



## Core Stability In Different Sports

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### Abstract:-

Core stability exercises have become popular amongst health care providers, personal trainers, coaches and athletes. Core stability is an important concept in clinical rehabilitation and in the training of competitive athletes also. Core stability is the foundation for explosive movements and control (agility, balance and coordination), qualities vital in any sport. It is the ability of your trunk to support the effort and forces from your arms and legs. This is so that your muscles and joints can perform in their safest, strongest and most effective positions. Core stability allows you to move faster with more power by enhancing your ability to control arm and leg movement. It provides central body control, and allows you to generate power by maximizing the efficiency of your muscular effort. So, in this present study various sports are included with the role of core stability in them respectively.

Keywords-core stability, core stability exercises, movements, enhancing.

### What is core?

The core has been described as a muscular cylinder with the abdominals in the front, erector spinae and gluteals in the back, the diaphragm as the roof, and the pelvic floor and hip girdle musculature in the bottom. The core is the center of the functional kinetic chain providing the proximal stability for the distal mobility and function of the limbs.

### Core stability:-

Core stability was defined as the ability to control the position and motion of the trunk over the pelvis to allow optimal output, transfer and control of force and motion to the terminal segment in integrated athletic activities, or as the ability of the lumbo-pelvic hip complex to prevent buckling and to return to equilibrium after instability. (5)

Core stability (CS) refers to musculature control around the lumbo-pelvic region, with the aim of maintaining functional stability in a neutral position and assisting in the generation and transfer of energy from the trunk to the extremities .(1)

## Role of Core Stability training in various Sports:-

1. Application of core stability training contributes to improving athletic performance by providing a foundation upon which the upper and lower extremities may contract to accelerate or decelerate body segments.
2. Importance of core stability training that allows the spine to transfer power to and from body extremities in neutral without taking part in performance and this is very important to most sporting activities. Core stability training also contributes in raising the level of fitness and the level of skill performance as well as its role in the treatment and prevention of injuries.
3. Effectiveness of core stability exercises to improve fitness and skill performance level effectively transfer kinetic energy, with greater compensatory stress being placed on the muscles, Joints and connective tissues so that the athlete is more likely to sustain an injury.
4. core stability is important to athletes and recreationally active individuals alike as it provides proximal stability for distal mobility, especially in cases involving spinal stability.
5. core stability training (CST) is used extensively in injury prevention and rehabilitation, but more recently it is also being used as a means to enhance sports performance.

## Discussion:-

### Role of core stability in different sports:-

#### 1. Foot Ball

Nikolaidis P. (2010) This study conducted on “Core stability of male and female football players”. According to this study, Performance in football is determined by physiological, psychological, biomechanical and environmental factors. Physiological factors include 5 components of health-related fitness (body composition, cardiorespiratory fitness, muscular strength and endurance, flexibility) and sport-specific characteristics like speed and reaction time. Many studies on cardiorespiratory fitness [9], flexibility [4], speed [9] and other factors were conducted. On the other hand, muscular endurance, i.e. the ability of muscles to output power for an extended time, was not so frequently studied, at least in football players. The contribution of core stability to sport performance, injury prevention and health has been addressed recently. Core stability may provide several benefits to the musculoskeletal system, ranging from maintaining low back health and preventing knee ligament injury [14] to providing a foundation for greater force production by upper and lower extremities in sport performance [13]. Decreased core stability was reported to be associated with a higher risk of injuries of low back or knee [1]. Since the prevalence of knee injuries is very high in football, a widely practiced activity whether recreationally or competitively, the assessment of core stability in football players is of great importance. The results of this study confirmed observations [11] that women had higher trunk extensors endurance and lower flexors-to-extensors endurance ratio than men. However, a novel finding was the quantification of core stability measures in the sport context, particularly in the widely popular football, indicating practical implications for sport training and injury prevention.

#### 2. Athletes

Arujo S, Cohen D, Hayes L, (2015) This study was conducted on “Six Weeks of Core Stability Training Improves Landing Kinetics Among Female Capoeira Athletes: A Pilot Study”. According to this study, Core stability training (CST) has increased in popularity among athletes and the general fitness population despite limited evidence CST programmes alone lead to improved athletic performance. In female athletes,

neuromuscular training combining balance training and trunk and hip/pelvis dominant CST is suggested to reduce injury risk, and specifically peak vertical ground reaction forces (vGRF) in a drop jump landing task. However, the isolated effect of trunk dominant core stability training on vGRF during landing in female athletes had not been evaluated.

There is some evidence that CST is effective at improving athletic performance (Ford et al., 2003). Dynamic stability of the trunk and lower limbs are based on the neuromuscular control of the lumbo-pelvic-hip complex. This complex consists of the hip, pelvis and trunk segment, as well as the muscles that cross these joints (Hibbs et al., 2008; Okada et al., 2011; Oliver et al., 2012). CST has previously improved stability and endurance capacity of the core musculature (Ekstrom et al., 2007; Fredericson and Moore, 2005; Imai et al., 2010), which may explain improved performance in endurance events (Sato and Mokha, 2009). Females have a greater risk of lower limb injury than males (Barber-Westin et al., 2010;

Myer et al., 2006; Shirey et al., 2012). Additionally, associations between poor core stability of the trunk and non-contact anterior cruciate ligament (ACL) injuries in female athletes have been described (Hewett et al., 2006; Leetun et al., 2004; Zazulak et al., 2007). Specifically, poor core neuromuscular control may increase external hip adduction and knee valgus moments during landing (Leetun et al., 2004) which increases ACL loading (Shin et al., 2011). Landings are common in gymnastics, and are the cause of many injuries, possibly due to the high ground reaction force (GRF) observed in these activities (Seegmiller and McCaw, 2003). Capoeira is a Brazilian martial art which combines balance, agility and strength, and involves acrobatic and dance movements as well as jumping and landing movements, similar to gymnastics (Assuncao, 2005). As such these athletes may also be at a higher risk of lower extremity injuries due to frequent exposure to high landing forces.

Our results indicate that CST which includes isometric trunk exercises may be an important component of lower extremity injury prevention programmes and may have contributed to the preferential landing kinetics seen in previous multi-component programs. Given previous evidence indicating that landing kinetics are associated with ACL loading (Hewett et al., 1999; Hewett et al., 2005) these changes may have implications in the design of preventive conditioning programs for non-contact ACL injuries in trained females.

This study provides evidence that trunk dominant core stability training improves landing kinetics without improving jump height, and may reduce lower extremity injury risk in female athletes.

### 3.a CRICKET

Core stability is the foundation for explosive movements and control (agility, balance and coordination), qualities vital in cricket. It is the ability of your trunk to support the effort and forces from your arms and legs. This is so that your muscles and joints can perform in their safest, strongest and most effective positions. Core stability allows you to hit harder and bowl faster by enhancing your ability to control arm and leg movement. Core stability is the buzz word in cricket fitness. Why? Because the 'core' is the origin of movement and the foundation for safe and dynamic cricket. It provides central body control, and allows you to generate power by maximising the efficiency of your muscular effort.

Benefits of developing 'core stability' In Cricket terms, you become more stable while batting, have better control while bowling, and become solid in your ability to catch and throw the ball. By training specifically for core stability, you gain a number of benefits(15) The research aims to identify the effect of core stability training on cricketing fitness.

Putatunda A., Subirdebnath, Chundawat M S, (2018), This study was conducted on “An Analysis: Core Stability and Cricketing Fitness”. The present study was investigated to prepare a model Fitness test and to know the relationship of core stability with total fitness level of male professional cricketers. Randomly 40 (Forty) male professional cricketers aged 22 - 28 years were selected. Test and measurements were administered for 50 yards Dash for speed, Cooper test for endurance, Run-3 test for agility, 1 min Push-Up test for shoulder strength, Vertical jump for explosive leg strength, Sit and Reach test for Hip flexibility and Plank hold test for core stability. Statistical analysis was done only after extracting outlier data. The remaining data was calculated in 10th percentile and established a 10 point rating scale. Data were then normalized using Z-score technique. The total fitness score was derived from 10th point percentile scale to ascertain each variable separately and calculated out of 70 marks to justify the model test. Statistical technique Pearson Product Moment correlation test was applied to establish the relationship between core stability and total fitness score of professional cricketers, at 0.01 level. The result revealed a significant relationship ( $r=.674$ ) between core stability and total fitness scores of the professional male cricketers. (7)

This study also stated the Benefits of developing 'core stability' In Cricket terms, you become more stable while batting, have better control while bowling, and become solid in your ability to catch and throw the ball. By training specifically for core stability, you gain a number of benefits.

### 3. b Cricket

Kataria J., Chadha C., Rai R., Sharma P., Asif5 M., (2018) Conducted a study on “Relationship between core stability and performance in recreational cricket players”.

Core stability is achieved through stabilization of one's torso, thus allowing optimal production, transfer, and control of force and motion to the terminal segment during an integrated kinetic chain activity [1]. A weak core is believed to interrupt the transfer of energy, resulting in reduced performance and risk of injury to a weak or underdeveloped muscle group. For this reason, there is an assumption that an increase in core strength will result in increased performance. Therefore, training the core has become popular among strength coaches and personal trainers as a means to improve performance and reduce the chance for injury despite the lack of research to support such findings.

In this study, Recreational Cricket players ( $n=30$ ; age 18-28 years) were selected. Core stability assessment was done by 2 tests – Flexor endurance test and Side Bridge (right and left). Performance was assessed by BOMB and SLS. Karl Pearson's Correlation ( $r$ ) between Core stability and Performance in Recreational Cricket players were calculated. Concluded significant correlation exists Core Stability and Performance (BOMB and SLS). This study showed positive Correlation between (SBRT, SBLT) and SLS. This scores need to be implement in training of athletes at various level of sports training to enhance the Specificity of training. (4)

### 4.a Soccer

BORGHUIS et al., (2011) , This study was conducted on “ Core Muscle Response Times and Postural Reactions in Soccer Players and Nonplayers”. According to this study, In a physical contact sport like soccer, directionspecific muscle reflex responses are crucial in maintaining core stability. Delayed core muscle response times repeatedly have been reported in patients with low back pain, but no study has compared core muscle reflex latencies and postural control between soccer players and less active nonplayers. In this study, sudden trunk loading in the frontal and sagittal plane was used in 10 high-level amateur soccer players and 11 less active nonplayers to study core muscle reflex latencies, using surface EMG of six major trunk muscles. Simultaneously, kinematic response data of a balance seat were obtained using gyroscopes measuring seat

angular velocity. Results of this study was Soccer players demonstrated shorter reflex latencies compared with nonplayers for the rectus abdominis, erector spinae, and externus obliquus muscles in response to sagittal plane perturbations. These shorter reflex latencies went along with greater seat movement in response to sudden trunk loading, with moderate correlations between the two measures. This study Concluded that the results showed shorter reflex latencies and greater balancing movements for soccer players add to the debate whether more postural sway is an appropriate indicator of having less neuromuscular control.(2)

#### 4.b. Soccer:-

Ozmen T., (2016) this study was conducted on “Relationship between core stability, dynamic balance and jumping performance in soccer player”. Soccer game is required a good postural control during efforts such as kick, dribble, pass and to recover quickly after sprints, jumps and cutting maneuvers. Soccer is one of the most popular sports in the world, with more than 265 million players. Injury rate in male soccer players has been reported to be as high as 18.75 injuries per 1000 athlete-exposures in competitions and trainings. In both games and trainings, more than two thirds of soccer injuries occurred to the lower extremities, followed by the head and neck in games and the trunk in trainings (6’).

#### 5. Runners:-

Fredericson M, Moore T, (2005) Conducted a study on “Muscular Balance, Core Stability, and Injury Prevention for Middle- and Long-Distance Runners”. This study discussed the importance of muscle balance and core stability for injury prevention and for improving a distance runner’s efficiency and performance.

It includes a detailed series of core exercises that can be incorporated gradually into a runner’s training program. The program started with restoration of normal muscle length and mobility to correct any muscle imbalances. Next, fundamental lumbo-pelvic stability exercises were introduced which teach the athlete to activate the deeper core musculature. When this has been mastered, advanced lumbopelvic stability exercises on the physioball was added for greater challenge. As the athlete transitions to the standing position, sensory motor training was used to stimulate the subcortex and provides a basis for functional movement exercises that promote balance, coordination, precision, and skill acquisition. The ultimate goal of core stabilization is to train “movements” and “positions” rather than muscles. Exercises are most effective when they mirror the demands of the athlete’s sport. (3)

#### 6. Tennis:-

Samson K M., Sandrey M A., (2007), this study was conducted on “A Core Stabilization Training Program for Tennis Athletes”. According to this study, Tennis is a sport that involves multidirectional movement patterns that challenge the ability to maintain dynamic stability. Tennis players need a stable core to effectively perform upper and lower extremity movements. The core stabilization program presented in this report incorporates the skill components necessary for effective tennis performance. The exercises emphasize eccentric and isometric muscle actions that are believed to enhance dynamic postural control. We feel that the five-week training study program produced positive effects on dynamic postural control, and that continuation of the program for a longer period of time will provide further benefit.(8)

## Conclusion:-

Many elite athletes undertake core stability training as part of their training programme, despite contradictory findings and conclusions as to their efficacy. This is mainly due to the lack of a gold standard method for measuring core stability when performing everyday tasks and sporting movements. A further confounding factor is that because of the differing demands on the core musculature during everyday activities (low load, slow movements) and sporting activities (high load, resisted, dynamic movements), research performed in the rehabilitation sector cannot be applied to the sporting environment and, subsequently, data regarding core training programmes and their effectiveness on sporting performance are lacking. There are many articles in the literature that promote core training programmes and exercises for performance enhancement without providing a strong scientific rationale of their effectiveness, especially in the sporting sector. In the rehabilitation sector, improvements in lower back injuries have been reported by improving core stability. Few studies have observed any performance enhancement in sporting activities despite observing improvements in core stability and core strength following a core training programme. A clearer understanding of the roles that specific muscles have during core stability and core strength exercises would enable more functional training programmes to be implemented, which may result in a more effective transfer of these skills to actual sporting activities.

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