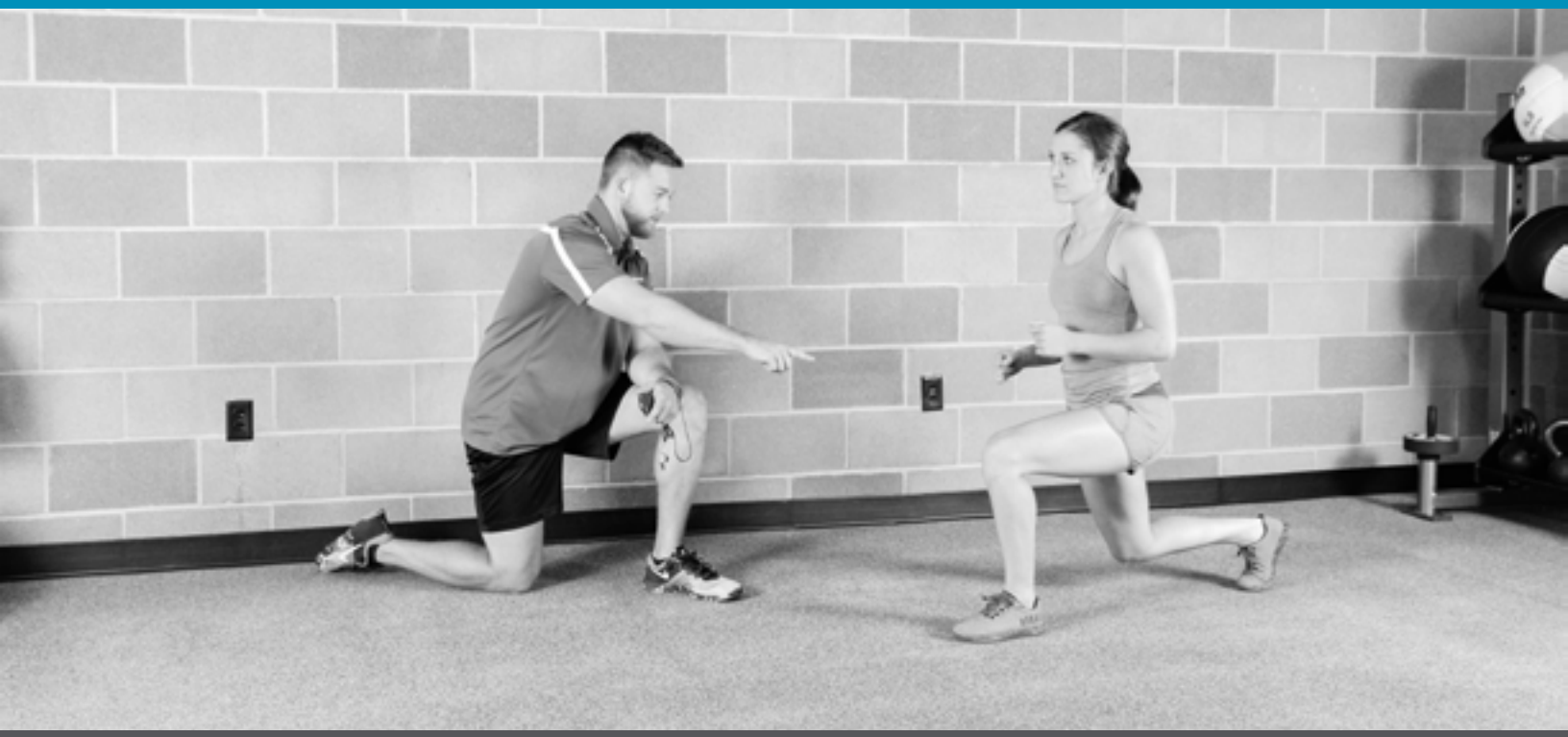

THE UNDERVALUED LUNGE

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INTRODUCTION

Regular participation in strength training provides a multitude of benefits, including increased muscular strength and power, decreased risk of injury, and improved activities of daily living (8,10). The lunge is an option for a lower body exercise that can help to achieve these benefits. The lunge is a staple unilateral exercise for the lower body that aims to improve strength and range of motion (ROM), which can potentially carryover to improving the ability to perform activities of daily living. Additionally, the lunge can be beneficial since it includes the integral "triple extension" of the hips, knees, and ankles. The utility of the lunge is often lost in its perceived difficulty and poorly performed technique. Several common errors occur in the performance of a lunge that can go unrecognized, even for experienced personal trainers, which will be discussed in this article. Additionally, there is also room for modification of the lunge and progressions, which the personal trainer may find useful for their clients.

BENEFITS OF THE LUNGE EXERCISE

STRENGTHENS LOWER BODY MUSCULATURE

Research has shown that the lunge can improve muscular strength and running speed in athletes (6). Additionally, the lunge is a common exercise in rehabilitation settings for improved lower limb strength and function (1,2). The lunge exercise strengthens the leg muscles, primarily the gluteus maximus, hamstrings, quadriceps, and gastrocnemius/soleus (calves). In addition to being prime movers, the hamstrings and gastrocnemius function as dynamic stabilizers at the knee joint through the lunge movement, increasing its effectiveness.

IMPROVES CORE STABILITY AND BALANCE

The lunge exercise involves several muscles in the abdomen and back that function as stabilizers. The lunge movement requires the torso to maintain stability in a split stance, where feet are apart with one leg in front of the other. This exercise helps the body stabilize for multiple positions in a staggered stance, such as walking or stair climbing (2). Additionally, a stronger core eases daily activities, helps to prevent lower back pain, and improves balance and posture (7).

PROVIDES FUNCTIONALITY

The forward lunge most closely mimics the pattern used for walking and stair climbing. The correct performance of a lunge mimics the gait pattern of walking, and challenges the body to maintain balance during dynamic postures, such as walking (2).

TEACHING CUES FOR THE CORRECT PERFORMANCE OF A LUNGE

STARTING POSITION (FIGURE 1)

- Start in a standing position and then take a step with one foot.
- One foot should be in front and one foot should be behind the torso, similar to a split stance.
- The feet should be about hip-width apart.
- The distance between the front foot and back foot should be a length that is greater than a walking stride.

- The torso should be straight and the abdominals should be tight.
- The scapula should be retracted and depressed with the eyes looking forward.
- The toes and knees of both legs should be pointing forward.
- The back heel should be off the ground. The correct distance between the front and back foot will enable this step to be performed more easily.

LOWERING (ECCENTRIC) MOVEMENT PHASE (FIGURES 2 AND 3)

- While keeping the torso straight and abdominals tight, lower the hips until both knees are bent at about a 90-degree angle, if possible.
- Make sure the front knee is directly above the ankle and not over the toe.

UPWARD (CONCENTRIC) MOVEMENT PHASE

- Push through the front heel to return to the starting position while contracting the glutes, quadriceps, and calves.

CONCERNS WITH LUNGE TECHNIQUE

Poor performance of the lunge can be problematic. Several common errors occur in the performance of a lunge that can go unrecognized, even for experienced personal trainers. Due to the risks of the lunge to exacerbate previous lower body injuries, it is extremely important that lunges are performed correctly (3,4,5). The ability of the personal trainer to address the critical issues of the lunge when teaching and critiquing will ultimately determine its value. Table 1 describes common concerns with the performance of the lunge exercise that often lead to poor exercise execution. Stride distance, foot placement, and movement errors are all problematic for inadequate technique. Table 1 also provides methods for correction of these concerns and errors.

TABLE 1. COMMON ERRORS IN THE PERFORMANCE OF THE LUNGE EXERCISE

COMMON ERRORS	
Feet Too Close	**Error**: Quite often, the lunge is plagued from the start due to a stride length that is too short. If the feet are too close together, the downward movement results in an increased amount of stress on the knee joint (specifically the patellar tendon) (4). **Solution**: The foot placement should be consistent throughout the lunge exercise. Specifically, the distance between the front foot and back foot should be a length that is greater than a walking stride. Before movement begins, the back heel should be lifted. At the lowest point of the downward movement, the hip, knee, and ankle joints should be no less than 90 degrees (3).
Over-Pronation of the Foot/ Knee Caves Inward	**Error**: Even a slight turn of the lead foot or lead knee inward during a forward lunge can increase the torque stress of the knee joint of the front leg. This increase in stress could be problematic for previous knee injuries, and could potentially lead to increased knee pain (4). **Solution**: Make sure the front foot and knee are pointed straight forward while performing a lunge. In all cases of the lunge, the toes and knees (of the same leg) should point in the same direction.
External Rotation of the Back Foot/Knee	**Error**: Because lunges challenge balance ability, the back foot is often externally rotated for stability compensation. Rotating the back knee or foot outward during a forward lunge also increases torque stress in the knee joint (4). Lunges performed without optimal technique can create unnecessary joint stress that can limit performance, exacerbate pre-existing injuries, and potentially cause pain (4). **Solution**: Make sure the back foot and knee are pointed straight forward while performing a lunge. In all cases of the lunge, the toes and knees (of the same leg), should point in the same direction.
Forward Knee Movement in Downward Phase	**Error**: Often, beginners tend to lean too far forward during the eccentric (downward) phase of the exercise. This technique error can increase the shear force at the knee joint, increasing the risk of injury or pain (3,4). **Solution**: Once in the appropriate starting position, the hips should move down and up in a straight line. The back and torso should be erected and the abdominals should be contracted through the duration of the movement.
Forward Torso Lean	**Error**: To compensate for balance and strength challenges, the torso can lean forward during the downward phase, even if the lower body is performing the correct technique (5). **Solution**: Ensure that the torso maintains and upright in an erect posture with the abdominals engaged, chest lifted, and shoulders and back are down.

TABLE 2. MODIFICATIONS OF THE LUNGE EXERCISE (EASIER OPTIONS)

Supported (Figure 4)	Performing the lunge with balance support reduces the difficulty. Holding on to anything that is stable and non-moving increases the points of contact, and can assist the individual in performing the lunge. One or two hands can help support the lunge.
Reduce ROM	The lunge does not have to be a full movement to be effective. Even a small ROM will activate the muscles used, challenge balance, and incorporate functionality (2,3).
Completely Stationary	Once the initial position is achieved, the lunge can be performed effectively without movement of the feet until the repetitions are completed.
Use a Box/Step (Figure 5)	Elevate the front leg just a few inches to decrease stress on the front leg, thus reducing the difficulty.
Use a Chair (Figure 6)	Chair lunges can be a great way to combine support and reduced ROM for a lunge. Turn sideways to the chair, with the starting stance over the seat of the chair and under the front hip. When the lower phase is performed, the glute of the front leg can sit on the chair, and then return to the starting position.

TABLE 3. PROGRESSIONS OF A LUNGE EXERCISE (MORE DIFFICULT OPTIONS)

Make it Mobile	Alternating lunges that require an opposite step forward for each repetition are more challenging. The challenge is even greater in walking lunges forward and backward. Side lunges are also more difficult, and place more mechanical stress on the muscles of the hip joints (glutes and hamstrings).
Increase Instability (Figure 7)	Incorporating a balance disk, wobble board, BOSU ball, or foam pad under the front leg increases the instability of the movement, thus increasing difficulty. Instability forces the stabilizer muscles to activate more than if the exercise was stable, and prime movers work harder to execute the movement under unstable conditions (9).
Compound the Movement (Add an Exercise)	There are several exercises that can be performed together with the lunge. Upper body exercises for biceps, triceps, and deltoids are easily paired with the lunge. Lower body exercises such as single-leg deadlifts or squats can be alternated with repetitions of a lunge in a set.
Add Resistance Away from the Body (Figures 8 and 9)	Of course, adding weight to any exercise can increase the difficulty, as long as the movement can still be performed correctly. Taking the weight as far away from the moving joints can increase the difficulty even more. Holding weight with straight arms overhead, in front, or to the sides of the body can increase the lever length, making it more difficult. Changing the mode of weight (i.e., dumbbell, barbell, plate, medicine balls, kettlebell, etc.) can further challenge the body to adapt in different ways.
Add Explosiveness	Performing split squat jumps, which are essentially explosive lunges from the split stance without a forward step, can be great for increasing power (6). Split squat jumps can be performed in place, or with the legs alternating in a cycle.

MODIFICATIONS AND PROGRESSIONS OF THE LUNGE EXERCISE

The forward lunge exercise can be modified and progressed in a variety of ways. It is imperative that the personal trainer is competent in prescribing the level of lunge that is most appropriate for the client performing the exercise. Modifications can be an "easier" version of the exercise, which may reduce total stress, energy requirement, and/or intensity. Modifications are appropriate for situations where individuals are novice, injured, recovering from injury, fatigued, or disabled (4,5). A variety of modifications are presented in Table 2. Progressions occur when exercise difficulty is increased without compromising safety. Progressions are most appropriate when an "easier" version can be performed with ease, and the adaptation response from the exercise is losing effectiveness. Options for lunge exercise progressions are provided in Table 3.

CONCLUSION

Performing the lunge exercise regularly can provide several benefits for everyone. It is critical for the exercise to be performed with correct technique. Learning to lunge correctly can strengthen the lower body musculature, improve core stability and balance, enhance hip flexibility, and increase functionality. There are a plethora of modifications and progressions to consider, based on the level of the individual that is performing the exercise. Through correct technique and appropriate modification, the lunge can be an exercise all individuals can utilize.

FIGURE 1. STEP OUT FROM STARTING POSITION

FIGURE 2. BOTTOM POSITION OF LUNGE

FIGURE 3. BOTTOM POSITION OF LUNGE (FRONT VIEW)

FIGURE 4. SUPPORTED LUNGE

FIGURE 5. LUNGE WITH A STEP

FIGURE 6. LUNGE ONTO A CHAIR

FIGURE 7. LUNGE ONTO AN UNSTABLE SURFACE

FIGURE 8. LUNGE WITH WEIGHT AT SIDES

FIGURE 9. LUNGE WITH WEIGHT OVERHEAD

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