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Importance of Trunk Stability in Preventing Knee and Ankle Injury in Soccer

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Short Communication

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Short Communication

A sports like football comes with an elevated risk of injury due to the nature of the game. It involves combination of high-intensity repetitive activities such as kicking, sprinting, and jumping. These activities are not only physically demanding on players but carry a potential bias toward the use of trunk and hip flexor muscles. Asymmetry or imbalance of muscle properties such as strength and flexibility are most common reasons behind injuries in football. Knee and ankle injuries are commonly seen in football [1].

Imbalance in muscle strength commonly refers to abnormal bilateral asymmetry (between homologous groups) and a disruption of the agonist-antagonist ratio. Hypertrophy or over recruitment of one group of muscles might be associated with a corresponding decrease in size or recruitment of opposite group of muscles (eg, flexor muscles versus extensor muscles). However, muscle imbalance is also possible within a synergy of muscles. For example, one flexor muscle in a group of flexors could increase, whereas another in the group could decrease. This is important for both screening and targeted rehabilitation. For example, if one flexor or extensor muscle decreases in size but another compensates by increasing in size, overall measures such as strength might be unchanged. Such muscular imbalance causes wrong mechanics and leads to poor muscle activity, resulting into injury. For example weak abdominal muscles and gluteal muscles automatically results in over activity of rectus femoris which leads to anterior pelvic tilt. This causes asymmetry in core and lower limb muscles which leads to back and lower limb injury especially in sports [2].

Symmetry of trunk muscles are very essential for a good trunk stability. Trunk stability has a great role not only in lower limb injuries but also in performance of the player. So, that the trunk stabilizers (multifidus, transversus abdominus) and mobilisers (erector spinae, rectus abdominis, and external oblique) should be balanced. Various forms of training and playing football can lead to an increase in muscle mass, the specific requirements of the game could affect individual muscles differently, creating muscle imbalance. Trunk stabilisers, such as the transversus abdominis and multifidus, play a key role in lumbopelvic stability, controls lumbar lordosis, proprioceptive role, generation of intra-abdominal pressure, tension in the thoracolumbar fascia, and compression of the SI joint which is important in athletic performance. Trunk mobilisers controls spinal orientation, balance external loads applied to the trunk and transfer load from thorax to pelvis, upper limb to lower limb and vice versa. Some muscles involved primarily in torque generation might get hypertrophied in response to training for and playing football, other muscles might decrease in size, in line with the concept of muscle imbalance. For normal function, integration or adequate neuromuscular control of local and global muscles is needed. Deficits in neuromuscular control of the lumbopelvic region have been suggested to affect the dynamic stability of the knee because they might contribute to instability throughout the entire segment of the kinetic chain. Stability of the lumbopelvic region involves dynamic trunk control to allow production, transfer, and control of forces and motion to the distal

segments of the kinetic chain, good control of the lumbopelvic area probably is needed to meet the high demands imposed on the body in a sport such as football [3].

In longitudinal studies of female athletes, researchers have shown that inadequate neuromuscular control of the trunk was associated with an increased incidence of knee injury. Results indicated that the size of the trunk muscles with a proposed role in torque production, such as internal oblique and lumbar erector spinae, increased over the playing season and decreased by the start of the next season. Results also indicated that the size of local muscles, such as the multifidus and transversus abdominis, decreased over the playing season and recovered by the start of the next season. This pattern of imbalance during the playing season might be problematic because torque-producing muscles of the trunk generate large forces on the spine. In this situation, a biomechanical in vivo model suggested that these forces might induce instability of the lumbar spine if deeper muscles, such as the multifidus and TrA, were not activated [4].

Asymmetry of pelvic and hip muscles have a wide impact over non-contact ankle injury because it could affect the activity of anterior and posterior leg muscles. Hip weakness, particularly in the abductors has shown to contribute to poor balance and compensatory neuromuscular adaptations at the ankle such as elevated inversion moments and increased activation and earlier onset of the ankle evertors. As such, it has been proposed that hip abductor weakness may increase one's risk for lateral ankle sprain. **A key focus area in this whole picture is the gluteus medius** [5]**.** The gluteus medius is a smaller muscle within the posterior chain, responsible for hip abduction as well as hip stabilization. If this muscle is weak, the hip will drop out, the knee will turn inward, and the ankle will not be able to stabilize properly. As a result of this, the rehabilitation program for the ankle injury should include strengthening for the hip [6].

Imbalance in trunk muscles alter the pelvis position into either excessive anterior or posterior pelvic tilt, which causes imbalance in lower limb muscles, such as in anterior pelvic tilt quadriceps (especially Rectus femoris) muscles will be tight or in shortened position and the abdominals and gluteal muscles will be in lengthened position. This causes alteration over knee and ankle joint. Suppose the medial thigh muscles are weak and lateral thigh muscles are tight which causes lateral tibial torsion. Abnormal tibial position affects the activity of anterior and posterior leg muscles. Studies proved that delayed activation of the inversion muscles is necessary in preventing lateral ankle sprain, thus allowing the peroneals to counteract the sprain during activities [7].

The result of the study indicated that symmetry in strength and flexibility of trnuk muscles are very important in a players performance and in preventing lower limb injury. Various types of training and game requirements are the main reason behind muscular imbalance. This is because during the training and game the muscles which produce more torque becomes hypertrophied and less torque produced muscles atrophied. This muscular imbalance causes poor stability of trunk which is very essential during running like activities to transfer the kinetic energy from lower limb to upper limb and vice versa. Poor trunk stability disperse the kinetic energy which affects the performance of the player and may leads to lower limb injury. Although trunk muscle symmetry is very important in football players to keep their lower limb injury free and for the best performance. Imbalance in trunk muscles causes asymmetric muscle performance on thigh and leg muscles and which will be a cause for knee and ankle injury in future.

My ongoing research reveals that the players with poor trunk stability show poor agility level, which is very important in football in preventing non-contact injury and for the best performance. Players with good agility level have less chance of non-contact injury when assessed through functional movement screening tool (FMS).

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