of plyometric exercises and training regimens that emphasise horizontal acceleration (such as sprint-specific plyometric workouts and leaps with horizontal displacement). Increasing the weight for Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) had no further benefits. (33)

**Dimitrios Skoufas et al 2008** - During training and detraining, researchers want to determine how upper limb segment stress affects the throwing velocity of rookie handball players. Handball-throwing ability tests were conducted at the conclusion of the ten-week training cycle. The shoulder joint was loaded with an extra 20% of the ball mass due to greater tension on the arm and forearm. A radar cannon was used to measure the ball's speed with and without external weights. Loading the upper limb during detraining may be an effective and safe training approach with various benefits over other strategies for preventing a quick fall in throwing velocity when loads are lacking. (34)

**FOTINI ARABATZI et al 2010** - The biomechanics of the vertical jump (VJ) were examined in this study using an Olympic weightlifting (OL), a plyometric (PL), and a WP training programme. PL, WP, OL (n = 9) and C (n = 8) were the four groups formed by chance from among the 36 participants. Each group exercised three times each week for eight weeks. Vertical jump height, power, and kinematics of squatting and countermovement jumping were all assessed before and after training, as well as RF/GAS electromyographic (EMG) activity (CMJ). VJ skills may be improved using any training approach, according to the results. Each training programme has a different approach for achieving these results. The pre-competition stage of the training season may be more suited to weightlifting for VJ performance and power. It is best to perform PL exercises in order to be ready for competition, but they may also be used to transition from pre-competition to the competition phase. (35)

**Kevin E. Wilk et al 1996** - It is the purpose of this study to examine the scientific foundation for closed kinetic chain therapy of upper extremity disorders. When it comes to strengthening the glenohumeral joint, it's important to understand how the joint functions dynamically. The closed and open kinetic chain ideas that apply to the lower extremity may not apply to the upper extremity because of the shoulder's unique anatomical and biomechanical characteristics and functions. Shoulder discomfort sufferers are advised to participate in both closed and open kinetic chain exercises as part of their treatment. (36)

## STATEMENT QUESTION

is there any effect of upper extremity plyometric training to improve strength and pain of shoulder joint in professional shooters?

## AIMS AND OBJECTIVES OF THE STUDY

- To see the effect of Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) exercise on pectoralis major and triceps brachii
- To check the strength of pectoralis major and triceps brachii

## HYPOTHESIS

### NULL HYPOTHESIS:

Professional shooters will not benefit from plyometric training in terms of increasing their strength and eliminating soreness.

### RESEARCH HYPOTHESIS:

Plyometric training will have a major impact on shooters' strength and discomfort relief.

## METHODOLOGY

- STUDY DESIGN: Experimental Study
- Research setting- The study will be performed on females and males in India.
- STUDY LOCATION: People living in the Greater Noida, India.
- Duration - duration of study was 6 weeks.



- Consent and Ethical Consideration-Ethical approval will be taken from the institute to conduct the research and informed consent will be taken from each participant going to be include into the study
- Population- 30 subject. Reframe SAMPLE SIZE: 30 individuals taken by random sampling.
- Sampling method- Random sampling will be done on the basis of inclusion and exclusion criteria.
- Sample side -30 subject was include on the basis of inclusion and exclusion criteria.

#### **Inclusion Criteria:**

- We will take male shooters.
- In between 18 to 25 age group.
- We will take 30 shooters in this study.

#### **Exclusion Criteria:**

- Previous surgery
- Congenital anomalies
- Recurrent dislocation
- Cervical radiculopathy
- Recent fracture

**DATA COLLECTION:** To study effect of plyometric training of primary shooting muscles of the shoulder and upper back muscles group. The design of the study is experimental we had taken 30 shooters and divide them into two groups, the group is A&B. (group A control and group B is Experimental). Group A was trained with upper limb Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) and Group B was given ergonomic advice.

#### **PROCEDURE:**

Permission was taken from the academy, a group of 30 shooters was approach and a written consent was taken from them, explaining the aim and objectives of the study the participants was tested for enhancing the power, strength and removing their pain in shoulder joint they was divided into two groups, group A was be trained with upper limb plyometric and group B was controlled and trained with ergonomics. The duration of study was 6 weeks. The data was be collected on initial 0 day and 6 weeks. At the beginning and the end of sessions their performance was be excessed using closed kinetic chain upper-extremity stability test (CKCUEST), this test was select as the functional test has excellent test-retest reliability (ICC = 0.92), and the purpose of the study is to check the improvement in strength and removing their pain in shoulder joint.

#### **DATA ANALYSIS**

The data analysis was carried out using the Social Science Packaging Software (SPSS) 26.0 edition of the software. Readings were analyzed using an independent T-test and a paired t-test. This is a graphical depiction created using Microsoft Word 2021.

#### **RESULTS**

The result of study shows as the score of Closed Kinetic Chain Upper Extremity Stability Test pre score was  $22.12 \pm 0.981$  and post score was  $42.72 \pm 0.982$  for Group A, Group B pre score was  $21.22 \pm 0.782$  and post score was  $23.21 \pm 0.122$ . Both the groups p value was less than 0.05 as significant difference was seen in the both the groups. Group A post results was > than group B post score as this shows higher effects in the Group A. VAS score shows higher effects in the Group A as compared with Group B.

**TABLE NO 1: Demographic Descriptive Statistics.**

	AGE	HEIGHT	WEIGHT
Mean±SD	25.65±0.876	5.80±0.876	69.65±0.876

**TABLE NO 2. Closed Kinetic Chain Upper Extremity Stability Test (PRE-POST)**

	PRE	POST	P VALUE
GROUP A	22.12±0.981	42.72±0.982	P<0.05
GROUP B	21.22±0.782	23.21±0.122	P>0.05

**TABLE NO 3. Vas Score Paired t test (pre-post)**

	PRE	POST	P VALUE
GROUP A	5.77±0.87	3.45±0.145	P<0.05
GROUP B	5.76±0.34	4.98±1.03	P>0.0

**GRAPH 1 Closed Kinetic Chain Upper Extremity Stability Test**

**GRAPH 2 Vas Score (Pre and Post)**

## DISCUSSION

Study participants were professional shooters who participated in plyometric training of the upper extremities in order to increase strength and shoulder joint discomfort. Closed Kinetic Chain Upper-Extremity Stability Test (CKCUEST) was shown to be the most important factor in the study's findings. Pre and post scores for Group A were 22.120.981 and 42.720.982, respectively; pre and post scores for Group B were 21.220.782 and 23.210. 122. The p value for both groups were less than 0.05, indicating that there was a significant difference between the two groups. Because of the greater benefits shown in Group A after the findings, that group's score was higher than the score for Group B. The VAS score is more pronounced in Group A than in Group B. Systematic reviews have shown that plyometric exercise improves physical fitness in athletes participating in team sports, as reported by Maamer Slimani et al. (2016). Children and young adult amateur players may benefit from short-term physical training (i.e. 8 weeks or less), according to the literature. Nevertheless, top male athletes' physical performance does not seem to benefit from a 6- to 7-week training cycle, which looks to be too short. PT on non-rigid surfaces (such as aquatic, grass, or sand-based PT) has been shown to boost performance in the three main components of leaping, sprinting, and agility in the short term. Plyometric workouts and bilateral and unilateral leaps may enhance these results more than the use of single plyometric drills or standard physical therapy. There is a stronger impact on jump and sprint (30-meter sprint performance alone) performance from PT alone than from PT combined with sprint/strength training, as shown in the current research Even though there are still a lot of unresolved difficulties with PT, the findings in this research enable us to suggest its usage as a safe and effective training method for increasing team sport athletes' leaping and sprint performance as well as agility. Kenneth Stakset Dahl et al 2021 - An outfield handball team was selected for this study so that researchers could test the hypothesis that rotating motions in the handling would help improve shot accuracy and that this improvement would be connected to improved core strength and rotational velocity. Outfield handball players (average age 19.5 years, height 1.72 m, body mass 71.5 kg) completed seven-meter shots both with and without the use of a runup. After an eight-week training programme, subjects had their maximum ball velocity, trunk rotational velocity, and 1RM in a core strength test evaluated. A sling

training and plyometric/sprint training programme was conducted three times a week for eight weeks (control). Training with a sling, for example, may have altered parameters like as timing or power transfer between portions. This might explain the increased speed of the ball. AJANAW TENAW et al 2019 - The major objective of this study was to examine the impact of plyometric exercise on the physical fitness of male students in Kamashi woreda secondary schools. The aim was achieved via qualitative testing. A sample of 16 to 18-year-old Kamakshi and Engineer Tigre football players was randomly chosen for the research. Squat leap, Bounding speed, and Illinois agility exercises were done by the experimental group (n=20) two days a week for three months whereas the control group (n=20) did not complete this training. Football instruction was the same for both groups. After the experiment, both groups had completed evaluations before and after the experiment. Three football skill tests were completed by all participants: slalom 30 meters, speed dribbling, and power shooting. The data were examined and compared using statistical approaches such as the arithmetic mean, standard deviation, and paired t-test. Plyometric training had a significant influence on students' football skill performance, according to the measures used. In order to help male pupils enhance their football skills, plyometric training has been shown to be helpful.

#### **Future scope of study**

More study can be done with higher sample size in the study.

**Conflict of interest:** -None

#### **CONCLUSION**

According to the findings of this study, one effective remedy for the pain and weakness experienced by shooters in their shoulders is to engage in plyometric exercise. In terms of efficiency, training that emphasizes Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST) is superior than training that emphasizes ergonomics. The pain felt in the shooter's shoulders and whatever consequences it may have had on their strength are not significantly reduced by following ergonomic suggestions.

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