The Pull-up

Peter Ronai, MS, RCEP, CSCS*D, NSCA-CPT*D and Eric Scibek, MS, ATC, CSCS
Department of Physical Therapy and Movement Sciences, Sacred Heart University, Fairfield, CT

ABSTRACT

THE PULL-UP IS A MULTI-JOINT UPPER-BODY EXERCISE THAT CAN INCREASE SHOULDER GIRDLE STABILITY, UPPER-BODY MUSCULAR PULLING STRENGTH, AND PERFORMANCE OF ACTIVITIES REQUIRING HIGH LEVELS OF RELATIVE STRENGTH. THIS EXERCISE AND ITS VARIATIONS CAN BE PROGRESSED, REGRESSED, AND PERFORMED THROUGHOUT A TRAINING YEAR. THIS COLUMN PROVIDES A DETAILED DESCRIPTION AND FIGURES OF THE PROPER EXERCISE TECHNIQUE FOR A PULL-UP.

TYPE OF EXERCISE

The pull-up is a closed kinetic chain, multi-joint upper-body exercise that can improve an athlete’s shoulder girdle strength, stability, and ability to produce high forces during pulling activities, such as (but not limited to) rope climbing, rock climbing, gymnastics, rowing, and swimming (3,5).

MUSCLES USED

- Initial static stability in the start position: middle trapezius, lower trapezius, rhomboids, pectoralis minor, pectoralis major, posterior deltoid, infraspinatus, latissimus dorsi, teres major, subscapularis, biceps brachii, brachialis, brachioradialis, flexor carpi radialis, flexor carpi ulnaris, palmaris longus, flexor digitorum profundus, flexor digitorum superficialis, and flexor pollicis longus, external oblique, and erector spinae act statically (1,2,4,7–9).
- Ascending portion of the pull-up: All muscles previously described during the start position section act concentrically during the ascending phase (1,2,4,7–9).
- Descending portion of the pull-up: All muscles previously described in the start position and ascending phase sections act eccentrically during the descending phase (1,2,4,7–9).

BENEFITS OF THE EXERCISE

The pull-up is a closed kinetic chain upper-body exercise that promotes proximal stability of the shoulder girdle, multiplanar motion, and multiple muscle cocontractions necessary to perform activities like climbing ropes and poles, swimming, rowing/paddling, gymnastics, pole vaulting, and wrestling. Pull-ups have traditionally been used as a physical fitness testing tool with persons who engage in activities requiring a large upper-body strength-to-body mass ratio. They have been used to test upper-body strength and endurance in children, adolescents, and men and women attending the U.S. military service academies (9).

STARTING POSITION

Subjects grasp an overhead horizontal bar with a slightly wider than shoulder width, pronated (palms away) handgrip while hanging vertically (with feet just above the ground). Static contractions of muscles described in the previous (muscles involved) section facilitate the shoulder girdle’s stability with the scapula in a relative position of elevation, abduction, and upward rotation and the glenohumeral (shoulder) joint in a position of relative abduction. The elbow joint is in extension and the hand and wrist are in flexion. The trunk maintains an upright neutral position between flexion and extension (4) (Figure 1).

ASCENDING PHASE

While maintaining a vertical trunk position, the scapulae are forcibly depressed, retracted, and rotated in a downward position by concentric actions of the rhomboids, middle and lower trapezius, and pectoralis minor. The glenohumeral (shoulder) joint is adducted by concentric actions of the pectoralis major, infraspinatus, posterior deltoid, teres major, subscapularis, and latissimus dorsi. The elbow, wrist/hand...
joints are flexed by concentric actions of muscles discussed in the previous (muscles used/ascending portion) section. The body is pulled upright in a linear path until the underside of the chin is level with or above the top surface of the horizontal bar (4,6,7,9). The performer is encouraged to avoid all swinging, kicking, and twisting motions and to pause momentarily to allow the chin to pass over the top of the horizontal bar. Performers are verbally cued to "Keep the chest high," "squeeze the shoulder blades down, back, and in," and to "pull the arms and elbows down toward the hips and in toward the ribs." Maximal work and repetitions can be performed by maintaining a smooth and steady, controlled, and self-selected speed during the ascending phase of the pull-up (6) (Figure 2).

**DESCENDING PHASE**

While maintaining shoulder girdle and glenohumeral (shoulder) joint fixation and stabilization, the performer lowers the entire body to the original starting/static hanging position. Eccentric actions of muscles discussed in the previous section (muscles used/descending portion) help the body to follow a linear and controlled downward path and help to prevent excessive scapular (shoulder girdle) elevation, glenohumeral (shoulder) flexion, elbow extension and trunk flexion, and/or extension. Performers are verbally cued to "stay straight," "avoid dropping," and "lower gently" during descending phase of the pull-up (4,6).

**VARIATIONS**

Pull-ups can be performed with a supinated (chin-up) (Figure 3) forearm position to enhance biceps brachii activation and are generally considered easier for novices to perform than the pronated grip variation. In addition, a midprone or neutral forearm grip can be used (1,4–9).

Two additional exercise techniques that can help novices develop the requisite strength to eventually perform full pull-ups include "elastic exercise band-assisted vertical pull-ups" (Figure 4) and "pull-ups from the seated position" (Figure 5A and 5B). Using only the eccentric (or descending) portion of the movement pattern can also be useful for novice trainees to initially increase strength to the required levels to perform the pull-up exercise (5).

Elastic exercise band pull-ups are performed by attaching one end of the elastic exercise band loop over the middle of the horizontal pull-up bar while the other end is placed under the performer’s feet.

From a full hanging position, the performer executes the pull-up in a similar manner as that described for an unassisted pull-up in the previous "ascending phase" section. Exercise band thickness

![Figure 1. Starting position of the pull-up exercise.](image1)

![Figure 2. Ascending phase of the pull-up exercise.](image2)

![Figure 3. The supinated/chin-up grip variation.](image3)

![Figure 4. Assisted pull-up with elastic resistance bands.](image4)
determines the amount of assistance provided during an exercise band pull-up.

Pull-ups from the seated position require the performer to pull the chin over a horizontal bar while raising the weight of the trunk upward in a linear path from a seated position. The performer grasps a horizontal bar placed just beyond arm’s reach height and sits with the trunk perpendicular to the floor with the hips flexed, knees extended, and heels resting on top of either a training box or portable training bench. The feet can provide as much or little assistance to the performer as necessary while he/she attempts to raise the chin above the horizontal bar during the ascending phase. The seated pull-up can be performed on either an adjustable Smith Machine or weightlifting bar placed in adjustable power racks.

**PRACTICAL APPLICATIONS**

Performers can increase their muscular strength, muscular endurance, and ability to perform more pull-up repetitions by combining sets of full body weight pull-ups with sets of assisted pull-ups. In addition, full body weight pull-ups can be made more challenging by adding weight (weight belts, vests, etc.) to the performer (2,5).

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**Peter Ronai** is an associate clinical professor in the exercise science Department at Sacred Heart University.

**Eric Scibek** is a clinical assistant professor of exercise science at Sacred Heart University.

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