

# Mechanics of Ball Striking

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## Introduction

According to Lees et al. (2010), kicking is the defining action of soccer. While striking a soccer ball at maximum force, flexion and extension can be observed in the hips, knees, arms, and ankles (Lees et al., 2010). The main phases that were identified when striking a soccer ball are planting phase (Figure 1), initial contact phase (Figure 2), follow-through phase (Figure 3), and landing phase (Figure 4). According to Robertson & Mosher (1985), throughout these phases, there are various eccentric and concentric contractions of the knee extensors, hip flexors, and hip extensors. A concentric contraction is when the muscles shorten, or become compact, and an eccentric contraction is when the muscles lengthen, or stretch. This movement primarily occurs in the sagittal plane, however as the ball is struck, there is some movement within the transverse plane. The core plays a vital role in the stabilization throughout the kicking phases. Proximal stiffness, being the core, enhances distal mobility of the kicking leg. Triple-extension is also a key component of the kicking motion, which can be seen during the follow-through phase.

## Planting Phase



The planting phase of striking a soccer ball is when the support leg is set next to the ball with the heel striking the ground first and the toe facing the direction in which the ball is desired to go. According to Lees et al. (2010), during the planting phase when striking a soccer ball, the support leg knee is flexed and remains flexed throughout the duration of the kick. As shown above, the hip is hyperextended resulting in an eccentric motion. This eccentric hip extension in the kicking leg creates a greater concentric hip flexion as the leg is swung forward to kick the ball. Apart from the legs, the arms also play a substantial role in aspects of perfecting this technique, such as balance, coordination, and direction (Lees et al., 2010). The non-kicking side arm is abducted and horizontally extended before contact is made with the ball. The horizontal elevation of the arms are frequently attributed to the maintenance of balance. The arms play a critical role in balance because kicking a soccer ball at maximum force requires the athlete to remain stable on one leg while in motion for a short duration of time (Lees et al., 2010). It was noticed in this phase that the athlete did not have the planting foot directly next to the ball, therefore causing her to slightly reach. If her foot was closer to the ball, she could have performed a more driven and powerful kick. In order to create a more powerful force when kicking a ball, the hip flexor muscles, as well as the quadricep muscles should be strengthened through various exercises. These exercises can include single leg hurdle hops, single leg squats, and lunges. These exercises can be performed to strengthen the quadriceps and hip flexors to enhance planting and absorbing the shock that comes with planting.

## Initial Contact Phase



Figure 2

In the initial contact phase, the athlete's kicking leg swings through to make contact with the ball. According to Katis et al. (2013), a player kicking a soccer ball should have the ankle joint dorsi-flexed when contact is made with the ball to create optimum conditions for an improved foot to ball collision, leading to a higher trajectory of the ball. The significance of the dorsiflexor movement is to provide stability and allow the knee to remain flexed. According to Lees et al. (2010), the support leg begins to extend just before ball contact. This stabilizes the action as the muscles slowly contract around the support leg knee and enables these muscles to generate their highest forces. According to Robertson & Mosher (1985), the knee flexors act in order to prevent hyperextension and possible damage to the knee. If hyperextension were to occur, it is possible that the ligaments in the knee could become stretched or damaged. These ligaments could include those of the unhappy triad. According to Barber (1992), the unhappy triad consists of the damaging of the ACL, MCL, and meniscus. The ACL injury is a common injury found in female soccer players and can occur when the athlete is planting or cutting, placing further emphasis on the importance of the knee flexors during planting. In order to decrease the risk of injury, it is pertinent to enhance the muscles surrounding the knee, such as the vastus medialis oblique (VMO). The VMO can be strengthened by performing basic front squats, as well as progressing to jump squats.

## Follow-Through Phase

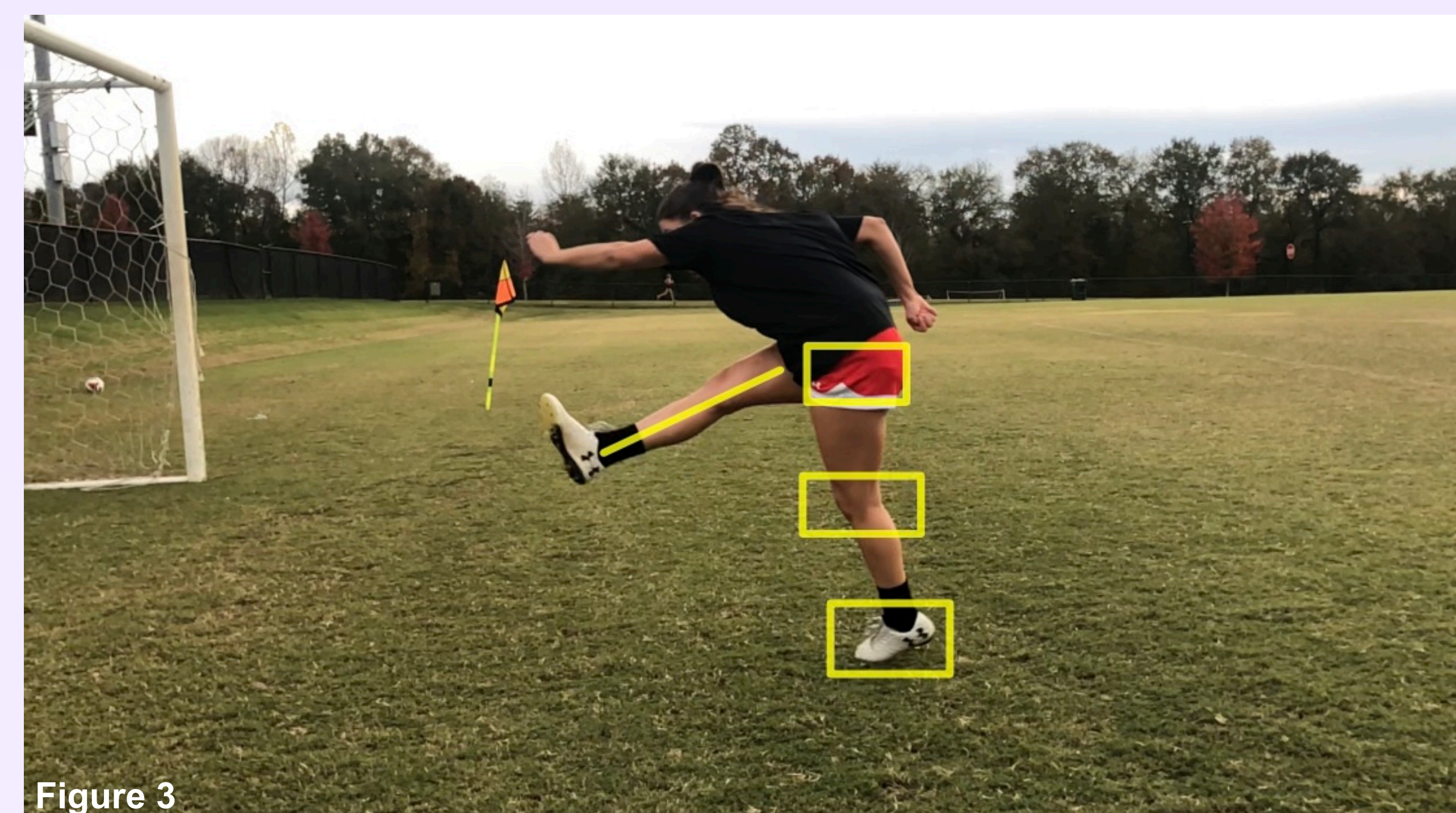


Figure 3

In the follow-through phase, the athlete has already struck the ball and the planting foot is preparing to leave the ground. According to Frounfelter (n.d.), triple extension, which is the explosive extension of the knee, hip, and ankle, is considered the key to athletic power and explosiveness.

Both legs during this phase are extended, however the support leg displays triple extension as the ankle of the planting foot extends before leaving the ground. As the planting foot leaves the ground, the athlete exhibits a "hop" off of that foot, and in turn lands on the kicking foot. Soccer players are always told is that in order to obtain the most power on the ball, it is essential to land on the kicking foot as a part of the follow-through motion. Athletes can improve in this phase by performing split squats to strengthen their hamstrings and glutes while all on one leg.

## Landing Phase



Figure 4

The landing phase of striking a ball consists of the athlete concluding the striking motion on the kicking leg. This phase occurs after the "hop" that takes place in between the follow-through phase and the landing phase. According to Lees et al. (2010), the flexion of the knee in the kicking leg continues for longer than necessary to absorb the impact of landing and is the overall cause of the slowing forward motion after the kick is completed. Once again, the flexion of the knee is important in order to prevent hypertension and possible injury. Due to the landing on one leg, it is critical that the core is engaged and intact, and also that the arms are out to stabilize the body upon landing. To improve the landing phase, exercises such as single leg RDL's can be performed to strengthen the hamstrings and glutes of the planted leg, as well as strengthen the knees and ankles.

## Conclusion

In conclusion, the mechanics of kicking a soccer ball rely heavily on the technique of how the athlete plants, as well as other elements like the core, balance, and concentric and eccentric contractions. In the sequence displayed, the overall motion was performed well, however during the landing phase, the athlete is shown slightly off-balanced to the right. To improve this, it is recommended that the athlete performs the displayed exercises that were mentioned throughout each phase. These exercises would enhance stability in both the planting and landing phases.

## References

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