In the modern day of the National Football League (NFL) placekicker, many aspects must be taken into consideration within the span of a single play, which could be less than 1.5 s. Aspects that can drastically change the outcome of the play include: the snap from the center, whether the holder turns the laces to point toward the front and away from the point of impact on the kicker’s leg, the precise point where the holder places the ball, the tilt on the ball during the hold, how the placekicker fixes his eyes on one specific point on the lower part of the football, the angle that the placekicker takes towards the ball, how the plant leg stabilizes next to the ball, how the placekicker recoils the kicking leg back, how the placekicker locks the knee and ankle through the point of precise contact on the football, how the placekicker elevates the ball through its trajectory, the kicking leg follow through, and the flight of the ball. There are also intangibles that may affect placekicking such as kicking on an artificial turf vs. a grass field, altitude, wind direction, and precipitation conditions.

A review of the current literature reveals some research studies looking into football conditioning programs and NFL Combine tests used to predict NFL success in football players (10,11,16,24,25,26). However, there is very little information on how to prepare elite placekickers for the NFL. There is anecdotal evidence on how placekickers implement strength and conditioning programs that will enhance their kicking programs, but no standardization of sports science on how to best design and implement resistance training programs for elite NFL placekickers. Much of the literature on kicking focuses on soccer kicking mechanics (6,9,14,18,21,28,30,32). Although, in principle the instep kick used in soccer is quite similar to that used for placekicking in football, how it is actually implemented for the modern game of the NFL is different.

It is well understood that using a periodized training program for football players at any level will have a time and place for appropriate hypertrophy, strength, power, and maintenance. What is missing in the literature is functional and movement-specific strength and conditioning resistance training programs aimed towards NFL placekickers. The purpose of this article is to illustrate movement-specific placekicking resistance training programs that will target specific muscle groups that are involved in the motion of placekicking. This program can be easily implemented during the preparatory phase of the periodization model.

THE SCIENCE OF PLACEKICKING (FIGURES 1 – 4)
A graduate thesis (23) looked at the kicking mechanics of Philadelphia Eagles’ field goal kicker, Alex Henery and focused on the kinematics and dynamics of placekicking (23). It was determined that the characteristic of the kick is not determined solely on foot velocity, but also on direction and location of foot velocity (23). The aim and force upon impact determines success. Additionally, it was determined that the position and orientation of the plant foot is critical in delivering more force upon impact on the football (23).
In similar fashion, Imamura and Mandeville at Sacramento State University created a multiyear research project using 3D motion capture analysis to investigate placekicking. They asked kicking coaches throughout the United States to prioritize what they felt were the top five factors leading to successful placekicking. Hip position, foot plant, ankle lock, angle of the kicking foot, and the chest position at the point of ball contact were rated as the top five elements that are critical to success. Translating these types of laboratory investigations into applied strength and conditioning resistance programs is the key. Some studies have looked at whether improving leg strength will enhance kicking (3,4,5,12,15,20). One review article describes the many muscles used during a placekick and how the agonist muscles require more concentric strengthening, whereas the antagonist muscles require more eccentric strength training (32). Furthermore, they describe the role of sequential muscle activation during a place kick such as iliopsoas followed by the rectus femoris and finally the vastus lateralis muscle (32). Adductor muscles were found to become more active as the approach angle to the kick increased (31). What is important to the strength and conditioning coach working with placekickers is that there is complex cumulative effect of angles, accelerations, core strength, and body segments that are synergistically working to allow the placekicker to impart the greatest force upon impact at a very specific point on the football (2,8,11,14,24,28,30,33,34).

The sport movement pattern for contemporary placekickers in the NFL has changed since the early days of football. The days of the straight away placekickers such as Tom Dempsey and Mark Moseley are long gone. The soccer style kicking has improved accuracy of NFL placekickers. Every placekicker has their own style or approach to the ball but two things are consistent: 1) it is a basic right triangle approach, and 2) all placekickers are in the same position when they make contact with the ball. Once the mark is made where the holder is going to place the ball, the placekicker will take two or three steps back, then slide two steps to the left (for a right footed placekicker).

**THE APPLICATION OF A MOVEMENT-SPECIFIC PLACEKICKING PROGRAM**

The following program will take the placekicker through lower body prehabilitation strengthening techniques and gradually progress through more movement-specific resistance training exercises. It is the aim of this approach to develop all facets of the kicking program from stabilized and synergistic muscle groups through major core and major kicking muscles for strength and power development.

**FUNCTIONAL PLACEKICKER STRETCHES**

**FUNCTIONAL STRETCHES**

The need to implement a comprehensive and thorough warm-up for an elite placekicker is critical. The kicking leg muscles include the rectus femoris, iliopsoas, femoris, vastus lateralis, adductor magnus, adductor longus, adductor brevis, gracilis, semitendinosus, biceps femoris, and gastrocnemius (8,10,30). Table 1 lists the various stretches that a placekicker may incorporate into their warm-up routine. These stretches focus on many of the functional muscles that are used during the motion of kicking. Many of these muscles serve as primary movers and/or stabilizing muscles on the supporting plant leg of the kicker.

The act of placekicking is a very explosive movement on the lower body. The necessity to prepare the lower body for this explosive movement is important to any placekicker at any level of competition. Athletic movements require quick bursts of speed from either a stationary or slowly moving position; therefore, stretching from a static position might not fully prepare the muscles for activity (19). Incorporating both static and dynamic stretches can ensure a proper functional warm-up.

**PREHABILITATION**

During the kicking motion, right before impact on the ball, the lower body uses the plant leg to stabilize and set up the transfer of momentum and power through the football. By performing ankle prehabilitation (Figure 17) using exercise bands, the placekicker can help to develop their muscular strength in the ankle complex. Peroneus longus and brevis are typically used for dynamic stabilization of the ankle. Exercise bands can also be used to aid in developing strength to the tibialis anterior muscle (Figure 18). To do this, perform flexion (both plantar and dorsi) at the ankle through the resistance provided by the band. These prehabilitation exercises should be done as part of a kicker’s warm-up and as part of the general strength and conditioning program throughout the year. Various levels of resistance can be used by selecting different types of exercise bands.

The clamshell exercise can be performed while using small exercise bands (Figure 19). Resistance can be varied by selecting different colors and varieties of bands. Because successful placekickers will require power through the hips, it is essential to develop a comprehensive battery of hip strengthening exercises.

**FUNCTIONAL HIP STRENGTHENING**

**EXTERNAL/INTERNAL HIP ROTATORS**

Cable crossover external/internal hip rotation (Figures 21 and 22) is an exercise that uses another level of progression by incorporating the cable crossover machine to focus on external/internal hip rotation. To perform this exercise, the placekicker should lie face down in a prone position on a bench and move the lower leg with external/internal rotation of the hip muscles. As the placekicker develops more strength, more weight can be added to further challenge the athlete.

**HIP EXTENSION/FLEXION**

The front plank with hip extension exercise (Figure 23) can be used to aid in further strengthening the hip complex. This exercise places demands on the core and can be used as a warm-up for the next level of progression. Using the same movement as the front plank with hip extension, the cable crossover front plank with hip extension (Figure 24) is more challenging due to the added resistance from the cable crossover machine. This functional movement exercise works on one single aspect of the placekicker’s motion—hip extension.
HIP ADDUCTORS/ABDUCTORS AND CORE STABILIZATION/ABDUCTION
The side plank with hip adduction (Figure 25) may help develop strength and endurance in the leg adductors and abductors. More resistance can be added through the range of motion by using the cable crossover machine (Figure 26). For this, the placekicker will elevate the hips while adducting and abducting the elevated leg. The cable crossover side plank windmill with hip adduction/abduction exercise (Figure 27) is the final and most challenging level of the progression. This involves having the placekicker support the body while the hands are on the floor. Whenever possible, it is important for the placekicker to keep the arms where they would normally be positioned during an actual kick.

HIP FLEXION AND CORE STABILIZATION
Cable crossover hip extensions on a stability ball (Figures 28 and 29) provide more instability while engaging the core musculature. In this exercise, the placekicker moves the kicking leg through the range of motion while trying to maintain balance on the stability ball. The next progression (Figures 30 and 31) adds a bench to increase the difficulty. This progression involves having the athlete’s legs on a bench while maintaining the hands on the stability ball. The placekicker will move through the range of the kicking motion. This exercise will challenge the placekicker to engage the core musculature even further.

PLACEKICKING FIRST STEP AND CORE STABILIZATION
The cable crossover first step exercise (Figure 32) mimics the first step towards the football in a game situation, but with added resistance. The sole aim of this exercise is to practice the critical first step. The next level of progression (Figure 33) incorporates having the right footed placekicker place their left foot on a balance trainer. The aim here is to work the left foot proprioceptively while moving the kicking leg with the added resistance. As the placekicker gains more strength, more weight can be added. The placekicker should try to maintain the arms in the same position as they would normally during their first step towards the football.

The side plank hip extension/flexion (Figures 34 and 35) focuses on flexibility and core stabilization. The placekicker will try to maintain a realistic leg and foot position while moving through the normal range of movement. The levels of progression could take the placekicker with the arms perpendicular to the floor to the right arm for a right footed kicker up in the air as they would normally be during a kick. Added resistance to the kicking leg would be the next level of progression, in either an assistive or resistive manner.

CONCLUSION
A careful review of the literature demonstrates the lack of sport science and movement-specific functional resistance training information on strength and conditioning for NFL, college, and high school placekickers. Oftentimes, a high school coach will take a soccer player and convert them into a football placekicker and will devote very little time to develop their kicking strength through a proper periodized training program. Additionally, what is seen now at the college level is a very diverse kicking approach because every placekicker follows an esoteric training regimen since that is what has worked best for them.

What has been missing is empirical data collection and resistance training programs specifically designed for elite level football placekickers. Currently, there is a need to develop training programs that are designed with periodization principles and that also take the individual placekicker’s style and approach to the football into consideration. A careful analysis of each and every step taken and the point of impact on the football should be done at every level. A complete understanding of what muscles are used and how they are recruited individually or synergistically is valuable to the strength and conditioning professional.

The aforementioned exercises cover the fundamental movement patterns of a placekicker and help in developing a resistance training program that is based on functionality. The key to developing any functional resistance training program is to focus on those key muscle groups that, when trained in a progressive and supplemental way, synergistically enhance overall power.
REFERENCES


**ABOUT THE AUTHOR**

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Jose Ramos Jr., is the Head Athletic Trainer at McAllen High School in McAllen, TX and is currently teaching within the Health and Kinesiology Department at the University of Texas-Pan American. He is a doctoral student in sports management at the United States Sports Academy and a Licensed Massage Therapist (LMT).

Jessica Vela is a senior at the University of Texas-Pan American, majoring in psychology. Her plan is to become a physical therapist.
### TABLE 1. FUNCTIONAL STRETCHES FOR THE PLACEKICKER

<table>
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<tr>
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<th>MUSCLES USED</th>
<th>SETS/REPS</th>
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<tr>
<td>Forward Lunge</td>
<td>5</td>
<td>Iliopsoas</td>
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<td>6</td>
<td>Iliopsoas</td>
<td>3 of 15</td>
</tr>
<tr>
<td>Myofascial Release (Foam Roller)</td>
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</tr>
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<td>9</td>
<td>Hamstrings, iliopsoas</td>
<td>3 of 15</td>
</tr>
<tr>
<td>Sumo Squat Stretch</td>
<td>10</td>
<td>Pectineus, adductor mangus, adductor longus, adductor brevis, adductor minimus, and gracilis</td>
<td>3 of 15</td>
</tr>
<tr>
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<td>Gluteus medius, gluteus minimus, and tensor fasciae latae</td>
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<tr>
<td>Three-Plane Hurdle Stretch</td>
<td>12,13,14</td>
<td>Hamstrings, abductors, adductors, glutes, and erector spinae complex</td>
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<tr>
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### TABLE 2. PREHABILITATION FOR THE LOWER LEG

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<td>Exercise Band Clamshell</td>
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<td>Abductors and external rotators</td>
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<tr>
<td>Exercise Band Hip Abduction</td>
<td>20</td>
<td>Piriformis, gemellus superior, obturator internus, gemellus inferior, obturator externus, and quadratus femoris</td>
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</table>
### TABLE 3. FUNCTIONAL HIP STRENGTHENING

<table>
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<th>EXERCISES</th>
<th>FIGURE(S)</th>
<th>MUSCLES USED</th>
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<tr>
<td>Cable Crossover Hip External/Internal Rotations</td>
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<td>Piriformis, gemellus superior, obturator internus, gemellus inferior, obturator externus, and quadratus femoris</td>
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<td>Front Plank Hip Extension</td>
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<td>Gluteus maximus, biceps femoris, semitendinosus, and semimembranosus</td>
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<td>Cable Crossover Front Plank with Hip Extension</td>
<td>24</td>
<td>Gluteus maximus, biceps femoris, semitendinosus, and semimembranosus</td>
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<td>Side Plank with Hip Adduction/Abduction</td>
<td>25</td>
<td>Core muscles, adductor magnus, adductor brevis, adductor minimus, pectinus, and gracilis</td>
<td>3 of 15</td>
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<tr>
<td>Cable Crossover Side Plank with Hip Adduction/Abduction</td>
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<td>Core muscles, adductor magnus, adductor brevis, adductor minimus, pectinus, and gracilis</td>
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### TABLE 4. FUNCTIONAL HIP FLEXION STRENGTHENING

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<td>Core muscles, iliopsoas major, iliopsoas minor, iliacus, sartorius, and rectus femoris</td>
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<td>Cable Crossover First Step on a Balance Trainer</td>
<td>33</td>
<td>Core muscles, rectus femoris, sartorius, iliopsoas, iliacus, and gluteus maximus</td>
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<tr>
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<td>34,35</td>
<td>Core muscles, gluteus maximus, biceps femoris, semitendinosus, semimembranosus, adductor magnus, adductor brevis, adductor minimus, pectinus, gracilis, and tibialis anterior</td>
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</table>
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FIGURE 5. FORWARD LUNGE

FIGURE 6. MYOFASCIAL RELEASE ILIOPSOAS

FIGURE 7. MYOFASCIAL RELEASE HIP ABDUCTOR

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FIGURE 13. THREE-PLANE HURDLE STRETCH

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FIGURE 18. EXERCISE BAND FLEXION

FIGURE 19. EXERCISE BAND CLAMSHELL

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**FIGURE 23. FRONT PLANK WITH HIP EXTENSION**

**FIGURE 24. CABLE CROSSOVER FRONT PLANK WITH HIP EXTENSION**

**FIGURE 25. SIDE PLANK WITH HIP ADDUCTION/ABDUCTION**

**FIGURE 26. CABLE CROSSOVER SIDE PLANK WITH HIP ADDUCTION/ABDUCTION**

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FIGURE 35. SIDE PLANK WITH HIP FLEXION