

Appendix 1

Upper extremity physical examination measures

Test	Description
Scapular upward rotation AROM ²²	Participant was standing. An inclinometer was zeroed on the floor then placed on top of the midpoint of the scapular spine and degrees with arm resting at side and again at full shoulder flexion were recorded.
Shoulder complex flexion PROM ²³	Participant was supine with knees flexed, and arm at the side in neutral. The PT stabilized the anterolateral thorax with one hand and passively flexed the shoulder until resistance felt and more motion would cause trunk extension or rib motion.
Shoulder extension PROM ²³	Participant was prone with their face turned to the opposite side. Elbow was in slight flexion and palms facing toward body (neutral forearm). The PT stabilized the thorax as needed to prevent rotation then passively extended shoulder until resistance and further motion would cause spinal flexion or rotation.
Glenohumeral internal and external rotation PROM ²³	Participant was supine with shoulder abducted to 90°, elbow flexed to 90°, and forearm neutral. The humerus was maintained in line with the acromion while PT passively internally or externally rotated the shoulder until resistance and further motion would cause scapular anterior tilt or protraction with internal rotation or scapular posterior tilt or retraction with external rotation.
Latissimus dorsi flexibility ²⁴	Participant was supine with knees flexed to flatten their lumbar spine. The PT externally rotated the arm in neutral and then passively flexed the shoulder until resistance and further motion would extend the lumbar spine or internally rotate.
Pec Minor Index ²⁵	Participant was supine with arms at side and palms facing inward. The PT measured the distance between the caudal edge of the 4 th rib at the sternum to the inferomedial aspect of the coracoid process is measured with a tape measure. This measure was normalized to height.

<p>Shoulder internal and external rotation MMT²⁶</p>	<p>Participant was prone, shoulder abducted to 90° and elbow flexed to 90°. A folded towel was placed under the humerus to keep it horizontal. The participant internally or externally rotated through full range. The PT stabilized the ipsilateral thorax (not over infraspinatus/teres minor), then applied resistance just proximal to wrist in direction of lateral or medial rotation.</p>
<p>Middle trapezius MMT²⁶</p>	<p>Participant was prone, shoulder abducted to 90°, fully externally rotated with elbow flexed to 90 and head turned to opposite side. Participant adducted their scapula through full range with horizontal abduction of arm. The PT stabilized the opposite thorax to prevent rotation and applied resistance at lateral aspect of scapular into scapular abduction.</p>
<p>Lower trapezius MMT²⁶</p>	<p>Participant was prone, shoulder abducted to 130°, fully externally rotated with elbow extended and head turned to opposite side. Participant adducted their scapula through full range with horizontal abduction of arm. The PT stabilized the opposite thorax to prevent rotation and applied resistance at lateral aspect of scapular into scapular abduction and elevation.</p>
<p>Serratus anterior MMT²⁶</p>	<p>Participant was seated on edge of table. They flexed their shoulder in the sagittal plane to 125°. The PT applied force at the distal humerus into extension and lateral border of the scapula into downward rotation.</p>
<p>Grip dynamometry^{27,28}</p>	<p>Participant was seated on edge of table, shoulder neutral, elbow flexed to 90°, neutral forearm position, and wrist slightly extended and ulnarly deviated. They were instructed to apply maximal grip to Jamar dynamometer, with handle set to position 2.</p>
<p>Handstand balance</p>	<p>Participants were allowed a couple minutes to warm up including 1-2 practice trials. The participant then performed a handstand on a firm surface with a vertical trunk and leg position of their choice. The best of 2 trials was recorded. No stepping or sliding of hands was allowed. The test was stopped if the participant reached 60 seconds.</p>

<p>Closed Kinetic Chain Upper Extremity Stability Test (CKCUEST)^{29,30}</p>	<p>Participants started in plank position, hands 36-inches apart, arms perpendicular to the floor over hands, and feet hip width apart. After a practice trial, participants performed as many repetitions as possible in 15 seconds of alternating sides to bring the opposite hand across to touch the other hand and then returning to the start position.</p>
<p>Pull-ups on trapeze</p>	<p>Participants were allowed a couple minutes to warm but no practice trials. They were assisted as needed up to the trapeze bar, to start position with hands pronated, elbows fully extended, and feet off the mat. They performed their maximum number of pullups from full hang to chin over the bar.</p>

AROM, active range of motion, PROM, passive range of motion; MMT, Manual muscle testing. MMT graded as normal (full AROM against gravity and able to hold with maximal resistance), good (full AROM against gravity and able to hold with moderate resistance), fair (full AROM against gravity), or fair minus (greater than 50% of AROM against gravity).²⁶