



Guideline Focused Care for Lateral Elbow Tendinopathy: Implementing Best Evidence

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Objectives

Describe	Describe the risk factors for development and persistence of lateral elbow tendinopathy.
Understand	Understand the current evidence related to the examination and management of individuals with lateral elbow tendinopathy.
Discuss	Discuss outcome measures with established psychometric properties used for individuals with lateral elbow tendinopathy.
Classify	Classify the irritability of the condition based on self-reported pain description, distribution of symptoms, and level of disability in individuals with lateral elbow tendinopathy.
Create	Create an evidence-informed plan of care for individuals with lateral elbow tendinopathy.

CLINICAL PRACTICE GUIDELINES

Lateral Elbow Pain and Muscle Function Impairments

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health from the Academy of Hand and Upper Extremity Physical Therapy and the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association

J Orthop Sports Phys Ther. 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302

<https://www.jospt.org/doi/10.2519/jospt.2022.0302>



TABLE 2

GRADES OF RECOMMENDATION

Grades of Recommendation	Strength of Evidence	Level of Obligation
A Strong evidence	A preponderance of level I and/or level II studies support the recommendation. This must include at least 1 level I study	Must or should
B Moderate evidence	A single high-quality randomized controlled trial or a preponderance of level II studies support the recommendation	Should
C Weak evidence	A single level II study or a preponderance of level III and IV studies, including statements of consensus by content experts, support the recommendation	May
D Conflicting evidence	Higher-quality studies conducted on this topic disagree with respect to their conclusions. The recommendation is based on these conflicting studies	
E Theoretical/foundational evidence	A preponderance of evidence from animal or cadaver studies, from conceptual models/principles or from basic sciences/bench research, supports this conclusion	May
F Expert opinion	Best practice based on the clinical experience of the guideline development team	May



Impairment/ Function-Based Diagnosis



Pathoanatomic Features

- Tendinopathy
 - A non-rupture injury in the tendon or peritendon that is aggravated by mechanical loading
- Lateral Elbow Tendinopathy
 - Affects the common extensor origin at the lateral epicondyle, most commonly within the fibers of the ECRB
 - Associated with complex pathophysiologic mechanisms characterized by:
 - Microscopic cellular and chemical alterations
 - Macroscopic structural changes of the tendon
 - May present in the context of alterations in the neuromodulation of pain (both peripherally and centrally)
 - Lack of consistent correspondence of pathology with severity of clinical presentation

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Risk Factors

Non-modifiable

- Female sex
- Previous smoking history
- Rotator cuff injuries
- De Quervain's disease
- Carpal tunnel syndrome
- Oral corticosteroid therapy

Modifiable

- Low job control
- Low social support
- Handling heavy tools greater than 20 kg
- Repetitive elbow/ wrist flexion/extension for more than 2 hours a day
- Repetitive forearm twisting/rotating/screwing movements

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Clinical Course

- Some experience full and fast resolution of symptoms
- Others can have lasting pain and disability
 - Depends heavily on repetitive exposure to irritating forces
 - Almost ½ of people seeking general medical care for LET continue to report symptoms at 1 year
 - 20% report persistent pain for 3-5 years

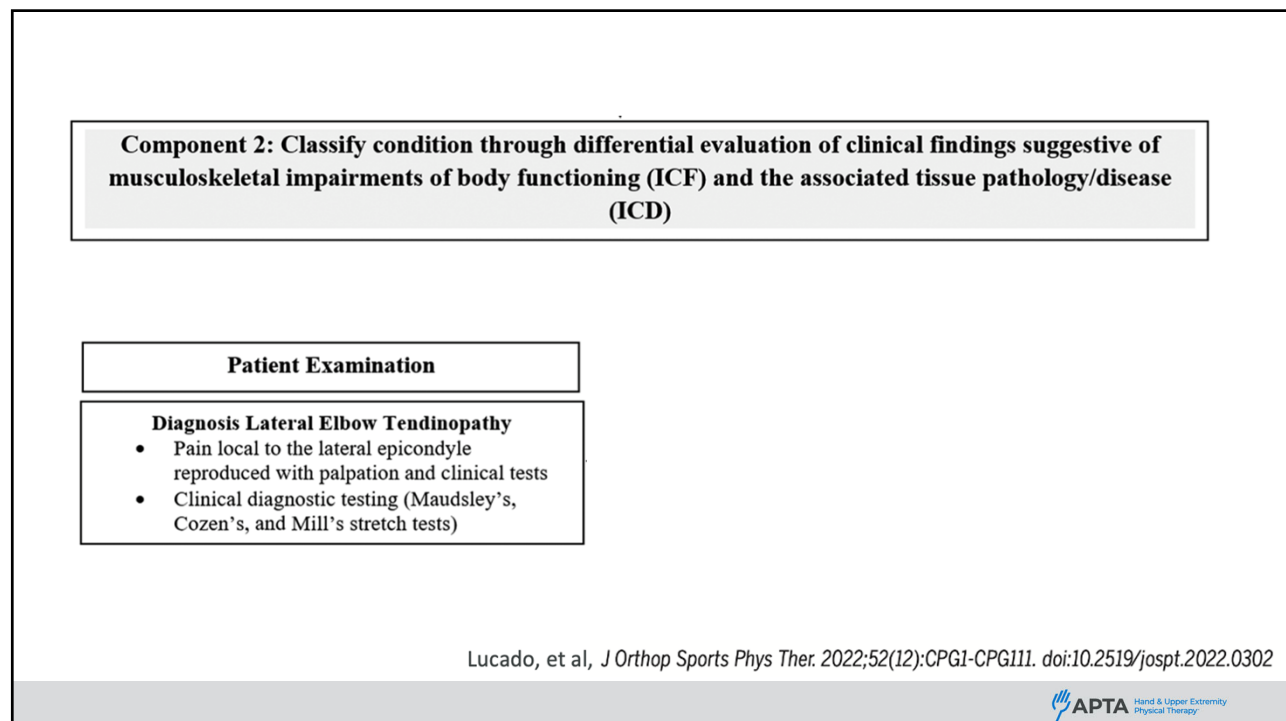
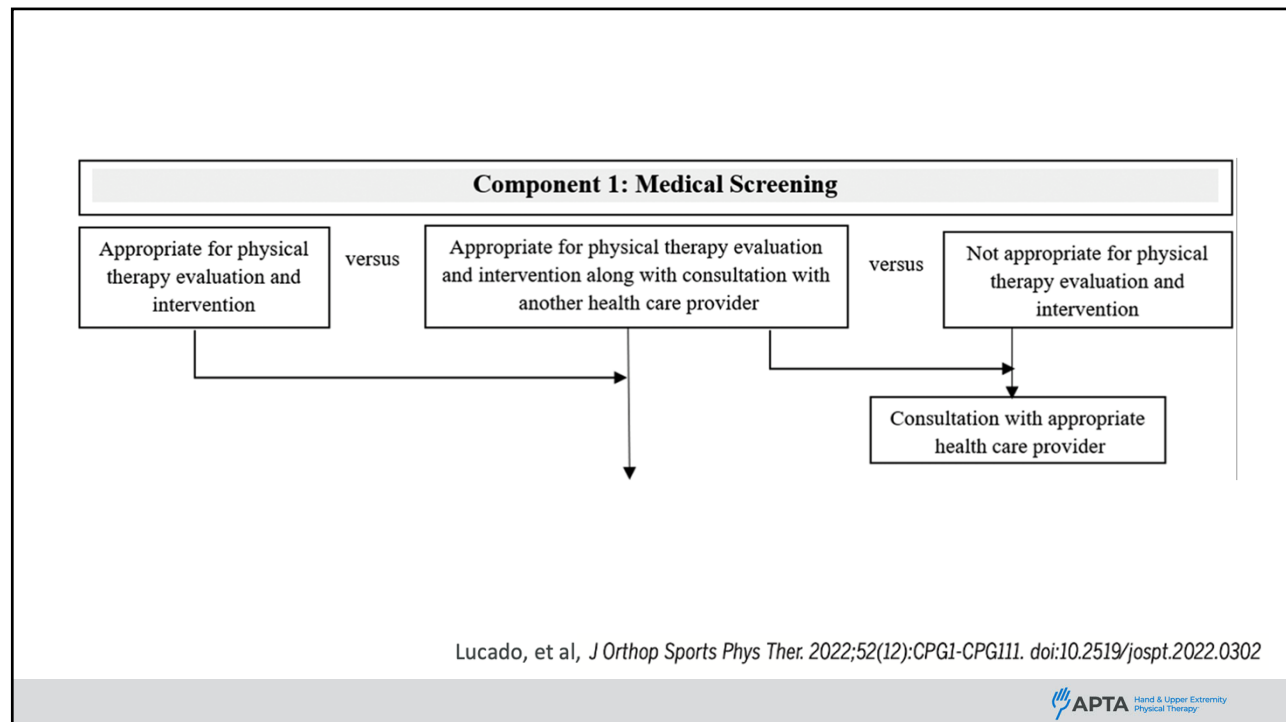
Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



Prognosis

- 3-week outcomes
 - Grip strength and age were useful predictors
- 8-week outcomes
 - Baseline disability, female sex, and self-reported nerve symptoms were useful predictors
- 6-month outcomes and beyond
 - Occupation and hand dominance were useful predictors

Evidence-Based Examination of LET



Diagnosis

TABLE 5

RESISTED MIDDLE
FINGER EXTENSION TEST
(MAUDSLEY'S TEST)¹¹⁷

ICF Category	Measurement of Impairment of Body Function
Description	Special test to assist with the diagnosis of LET
Measurement method	Patient position: The patient can be in sitting or standing with the elbow in full extension, forearm pronated, and fingers in extension. Test: The examiner supports the distal end of the forearm and applies resistance to the dorsum of the distal phalanx of the third digit of the hand, indirectly stressing the ECRB muscle and tendon. Positive test: Reproduction of pain at the lateral epicondyle of the humerus or within 2 cm distal to the common extensor tendon insertion site.
Nature of variable	Nominal/dichotomous
Units of measurement	None
Measurement properties	Maudsley's test showed little association with pressure pain threshold ($\beta = .293$).¹⁴⁵ Sensitivity = 88%¹⁵⁹ Sensitivity = 66%; 95% CI: 53%, 76%⁵¹

Abbreviations: ECRB, extensor carpi radialis brevis; ICF, International Classification of Functioning, Disability and Health; LET, lateral elbow tendinopathy.

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Diagnosis

TABLE 5

TABLE 6

RESISTED WRIST EXTENSION
TEST OR COZEN'S TEST
OR LET TEST¹¹⁷

ICF Category	Measurement of Impairment of Body Function
Description	Special test to assist with the diagnosis of LET
Measurement method	Patient position: The patient can be in sitting or standing with the elbow fully extended, forearm pronated, and the wrist extended to 30°. Test: The patient's elbow is stabilized by the examiner's thumb, which rests on the patient's lateral epicondyle. The examiner then provides pressure to the dorsum of the second and third metacarpals using the other hand to resist active wrist extension. Positive test: Reproduction of pain at the lateral epicondyle of the humerus or within 2 cm distal to the common extensor tendon insertion site.
Nature of variable	Nominal/dichotomous
Units of measurement	None
Measurement properties	Cozen's test showed fair association with pressure pain threshold ($\beta = .436$).¹⁴⁵ Sensitivity = 84%¹⁵⁹ Sensitivity = 91%; 95% CI: 81%, 96%⁵¹

Abbreviations: ECRB, extensor carpi radialis brevis; ICF, International Classification of Functioning, Disability and Health; LET, lateral elbow tendinopathy.

Abbreviations: ICF, International Classification of Functioning, Disability and Health; LET, lateral elbow tendinopathy.

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Diagnosis

TABLE 5

ICF Category
Description
Measurement method

Nature of variable
Units of measurement
Measurement properties

TABLE 6

ICF Category
Description
Measurement method

Nature of variable
Units of measurement
Measurement properties

TABLE 7

MILL'S STRETCH TEST OR LONG EXTENSOR STRETCH¹²⁴

ICF Category

Description
Measurement method

Measurement of impairment of body function

Special test to assist with the diagnosis of LET

Patient position:

The patient can be in sitting or standing beginning with the elbow flexed to 90°, with the forearm pronated, and the wrist fully flexed.

Test:

The examiner extends the elbow slowly while palpating the lateral epicondyle.

Positive test:

Reproduction of pain at the lateral epicondyle of the humerus or within 2 cm distal to the common extensor tendon insertion site.

Nature of variable

Nominal/dichotomous

Units of measurement

None

Measurement properties

Mill's test showed little association with pressure pain threshold ($\beta = .267$).¹⁴⁵
Sensitivity = 53%; Specificity = 100%¹⁵⁹
Sensitivity = 76%; 95% CI: 63%, 85%⁵¹

Abbreviations: ICF, International Classification of Functioning, Disability and Health; LET, lateral elbow tendinopathy.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;
tendinopathy.

Abbreviations: ICF,
ability and Health; LET, lateral elbow tendinopathy.

Component 2: Classify condition through differential evaluation of clinical findings suggestive of musculoskeletal impairments of body functioning (ICF) and the associated tissue pathology/disease (ICD)

Patient Examination

Diagnosis Lateral Elbow Tendinopathy

- Pain local to the lateral epicondyle reproduced with palpation and clinical tests
- Clinical diagnostic testing (Maudsley's, Cozen's, and Mill's stretch tests)

Differential Diagnosis

Test for other elbow, forearm, and wrist conditions and/or impairments as a part of the differential diagnosis screen. Examine for symptoms and/or impairments from the cervical/thoracic region. Consider systemic or medical conditions that may impact diagnosis and management to rule out other potential causes of lateral elbow pain.

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Differential Diagnosis

- Cervical radiculopathy
- Radial tunnel syndrome
- Posterior interosseous syndrome
- Plica syndrome
- Radio-capitellar chondromalacia
- Posterolateral rotatory instability
- Myofascial trigger points in the wrist extensors

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Differential Diagnosis

Cervical Radiculopathy Cluster

- Cervical rotation <60°
- + Spurling's Test (A)
- + Distraction Test
- + Upper Limb Tension Test- median nerve bias

Table 5. Test Item Cluster for the Diagnosis of Cervical Radiculopathy

Criteria for a Positive Test	Sn 95 CI	Sp 95 CI	LR+ 95 CI	Post-test Probability
Two positive tests	0.39 (0.16–0.61)	0.56 (0.43–0.68)	0.88 (1.5–2.5)	21%
Three positive tests	0.39 (0.16–0.61)	0.94 (0.88–1.0)	6.1 (2.0–18.6)	65%
All four tests positive	0.24 (0.05–0.43)	0.99 (0.97–1.0)	30.3 (1.7–538.2)	90%

ULTTA, involved cervical rotation <60°, Distraction, and Spurling's A. Sensitivity (Sn), Specificity (Sp), and Positive Likelihood Ratio (LR+) of clinical examination variables with 95% confidence intervals (95 CI). The associated post-test probability values for each criteria level is based on a pre-test probability of 23%.

Wainner et al, 2003



Differential Diagnosis

Radial Tunnel Syndrome

- No tenderness at lateral epicondyle
- Pain at night
- Tenderness pronounced over Supinator
 - + Resisted Supination (pain at Supinator)
 - + Middle Finger Ext Test (pain at Supinator)
 - Pain over Supinator with resisted test to ECRB

Coloozza et al, [Acta Biomed. 2022; 93\(1\): e2022029.](#)

Differential Diagnosis

Posterior Interosseous Syndrome

- Paralysis or weakness in EDC, EDM, EIP, EPB, EPL, APL
- Radial drift of wrist with active wrist extension (weak ECU)
- Possible weakness of Supinator



Braza et al, [ePlasty 2021;21:ic5](#)

Differential Diagnosis

Posterolateral Plica Syndrome



Flexion-pronation test for detecting lateral plica.



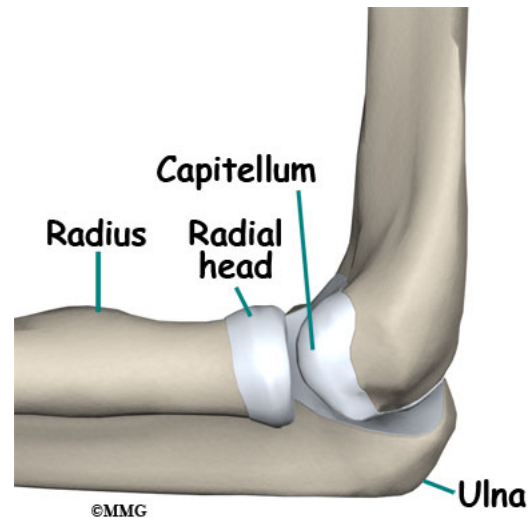
Extension-supination test to detect posterior plica

Coloozza et al, [Acta Biomed. 2022; 93\(1\): e2022029.](#)

Differential Diagnosis

Radio-capitellar chondromalacia

- Joint pain at lateral elbow
- Lateral elbow boggiess/ swelling
- Pain with P/AROM
- May be associated with posterolateral plica



©MMG

<https://www.eorthopod.com/images/ContentImages/Fractures/adult fractures/adult elbow fx/adult elbow fx radial head anatomy01.jpg>

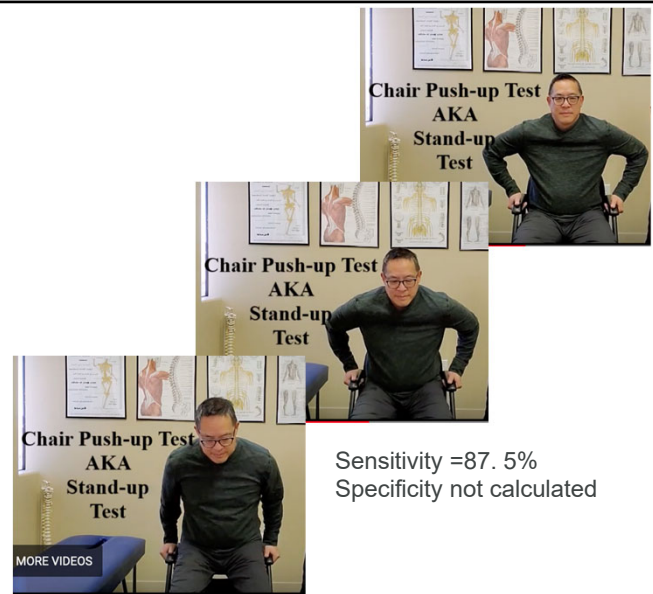
Coloozza et al, [Acta Biomed. 2022; 93\(1\): e2022029.](#)

Differential Diagnosis

Posterolateral rotatory instability

- History of trauma
- History of multiple steroid injections
 - Pain at the radiocapitellar joint, especially with supination and extension
 - Lack of terminal elbow extension in supination
 - + pivot shift test
 - + posterolateral drawer test
 - Better dx utility under anesthesia

Gilotra, [JSES Int.](#) 2021 Jul; 5(4): 827–833.

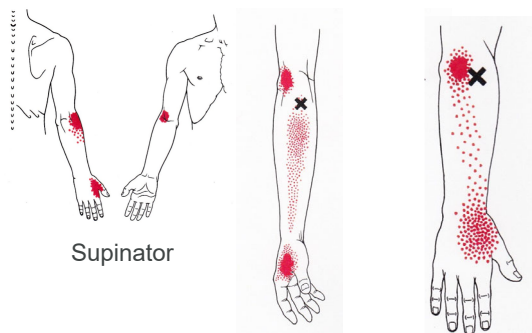


Sensitivity = 87.5%
Specificity not calculated

https://www.physio-pedia.com/Chair_Push-up_Test

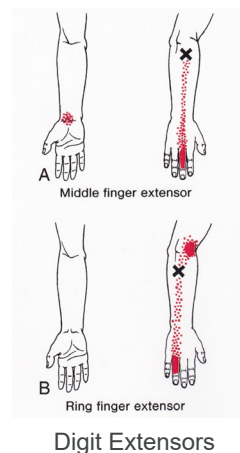
Differential Diagnosis

Myofascial Trigger Points

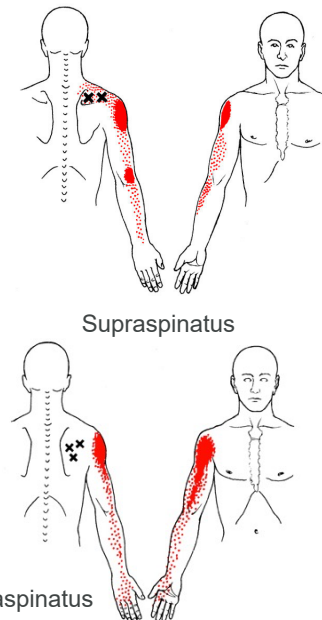


Brachioradialis

Wrist Extensors



Digit Extensors



Supraspinatus

Infraspinatus

Evidence-Based Outcome Measures for LET



Component 3: Outcome Measures

Patient-Reported Outcome Measures

Grade A

- PRTEE or DASH
- NPRS
- PSFS

Physical Impairment Measures

Grade B

- Elbow, forearm, and wrist ROM
- PPT
- PFGS
- Maximum grip strength

PHYSICAL IMPAIRMENT MEASURES

B Clinicians should include the physical impairment measures of elbow and wrist range of motion, pressure pain threshold, pain-free grip strength, and maximum grip strength at baseline and at least one other follow-up point that includes discharge for individuals with LET.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



A

TABLE 9

PATIENT-RATED TENNIS ELBOW EVALUATION QUESTIONNAIRE (PRTEE)

ICF Category

Activity Limitations and Participation Restrictions

Description

The PRTEE¹² is a 15-item self-reported questionnaire to measure patients' perceived pain and disability. It has 5 items on pain, 6 items on the difficulty in performing usual activities, and 4 items on the difficulty in performing specific activities. Each of the items is scored on a 0-10 scale. The total score ranges from 0 to 100 where 100 indicates greater disability. It takes approximately 5 minutes to complete.¹²⁸

TABLE 10

DISABILITIES OF THE ARM, SHOULDER AND HAND QUESTIONNAIRE (DASH)

ICF Category

Activity Limitations and Participation Restrictions

Description

The DASH is a region-specific self-report questionnaire to measure impairments and functional limitations due to disorders in the upper limb. There is an optional component containing questions covering sports and performing arts, and work. The total DASH score ranges from 0 (no disability) to 100 (severe disability). The DASH has been extensively used in efficacy studies on the management of LET.¹³

TABLE 11

PATIENT-SPECIFIC FUNCTIONAL SCALE (PSFS)

ICF Category

Activity Limitations and Participation Restrictions

Description

The PSFS is a self-report outcome measure that is used to quantify patient-identified activity limitations related to any musculoskeletal disorder. Patients self-select activities to rate on an 11-point scale. The anchor "0" represents being "unable to perform" the task, and "10" represents being "able to perform at prior level." Measurement properties have been established for adults with general UE musculoskeletal conditions⁹ but have not been specifically tested for adults with LET.

TABLE 12

THE NUMERIC PAIN-RATING SCALE (NPRS)

ICF Category

Self-report of Impairment of Body Function: Pain Levels

Description

To measure or evaluate the levels of pain, clinicians use a variety of self-report tools in their practice such as VAS, NPRS, and verbal rating scale. A systematic review²⁹ conducted to compare different scales used to measure pain intensity in adults concluded NPRS to be the ideal measure. Patients rate their level of pain on a scale of 0-10 ("0" = no pain and "10" = worst imaginable pain).^{61,82} It has been shown to have acceptable psychometric properties. In a study looking into the validity of 4 pain rating scales, the NPRS was reported to be more responsive and sensitive to change than other scales.⁶¹

OUTCOME, ACTIVITY LIMITATIONS, SELF-REPORT MEASURES

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



Development of a core outcome set

Original research



Development of a core outcome set for lateral elbow tendinopathy (COS-LET) using best available evidence and an international consensus process

Marcus Bateman ,¹ Jonathan P Evans ,^{2,3} Viana Vuvan,⁴ Val Jones,⁵ Adam C Watts,⁶ Joideep Phadnis,^{7,8} Leanne M Bisset,^{9,10} Bill Vicenzino ,⁴ COS-LET Authorship Group

Bateman M, Evans JP, Vuvan V, et al. Trials. 2021 May 10;22(1):339. doi: 10.1186/s13063-021-05291-9.



Classification of LET



TABLE 8**DESCRIPTIVE CLASSIFICATION OF LATERAL ELBOW TENDINOPATHY^a****Axis I****Context**

- ☐ General Population (screening/prevention)
- ☐ Mixed Clinical Setting (Treatment)
- ☐ Special Population
- ☐ Athlete _____
- ☐ Work _____
- ☐ Claim (Workers' Compensation)
- ☐ Other _____

Axis II**Acuity**

- ☐ Acute (0-6 wk)
- ☐ Subacute (<3 mo)
- ☐ Chronic (>3 mo)

Axis III**Pathology**

- ☐ Tendinosis
- ☐ Paratenonitis
- ☐ Mixed

Axis V**Distribution**

- ☐ Type 1: Unilateral signs/symptoms localized to lateral elbow
- ☐ Type 2: Bilateral signs/symptoms that are localized to lateral elbows
- ☐ Type 3: Elbow + Cervical: Lateral elbow symptoms/signs combined with cervical signs/symptoms or neuropathic pain

Axis IV**Course**

- ☐ Isolated episode
- ☐ Recurrent
- ☐ Persistent
- ☐ predictable
- ☐ unpredictable

Axis VI[~]**Irritability**

- ☐ Level I: Mild pain* occurring after exercise/work, lasts <6 hours Mild
- ☐ Level II: Mild pain* occurring after exercise/work that lasts 7-48 hours
- ☐ Level III: Mild pain* occurring during exercise/work that persists after activity, but does not limit activity
- ☐ Level IV: Mild* to moderate** pain that occurs during exercise/work activity, persists >6 hours and limits activity Moderate
- ☐ Level V: Moderate** overall pain ratings; severe pain with heavy activities of daily living
- ☐ Level VI: Moderate** to severe*** overall pain ratings; severe pain with light activity; intermittent pain at rest Severe
- ☐ Level VII: Constant pain at rest, severe*** pain with activity, pain disturbs sleep

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG11. doi:10.2519/jospt.2022.0302

Component 4: Determination of Irritability Stage

Self-reported pain, distribution of symptoms, and level of disability should all be considered in the stage of irritability: Self-reported pain scores (NPRS); mild < 3/10, moderate = 4-6/10, severe = 7+/10. Distribution: Type 1 = unilateral signs/symptoms localized to the lateral elbow, Type 2 = bilateral signs/symptoms localized to the lateral elbow, Type 3 = diffuse elbow signs/symptoms combined with cervical, diffuse upper extremity, or neuropathic pain. Disability: mild = 20/50 or less on PRTEE, moderate = 21-34/50 on PRTEE, severe = 35 and above/50 on PRTEE.

- Symptom Modulation: severe pain, type 3 distribution, and severe disability.
- Mobility = moderate pain, type 3 distribution, and moderate disability
- Loading: mild pain, type 1-2 distribution, and low disability.
- Return to Function: mild-absent pain, type 1-2 distribution, and mild-absent disability.

Use symptom irritability stage to guide management of symptoms and intervention choices.

*Please note that movement between categories is fluid, and patients may often fit more than one category at a given time.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG11. doi:10.2519/jospt.2022.0302

Evidence-Based Interventions



Interventions: Emphasis on Symptom Modulation



Component 4: Determination of Irritability Stage

Self-reported pain, distribution of symptoms, and level of disability should all be considered in the stage of irritability: Self-reported pain scores (NPRS); mild < 3/10, moderate = 4-6/10, severe = 7+/10. Distribution: Type 1 = unilateral signs/symptoms localized to the lateral elbow, Type 2 = bilateral signs/symptoms localized to the lateral elbow, Type 3 = diffuse elbow signs/symptoms combined with cervical, diffuse upper extremity, or neuropathic pain. Disability: mild = 20/50 or less on PRTEE, moderate = 21-34/50 on PRTEE, severe = 35 and above/50 on PRTEE.

- **Symptom Modulation:** severe pain, type 3 distribution, and severe disability. = No Emphasize on Exercises
- **Mobility:** moderate pain, type 3 distribution, and moderate disability
- **Loading:** mild pain, type 1-2 distribution, and low disability.
- **Return to Function:** mild-absent pain, type 1-2 distribution, and mild-absent disability.

Use symptom irritability stage to guide management of symptoms and intervention choices.

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WHAT WE NOW RECOMMEND: THE BOTTOM LINE FOR CLINICAL PRACTICE

1. For symptom modulation, physical therapists should use strategies to off-load tissues (grades B, C, E, and F) and to manage impairments through a combination of regional joint mobilizations (grade C) and physical agents, if needed

<https://www.jospt.org/doi/epdf/10.2519/jospt.2023.0501>

Off-Loading- Education on Activity Modification

INTERVENTIONS: ERGONOMICS

E Clinicians may use ergonomic interventions in the management of symptoms in individuals with LET; the implementation of education, behavioral modification, ergonomic equipment, and workstation adjustments is moderately supported by best practice/standard of care.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



Off-Loading- Orthotic Interventions

INTERVENTIONS: ORTHOSES

D Based on conflicting evidence, a recommendation cannot be made regarding the use of a forearm counterforce or wrist support orthosis to alleviate intermediate or long-term symptoms in individuals with LET.

?

F Clinicians may use a forearm counterforce or wrist support orthosis to be worn during activity for immediate improvement of pain and strength in those with LET whose symptoms are aggravated with activity. 

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Off-Loading- Taping Interventions

INTERVENTIONS: TAPING

- B** Clinicians should use rigid taping techniques for immediate/short-term pain relief and improvement in pain-free muscle function in those with irritable LET.
- C** Clinicians may use kinesiology tape application as part of a multimodal treatment program for immediate and short-term management of pain and muscle function in individuals with LET.

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Regional Joint Mobilizations

INTERVENTIONS: MANUAL THERAPY JOINT MOBILIZATIONS/MANIPULATIONS

- C** Clinicians may use manipulation or mobilization techniques directed at the cervical spine, thoracic spine, and/or wrist as an adjunct to local treatment for short-term pain relief in individuals with LET when impairments in those regions are identified.

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Physical Agent Modalities



INTERVENTIONS: IONTOPHORESIS

- C** Clinicians may use iontophoresis with an anti-inflammatory drug, early in the rehabilitation phase (no later than 2-4 weeks from onset or aggravation of symptoms), in individuals presenting with highly irritable symptoms of LET.

INTERVENTIONS: THERAPEUTIC ULTRASOUND

- D** Based on conflicting evidence, a recommendation cannot be made for the use of ultrasound as a stand-alone treatment.

INTERVENTIONS: PHONOPHORESIS

- C** Clinicians should not use phonophoresis with 10% hydrocortisone gel, topical prednisolone (2 mg/d), or 1% diclofenac sodium gel for the treatment of LET.

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Physical Agent Modalities

INTERVENTIONS: CRYOTHERAPY

- C** Clinicians may use cryotherapy combined with burst transcutaneous electrical nerve stimulation (TENS) to reduce pain in the short term in individuals with symptoms of LET for greater than 30 days.

- E** Clinicians may use cryotherapy to reduce pain in individuals with irritable symptoms of LET. 

INTERVENTIONS: LASER

- C** Clinicians may use laser therapy for improvements in pain and grip strength, seen in follow-up periods >4 weeks to 6 months, for individuals with LET.

INTERVENTIONS: TENS

- C** Clinicians may use burst TENS applied to the painful region or high- or low-frequency TENS applied to acupuncture points, for short-term pain relief in individuals with LET.

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Interventions: Emphasis on Mobility



Component 4: Determination of Irritability Stage

Self-reported pain, distribution of symptoms, and level of disability should all be considered in the stage of irritability: Self-reported pain scores (NPRS); mild < 3/10, moderate = 4-6/10, severe = 7+/10. Distribution: Type 1 = unilateral signs/symptoms localized to the lateral elbow, Type 2 = bilateral signs/symptoms localized to the lateral elbow, Type 3 = diffuse elbow signs/symptoms combined with cervical, diffuse upper extremity, or neuropathic pain. Disability: mild = 20/50 or less on PRTEE, moderate = 21-34/50 on PRTEE, severe = 35 and above/50 on PRTEE.

- Symptom Modulation: severe pain, type 3 distribution, and severe disability.
- Mobility = moderate pain, type 3 distribution, and moderate disability = **Phase 1 Exercises**
- Loading: mild pain, type 1-2 distribution, and low disability.
- Return to Function: mild-absent pain, type 1-2 distribution, and mild-absent disability.

Use symptom irritability stage to guide management of symptoms and intervention choices.

*Please note that movement between categories is fluid, and patients may often fit more than one category at a given time.

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WHAT WE NOW RECOMMEND: THE BOTTOM LINE FOR CLINICAL PRACTICE

1. For symptom modulation, physical therapists should use strategies to off-load tissues (grades B, C, E, and F) and to manage impairments through a combination of regional joint mobilizations (grade C) and physical agents, if needed (grades C and E).
2. To address joint and soft tissue mobility physical therapists should incorporate therapeutic exercise alone or in combination with other interventions such as local (grade B) or regional (grade C) joint mobilization, dry needling (grade B), or soft tissue mobilization (grade C).

<https://www.jospt.org/doi/epdf/10.2519/jospt.2023.0501>

Interventions: Emphasis on Mobility

MULTIMODAL INTERVENTIONS: INCLUDING THERAPEUTIC EXERCISE

B Clinicians should use therapeutic resisted wrist extension strengthening exercises in combination with other therapeutic interventions, including manual therapy, in the treatment of patients with subacute or chronic LET.

C Clinicians may include shoulder and scapular stabilizer muscle training exercises, when impairments are identified, in conjunction with other forms of wrist extensor strengthening exercise in individuals with LET.

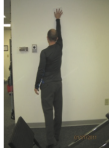
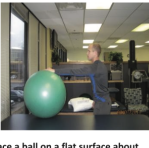
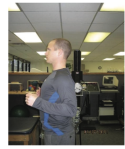
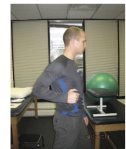
INTERVENTIONS: THERAPEUTIC EXERCISE

B Clinicians should use isometric, concentric, and/or eccentric therapeutic resisted exercises of the wrist extensors in the treatment of individuals with subacute or chronic LET.

F Clinicians may use a phased approach to reintroduce stress, increase strength, improve endurance, and restore optimal motor control in individuals who have LET symptoms with high-demand occupations, hobbies, performing arts, or athletic interests.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG11. doi:10.2519/jospt.2022.0302

Emphasis on mobility/ neuromuscular education- Scapula

Scapular Muscle Strengthening Phase 1: Isometric Recruitment			
Scapular Depression  Stand with your chest up and good back posture. Push your shoulder blades down toward your back pockets.	Inferior Glides  Place a ball on a supportive surface. Stand facing the ball so that your involved arm can rest on the top of the ball as shown. Push your shoulder blade down toward your back pocket.	Wall Washes  Hold a towel against a wall with your involved hand facing away. Stand with the same side leg slightly in front of the other about a foot length from the wall. Start with your elbow bent, then extend the elbow as the towel is slid upward.	Ball Roll Standing  Place a ball on a flat surface about shoulder level. Stand facing the ball so that your involved arm can rest on the top of the ball with the palm down. Roll the ball forward with the involved arm and reach without pain.
Isometric Scapular Retraction  Stand with your chest up and good back posture, arms by your side, elbows straight. Squeeze your shoulder blades down and back as you bring both arms behind you.	Low Row  Stand in front of a supportive surface so that your involved hand can touch. Push your involved hand back against the surface while squeezing your shoulder blades together.	Sternal Lift with Trunk Extension  Stand with your arms by your side and elbows bent. Slightly lift your chest and at the same time squeeze your shoulder blades down and together.	Lawnmower without Weight  Reach forward with your involved arm while keeping good posture. Stand with the same side leg slightly behind the other. Pull the involved arm back (starting a lawnmower) and at the end squeeze your shoulder blades together.

*Choose 1 exercise from each row. The top row are exercises targeting the serratus anterior and the bottom row are exercises targeting the middle/lower trapezius. Hold times, sets, and repetitions will vary.

Day, 2019

APTA Hand & Upper Extremity Physical Therapy

Emphasis on mobility/ neuromuscular education- Wrist

Wrist Strengthening Phase 1: Range of motion/isometrics

Wrist motion- up and down  With your forearm palm down and wrist over the edge of a table, bend your wrist forward and back.	Wrist Motion – Side to Side  With your forearm thumb up and wrist over the edge of a table, move your wrist up and down.	Stick twists  Hold stick or cane in both hands, twist upward with affected hand (like a motorcycle throttle)
Putty Squeezes  Gently squeeze putty into a fist.	Wrist Isometrics- flexion  With your hand closed place your involved hand palm down on the table. Press forward letting the table resist your movement.	Wrist Isometrics- extension  With your hand in a close place your uninvolved hand on the back side of your involved hand. Resist backwards movement with the fingers of your other hand.

*Choose 2-3 exercises from the available list. Hold times, sets, and repetitions will vary.

Day, 2019

APTA Hand & Upper Extremity Physical Therapy

Interventions: Emphasis on Mobility

INTERVENTIONS: MANUAL THERAPY JOINT MOBILIZATIONS/MANIPULATIONS



B Clinicians should use local elbow joint manipulation or mobilization techniques to reduce pain and increase PFGS in individuals with LET as a stand-alone or adjunctive treatment in improving short-term outcomes for those who can tolerate the specific technique.

C Clinicians may use manipulation or mobilization techniques directed at the cervical spine, thoracic spine, and/or wrist as an adjunct to local treatment for short-term pain relief in individuals with LET when impairments in those regions are identified.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



Interventions: Emphasis on Mobility

INTERVENTIONS: DRY NEEDLING



B Clinicians should use either tendon or trigger point dry needling for the treatment of pain and functional deficits associated with LET.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



Interventions: Emphasis on Mobility

INTERVENTIONS: MANUAL THERAPY SOFT TISSUE MOBILIZATION



- C** Clinicians may use soft tissue mobilizations, including manual release therapy, to improve pain and function in individuals with chronic LET.
- C** Clinicians may use instrument-assisted soft tissue mobilization combined with exercise to improve pain and function in those with chronic LET.
- D** Based on conflicting evidence, a recommendation cannot be made regarding the use of deep transverse tendon cross-friction massage to alleviate symptoms in individuals with LET. **?**

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



Interventions: Emphasis on Loading



Component 4: Determination of Irritability Stage

Self-reported pain, distribution of symptoms, and level of disability should all be considered in the stage of irritability: Self-reported pain scores (NPRS); mild < 3/10, moderate = 4-6/10, severe = 7+/10. Distribution: Type 1 = unilateral signs/symptoms localized to the lateral elbow, Type 2 = bilateral signs/symptoms localized to the lateral elbow, Type 3 = diffuse elbow signs/symptoms combined with cervical, diffuse upper extremity, or neuropathic pain. Disability: mild = 20/50 or less on PRTEE, moderate = 21-34/50 on PRTEE, severe = 35 and above/50 on PRTEE.

- Symptom Modulation: severe pain, type 3 distribution, and severe disability.
- Mobility = moderate pain, type 3 distribution, and moderate disability
- Loading: mild pain, type 1-2 distribution, and low disability. = **Phase 2 Exercises**
- Return to Function: mild-absent pain, type 1-2 distribution, and mild-absent disability.

Use symptom irritability stage to guide management of symptoms and intervention choices.

*Please note that movement between categories is fluid, and patients may often fit more than one category at a given time.

Lucado, et al, *J Orthop Sports Phys Ther.* 2022;52(12):CPG1-CPG111. doi:10.2519/jospt.2022.0302



WHAT WE NOW RECOMMEND: THE BOTTOM LINE FOR CLINICAL PRACTICE

1. For symptom modulation, physical therapists should use strategies to off-load tissues (grades B, C, E, and F) and to manage impairments through a combination of regional joint mobilizations (grade C) and physical agents, if needed (grades C and E).
2. To address joint and soft tissue mobility, physical therapists should incorporate therapeutic exercise alone or in combination with other interventions such as local (grade B) or regional (grade C) joint mobilization, dry needling (grade B), or soft tissue mobilization (grade C).
3. To restore load capacity once symptoms are less irritable physical therapists should advance progressive resistance exercises (grade B) including the upper extremity kinetic chain (grade C) as symptoms allow, until function is restored.

<https://www.jospt.org/doi/epdf/10.2519/jospt.2023.0501>

Emphasis on loading: Resistive therapeutic exercise with light to moderate loads/ short lever arms

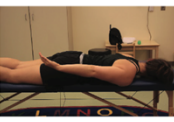
- Exercise to gradually increase loads between ~20-40% MVIC
- Continue to emphasize activity modifications
- May address impairments identified along the kinetic chain



Day, 2019

Emphasis on loading: Resistive with light to moderate loads/ short lever arms- Scapula

Scapular Muscle Strengthening Phase 2: Light/Short Lever Arm

Supine Scapular Punches (with weight)  Lie on your back with the involved arm pointing straight to the ceiling. Without bending the elbow, punch your entire arm up toward the ceiling. Slowly rest the shoulder down.	Wall Push Up  Place your hands flat against the wall. Bend your elbows, then push your body away from the wall as if doing a push up. When your elbows are straight, give an extra push way from the wall while separating your shoulder blades.	Elastic Resistance Punch with Step  Stand holding a band with the involved arm pointing straight ahead. Punch forward, elbow straight, with the involved arm. If instructed, take a step forward with your opposite leg while punching.	Knee Push Up Plus  Begin on your hands and knees. Bend your elbows, then push your body away from the floor as if doing a push up. When your elbows are locked out, give an extra push way from the floor while separating your shoulder blades.
Prone Extension (no weight)  Lie on the edge of your bed with the involved arm hanging off. Bring the arm straight back with the palm facing down. Slowly lower it back to the starting position.	Prone Elevation at 135 (no weight)  Lie on the bed with your hands clasped behind your head. Lift your elbows off of the bed (small movement) as you pull the shoulder blades together and down. Lower back to the starting position	Lawnmower with External Rotation  Reach forward with your involved arm while keeping good posture. Stand with the same side leg slightly behind the other. Pull the involved arm back (like starting a lawnmower) and at the end, rotate your forearm out and back while squeezing your shoulder blades.	Elastic Resistance Rows  Attach a thera-band above doorway. Pull the band back with both arms, keeping the elbows bent. Squeeze the shoulder blades down and together at the end.

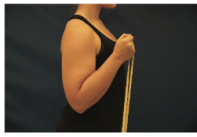
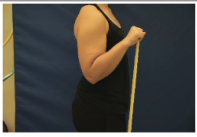
*Choose 1 exercise from each row. The top row are exercises targeting the serratus anterior and the bottom row are exercises targeting the middle/lower trapezius. Hold times, sets, loads and repetitions will vary.

Day, 2019



Emphasis on loading: Resistive with light to moderate loads/ short lever arms- Wrist

Wrist Strengthening Phase 2: light/short lever arm

Twist stick with elbow extended	Resisted biceps curl (palm up)	Resisted biceps curl (thumb up)
 Hold stick or cane in both hands, elbows straight in front of you. Twist upward with affected hand (like a motorcycle throttle). You may add a string with a weight to make it more challenging.	 Stand with band in your hand, <i>palm up</i>. Step on the other end to secure. Pull arm up toward your shoulder and slowly lower.	 Stand with band in your hand, <i>thumb up</i>. Step on the other end to secure. Pull arm up toward your shoulder and slowly lower.
Resisted biceps curl (palm down)	Resisted radial deviation (elbow bent)	Resisted extension (elbow bent)
 Stand with band in your hand, <i>palm down</i>. Step on the other end to secure. Pull arm up toward your shoulder and slowly lower.	 Sit with band in your hand as shown. Step on the other end to secure. Pull thumb/wrist up toward ceiling and slowly lower.	 Sit with band in your hand as shown. Step on the other end to secure. Pull wrist up toward ceiling and slowly lower.

*Choose 2-3 exercises from the available list. Hold times, sets, loads and repetitions will vary.

Day, 2019



Emphasis on Return to Function



Component 4: Determination of Irritability Stage

Self-reported pain, distribution of symptoms, and level of disability should all be considered in the stage of irritability: Self-reported pain scores (NPRS); mild < 3/10, moderate = 4-6/10, severe = 7+/10. Distribution: Type 1 = unilateral signs/symptoms localized to the lateral elbow, Type 2 = bilateral signs/symptoms localized to the lateral elbow, Type 3 = diffuse elbow signs/symptoms combined with cervical, diffuse upper extremity, or neuropathic pain. Disability: mild = 20/50 or less on PRTEE, moderate = 21-34/50 on PRTEE, severe = 35 and above/50 on PRTEE.

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- Return to Function: mild-absent pain, type 1-2 distribution, and mild-absent disability. = **Phase 3 Exercises**

Use symptom irritability stage to guide management of symptoms and intervention choices.

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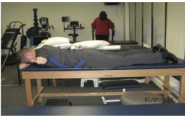
Emphasis on return to function: Resistive with moderate to heavy loads/ long lever arms

- Exercise is with moderate to heavy resistance greater than 40% MVIC
- Consultation with a sports specific trainer who can make appropriate adjustments in equipment and/or correct faulty mechanics is recommended
- Alternatively, further ergonomic assessment and modifications may be appropriate



Day, 2019

Emphasis on return to function: Resistive with moderate to heavy loads/ long lever arms- Scapula

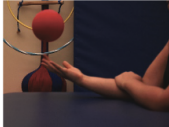
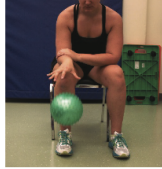
Scapular Muscle Strengthening Phase 3: Heavy/Long Lever Arm			
Adduction with Straight Arm	Horizontal Adduction (Bear Hug)	Upper Cut	Full Push-up Plus
			
Attach a thera-band above the door. Begin by holding the band straight out about shoulder level. Pull the band straight down by your side while keeping the elbow straight while emphasizing scapular stability	In the standing position, grasp two weights with the arms out to the side. Bring the weights together, keeping the elbows bent, as if giving a bear hug. Bring the arms back out to the starting position. (Begin with the thumbs up if the patient is experiencing symptoms.)	Place the band low in the doorway. Begin with your arm straight by your side. Pull the band across your body and up (upper cut). Slowly lower down to your side.	Begin in a plank position as shown. Bend your elbows, then push your body away from the floor as if doing a push up. When your elbows are locked out, give an extra push away from the floor while separating your shoulder blades.
Prone Extension with Weight	Horizontal Adduction (Bear Hug)	Prone Horizontal Abduction	Horizontal Abduction with Elastic Resistance
			
Lie on the edge of your bed with the involved arm hanging off. Bring the arm straight out to the side with the palm facing down. Slowly lower it back to the starting position.	Place the band shoulder level in the doorway. Begin with your arm straight out at about 90°, and pull the band straight back with the involved hand. Slowly bring it back to the starting position.	Lie on the edge of your bed with the involved arm hanging off. Bring the arm up at an angle while positioning the wrist so that the thumb is pointing up. Slowly lower it back to the starting position.	Place the band low in the doorway. Begin with your arm straight by your side. Pull the band straight up to shoulder level. Slowly bring it back to the starting position.

*Choose 1 exercise from each row. The top row are exercises targeting the serratus anterior and the bottom row are exercises targeting the middle/lower trapezius. Hold times, sets, loads and repetitions will vary.

Day, 2019

Emphasis on return to function: Resistive with moderate to heavy loads/ long lever arms- Wrist

Wrist Strengthening Phase 3: Heavy/long lever arm

Plyometric wrist flips	Resisted radial deviation (elbow straight)	Resisted extension (elbow straight)	Plyometric wrist snaps
			
Sit with a ball in your hand, palm up. Using one hand, toss up the ball and catch it. As you get better, you may try doing this with a weighted ball.	Sit with weight in your hand as shown. Pull thumb/wrist up toward ceiling and slowly lower. (thera-band can replace weight)	Sit with weight in your hand as shown. Pull wrist up toward ceiling and slowly lower. (thera-band can replace weight)	Sit with a ball in your hand, palm down. Using one hand, toss the ball upward and catch it. As you get better, you may try doing this with a weighted ball

*Choose 2-3 exercises from the available list. Hold times, sets, loads and repetitions will vary.

Day, 2019

Phase 3: Resistive with moderate to heavy loads/ long lever arms and **return to function/ sport**

- Large muscles of the trunk and lower extremities produce approximately 50% of kinetic energy transferred to the hand in throwing
- Deficits in ankle, hip, and spinal mobility and strength can lead to higher force moments in the upper extremity
- Examine for weakness in the hip abductors and knee extensors that could impair single leg stance (and thus balance)
- Task specific training may be required to transition into full participation

Chu, 2016; Ellenbecker, 2012



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