The Cure for Weak Gluteal Muscles
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The gluteal muscles are an important part of the human body that provides support to the spine, stabilization to the pelvis and allows movement in the hip joint. The gluteal muscles also help to support the lower back during lifting motions, and prevent knee injuries during lifting and conditioning exercises. These muscles are made up of three different layers: gluteus medius, gluteus maximus and gluteus minimus.

All these muscles play a different role in our bodies and assists us in daily activities. The gluteus maximus is the largest muscle in the human body and it attaches to the side of the sacrum and femur (Delp, Hess, Hungerford, and Jones, 1999). A literature review of studies evaluating gluteus maximus and gluteus medius activation during rehabili- tation exercises. Physiotherapy Theory and Practice, 28(4), 257-268. It is the main extensor of the thigh and assists with lateral rotation. It is mainly used when force is required, such as running or climbing. The gluteus medius is located partway under the gluteus maximus and con- nects the ilium to the side of the upper femur. The purpose of this muscle is to abduct and medially rotate the lower limbs. The gluteus minimus lies under the gluteus medius and is responsible for abducting, flexing and internally rotating the hip.

The gluteal muscles play a big role in our daily lives and weakness in this muscle can cause major issues. One of the major causes of weak gluteal muscles is inactivity. (Berg, Eiken, Miklavcic, & Mekjavic, 2007). The largest muscle of the 3 is the gluteus maximus and it is only activated during movements that require force (e.g. squatting, jumping, lunging, etc.) (Bartlett, Sumner, Ellis, Kram, 2014).

According to the studies of electromyography (EMG) on the gluteal muscles, the gluteal maximus fails to achieve high levels of activation during common everyday movements (McCurdy, Walker, & Yuen, 2018). In comparison to the other muscles in the body, the quadriceps are activated every time we stand or pick up something off the floor (Sullivan, 2003). Other examples of this would be the activation of the calves and hamstring when walking up stairs (Tikkanen, Haakana, Pesola, Häkkinen, Rantalainen, Havu, 2013), the abdominals when sitting up from a lying position, the triceps from pushing open a door and the biceps when pulling a door open (Ricci, Santiago, Zampar, Pinola, & Fonseca, 2015). However, as stated before, the gluteus maximus needs force to be activated, which means only heavy or explosive movements are going to strengthen this muscle. The problem is that many people fail to perform such movements on a daily basis which can lead to gluteal weakness and imbalances.

Gluteal Strength on Athletic Performance

Since the gluteal muscles are responsible for accelerating, decelerating, changing directions, creating explosive power in jumps and effective hip extension, athletes need strong and active glutes to be able to perform at their highest peak (Bartlett, Sumner, Ellis, & Kram, R, 2014). According to the article Gluteus Medius: Applied Anatomy, Dysfunction, Assessment, and Progressive Strengthening (2008), rehabilitation specialists and strength and conditioning practitioners have identified one of the more common deficiencies in athletes: weakness of the glutei muscles, particularly the gluteus medius.

The gluteus provides frontal plane stability for the pelvis during walking and other functional activities involved in sports conditioning. It states that a weakened gluteus medius may contribute to the development of several lower-extremity injuries which will in turn reduce athletic performance in these athletes. In a study produced by Crow, Buttifant, Kearny, & Hrysomallis (2012), a group of 22 elite Australian Rules Football players performed 3 different warm-up protocols over 3 testing sessions in a randomized order to determine if low load exercises to target the gluteal muscle group acutely would enhance power output. The 7 exercises in the study included a double leg bridge, side lying hip abduction exer- cise, and quadruped lower extremity lift. The results of this study showed that this particular warm-up protocol involving low load exercises targeting the gluteal muscles is effective at acute- ly enhancing explosive power output in the lower limbs. This protocol would be most applicable for athletes

competing in sports with high demands for explosive power output from the lower limbs because of the low loads involved in the protocol, it minimizes any risks of fatigue or injury before performance.

In 2014, a study done by Plummer, Hillary, and Gretchen determined the relationship between gluteal muscle activation and pelvis and trunk kinematics when catchers throw to second base. Forty-two baseball and softball catchers participated in this study. Muscle activity of the bilateral gluteus maximus and medius as well as pelvis and trunk kinematics throughout the throwing motion were analyzed. It was discovered that at foot contact, there were 2 significant inverse relationships between stride leg gluteus maximus activity and pelvis axial rotation, and between trunk axial rotation and pelvis lateral flexion. In addition, at foot contact, a significant positive relationship between the drive leg (throwing arm side) and trunk flexion was present. The results of this study provide evidence of gluteal activation both concentrically and eccentri- cally, in attempt to control the pelvis and trunk during the throwing motion of catchers. Stride leg (non-throwing arm side) and drive leg (throwing arm side) gluteus maximus activity was greatest during the acceleration phase of throwing. In addition, stride leg gluteus medius activity was greatest during deceleration. Plummer, Hillary, and Gretchen conclude that the gluteal muscles play a direct role in maintaining the stability of the pelvis, and catchers should incorporate strengthening of the entire lumbopelvic-hip complex into their training regimen. Incorporating concentric and eccentric gluteal exercises will help to improve musculoskeletal core stability, thereby assisting in upper extremity injury prevention. Athletes with strong gluteal muscles are able to produce more speed,

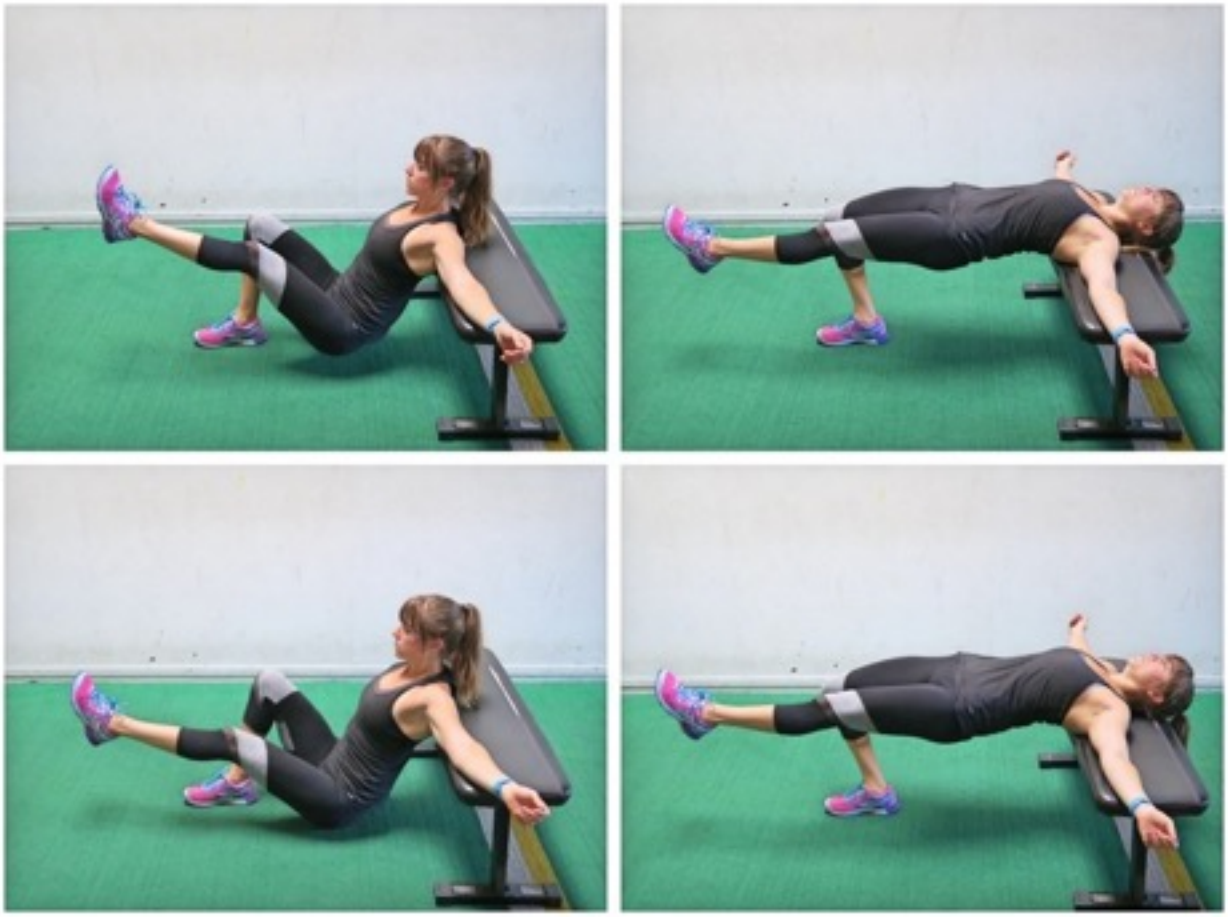
maintain the stability of their pelvis during movement, and are more efficient and explosive than athletes with inactive gluteal muscles (Leetun, Ireland, Willson, Ballantyne, Davis, 2004).

Lower Back Pain

According to Aboufazeli (2018), low back pain is a significantly common disorder that approximately 70-85% of all adults experience at some point in their life. One of the biggest problem in clinical examinations of patients with lower back pain is the lack of a comprehensive diagnosis protocol comprising all muscular alterations responsible for this disability. Due to the pain, patients suffering from low back pain refrain from using

their back muscles properly in their daily life. At the Department of Physical Therapy at the University of Social Welfare and Rehabilitation Sciences in Tehran, Iran, researchers state that this generally leads to atrophy of the back muscles and the entire posterior chain including the gluteal muscles.

Gluteal Imbalances



By nature, we are built as asymmetrical beings. Our anatomical nature is to be right to left pelvic and hip asymmetries and leg length discrepancies are common (Contreas, 2013). However, our daily movement affects the strength differences in each gluteus. For example, we tend to shift to one side when standing for long periods at a time and then eventually become comfortable in that position. Inactivity and living a sedentary lifestyle can also cause gluteal im- balances (Berg, Eiken, Miklavcic, & Mekjavic, 2007). If you fail to consistently activate a mus- cle at high levels of capacity, it will inevitably quit working properly. As Contreas states, strengthening the gluteals - just like any other muscle, takes time, consistency and high and low training loads. Whether both sides of your gluteals are weak or one side is stronger than the oth- er, unilateral and bilateral movements, isometric contractions, self myofascial release (SMR) and stretching can help create a stronger posterior chain and a more balanced structure.

Fixing a gluteal imbalances slightly differs from overall gluteal strength training because in order to fix an imbalance, Stastny, Tufano, Golas, & Petr, (2016), suggests to focus

on the weaker side first before performing higher load bilateral movements. An example of this would be isometric contractions for the weaker side.

A study done by O'Dwyer, Sainsbury, & O'Sullivan (2011), shows that the gluteus medius is most activated during isometric abductions and internal rotation of the hip compared to adductions and external rotation of the hip. Unilateral movements such as single leg squats, step ups, side lying leg lifts, standing hip abduc- tions, cable kickbacks and step downs are all reccommend to increase strength of the weaker gluteal muscle (Presswood, Cronin, Keogh, Justin, Whatman, Chris, 2008). Although consensus may not exist, a Position Stand from the American Council of Sports Medicine suggests that per- forming at least 2 training sessions a week that involve 2 to 3 sets of between 6 to 15 repetitions per set will lead to considerable increases in muscular strength and endurance.

Strength Exercises

To be able to strengthen the gluteal muscles as a whole, we must target all muscle groups within this region consistently to be able to allow hypertrophy. Contreas (2016), and commonly known as the "Glute Guy" states there are different movements that are going to recruit different muscles in the gluteals: frontal abductions, transverse abductions, rotators, hip drivers, and head drivers. Frontal abduction gluteal exercises involve the standing cable hip abduction, banded side walk, lying band and ankle weight abduction and the off-bench side lying abduction. Transverse abduction exercises such as the banded side lying clamshell and the banded sumo walks are going to target the gluteals in the transverse plane. Rotators such as the cable external rotation are going to involve the abdominals as a stabilizer while activating the gluteus medius. An example of a hip driver exercise would be a barbell hip thrust - which is a huge compound exercise that activates 90% of the gluteal muscles. Head drivers exercises that involve any type of squatting motion, lunge variation or step up (see Figure below).


FRONTAL ABDUCTIONS
TRANSVERSE ABDUCTIONS
ROTATORS
HIP DRIVERS
HEAD DRIVERS
Off-bench Side Lying Hip Abduction
Band Side Lying Clam
Standing Cable External Rotation
Barbell Hip Thrust
Bulgarian Split Squat
Band Sumo Walk
American Hip Thrust
Lunge
Standing Cable Hip Abduction
Parallel Squat
Band Seated Hip Abduction
Cable Pull-Through
Ankle Weight Hip Abduction
Band Standing External Rotation
Full Squat
Back Extension
Front Squat
Band Hip-hinge Abduction
Band Side Walk
Cable Kick-back
Landmine Squat
Lying Band Hip Abduction
Any bent-knee weighted hip extension
Deficit Curtsy Lunge
Stretchers
Activators
Pumpers
Elevated Glute Bridge
Romanian Deadlift
Band Quadruped Hip Extension
Traditional Deadlift
Frog pump
Sumo Deadlift
Band Back Extensions
Barbell + Band Glute Bridge
High Step-up
Double Banded Hip Thrust
Band around knees and waist
Squat Bouncer
Standing/kneeling Banded Hip Hinge

Even though having strong gluteals is important, the surrounding muscles around this region can be beneficial in providing support and stability to the spine and hip complex. If the glutel muscles ever become strong enough to overpower other muscles group, this can cause other muscles to compensate and this my lead to lower back pain and/or muscle imbalances.

Stretchers, Activators, and Pumpers

In the Figure shown above, you can see that all the exercises listed are colored and differentiated by: stretchers, activators and pumpers. This is segmented by the amount of time each exercise needs to fully recover. Barbell back squats take longer to recover from, because they show moderate gluteal activity, involve a big range of motion, with an emphasis on the eccentric phase and there is peak tension when the gluteals are lengthened. Combine these, and you have a lot of muscle damage, which allows more time for recovery (approx. 3-4 days). The barbell squat would generally be categorized as a stretcher exercise.

The barbell hip thrust would take less time to recover from because the range of motion is smaller, and there is peak tension when the gluteals are maximally shortened. However, the barbell hip thrust involves tremendous gluteal activity (Contreas, 2015) with a heavy-loaded eccentric phase (controlling the movement on the way down). The recovery time for this exercise and all other activator type exercise takes 2-3 days.

Banded side walks have a very small range of motion while gluteal activity is fairly low. This exercise would be determined as a pumper type of exercise. This is because the short range of motion and varying tension on the gluteals allow for more reps to be performed, which causes a lot of metabolic stress on the muscle as opposed to a stretcher exercise that results in a great deal of muscle breakdown.

Frequency and Adherence

Before diving into any strength program, there are many factors that are going to affect the outcome. The number one factor is going to be adherence. Adherence to any training program is going to be important because it is the only way to show results based on consistency. Another significant factor is going to be frequency. A study done by Thomas and Burns (2016) determined the effect of strength training frequency and it's improvements in lean mass and strength. Seven women and 12 men with strength training experience were and assigned to follow a high frequency (HFT) or low frequency (LFT) training program. The HFT group trained each muscle group as the agonist, 3 times per week, exercising with 3 sets per muscle group per session (3 total body workouts). The LFT group trained each muscle group as the agonist one time per week, completing all 9 sets during that one workout. LFT protocol consisted of a routine split over three days: 1) pectoralis, deltoids, and triceps; 2) upper back and biceps; 3) quadriceps, hamstrings, calves, and abdominals. Both of these groups would adhere to their training programs for a total of eight weeks. The results of this study demonstrate that both High Frequency Training (three sets on three occasions per week) and Low Frequency Training (nine sets, on one occasion per week) produced similar improvements in lean mass and strength in these 19 active, men and women, following an eight week training period. It is recommend that coaches and exercise professionals

could use both training frequencies within a periodized training program to increase lean mass and in strength in athletes and/or individuals striving for this particular goal.

Discussion

Inactivity, injuries, and muscle imbalances are the three main causes to weakness in the gluteal muscles. Weakness in this area can decrease athletic performance and cause lower back and joint pain in athletes and sedentary individuals. An increase in physical activity and consistent strength training will increase the strength in the gluteals and fix these issues. The best exercises to strengthen the gluteals involve isometric contractions, compounds movements, and bilateral and unilateral movements. Perhaps coaches, exercise specialists, and physical therapists can incorporate gluteal strength training for their athletes and clients who strive to be stronger and healthier individuals.

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