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WHY YOU SHOULD
Properly Train the Posterior Chain

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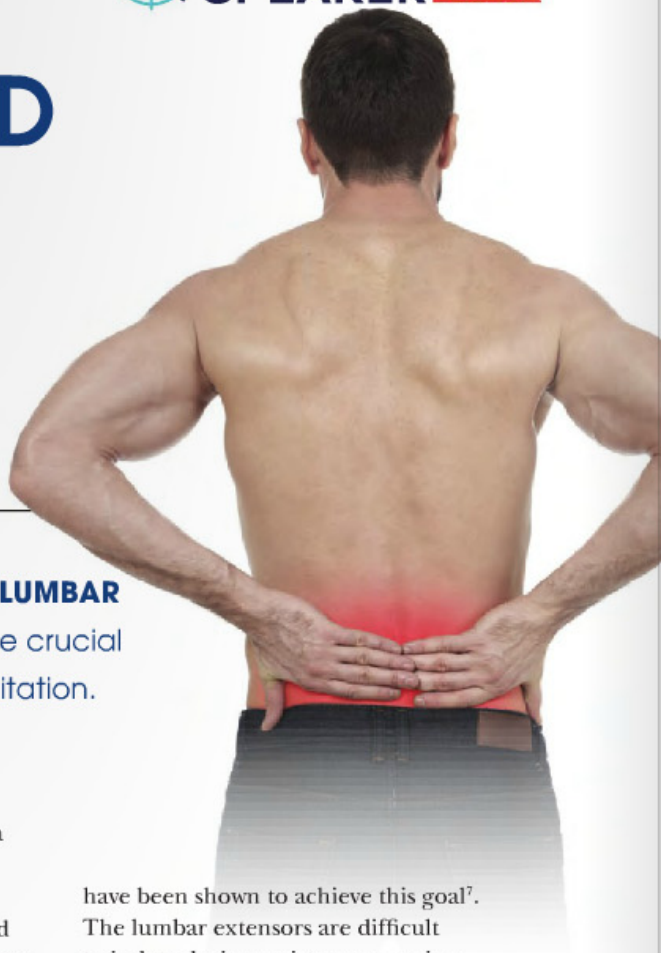

THE POSTERIOR CHAIN MUSCLES, WHICH INCLUDE THE LUMBAR EXTENSORS, GLUTEALS, HAMSTRINGS, AND CALVES[1], are crucial for performance, physique, injury prevention, and rehabilitation.

For example, individuals with low back pain exhibit a loss of strength and endurance[2], atrophy[3], and fatty infiltration of the lumbar extensor muscles[2]. Abnormal function and altered activation of the gluteal muscles is linked to performance deficits and injuries in athletes[4]. When the gluteal muscles do not properly fire, the likelihood of low back pain and other performance issues increases[5]. Also, gluteal muscle atrophy caused by inactivity is not ideal for physique reasons in various individuals ranging from the general population to elite fitness competitors. Unfortunately, resistance training for the lumbar extensors (e.g. multifidus) and the gluteal muscles can be easily overlooked by clinicians and clients when addressing performance, physique, injury prevention, and rehabilitation concerns linked to the posterior chain.

EXERCISE STRATEGIES

This article will review strategies for resistance exercise training of the lumbar extensor and gluteal muscles in order to develop and maintain a healthy posterior chain. For the purposes of this article, we define a healthy posterior chain as one that has sufficient muscular strength, endurance, and size, is flexible, and exhibits proper motor control during a variety of movements and activities. A healthy posterior chain also enables good posture during movements and static positions.

Lumbar Extensor Muscles

Numerous options are available for resistance exercises for the lumbar extensors, such as machines (e.g. dynamometers), benches, Roman chairs, free weights (e.g. dead lifts), and core stability exercises[6]. Since each approach offers distinct advantages and disadvantages[6], determining the best approach depends on several factors, such as available resources (e.g. access to fitness centers, trainers) and goals for specific clients.

Generally, resistance exercises for the lumbar extensors should focus on movements that preferentially activate the lumbar multifidus versus the erector spinae. Properly performed Roman chair back extension exercises have been shown to achieve this goal[7]. The lumbar extensors are difficult to isolate during resistance exercises due to compound trunk extension, which requires input of the larger gluteal and hamstring muscles, along with the lumbar extensors[8]. Various strategies can be used to isolate the lumbar extensors and thereby increase activation of these muscles, such as internally rotating the hips and actively focusing on contraction of the target muscles during back extension exercises on Roman chairs[9,10]. Also, higher tech options, such as lumbar dynamometers, provide pelvis restraint mechanisms to isolate the lumbar extensors during exercise[8].

Many studies, such as our research[11,12] and the work of others[13,14], have demonstrated the safety and efficacy of lumbar extensor training for patients with back pain and healthy individuals such as firefighters and military personnel. We recognize that lumbar extensor training has sometimes been discouraged in the literature due to

perceived lack of safety. However, to our knowledge, no data from randomized controlled trials are available to support this hypothesis.

Gluteal Muscles

Training the gluteal muscles (glutes), a "non-mirror" muscle group, is difficult for most people since they have trouble with properly engaging these muscles. Glutes are effectively trained only when the hips move properly with good form, isolation, tension, and repetition range. Tight hip flexors and misaligned hips do not enable the glutes to fire properly and will ultimately cause performance issues and less than desirable physique[5]. Moreover, equipment options for training the glutes are limited, leading to the need for precise supervision.

Compound trunk movements, such as squats and deadlifts, and glute isolation exercises, such as the floor bridge and hip thruster, are often considered for training the glutes. For proper glute activation, we recommend the squat and hip thruster. Squatting for glute activation can be tricky, has been proven effective when properly done, and can be performed with or without added resistance[15]. The hip thruster exercise has gained popularity because it has been shown to elicit more myoelectric activity in the gluteus maximus and biceps femoris than the squat[16].

Squatting for optimal glute activation can be achieved by standing with the core tight, lumbar spine in a neutral position, and legs slightly wider than shoulder width apart (some may angle the toes out for more posterior chain focus)[15]. Push the hips back and slowly squat stopping just before the hip/pelvic region begins to de-rotate and tension in the glutes is lost, hold for a count of 3 and, while pressing through the heels, stand back up to the starting position. The hip thruster is performed with the shoulders resting on the edge of a bench, feet flat on the floor, and hips level with the shoulders. The hips are lowered to the floor and lifted back up as high as possible while squeezing the glutes and holding the tension at the top for 3 seconds before lowering down again and starting another repetition. For both the squat and hip thruster, progressive resistance can be applied by using a weighted barbell, plate weight, or resistance band.

RECOMMENDATIONS

Doctors of Chiropractic are well-positioned to be the provider of choice

continued on page 26

References

[1]*Nickelson P. The posterior chain: it's all in the hips. Dynamic Chiropractic. 2011;29(15).*

[2]*Mooney V, Gulick J, Perlman M, Levy D, Pozos R, Leggett S, et al. Relationships between myoelectric activity, strength, and MRI of the lumbar extensor muscles in back pain patients and normal subjects. J Spinal Disord. 1997;10(4):348-56.*

[3]*Hides JA, Stokes MJ, Saide M, Jull GA, Cooper DH. Evidence of lumbar multifidus muscle wasting ipsilateral to symptoms in patients with acute/subacute low back pain. Spine. 1994;19(2):165-72.*

[4]*Crow JF, Buttifant D, Kearny SG, Hrysomallis C. Low load exercises targeting the gluteal muscle group acutely enhance explosive power output in elite athletes. J Strength Cond Res. 2012;26(2):438-42.*

[5]*Sutherlin MA, Hart JM. Hip-abduction torque and muscle activation in people with low back pain. J Sport Rehab. 2015;24(1):51-61.*

[6]*Mayer JM, Mooney V, Dagenais S. Evidence-informed management of chronic low back pain with lumbar extensor strengthening exercises. The Spine Journal. 2008;8(1):96-113.*

[7]*Mayer JM, Graves JE, Clark BC, Formikell M, Ploutz-Snyder LL. The use of magnetic resonance imaging to evaluate lumbar muscle activity during trunk extension exercise at varying intensities. Spine. 2005;30(22):2556-63.*

[8]*Graves JE, Webb DC, Pollock ML, Leggett SH, Carpenter DM, Foster DN, et al. Pelvic stabilization during resistance training: its effect on the development of lumbar extension strength. Arch Phys Med Rehabil. 1994;75(2):210-5.*

[9]*Mayer JM, Graves JE, Robertson VL, Pierra EA, Verna JL, Ploutz-Snyder LL. Electromyographic activity of the lumbar extensor muscles: effect of angle and hand position during Roman chair exercise. Arch Phys Med Rehabil. 1999;80(7):751-5.*

[10]*Mayer JM, Verna JL, Manini T, Mooney V, Graves JE. Electromyographic activity of the trunk extensor muscles: effect of varying hip position and lumbar posture during Roman chair exercise. Arch Phys Med Rehabil. 2002;83(11):1543-6.*

[11]*Mayer JM, Quillen WS, Verna JL, Chen R, Lunseth P, Dagenais S. Impact of a supervised worksite exercise program on back and core muscular endurance in firefighters. Am J Health Promot. 2015;29(3):165-72.*

[12]*Mayer JM, Childs JD, Neilson BD, Chen H, Koppenhaver SL, Quillen WS. Effect of lumbar progressive resistance exercise on lumbar muscular strength and core muscular endurance in soldiers. Mil Med. 2016;accpeted for publication.*

[13]*Kulig K, Baneck GJ, Selkowitz DM, Popovich Jr JM, Ge TT, Flanagan SP, et al. An intensive, progressive exercise program reduces disability and improves functional performance in patients after single-level lumbar microdiskectomy. Phys Ther. 2009;89(11):1145-57.*

[14]*Nelson BW, O'Reilly E, Miller M, Hogan M, Wegner JA, Kelly CE. The clinical effects of intensive, specific exercise on chronic low back pain: a controlled study of 895 consecutive patients with 1-year follow up. Orthopedics. 1995;18(10):971-81.*

[15]*Clark DR, Lambert MI, Hunter AM. Muscle activation in the loaded free barbell squat: a brief review. J Strength Cond Res. 2012;26(4):169-78.*

[16]*Contreras B, Vigotsky AD, Schoenfeld BJ, Beardsley C, Cronin J. A comparison of gluteus maximus, biceps femoris, and vastus lateralis electromyographic activity in the back squat and barbell hip thrust exercises. J Appl Biomech. 2015;31(6):452-8.*

Why You Should Properly Train the Posterior Chain continued from page 25

A HEALTHY POSTERIOR CHAIN IS CRUCIAL FOR PERFORMANCE, PHYSIQUE, INJURY PREVENTION, AND REHABILITATION AND ALSO ENABLES GOOD POSTURE DURING MOVEMENTS AND STATIC POSITIONS.

for posterior chain health concerns through the application of properly performed resistance exercises. Given the importance of the posterior chain muscles and the exercise principles outlined above, we recommend that clinicians incorporate the following for patients and clients with health needs related to the posterior chain and without contraindications to resistance exercise:

1. **Clinicians should include exercises that isolate the gluteal and lumbar multifidus muscles** through appropriately prescribed programming and application of resistance exercise principles. These muscles are very challenging to activate and very close attention should be paid to isolation and contraction throughout movement.

2. **Clinicians should customize the exercise program for the gluteal and multifidus muscles** based on the client's goals, needs, and preferences, along with the scientific evidence, and clinician/trainer expertise. There is no one size fits all for training the posterior chain.

3. **Given the challenges of targeted training for these muscle groups, close supervision by trained professionals is required.** As suggested by Nickelson[1], the posterior chain muscles are not a "mirror" muscle and could be subject to neglect from being "out-of-sight, out-of-mind." With other muscle groups that are relatively easy to visualize contraction and feel isolation, such as the biceps brachii, people can train independently without supervision once the movement is learned. In contrast, the gluteals and lumbar extensors require an advanced approach to effectively isolate and contract the muscles. Thus, most people, regardless of experience level with resistance exercise, require a coach or trainer to ensure effective movement for these muscles.

4. **If the clinician chooses to not directly supervise an exercise program** that requires very close monitoring and guidance, consider partnering with a qualified exercise specialist or personal trainer with the characteristics we previously described[17].

5. **As we previously recommended[17], a hybrid approach combining directly supervised exercise training sessions** with a telehealth coaching approach over the long-term is critical for adherence and proper movement. The gluteal and lumbar extensor muscles are particularly conducive to long-term supervision via a hybrid approach to avoid improper motor patterns, misalignment, and dysfunction.

In summary, the lumbar extensor and gluteal muscles are crucial for performance, physique, injury prevention, and rehabilitation. Clinicians are encouraged to incorporate resistance exercise training for these muscles to ensure that their patients and clients develop and maintain a healthy posterior chain. ◀FCA

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