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A Comparative Analysis and Technique of the Lat Pull-down

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ABSTRACT

DIFFERING LITERATURE OVER THE MOST EFFECTIVE METHOD OF HOW TO PERFORM A LAT PULL-DOWN (LP) IS PREVALENT THROUGHOUT PEER-REVIEWED JOURNALS. THIS COLUMN WILL ANALYZE RESEARCH OF THE LP AND EXAMINE DIFFERENCES BETWEEN COMMON VARIATIONS. THIS ARTICLE WILL ALSO PROVIDE A DESCRIPTION OF THE PROPER TECHNIQUE FOR THE TRADI-
AU4 TIONAL LP.

TYPE OF EXERCISE

The lat pull-down (LP) is a multijoint exercise involving movements of the shoulder complex (e.g., glenohumeral, scapulothoracic, etc.) and the elbow joint, and is designed to increase muscular capacity of both the upper extremities and torso. This exercise will provide a benefit to those athletes requiring increases in upper-body strength and endurance. Although most sports do not require an overhead pulling movement, strengthening of the latissimus dorsi and glenohumeral supporting musculature may enhance an individuals' ability to transfer power between the upper and lower extremities during movements, such as swinging, throwing, and even sprinting. Athletes who may gain the most benefit from an overhead pulling movement include gymnasts, swimmers, and wrestlers.

MUSCLES INVOLVED

Key musculature: latissimus dorsi, posterior deltoid, rhomboids, trapezius, biceps brachii (BB).

Secondary: teres minor, teres major, pectoralis major, triceps brachii, infraspinatus, brachialis, and brachioradialis (2,5,8,11,12).

BENEFITS OF THE EXERCISE

The LP is a multijoint exercise that is designed to increase muscular capacity of the upper body, particularly strengthening of the musculature of the glenohumeral joint, as well as the primary mover (i.e., latissimus dorsi [LD]). The LD is an integral component of the posterior oblique subsystem and also serves as part of the posterior kinetic chain (1). This subsystem plays an important role in the transfer of forces between upper and lower extremities, and is important for movements such as opposite arm swing, propulsion of gait, and rotational movements (e.g., swinging and throwing) (1).

Although previous techniques of the LP consisted of pulling the bar behind-the-neck, a more modern and safer way to perform the exercise uses a pull in front of the body (2,7,11,13). Pulling the bar behind-the-head puts the glenohumeral joint in a comprised position (i.e., externally rotated, abducted, and horizontally abducted) increasing the risk of shoulder injury (6,13). Chronic use of the behind-the-head LP increases the likelihood of developing anterior instability (AI) in the shoulder joint (6,9). AI in the shoulder joint is often associated with a variety of other soft tissue injuries such as supporting rotator cuff musculature, ligamentous, and cartilaginous damage (10). With a transfer to an anterior pull (i.e., in front of the body), the LP becomes a more functional movement and reduces the prevalence of injury (4).

By incorporating different variations of the LP regarding grip width or orientation, it may be possible to emphasize and strengthen varying muscle groups. The pronated, wide grip LP (WG) is the most commonly performed variation of the LP with a reputation to produce the most activation of the LD. A close grip LP (CG) typically consists of a pronated grip roughly shoulder width apart. By decreasing the distance between the hands, the arms can no longer primarily adduct to complete the movement and therefore must work in both the frontal and sagittal plane simultaneously (i.e., adduction and extension). This change in joint motion causes a substantial increase in the range of motion through the glenohumeral joint (50°) and the elbow (15°) (4). A neutral grip LP (NG) is typically performed using a v-bar. When performing this variation, the major difference is the action at the shoulder joint during the movement. Instead of primarily adduction, the shoulder is concentrically extending during the NG, which affects muscular recruitment (11). A supinated grip LP (SG), also known as a reverse grip LP, is performed with an underhand, shoulder width grip on a traditional pull-down bar. As with the NG, the action at the shoulder is extension compared with adduction. Although all of these grip widths and orientations are possible during training, the following provides a review of literature examining the electromyographical (EMG) patterns during these LP variations.

A study performed by Signorile et al. (11), compared the primary and secondary EMG activity of the shoulder musculature during 4 types of the LP (i.e., pronated WG anterior to the body, WG posterior to the body, pronated CG, and SG). Their results demonstrated a greater activation of the LD and the long head of the triceps brachii during the WG when compared with the remaining variations (11). Although the pectoralis major and posterior deltoid showed no significant differences between close, supinated, or WG anterior (all were significantly greater than the WG posterior) (11). However, Lehman et al. (7), showed only a small, but nonsignificant, increase in LD activation during the WG when compared with a SG.

Sperandei et al. (13), elicited results that provided no differences in LD activation between 3 variations of the LP. However, supporting musculature (i.e., pectoralis major, posterior deltoid, and BB), all presented significantly greater values within the exercise variations. For instance, pectoralis major showed significantly greater activation during the WG in front of the body compared with a CG and behind-the-neck LP. The BB was greater during the behind-the-neck variation (13).

Furthermore, Lusk et al. (8), provided a closer examination of forearm orientation and grip width during the LP. Researchers tested 4 variations of the movement (pronated WG, pronated CG, supinated WG, and supinated CG) to determine whether an EMG difference existed within the LD, BB, or middle trapezius (MT). Results demonstrated that the LD was activated to a greater extent with a pronated grip (regardless of width) when compared with the SG. However, BB and MT showed no differences, despite grip width and forearm orientation changes (8).

More recently, Andersen et al. (2), studied 3 different pronated grip widths (i.e., WG, medium, and narrow) to determine whether the LD, MT, BB, or infraspinatus was activated to a greater or lesser extent among the variations. Researchers also wanted to see if the grip variations made a difference during a 6 repetition maximum (RM) protocol. Results indicated that a narrow and medium grip showed difference in EMG activity with load lifted, but both were significantly higher than WG. In terms of EMG patterns, there was no difference between the grips for the LD, MT, or infraspinatus. However, when the movements were analyzed concentrically and eccentrically, significant changes were present. The LD and infraspinatus were significantly higher during the WG versus the narrow grip in the eccentric phase; however, BB activity was significantly greater during the concentric phase of the medium grip when compared with the narrow (2).

Although all of the above aforementioned grip and orientation changes can produce various differences in EMG activity, LD activity may be increased with proper instruction alone. A study performed by Snyder and Leech (12), demonstrated that with specific training instruction and kinesthetic feedback during a LP, participants were able to significantly increase LD activity while still maintaining BB and teres major activation levels. This study reinforces the aspect that without proper technique during complex movements, individuals may not be receiving maximal benefits of an exercise. Thus, the proper technique for the WG is described in detail as follows. The WG was chosen as it is the most common method for the LP.

EXERCISE TECHNIQUE

STARTING POSITION

- Before taking a seated position, adjust the machine so the handles can be grabbed from the seated position, but while the arms are still fully extended overhead.
- Adjust the knee pad (if necessary) so that knees are secured at an approximate 90° knee bend. This ensures that the exerciser remains in contact with the seat during the exercise.
- Grasp the handles slightly wider than shoulder width apart with a closed, pronated grip.
- Throughout the exercise, keep the feet flat on the floor and the spine in a neutral position with a slight backward lean, approximately 70–80° of flexion at the hips (Figure 1). F1

CONCENTRIC PHASE (DOWNWARD MOVEMENT)

- Exhale while adducting the shoulder and flexing the elbow in order to pull

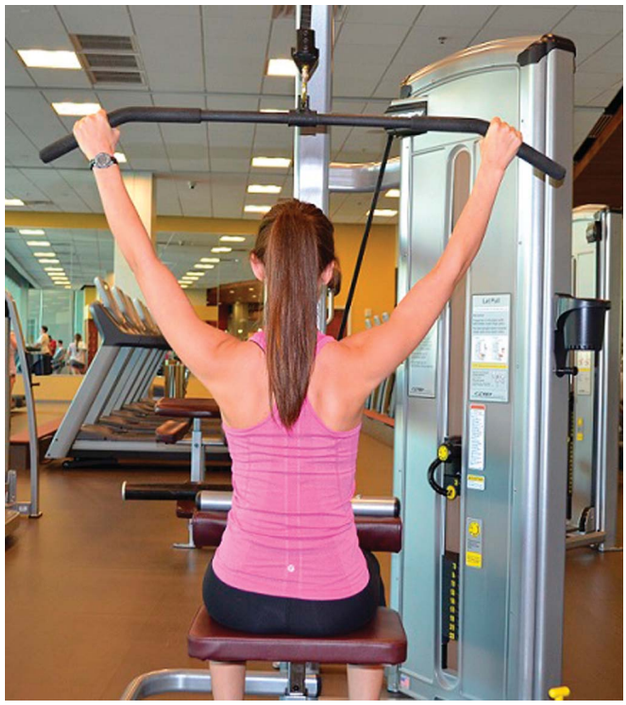

Figure 1. Starting position of the lat pull-down.

the bar downward in front of the body.
- Avoid internally rotating the shoulder joint while pulling the bar towards the body by keeping the elbows pointed towards the floor.
- Continue to pull the bar toward the body until it reaches chin level (Figure 2). F2
- This should be performed under control at a rate of 2–4 seconds.

ECCENTRIC PHASE (UPWARD MOVEMENT)

- Inhale while controllably abducting the shoulder and extending the elbow as the bar ascends toward the initial starting position.
- Continue to abduct the shoulder and extend the elbow until the elbows reach full extension (avoid shrugging the shoulders to maintain muscle tension throughout the shoulder adductors and elbow flexors) (Figure 1).
- This should be performed under control at a rate of 2–4 seconds.

KEY CHECKPOINTS AND COMMON ERRORS

While performing the WG, fitness professionals should monitor the technique for the following key checkpoints and common errors:
- While in the seated position, allow for only a slight backward lean, approximately 70–80° of flexion at the hips.
- Avoid an excessive backward lean (i.e., less than 70° of flexion at the hips) and trunk flexion (rounding).
- Keep the spine and neck in a neutral position throughout the movement.
- Avoid elevation (i.e., shrugging) of the shoulders at the top of the eccentric phase to maintain tension in the shoulder adductors.
- Maintain a slow and controlled tempo (2–4 seconds) during the concentric and eccentric phases.
- Be sure to avoid the use of momentum (by swaying backward) to assist the movement. If this occurs reduce the load lifted.
- Also, be certain to avoid lifting off of the seat by either use of the knee pad (if available) or by reducing the external resistance.

VARIATIONS

For certain individuals, access to the LP machine may not be practical (e.g., individuals using a wheelchair or shorter athletes who can successfully stabilize the lower body with the knee pad). Therefore, a variation or modification to the traditional LP may be necessary. The same movement can be performed using a cable crossover station in which 2 independent handles are used in place of a traditional LP bar. The handles should be set to an overhead position. This can either be performed in a standing position for shorter athletes, or the use of bench for a seated position is also advised. Individuals performing this variation should be instructed to grasp a handle in each hand and perform the LP with the same movement technique, by adducting at the shoulder joints and flexing at the elbows to pull each handle toward the body in the frontal plane. The modification for individuals using a wheelchair is performed using the same techniques as stated above as well. However, the individual should position themselves in the middle of the cable crossover handles.

*Please note: A spotter may be necessary for these variations and modifications to assist the individual with pulling each handle from the machine to start and replacing them when finished. AU5

SETS, REPETITIONS, AND PROGRESSION

Programming variables (e.g., sets, loads, and repetitions) depend on the overall goals of the individuals, as well as their level of experience. The guidelines below are recommended by the National Strength and Conditioning Association in *Essentials of Strength Training and Conditioning* (3).
- Strength: 3–5 sets, ≤6 repetitions, 2–5 minutes of rest period.
- Hypertrophy: 3–5 sets, 6–12 repetitions, 60–90 seconds of rest period.

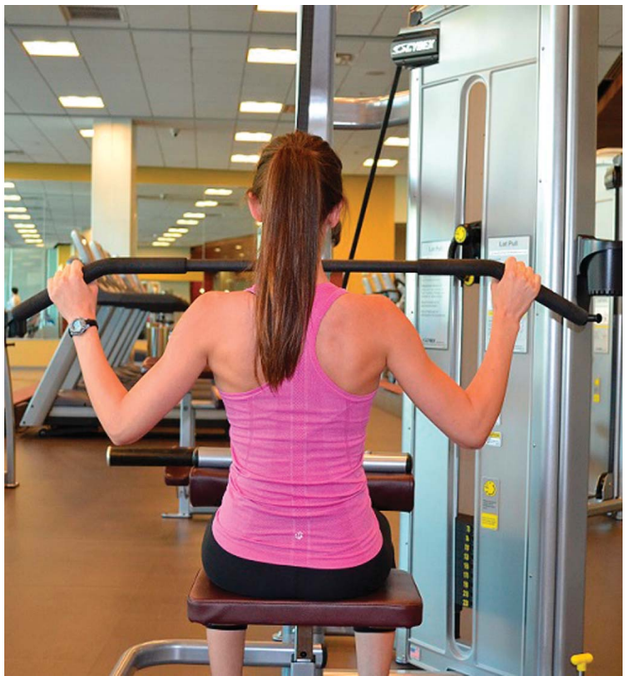

Figure 2. Ending position of the lat pull-down.

- Endurance: 2–3 sets, 12–25 repetitions, ≤30 seconds of rest period.

When the desired goal is muscle hypertrophy, novice, and intermediate exercisers are recommended to use loads of 67–80% of 1 RM for 8–12 repetitions, 1–3 sets, and with a rest period of 1–2 minutes. Advanced exercisers may use 67–85% of 1 RM for 6–12 repetitions, 3–6 sets with rest ranging from 30–90 seconds based on load. Additionally, when the desired goal is local muscular endurance, training recommendations include loads of 65–75% 1 RM for 10–15 repetitions, 1–3 sets, and with rest period of less than 30 seconds (3).

PRACTICAL APPLICATION

The LP is one of the more popular back exercises providing an increase in the muscular strength and endurance of the shoulder adductors, particularly the LD. This multijoint movement may also lead to an increased ability to transfer power between the upper and lower extremities; thereby potentially providing a benefit to athletes in which throwing, swinging, and overhead-type movements are essential. Although research in this area is inconsistent, individuals' may still benefit from using multiple variations of the LP while avoiding the behind-the-neck pull-down.

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