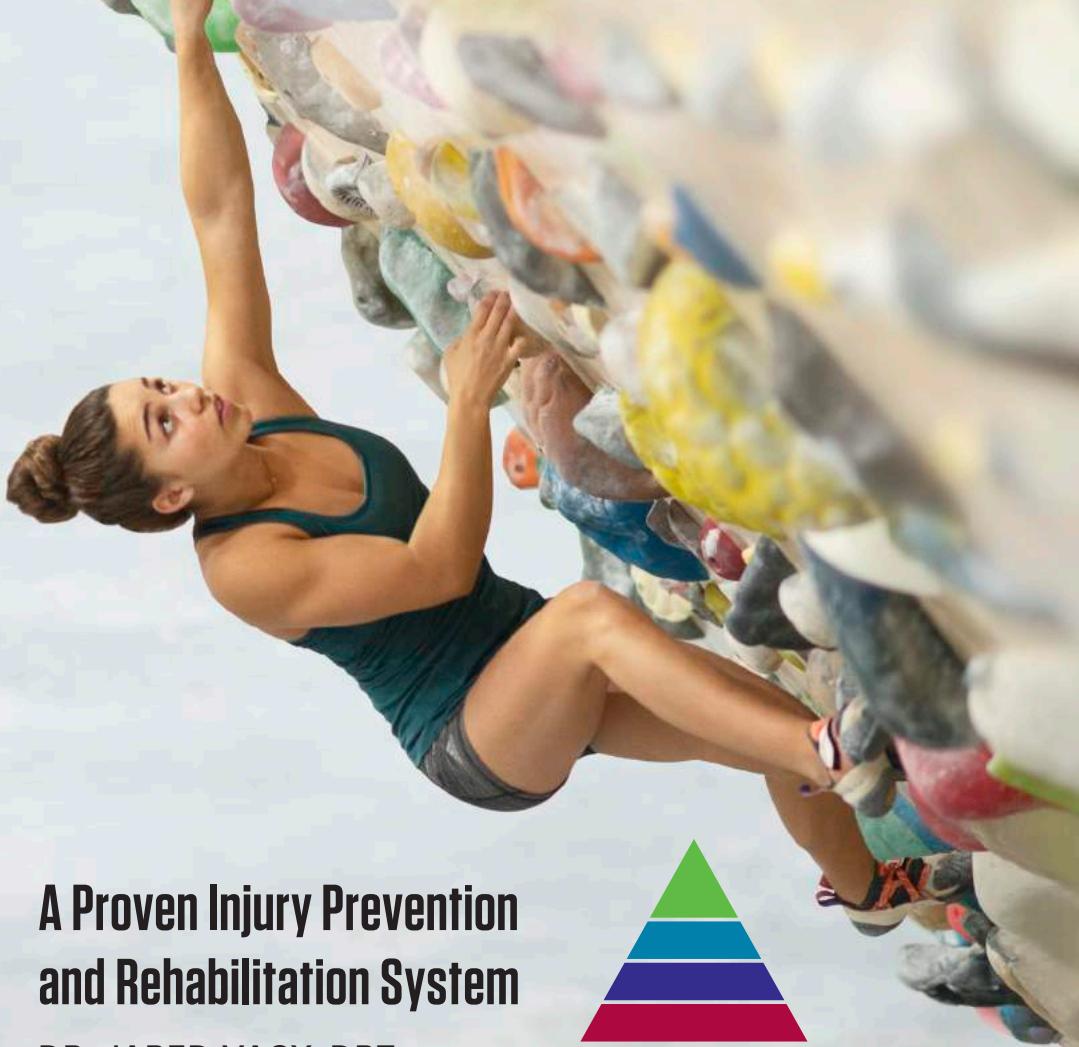
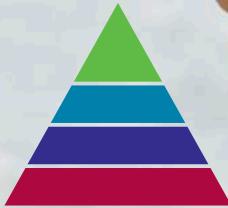


CLIMB INJURY-FREE



A Proven Injury Prevention
and Rehabilitation System

DR. JARED VAGY, DPT



Featuring The Rock Rehab Pyramid

CLIMB INJURY-FREE

**A Proven Injury Prevention
and Rehabilitation System**



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Advisory

Always consult your physician or physical therapist before beginning any exercise program. The information is not intended to diagnose or treat any medical condition. If you experience pain or difficulty with these exercises, stop and consult your healthcare provider. Your use of this book indicates your assumption of the risk of injury and is an acknowledgment of your own sole responsibility for your safety training for climbing. The author assumes no liability for injuries sustained by readers who engage in exercises or recommendations described in the book.

Dedication

Rick Vagy, Sharyl Vagy, Rachelle Vagy, Claire, Sid, Sylvia and Shawn Goodman.

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CHAPTER 1

THE APPROACH

Learn how to use this book to rehabilitate
and prevent climbing injury

THE CLIMBING DOCTOR STORY

Coarse and Buggy loomed overhead. I nervously took one last glance at the aesthetic line. I had been climbing for only a few years, but my raw excitement drove me to long hours of training and I thought I was ready for this classic J-Tree test-piece.

I tightened my harness, chalked up, and delicately stemmed across the open-book dihedral, which was split by a razor-thin crack. Gripping each hold like my life depended on it, I slowly made my way up the dihedral. At the top of the climb, I reached an awkward exit move where I had to pull myself around a small roof. I looked down to a micronut 10 feet below me. As my legs started to shake, I wondered if the psychological pro would hold a fall. I took a deep breath and cranked hard. Pop! In a single motion, I tore a pulley ligament in my finger and injured the rotator cuff muscles in my shoulder. Somehow, I stuck the move and made it to the anchor, but my injuries sidelined me from climbing for many months.

During this time, I was completing my Doctorate Degree in Physical Therapy. Since I couldn't climb for a while, and out of my own curiosity, I sat down and mapped out all the different movement patterns of climbing. From this, I developed new techniques and climbing-specific exercises, supported by the latest research, to prevent common overuse injuries.

If I had known then what I know now, I likely could have prevented my finger and shoulder injuries from occurring. So, I made it a goal to share my knowledge with other climbers. I created The Rock Rehab Pyramid—a science-based system that all climbers could learn, understand, and use on their own to prevent injuries and rehabilitate.

Summit of La Esfinge in Peru: 5.10d R at 17,470 feet



HOW TO USE THE BOOK

This book is for climbers of all ability levels and will teach you how to climb injury-free. You will learn through a series of chapters how to prevent injuries from occurring and how to rehabilitate the 10 common climbing injuries. Step-by-step instructions will take you through the process. The material in this book was developed from the combination of thousands of hours of clinical expertise treating climbing injuries and over 17 years of climbing experience as a rock climber of all disciplines (trad, sport, boulder, aid and big wall). It utilizes the latest research developments in rehabilitation and movement science. The book is divided into 8 chapters.

Chapter 1: The Approach

Provides you with the framework necessary to implement the prevention and rehabilitation exercises in the book.

Chapter 2: Prevent Injury

Teaches you the fundamentals to ensure you continue to climb without injury. Six guidelines are introduced to give a greater perspective on how to prevent injury. Injury-prevention warm-ups are thoroughly explained with concepts of dynamic stretching and muscle activation. A daily prevention program is introduced that targets both flexibility and antagonist strengthening to give you a foundation for climbing injury-free. Functional exercises that look and feel like climbing are introduced. Movement education is described to ensure proper climbing technique. Lastly, mind and body discussions are introduced to increase the awareness of diet, sleep and training capacity.

Chapter 3: The Rock Rehab Pyramid

Introduces a framework to self-manage climbing injuries. The pyramid is described and then applied to the 10 most common climbing injuries. Concepts of tissue unload, mobility, strength and movement re-education are all discussed in detail, teaching you how to rehabilitate your own injuries.

Chapter 4: Neck and Shoulder Rehabilitation

Outlines in detail the most effective way to rehabilitate neck strain, rotator cuff strain and shoulder impingement.

Chapter 5: Elbow Rehabilitation

Outlines in detail the most effective way to rehabilitate biceps tendinopathy, triceps tendinopathy, lateral epicondylitis and medial epicondylitis.

Chapter 6: Wrist and Finger Rehabilitation

Outlines in detail the most effective way to rehabilitate carpal tunnel syndrome, finger pulley sprain and finger collateral ligament sprain.

Chapter 7: Nerve Mobility

Outlines the concept of neurodynamics and how to use mobilization exercises to treat nerve pain.

Chapter 8: The Descent

Provides an appendix of rehabilitation pyramids, references, climber biographies and author biographies.

Beyond the Scope of the Book

Always consult your physician or physical therapist before beginning any exercise program. That said, it is equally important to seek medical advice from a person who is both a medical professional and a climber. A medical professional who is a climber will understand climbing movement, the unique physical demands and injuries of the sport, and your eagerness to get back on the rock.

What type of medical professional should you choose? Injury diagnosis and rehabilitation is a multidisciplinary approach that may include a physician, surgeon, physical therapist, athletic trainer, chiropractor, acupuncturist, mental health professional, dietitian or any other wellness/medical professional. From whom you seek advice depends on your injury.

For example, if you have a severe pulley tear and the tendon is bowstringing away from your bone, you should see an orthopedic hand surgeon. If you have a movement dysfunction, you should see a doctor of physical therapy.

Doctors of physical therapy are the medical professionals who have the greatest background in movement science. The educational process consists of seven years of university-level academics. Some advance their degrees (like myself) with an additional two years of residency and fellowship training to further specialize their skills. Whichever medical professional you choose to see, it may be helpful to bring with you a copy of this book as a starting point to discuss your injury.

REHABILITATE CLIMBING INJURIES

This book will walk you through rehabilitation for the 10 most common climbing injuries, including: belayer's neck, rotator cuff strain, shoulder impingement, biceps tendinopathy, triceps tendinopathy, lateral epicondylitis, medial epicondylitis, carpal tunnel syndrome, pulley sprain and collateral ligament sprain.

Each chapter first introduces the description, signs and symptoms, and cause of an injury, followed by a color-coded progression through the rehabilitation pyramid.

Techniques described in red are for UNLOAD

Techniques described in purple are for MOBILITY

Techniques described in blue are for STRENGTH

Techniques described in green are for MOVEMENT

Each technique is thoroughly described with instructions of what the exercise does and the frequency at which to perform it.

Individualized treatment plans are outside the scope of this book because of the high variability of personal injury. However, general guidelines are given that are based on tissue adaptation stages and principals.

You can perform tissue unload for as long as it takes for your pain at rest to subside; mobility exercises up to three times per day; and strength exercises daily. Movement advice should be used every time you climb.

Pro Advice

This book contains not only my opinions on rehabilitation, but also the consensus of the climbing community. With this in mind, I thought it was important to include the viewpoints of climbers who are performing at the highest level. I interviewed several of the top climbers in the world, many of whom are my clients, to explore their thoughts and opinions on how to rehabilitate injuries. Interspersed throughout this book are over 30 full-page photo spreads that include the thoughts and experiences of these pros on preventing injuries and rehabilitation.

EQUIPMENT RECOMMENDATIONS AND DIRTBAG TIPS

Equipment Recommendations

There are several rehabilitation tools that are utilized in this book to perform targeted exercises. Having the proper tool can make a big difference in your rehabilitation results. Much like having the correct piece of gear to put in a crack when you are 30 feet run-out from your last piece.

Of all the tools listed, a lacrosse ball and a set of resistance bands would be the highest on the recommendation list to purchase. They are cheap, versatile and portable.

Dirtbag Tips

DIRTBAG TIPS

Look out for “Dirtbag Tips” that are scattered throughout the book.

These blue boxes will give you cheap and easy ways to convert your climbing gear or household items into rehab tools without the need for any specialized equipment.

If you can't afford rehabilitation tools, you are in luck. I understand the financial plight of a dirtbag climber. A few years after I began practicing as a doctor of physical therapy, I quit my job to pursue climbing full time.

My dirtbag dreams, however, came to an end six months later. My professional path led me astray from the rootless lifestyle and into higher-level education. The fondness I retain for those months spent pursuing nothing other than climbing remains undiminished.

As such, I created this book with regard for the dirtbag. Almost all rehabilitation tools described in this book can be substituted with household items or retired climbing gear. Below is an example of a “Dirtbag Tip.”

DIRTBAG TIPS EXAMPLE

Instead of using a foam roll, you can use a coiled climbing rope or two large bath towels rolled up and placed at the center of your spine.

See pages 16 and 17 for additional suggestions of rehab tool substitutions that are used throughout the book.

REHAB TOOL



TheraBand

DIRTBAG SUBSTITUTION



Climbing Webbing



FlexBar



Rolled Towel



Foam Roll



Rope or Rolled Bath Towel



Baoding Balls



Two Rocks

REHAB TOOL



Arm Aid

DIRTBAG SUBSTITUTION



Lacrosse Ball or Smooth Rock



Big Wall Hammer



Wine Bottle or Frying Pan



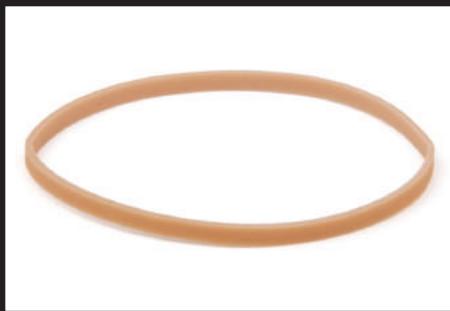
Slider



Paper Plate or Sock



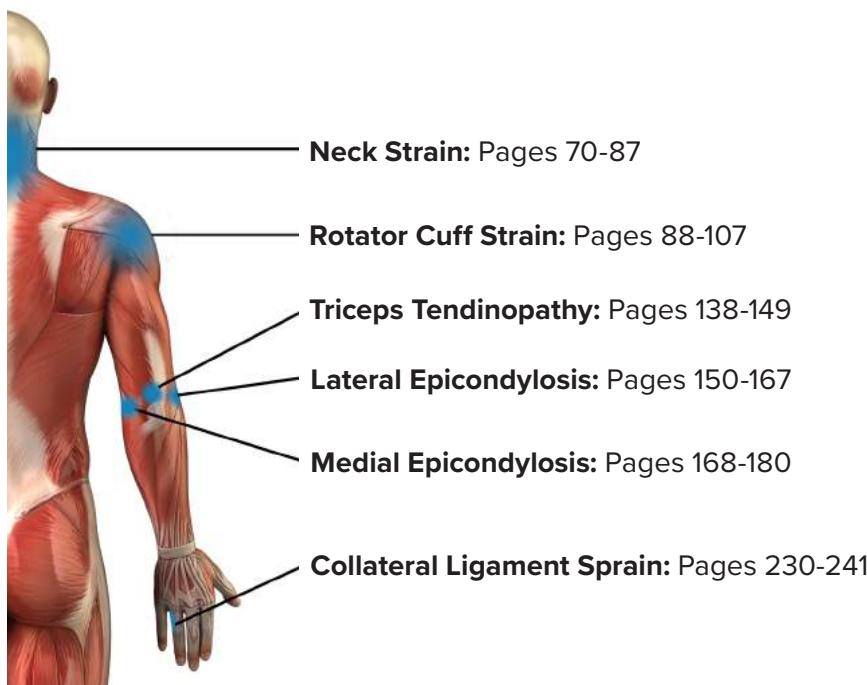
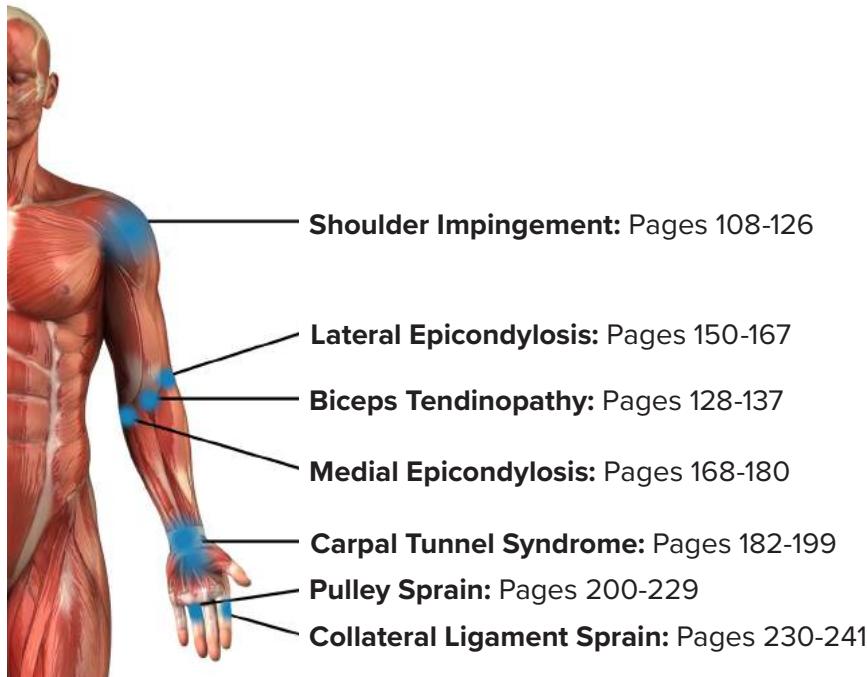
Hand Xtrainer



Rubber-Band

DIAGNOSE YOUR INJURY

Use the diagrams below to identify the region and associated medical terminology of your injury.



THE ROCK REHAB PYRAMID

How to Use the Pyramid

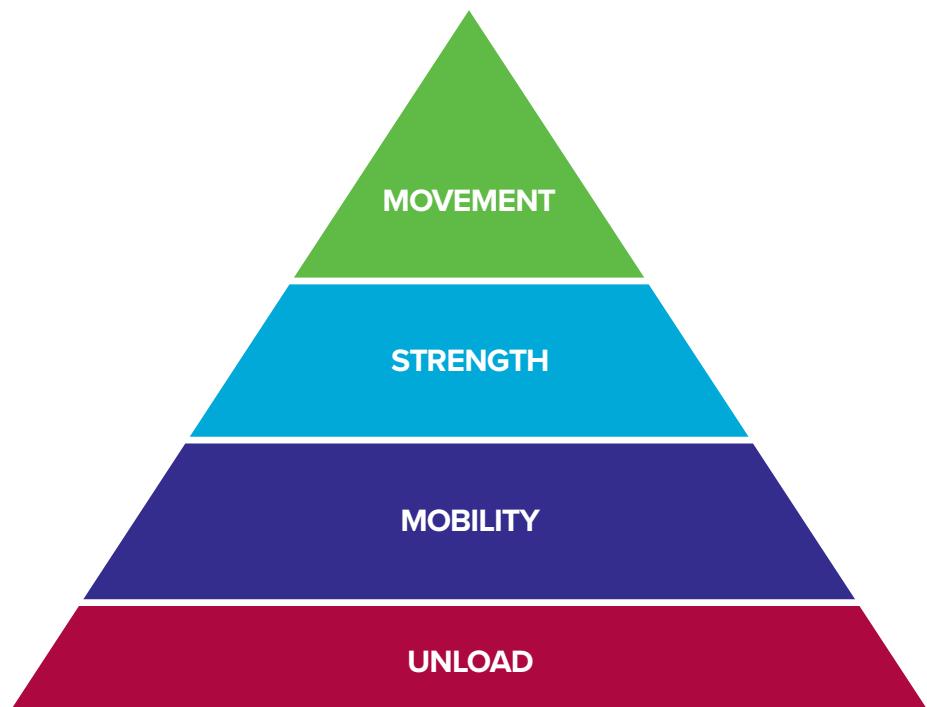
The Rock Rehab Pyramid is a step-by-step rehabilitation and injury prevention program designed specifically for rock climbers. It is comprised of four phases.

- 1. Unload**
- 2. Mobility**
- 3. Strength**
- 4. Movement**

Most climbers begin the rehabilitation process at the bottom of the pyramid in the unload phase where there is pain inflammation and tissue-overload. Through the rehabilitation process, you will progressively advance up the pyramid. The goal is to gain full mobility, strength and eventually pain-free climbing movement. At this point, you will achieve full recovery.

Perform Under the Guidance of a Medical Professional

The rehabilitation guidelines in this book are not a substitute for assessment and treatment by your medical professional. Perform at your own risk.



ROCK REHAB PYRAMID BREAKDOWN

Contents of the Pyramid

Phase 1 - Unload: Uses splinting, traction and taping techniques to unload the tissues. You can perform tissue unload for as long as it takes for your pain at rest to subside.

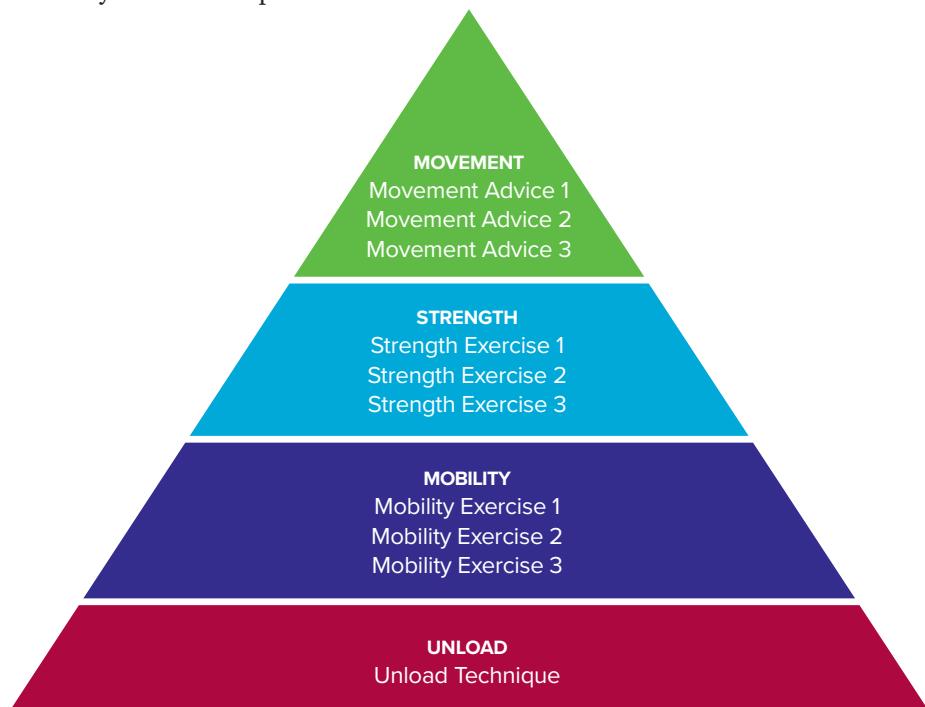
Phase 2 - Mobility: Uses three progressive stretching exercises to improve range of motion. Each exercise can be performed up to three times per day.

Phase 3 - Strength: Uses three progressive resistive exercises to increase strength. Each exercise can be performed daily.

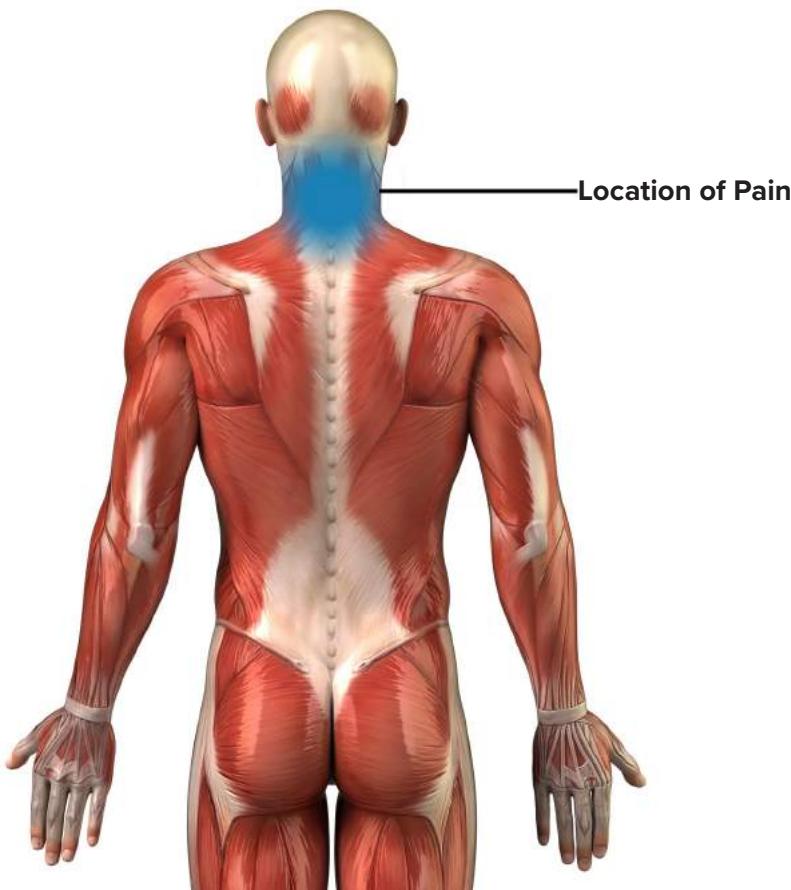
Phase 4 - Movement: Comprised of three movement advice tips and should be implemented during each session of climbing.

When to Progress to the Next Phase of the Pyramid

Once you are able to perform the prescribed exercises in a given phase of the pyramid without pain then you can progress to the next phase. Do not perform exercises if they are painful. There is no exact formula for how long it takes a climber to progress back to climbing and movement training. The recovery process is highly variable based on your injury and individual factors. If you have any questions regarding your progression using the pyramid, consult your medical professional.



NECK STRAIN



Signs and Symptoms

- Pain, tenderness, muscle spasm or stiffness in the back of the neck
- Discomfort looking upward or turning your head to the side

Cause

The neck is made up of flexor muscles in the front and extensor muscles in the back. When you look up at your partner while belaying or climbing, your neck extensors are constantly overworking. Over time, these muscles get strong and stiff while the neck flexors become weak, creating an imbalance. This imbalance can also lead to compression of the joints in your neck. You should be aware of the suboptimal movements that can increase the stress on the neck and eventually lead to pain and injury. These movements are likely to occur from poor belaying postures such as a backward-tilted neck, slumped spine and forward shoulders.

Unload: Towel Traction

Instructions

Lie on your back with the edge of the towel hooked under the base of your skull. Scoot away from the door until you feel a gentle traction or lifting throughout your neck. Tuck your chin slightly toward the spine. The base of your skull should rest two fingers from the ground.

What It Does

Unloads and decompresses the joints in your neck by providing a gentle stretch and traction.

Frequency

5-10 minutes up to 3 times per day.

Advisory

Perform at your own risk. Set a timer for no longer than 10 minutes and make sure you do not fall asleep in this position. Maintaining this position for long durations can actually increase the strain on the neck. Make sure the knots are secure and the door is closed and locked. Perform with your head below a padded surface such as a carpet in case your head falls out of the towel.



How to Make a Towel Traction

What You Need

A bath towel, a piece of 5/8-inch tubular webbing or a cordelette and a door with a doorknob.

Construction

- A** Begin with a bath towel.
- B** Fold the width in half so that it is the width of your head.
- C** Fold the length in half so your head can fit inside.
- D** Secure the two ends with a cordelette to a door.

Tips

Make sure the towel fits over your head. Test the traction device by pulling vigorously on the towel to ensure the knot will not slip. Tie the opposite end of the cordelette to the doorknob with two overhand knots making sure the towel is hanging two fingers distance from the ground. Slowly lower your head into the towel. Make sure that the door is closed and locked.



Mobility 3 Variation 2: SNAGS

Instructions

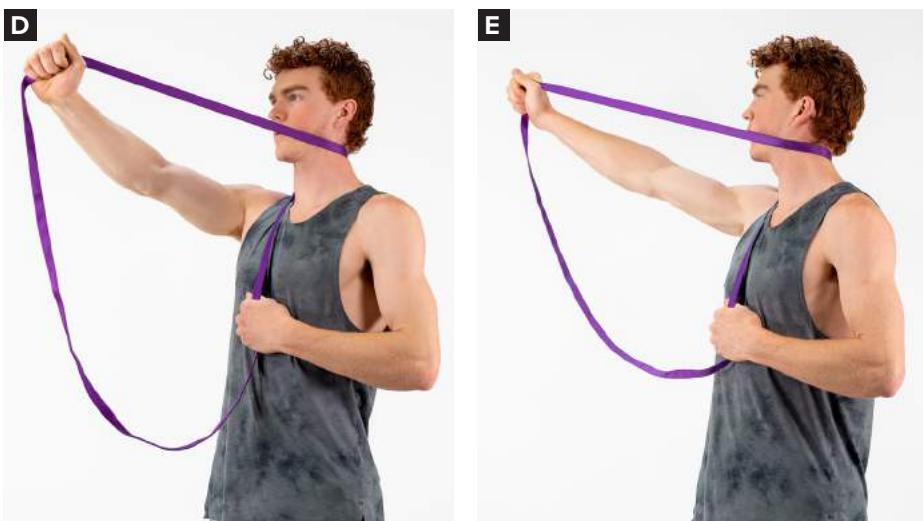
- A, B, C** Take a piece of cordelette or webbing and place it on the back of your neck at the level of the spinal segment you would like to treat.
- D** Grasp one end of the webbing at the level of your eye and the grasp the other end at the level of your chest or stomach.
- E** Rotate your neck as you pull the webbing in the direction that you are turning your neck. Maintain pressure into the webbing as you return to the starting position. Perform on both sides.

What It Does

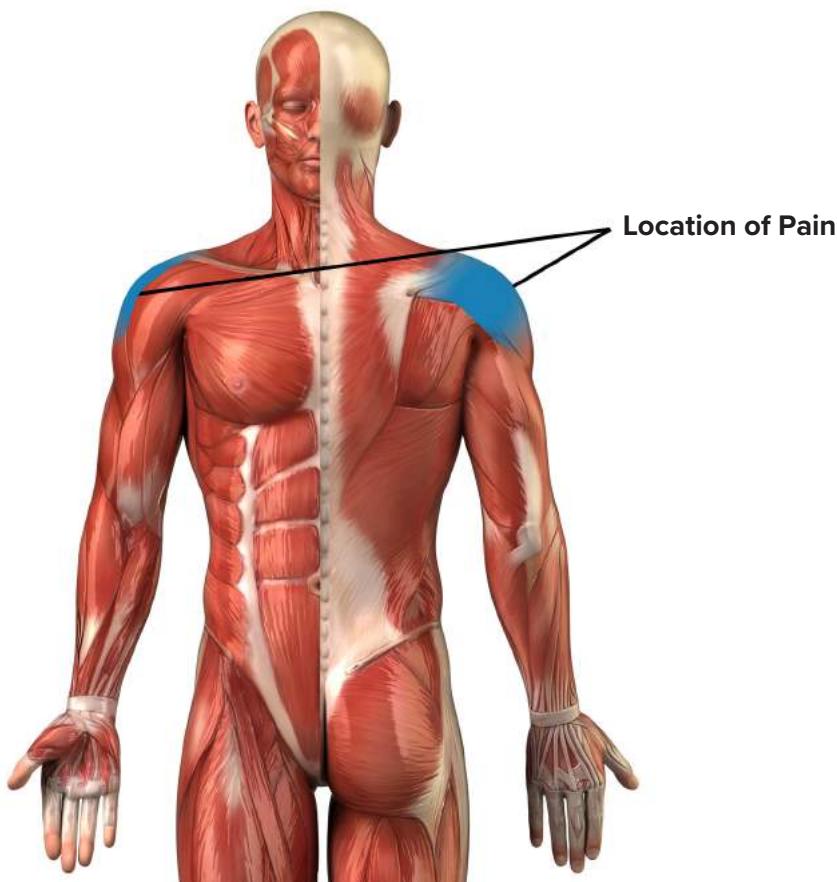
This exercise should be pain-free. The webbing assists in mobilizing stiff joints in the neck by adding overpressure with movement.

Frequency

3 sets of 6 repetitions up to 3 times per day.



ROTATOR CUFF STRAIN



Signs and Symptoms

- Dull ache radiating into the back or side of the shoulder.
- Discomfort lifting objects, especially out to the side.

Cause

The shoulder is made up of four rotator cuff muscles. These muscles connect the shoulder blade to the arm bone. The rotator cuff muscles act together as a unit to control shoulder motion. The rotator cuff is weaker than the large muscles that attach the shoulder blade bone to the spine. When you climb with poor posture and pull excessively with your arms instead of climbing with your shoulder blades engaged, you increase the strain on the rotator cuff muscles in your shoulder.

Mobility 1: Tissue Release of the Rotator Cuff

Instructions

Place a firm ball against the wall or floor; a lacrosse ball works best. Lift your arm up and across your body to expose the rotator cuff muscles. Press your weight into the ball and move your body in a circular pattern. You should feel a point of maximal discomfort, this is most likely the stiffest region of the rotator cuff muscles and will need the most attention.

What It Does

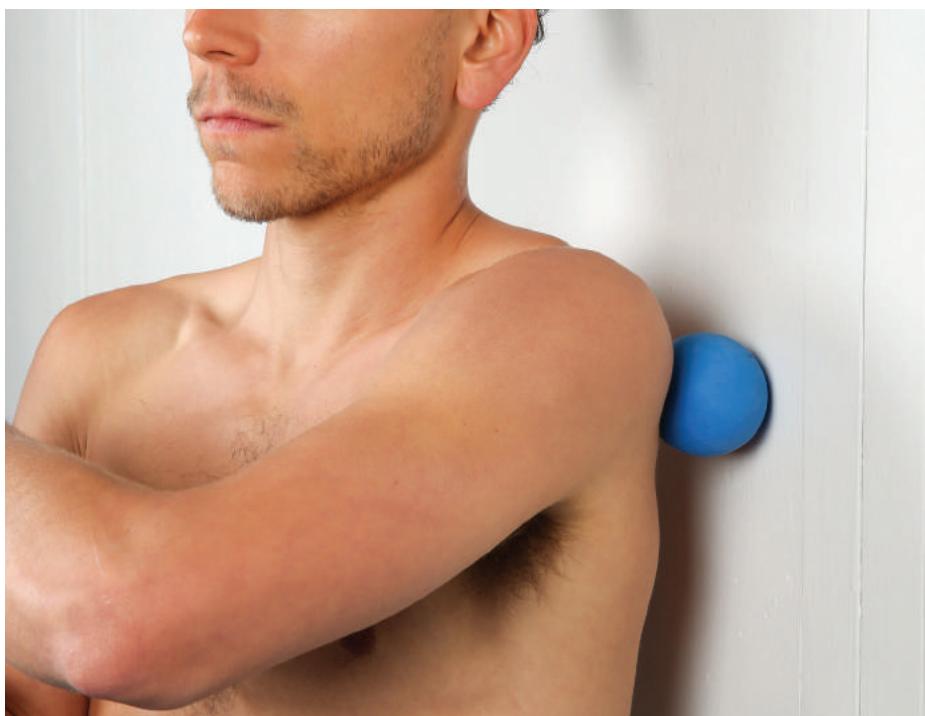
When the rotator cuff overworks it becomes stiff and contracted. This can lead to taut muscle tissue which can restrict range of motion and lead to pain. The tissue needs to be massaged and released for the muscle to work optimally.

Frequency

8-10 minutes up to 3 times per day.

DIRTBAG TIPS

Anytime a ball is used for soft tissue release in this book, you can substitute it with using your fingers to self-massage. Tools such as a retired carabiner, soup can or even just a rounded rock are also good alternatives.



Mobility 2: Rotator Cuff Stretch

Instructions

Engage your shoulder blade back toward the mid-line of your spine. Use your opposite hand to press and fulcrum your arm toward your chest. A stretch should be felt on the outside of your shoulder. Make sure to keep your shoulder blade down and back when you are stretching the arm.

What It Does

Stretches the stiff rotator cuff muscles.

Frequency

3 sets of 30-second holds up to 3 times per day.



Mobility 2 Variation: Sleeper Stretch

Instructions

- A Lie on the side that you would like to stretch and cushion your head with a pillow or towel. Bend your hips and knees to provide a stable base. Flex your elbow and position it at the level of your shoulder. Grasp your wrist with your opposite hand.

- B Gently press your forearm downward.

What It Does

Stretches the rotator cuff muscles and shoulder joint capsule.

Frequency

3 sets of 30-second holds up to 3 times per day.

Tips

Perform this exercise gently so that it is comfortable. Don't overstretch. It should not cause pain. If your arm can go much further, then just perform this stretch enough so that both shoulders have equal flexibility.

A



B





Pro Advice

SASHA DIGULIAN

First North American Woman to Climb 5.14D, Indoor Climbing Overall World Champion

It is important to have flexible chest and lat muscles for climbing. If these muscles are too tight, it will be more challenging to reach holds and it will be harder to keep your body close to the rock wall on reachy moves.

Tight chest muscles can also cause a “climber hunch.” So remember to keep good posture when you sit, stand and climb. Stretch your chest muscles regularly in a door-frame or on a foam roll.

Sasha DiGiulian climbing at the Dardago sport crag in northern Italy. Photo Credit: Jensen Walker

Strength 2 Progression 2: Dual Vector Rotation

Instructions

- A Tie a loop at each end of a full-length resistance band. Place your arm through one loop, and position it just above your elbow. Wrap the free end around a pole or similar object to anchor the middle of the band, then grasp the other loop with your hand. Position yourself so that the anchor point is behind you. Bring your elbow to shoulder level, out to the side, and bent to 90 degrees.
- B Pull the band forward until your palm faces the floor. Return to the starting position, and repeat.
- C Next, turn around to face the anchor point with your palm facing the floor.
- D Pull against the band to raise your arm until your palm faces the wall in front of you, then slowly lower your arm to the starting position. Repeat.

What It Does

The resistance of the band acting on the shoulder teaches it to remain engaged and stable while the humerus (upper arm) rotates.

Frequency

3 sets of 10 repetitions (each movement) once per day. Complete all reps of internal rotation (A-B) before moving on to external rotation (C-D).



Strength 3: Air Clock

Instructions

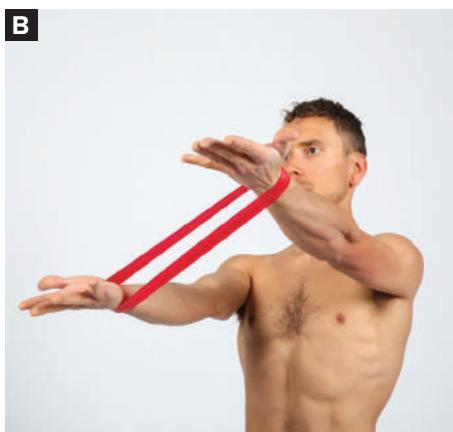
- A** Wrap a single resistance band around your wrists. Imagine there is a clock in front of you with 12 o'clock at the top and 6 o'clock at the bottom. Press your wrists outward into the band, keep your elbows straight and reach out toward various positions on the clock.
- B** Example of the left arm reaching to eleven o'clock.
- C** Example of the left arm reaching to seven o'clock.

What It Does

Strengthens the rotator cuff muscles by reaching the arms in different directions. This mirrors similar shoulder movements that are performed when rock climbing. Challenge yourself by performing air clocks on the rock wall.

Frequency

3 sets of 30-second holds once per day.



Strength 3 Variation: Wall Taps

Instructions

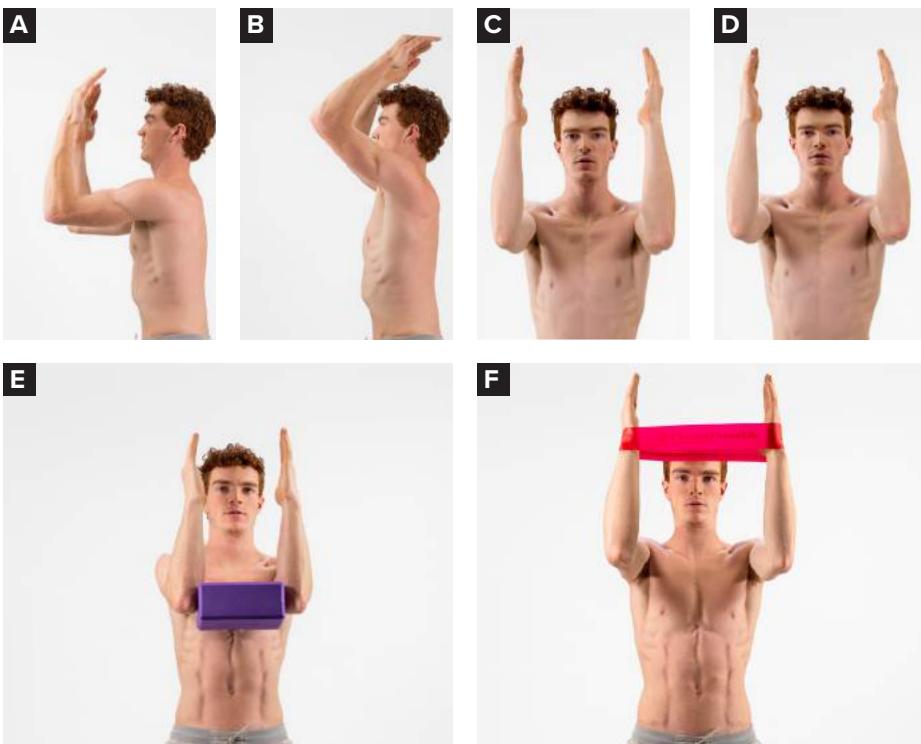
- A, C** Stand against a wall with your feet 6 inches away and with your knees slightly bent. Raise your arms so that your elbows are at the level of your shoulder. Bend your elbows and press your wrists outward so that your forearms are parallel to each other.
- B, D** From here, reach your arms as high as possible to touch the wall behind you while focusing on keeping the forearms parallel to each other. Your elbows will want to bow outward and your wrists inward, so you will need to control the motion to prevent this compensation.
- E, F** Vary the challenge by placing a yoga block on the inside of your elbows or by placing a resistance band around your wrists and pressing outward on the band.

What It Does

Strengthens the rotator cuff external rotators in a position that challenges latissimus dorsi muscle length.

Frequency

3 sets of 10 repetitions once per day.



Movement Re-education

Suboptimal Movements	Optimal Movements
Hanging on arms in rest stances	Engage shoulder blades
Climbing with poor posture	Maintain upright posture
Strenuous overhead reaching	Step feet higher

Movement Advice

Climbing with a hunched shoulders, strenuous overhead reaching, and poor posture during rest stances can all increase your likelihood of a rotator cuff strain. Posture is especially important during rest stances. It feels more relaxing to shake out with slumped shoulders, however, this posture increases the passive strain on your connective tissue and can lead to injury. To avoid this injury, engage your shoulder blades and straighten your spine when climbing and resting. Strenuous overhead reaching is more common with shorter climbers, but can be avoided by using intermediate foot holds and working the feet higher.





Pro Advice

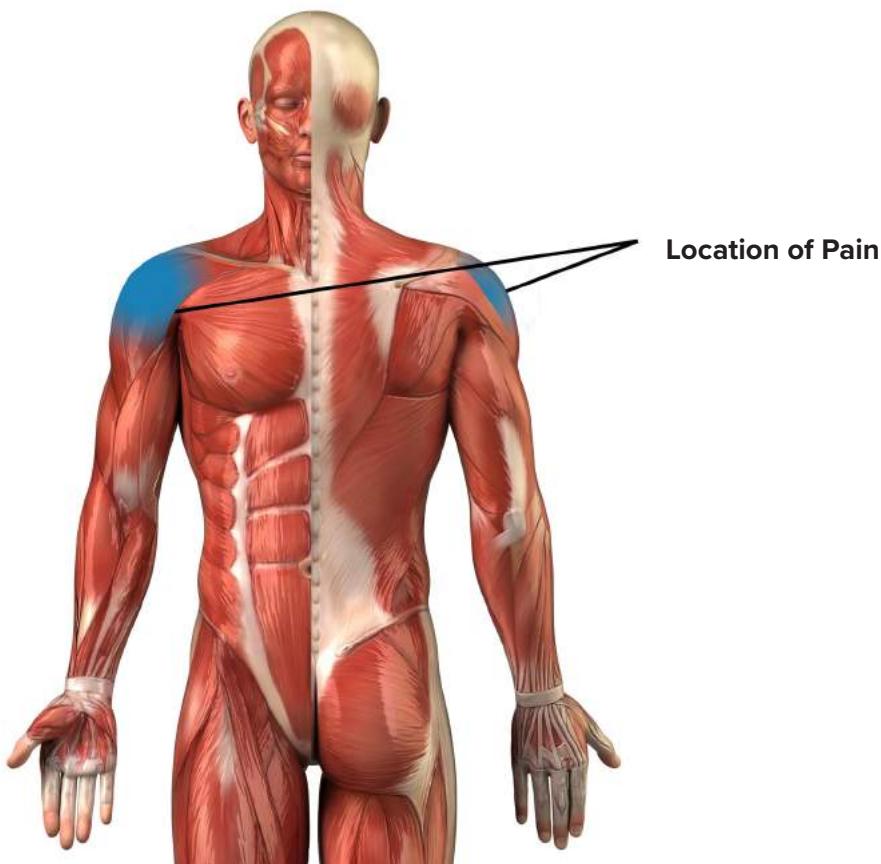
MAYAN SMITH-GOBAT

Holds the Women's Speed Record on the Nose

Acquiring patience after my shoulder injury was the hardest lesson I have learned. After my surgery I had to be smarter about doing things right so that I would avoid re-injury in the future. I continue to remind myself of the importance of stretching, training oppositional muscle groups and paying careful attention to movement. I stretch with my foam roller. I strengthen with TheraBands and gymnastics rings. I know when to stop training and climbing when my form gets sloppy. I remember to take days off and focus on quality over quantity. I look at the big picture instead of being caught in the moment. Over time and disciplined physical therapy, I have returned back to the sport I love stronger than ever.

Mayan Smith-Gobat on Zappa, 5.13+ Escalante Canyon, Colorado. Photo Credit: Daniel Holz

SHOULDER IMPINGEMENT



Signs and Symptoms

- Dull ache in the front or side of the shoulder.
- Painful to lie on the shoulder.
- Discomfort lifting the arm, reaching across body and behind the back.

Cause

The primary rotator cuff tendon in the shoulder, which attaches the upper arm bone to the shoulder blade, slides through a narrow passageway called the subacromial space. Repetitively moving the shoulder into stressful or suboptimal positions can cause this space to shrink and increase pressure on the tendon, which can generate pain. These aggravating movement patterns include climbing with the elbow in a chicken-wing position, mantling over the lip of a boulder or ledge, and jamming cracks with the thumb down. This injury is most commonly called shoulder impingement, but also goes by subacromial pain syndrome.

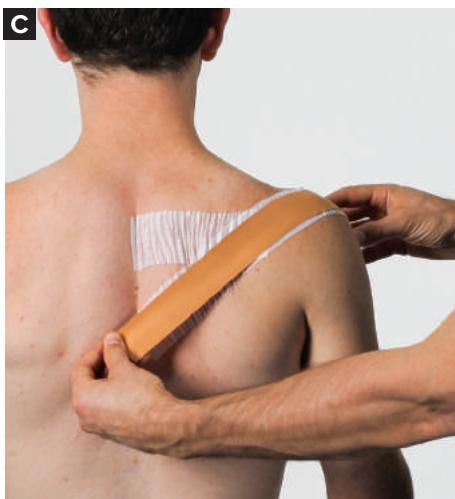
Unload: Shoulder Blade Joint Reposition

Instructions

- A Apply cover-roll to the front of the shoulder and wrap it down and around at a 45-degree angle until it reaches the center of the spine.
- B Apply a second piece from the midpoint of the tape on the back of the spine toward the middle of the spine.



- C The climber squeezes their shoulder blades together. Secure a strip of leukotape to the front of the shoulder along the cover-roll. Pull the tape taut and secure to the middle of the spine.
- D Secure a strip of leukotape to the horizontal piece of cover-roll. Pull the tape taut and secure to the middle of the spine. Adjust the tension of the tape as necessary.



What It Does

The tape acts just as your muscle would to support the shoulder blade.

Securing the shoulder blade in an optimal position allows for quicker healing, less pain and more effective activation of the rotator cuff muscles. The tension of the tape can be adjusted to provide more or less support.

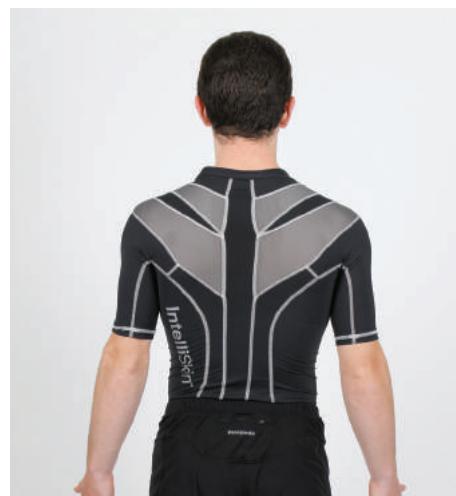
Frequency

Tape as needed. The tape is very rigid and may limit range of motion while climbing. It is for this reason that it is recommended to wear during the day to unload the shoulder and not during climbing.



Wear a Posture Shirt

A great alternative to taping is wearing a posture shirt. These shirts are constructed in a way that supports the shoulder blades similar to the tape. The shirts are lightweight, breathable and easy to wear while climbing and belaying. They come in several different styles of support. My favorite brand is Intelliskin®. They do an excellent job with their products.



Mobility 3: Pectoralis Stretch on Stomach

Instructions

- A Begin on your stomach with your legs straight, one elbow bent with the hand on the ground at chest height and the other arm reached out to the side with the palm down at level of your shoulder.
- B Press into the ground with your bent arm to gently roll your body toward your outstretched arm so that you feel a stretch in the front of your chest.
- C Begin in the same starting position and raise your arm above the level of your shoulder so that your hand is at the level of your head.
- D Rotate your body toward your outstretched arm so that you feel a stretch in the front of your chest.

What It Does

Increases the length of the pectoralis major and minor muscles in two positions.

Added Tip

Care must be taken during this exercise not to overstretch the anterior capsule in the shoulder joint. Since this exercise can be aggressive and uses bodyweight to generate a stretch, it is advised to perform the exercise with care and make sure the stretch is felt in the chest and not the shoulder. A pillow can also be used for increased comfort.

Frequency

3 sets of 30 seconds up to 3 times per day.



Strength 2: Bent Over Letter T, Y and L

Instructions

Start position: Wrap a full-length resistance band around your torso (see page 122 for details how to wrap). Bend your knees and hips and lean your trunk forward to approximately 45 degrees. The closer to the floor that you can angle your trunk, the more challenging the exercise will be.

What It Does

Activates the middle trapezius (T), lower trapezius (Y) and the rotator cuff (L) muscles that provide support and protect your shoulder while climbing. The bent knee and forward trunk for position simulates more closely the body during overhang climbing.

Frequency

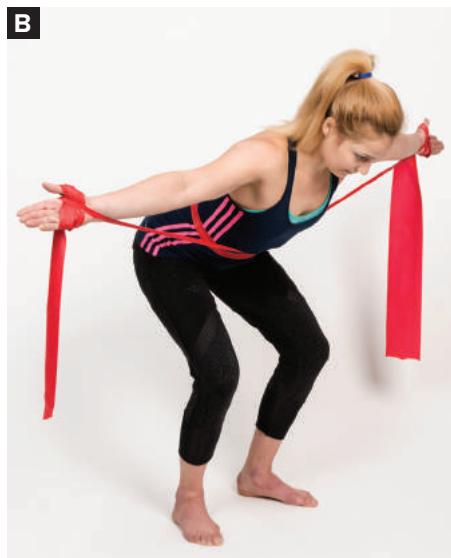
3 sets of 8 repetitions once per day.

DIRTBAG TIPS

Use a soup can, water bottle or free weights to perform the same exercise if you do not have access to a TheraBand.

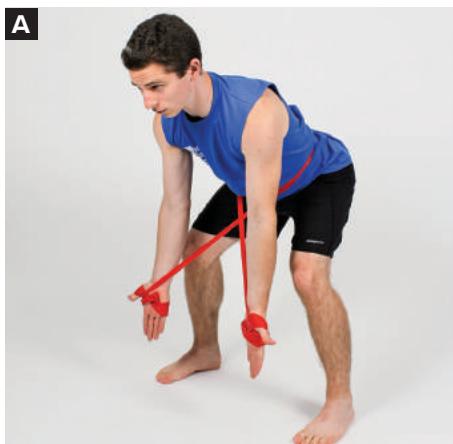
Bent Over Letter T

- A Start with the arms straight down by your side and palms rotated forward.
- B Engage your shoulder blade muscles and bring your arms into the air to form the letter T. Make sure that the thumbs stay pointed into the air.



Bent Over Letter Y

- A Start with the arms down by your side and palms rotated forward.
- B Reach overhead with your thumbs up and our arms straight to form the letter Y. Engage your shoulder muscles throughout the motion.



Bent Over Letter L

- A Start with your elbows bent at 90 degrees and raised to shoulder height. Rotate your palms down so that they are facing the ground.
- B Rotate your hands and shoulder backward forming the letter L with each arm. Make sure the shoulder rotates on a perfect axis and the elbow does not deviate up or down during the exercise. Engage your shoulder blade muscles throughout the motion.



HAZEL FINDLAY

First British Woman to Climb a Trad Route at E9

I was climbing a route where I had limited footholds with several powerful and reachy moves. I am small in stature and very flexible but repeatedly doing the big moves was stressful on my body. Over the course of a few days of trying the route, I injured my shoulder.

I have always been very flexible. I believe one of the big reasons that my shoulder was susceptible to injury was that I had a lot of mobility but not necessarily the strength or stability at the extreme ranges of motion. Perhaps I may not have had my shoulder injury if I had known how to strengthen the correct muscles.

After the injury, I had several months of physical therapy. It was in therapy that I learned how to activate all of the smaller supporting muscles in the shoulder to balance the body. I learned that I had a weak lower trapezius muscle. I performed several exercises to strengthen it. I also learned several specific rotator cuff exercises with a TheraBand. These exercises have been effective in improving my shoulder health. The only reason I was able to climb for years after my injury was that I was constantly performing physical therapy exercises to strengthening everything around the injury.

Hazel Findlay flashes Masada, 29 (5.13a). Arapiles, Australia. Photo Credit: Adam Demmert



Movement Re-education

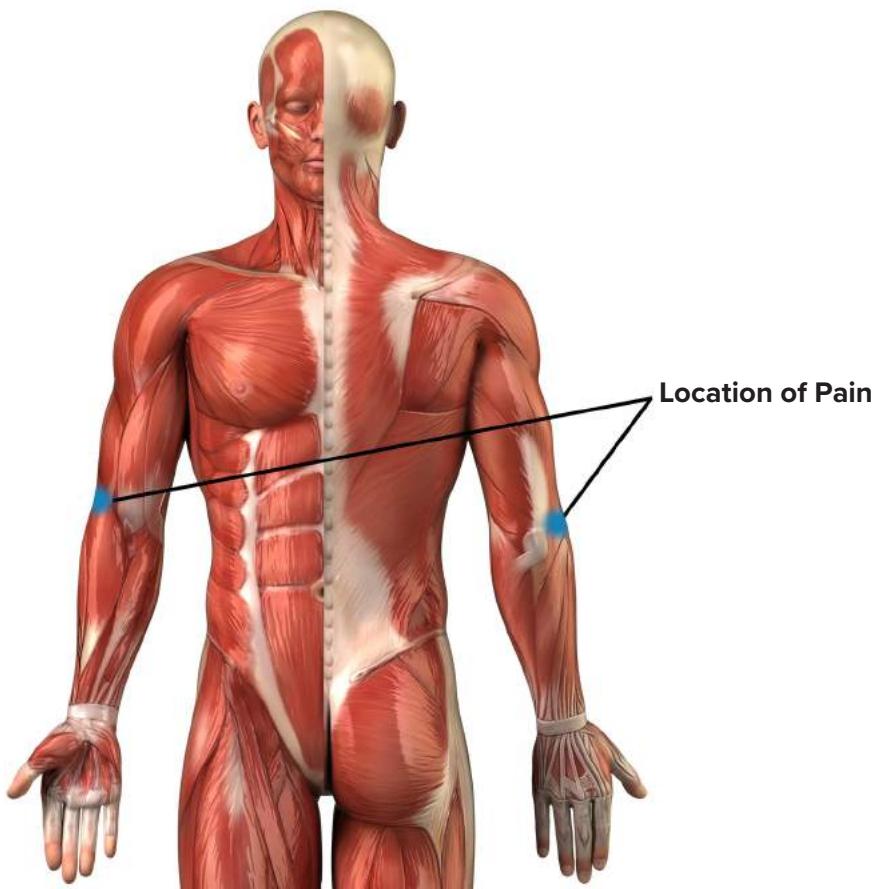
Suboptimal Movements	Optimal Movements
Chicken wing	Angle elbow with hand
Mantling over a lip of a boulder	Utilize a pivot foot
Jam cracks thumb down	Jam cracks thumb up

Movement Advice

Climbing with the elbows above the shoulders in a chicken-wing position can lead to shoulder impingement. The alignment of the elbow depends on the angle of the wall. On an overhanging wall or roof, the most efficient position for the wrist and forearm is nearly perpendicular to the wall. On a vertical wall, the most efficient position is the elbow in line with the hand. This allows gravity to work with you, not against you. When performing a top-out on a boulder problem, it is often necessary to mantle over the lip. This is a stressful maneuver for the shoulder. When topping out, try swinging one foot over the lip on the low side of the boulder and using it to pivot your weight over the lip. This will take the weight out of your shoulder and into your legs. When jamming cracks always remember to utilize thumb-up jams where possible.



LATERAL EPICONDYLOYSIS



Signs and Symptoms

- Painful localized point along the outside of the forearm
- Discomfort with actively extending the wrist backward
- Discomfort with passively flexing the wrist forward

Cause

When you climb, you are constantly overworking the finger and wrist flexors in the front of your forearm by gripping. However, every time that you grip a hold, the muscles in the back of your forearm contract to stabilize the wrist. This constant activation of the muscles in the back of your forearm can lead to overuse and injury at the origin of the muscle on the outside of the elbow called the lateral epicondyle. You should be aware of suboptimal movements that can lead to injury. This includes gripping with an extended wrist, climbing with your elbows away from the wall and jamming wide cracks.

Unload: Lateral Epicondyle Tendons

Instructions

Find your lateral epicondyle, which is the knobby bone on the outside of your elbow. Cut four strips of rigid strap tape into 8-10 cm pieces. Flex your elbow to 20 degrees.

A, B, C, D Apply the cover-role in a diamond shaped pattern around the lateral epicondyle of the elbow.

E, F, G, H, I Place the leukotape on top of the cover-role. Secure one end down by pressing firmly. Pull the other end toward the elbow with the desired tension.

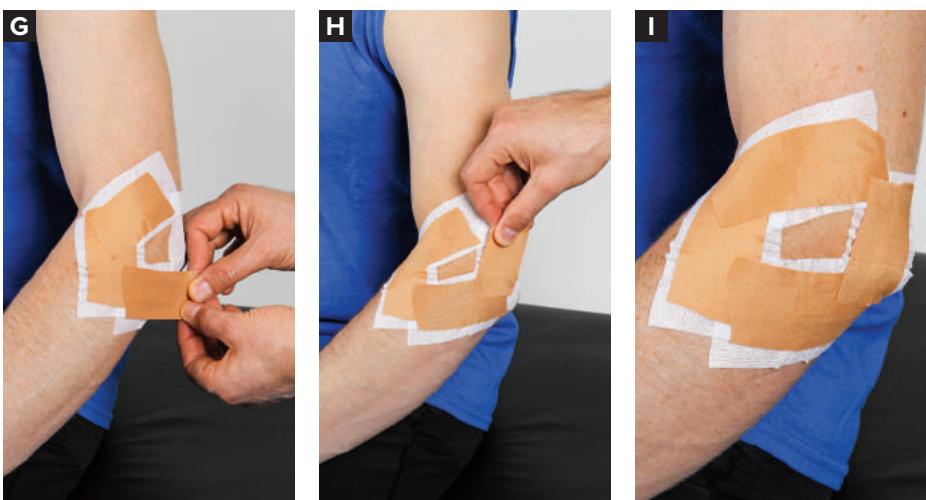
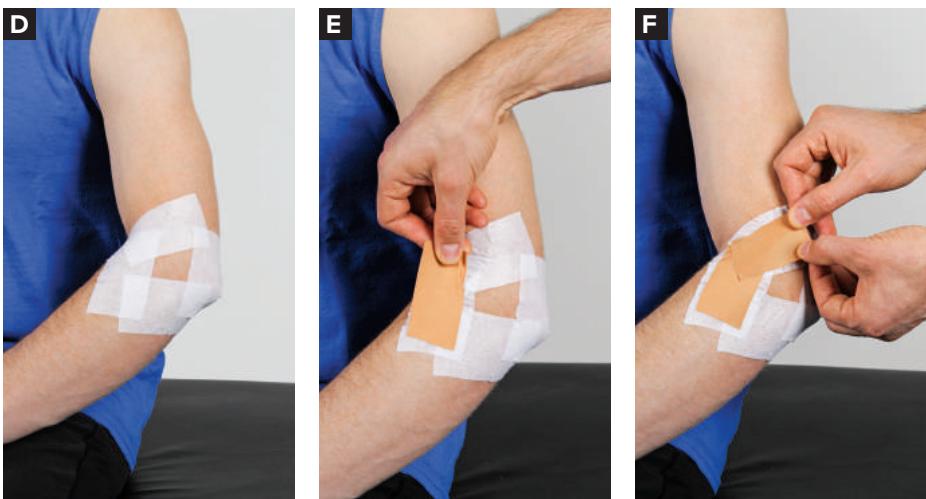
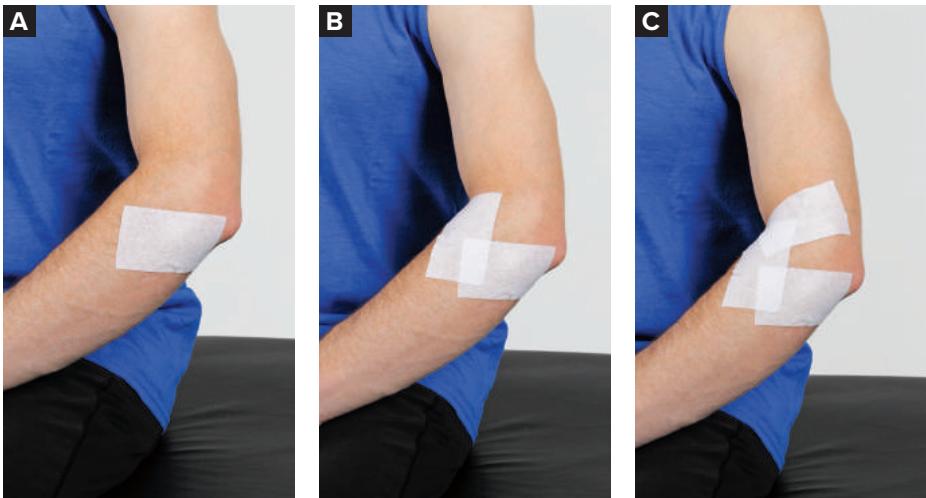
What It Does

Research has shown that this taping technique can decrease pain and increase strength. The tape puts the tendon on slack by taking up the tension in the soft tissue surrounding it.

Frequency

Tape as needed. The tape is very rigid and may limit range of motion while climbing. It is for this reason that it is recommended to wear during the day to unload the elbow and not during climbing.





Mobility 1: Soft Tissue Release of Wrist Extensors

DIRTBAG TIPS

You can use your hand, lacrosse ball, soup can or a specialized device such as an Armaid to perform soft tissue release of your muscles.

Instructions

- A Target your outside forearm muscles by finding the tightest location along the muscle. Extend your wrist and clamp down on the device.
- B Keep pressure on the device and straighten your wrist to neutral to create an active release of the soft tissue.
- C You can also perform using a lacrosse ball or soup can.

What It Does

Releases the tension in the wrist extensor muscles in the back of your forearm. Massaging this muscle reduces the stress on the tendon. Stop immediately if you feel any numbness, pins and needles, or a sense of weakness further down the arm.

Frequency

8-10 minutes up to 3 times per day.



Mobility 2: Elbow and Wrist Tendon Glides

Instructions

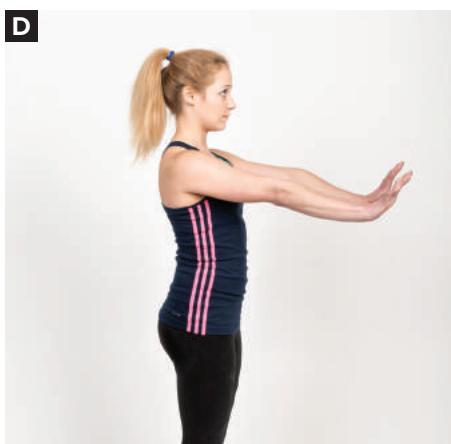
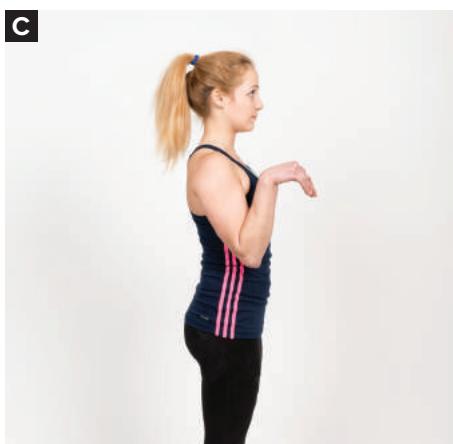
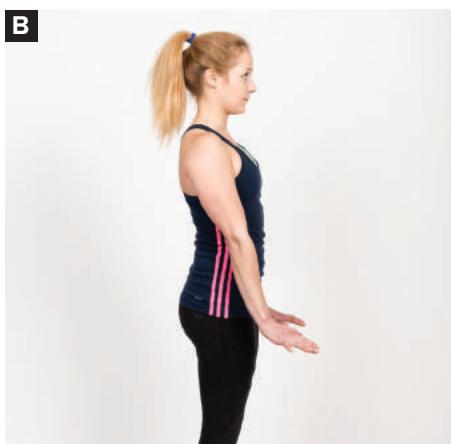
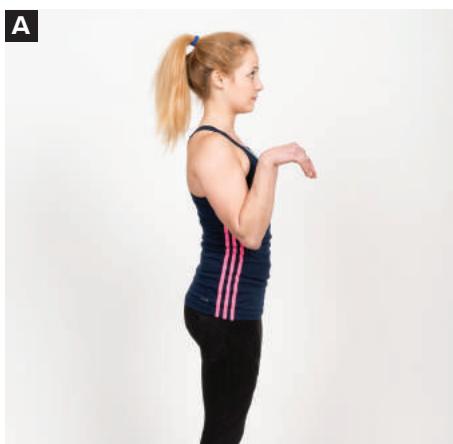
- A Begin with your elbows bent and wrists flexed.
- B Extend your elbows and wrists simultaneously.
- C Begin with your elbows bent and wrists flexed.
- D Perform the tendon glides at varying angles or in a similar sequence to the moves on your climbing project.

What It Does

In the starting position it lengthens the tendons at the wrist and shortens the tendons at the elbow. In the finishing position it does the reverse. This allows the tendon to glide safely and therapeutically without increasing stress.

Frequency

3 sets of 10 repetitions up to 3 times per day.



Mobility 3: Paint the Wall

Instructions

- A Stand one arm's length away from a wall with your hand at shoulder height and your palm pressed into the wall. Slide your arm down the wall as you press.
- B Reverse the hand position and press the back of your hand into the wall. Slide your arm up the wall as you press.

What It Does

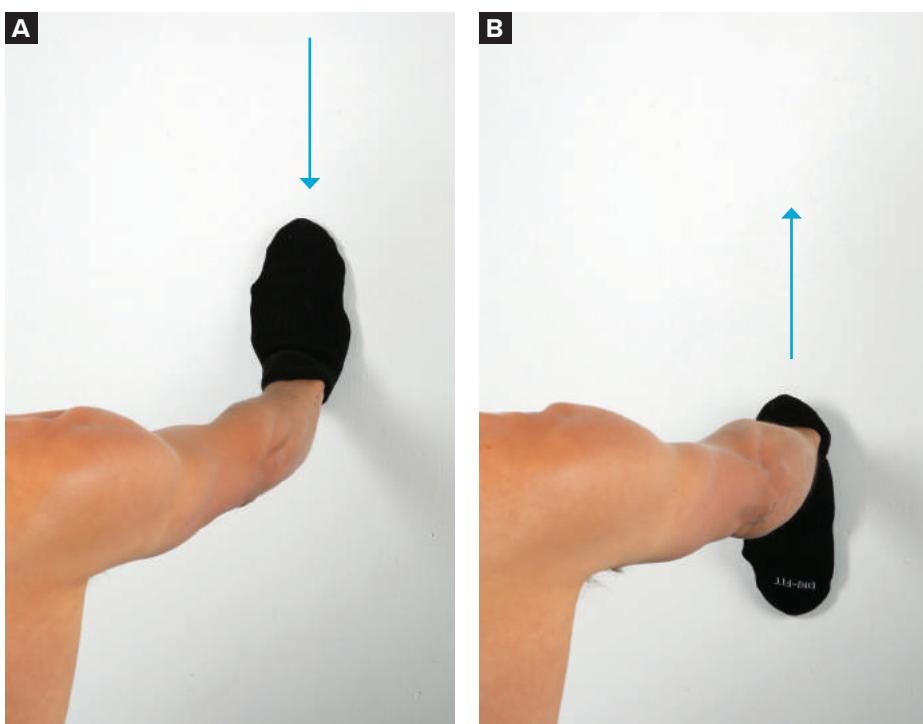
Provides a dynamic stretch to the muscles and tendons in the front and back of the forearm and wrist. Pressing into the wall activates the same muscles that are being stretched. This combination of stretching with muscle action provides the most effective form of mobilization.

Frequency

3 sets of 10 repetitions up to 3 times per day.

Note

It is recommended to place a pair of socks over each hand while performing the exercise. This will allow the motion to occur more smoothly.



PAUL ROBINSON

World-Class Boulderer with Multiple V15 Ascents

Climbing isn't a sport you can force yourself into getting better at. I think a lot of people feel that more is better. Many people think if their climbing partner climbs five days a week and they climb seven days a week that they will get better faster. It just doesn't work that way. The small muscle fibers in our fingers don't develop that quickly and the technique comes slowly over time.

Understanding complex body positions and knowing how the body will move between holds has led to my greatest success on boulder problems. Climbing is so detailed in so many ways, the true way to improve your climbing is to focus on movement and technique training. What makes climbing so special to me is that it is not the strongest person or the one with the most endurance who can succeed. It's the one who understands their body perfectly who has the most success. This is something that develops over time and comes with practice. You need to accept that. If you can't accept that, climbing just isn't the sport for you.

Paul Robinson climbs Seeing Red. Driehoek, South Africa. Photo Credit: Alexandra Kahn



Strength 2: Weighted Dowel Lowers

DIRTBAG TIPS

Refer to page 161 to learn how to construct your own weighted dowel out of household equipment.

Instructions

- A Hold the dowel with straight arms at shoulders height in front of you. Make sure that the weight is wound up fully and touching the dowel.
- B Slowly alternate flexing your wrists forward to lower the weight until it reaches the ground. Place the dowel on the ground to make it easier to wind back up. Wind the cordelette up until the weight touches the dowel. Stand back up and return to your starting position. Repeat lowering the weight with your arms straight in front of you.

What It Does

Targets the wrist extensors eccentrically to strengthen the tendon that attaches to your lateral epicondyle.

Frequency

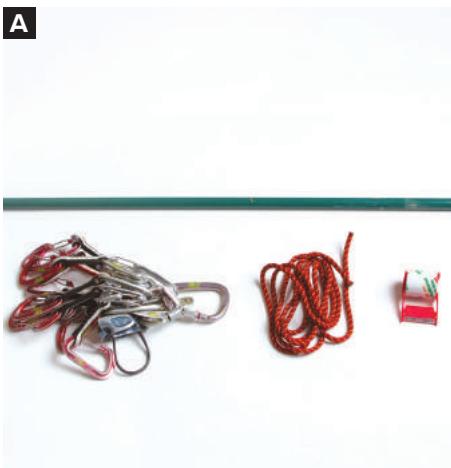
3 sets until fatigued once per day.



Dowel Construction

Build your own piece of exercise equipment at home.

A



B



C



D



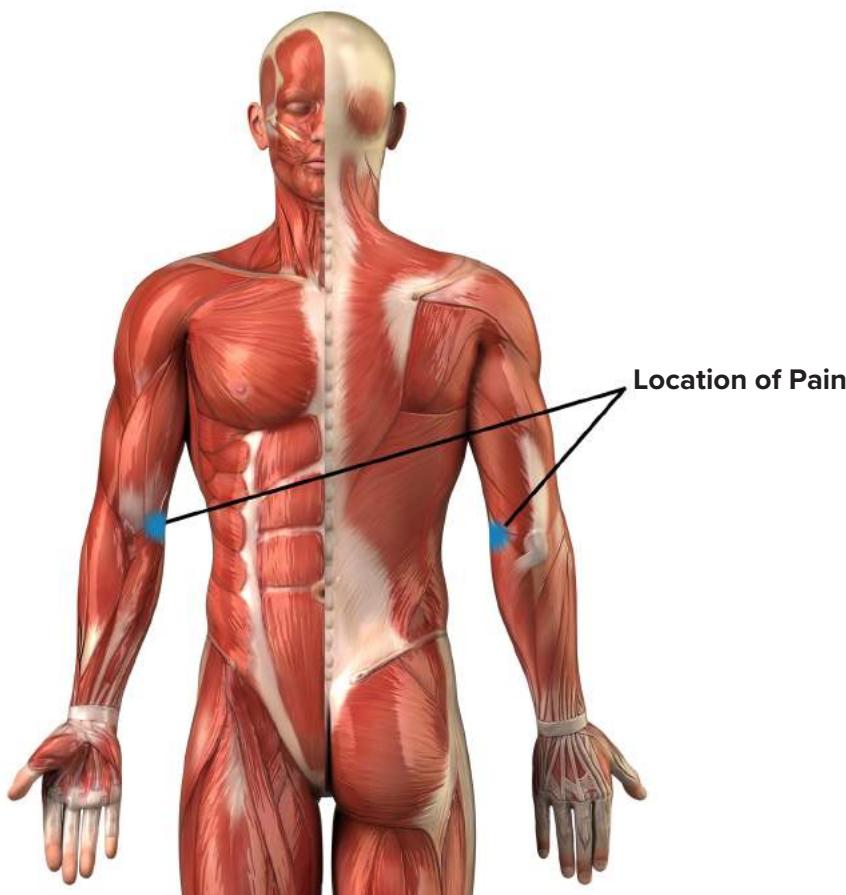
What You Need

- Broom or dowel
- 6-7 feet of climbing cordelette
- Tape
- 2-3 pound weight, a set of quickdraws or your trad rack

Construction

- A Take a small dowel such as a broom stick or pvc pipe.
- B Tie a clove hitch to secure the cordelette to the center of the dowel.
- C Tape the knot securely.
- D Tie a figure 8 on a bight on the other end of the webbing and attach your desired weight with a locking carabiner.

MEDIAL EPICONDYLOYSIS



Signs and Symptoms

- Painful localized point along the inside of the forearm
- Discomfort with actively flexing the wrist forward
- Discomfort with passively extending the wrist backward

Cause

When you climb, you are constantly overworking the finger and wrist flexors in the front of your forearm by gripping. The repetitive action of constantly flexing your fingers and wrist can lead to degeneration of the shared tendon as it inserts into the bone. You should be aware of suboptimal movements that can increase the stress on the finger and wrist flexors tendon and eventually lead to pain and injury. These movements include over-gripping, gripping with a flexed hand and sagging your hips too far away from the wall.

Strength 1: Reverse FlexBar Eccentric Twists

Instructions

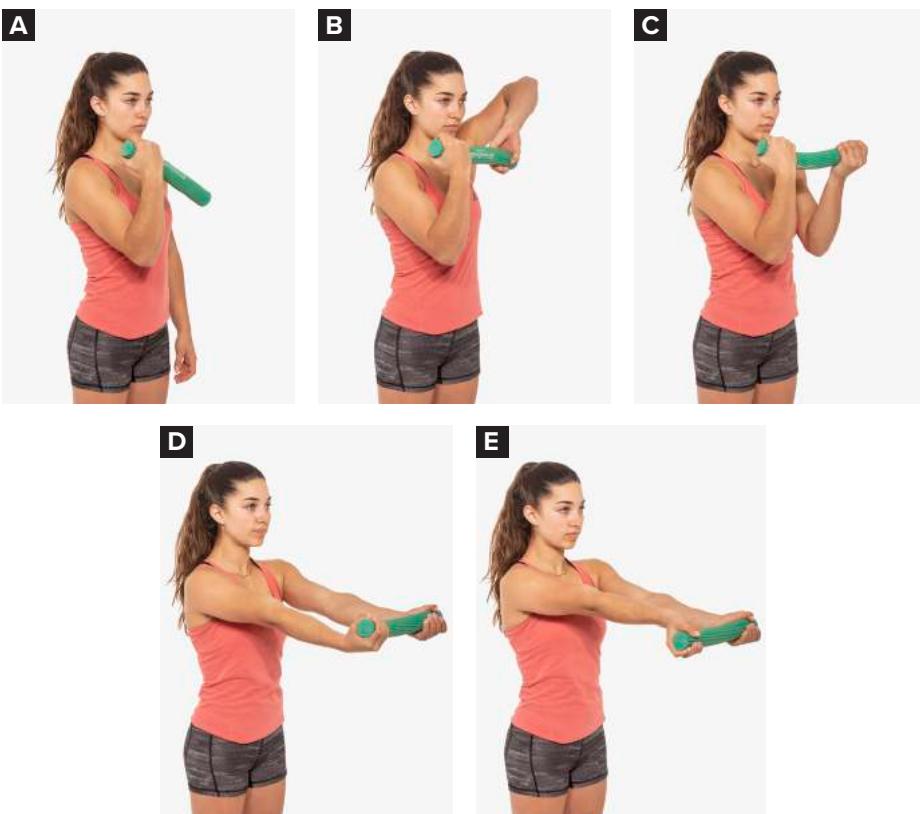
- A On your painful side, grip the FlexBar with your palm facing your body, wrist flexed forward.
- B Raise your elbow on the non-painful side, and firmly grasp the opposite end of the bar with your hand flipped.
- C Lower your elbow while keeping the painful-side wrist flexed to twist and create tension within the bar.
- D Extend your arms in front of your body until your elbows are straight while maintaining the twist in the bar.
- E Slowly release the twist by allowing the painful wrist to extend forward.

What It Does

Targets the wrist flexors that insert into your medial epicondyle with an eccentric exercise.

Frequency

3 sets of 15 repetitions up to 3 times per day.



PULLEY SPRAIN



Signs and Symptoms

- Can occur over any digit, but most commonly occurs over the ring finger along the A2 pulley
- Tender to the touch along the injured pulley
- Swelling, redness and inflammation
- Stiffness bending the fingers
- Painful to actively crimp and grip

Cause

The forearm muscles transition into long, narrow tendons as they extend into the wrist and fingers. These tendons thread through fibrous sheaths and pulleys, which keep them gliding flush to the finger bones, similar to the way a climbing rope runs through quickdraws.

In each finger, there are five annular pulleys, which sling around the front of the bones like the eyelets of a fishing rod, and three cruciform pulleys, which form crosses over the bones, to secure the tendons. When the forearm muscles contract, they pull these tendons and flex the fingers.

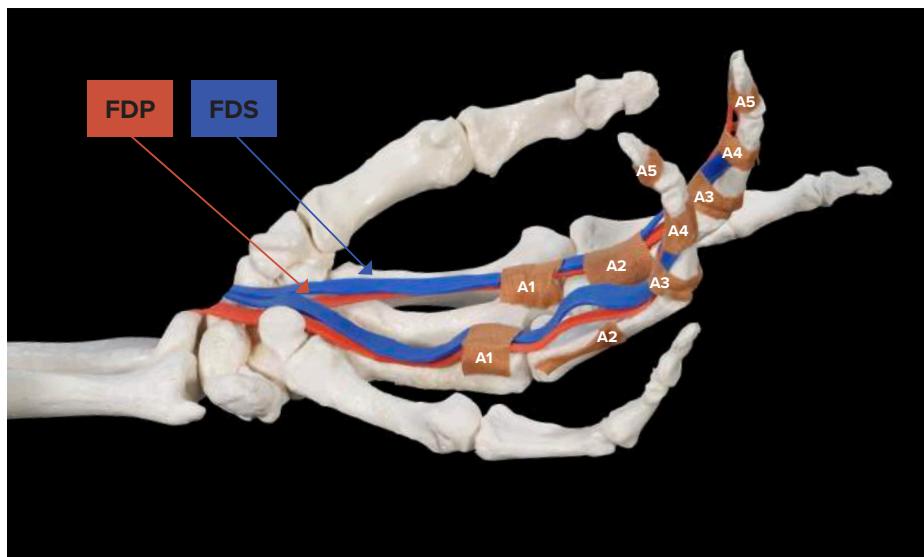
If the finger flexor tendons create too strong of an outward force - something that can happen if you pull hard on a mono pocket, for example - they can stretch, tear or completely rupture a pulley.

Pulley sprains are classified into four grades (see table below) according to severity, based on research by Dr. Volker Schöffl and Dr. Isabelle Schöffl. The A2 pulley is the most commonly injured in climbers because it's subject to greater outward forces than the others.

	Grade I	Grade II	Grade III	Grade IV
Injury	Stretching or Slight Tearing	A2 or A3 Partial Rupture A4 Complete Rupture	A2 or A3 Complete Rupture	Multiple Complete Ruptures

Table modified from Schöffl & Schöffl, 2006

The image below shows the flexor digitorum superficialis tendon (FDS) in blue, flexor digitorum profundus tendon (FDP) in red, and five annular pulleys (A1-5) in beige. It depicts a complete rupture of the A2 pulley (grade III sprain) on the ring finger and an intact pulley system on the middle finger of a left hand. The three cruciform pulleys (C1-3) are not shown.



Diagnostic ultrasound, an imaging technique that uses high-frequency sound waves to visualize structures within the body, is the most effective tool to diagnosis and grade a pulley sprain.

It allows medical practitioners to view the flexor tendons in the finger, and measure the distance between the tendons and the bone.

If you don't have access to diagnostic ultrasound, there's no need to panic. Other criteria exist. A paper by Dr. Carrie Cooper et al., published in the *Journal of the Hand Therapy*, presented a classification schema to assist in determining the severity of a pulley sprain without diagnostic imaging. This method uses clinical findings such as range of motion, muscle contraction, and palpation to classify whether the degree of injury is mild, moderate, or severe (see the table below).

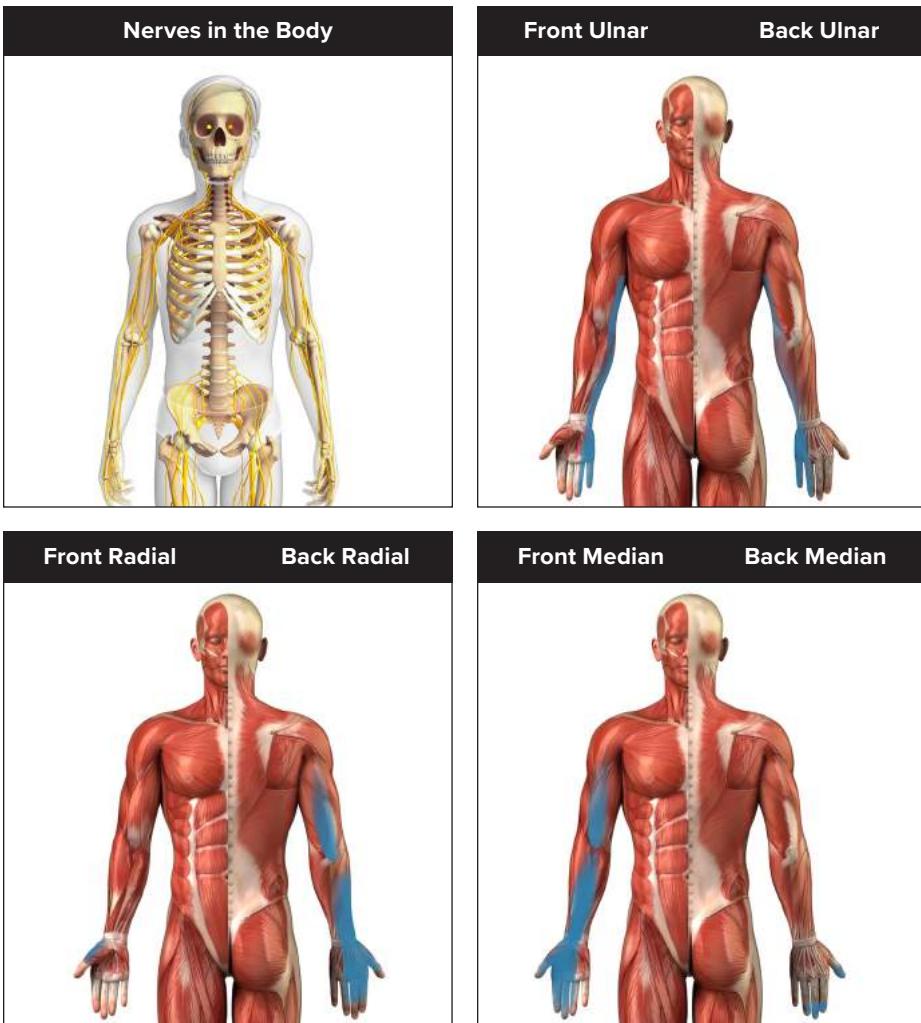
	Mild	Moderate	Severe
Pain	Daily Living: 0/10 does not limit activity Climbing: $\leq 2/10$ after climbing only crimp grip is painful	Daily Living: 3-5/10 does not limit activity Climbing: $\geq 5/10$ that limits climbing in all grip positions	Daily Living: 5/10 limits activity Climbing: $> 5/10$ that severely limits climbing
Active Range of Motion (AROM)	Pain at end range finger flexion with no AROM loss	Pain at end range finger flexion with $\leq 25\%$ AROM loss	Pain and $>50\%$ limited ROM with finger bending and straightening
Pain with Resisted Tests	Sloper: 0/10 Half crimp: $\leq 2/10$ Full crimp: $\leq 2/10$	Sloper: $\leq 2/10$ Half crimp: 2-5/10 Full crimp: 6-8/10	Pain and weakness with any resisted flexor muscle test or "grip" hand position
Palpation	Minimal pain with full blanching palpation (maximal pressure)	Pain with mild blanching palpation (moderate pressure)	Pain with no blanching palpation (minimal pressure)

Table modified from Cooper et al. 2019

Key terms from the table:

- **Pain:** Measured with a numeric scale of 0-10.
- **Active Range of Motion:** Straight fingers to fully-flexed hook/claw (see example - Image C - on page 189).
- **Resisted Tests:** Use the thumb of your opposite hand to pull against your fingers in sloper (open hand), half crimp and full crimp positions. Tests for weakness and/or pain.
- **Palpation:** Use the thumb of your opposite hand to palpate the pulley region. The degree of skin blanching (when the skin turns paler after you press on it) is associated with the amount of pressure you apply.

Numbness, Tingling and Radiating Pain



Signs and Symptoms

- Pain that radiates into the arm and/or fingers
- Numbness and/or tingling
- Weakness in the hand with a tendency to drop objects
- Increased symptoms at night while sleeping

Cause

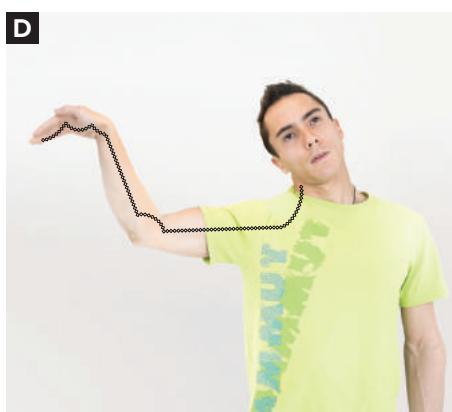
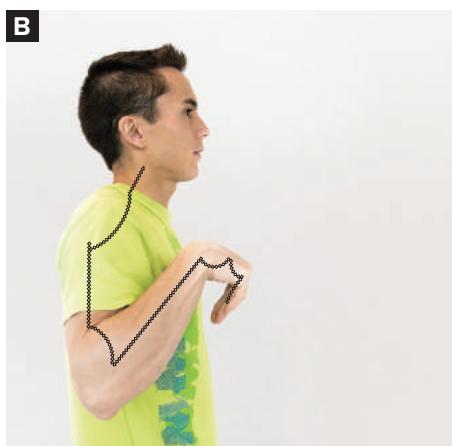
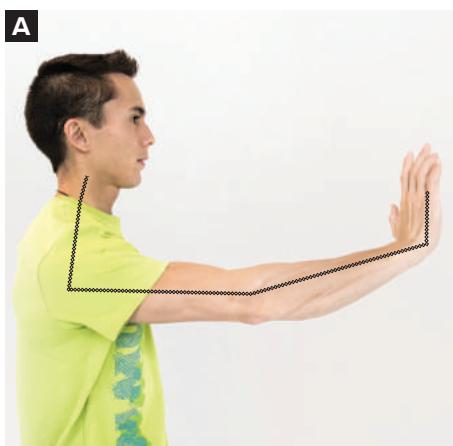
Nerves in the upper body exit through the neck and travel past the shoulder, elbow and wrist into the fingers. Nerves often become entrapped underneath tight muscles and lead to pain or numbness in the arm, hand and fingers.

Nerve Mobility

Imagine that you are belaying your climbing partner and they are stuck at the crux. They keep climbing up and down-climbing but they aren't going anywhere. You look at your belay device and you see the rope glide back and forth, gaining either more tension or slack.

This is how nerves move throughout in your body. They connect from the brain and spinal cord to your muscles. As you move, nerves tension and slacken several millimeters between the layers of muscle. Below is an example of how nerves tension and slacken just like a climbing rope. The curved lines represent slackened nerves while the straight lines represent tensioned nerves.

- A Tensions the median nerve across the elbow, wrist and fingers.
- B Slackens the median nerve across the elbow, wrist and fingers.
- C Tensions the ulnar nerve across the neck, elbow, wrist and fingers.
- D Slackens the ulnar nerve across the neck, elbow, wrist and fingers.



How to Know if a Nerve is Causing Your Pain

One test to identify if you have nerve pain is to put your arm in a nerve-tensioned position (see previous page for examples) and then move your neck. Only perform this test under supervision and clearance from a medical professional as it may cause increased symptoms. Once you are in the nerve-tensioned position, tilt your ear to the same side shoulder and opposite side shoulder. If your symptoms in the arm or hand change with head movement, then your pain is likely related to the nerve, and not the muscles, since there is no single muscle that attaches continuously from the neck down to the arm, wrist hand and fingers. The primary structure that can change tension with head movement is the nerve.

Use Nerve Motion to Treat Pain

You can use the dynamic properties of peripheral nerves to treat nerve related pain from a compressed nerve that is lacking mobility. Since nerves glide several millimeters between interfaces of muscle, you can glide nerves back and forth to increase their excursion and you can tension them to improve their capacity to withstand strain. Just don't stretch nerves statically like you would stretch a muscle—nerves don't respond well to sustained stretches. If you stretch a nerve with a sustained hold, the nerve can lose oxygen and blood flow. This can lead to further irritation of the nerve. This is the reason why you can sometimes feel “pins and needles” from a sustained stretch.

Nerve Glide Levels

Since nerves have extra play, they can be tensioned or slackened in different body positions. The next few pages will show you how to glide the median, ulnar and radial nerves through their respective muscular interfaces. There are two levels of exercise given to mobilize each nerve in this chapter. Level 1 is a gentle mobilization that utilizes alternating positions of slack and tension. Level 2 is a stronger mobilization that utilizes mostly tensioned positions.

How to Perform and How Often

All nerve glides should be performed for three sets of up to eight repetitions. Perform daily once you can glide the nerve without pain. The motion should be fluid and rhythmic. Never hold tension for more than two seconds at the end position. Start gentle with Level 1 exercises and progress to Level 2 exercises once you can perform Level 1 with ease and no pain. Discontinue nerve glides if you experience an increase in numbness and/or tingling. Nerves are sensitive and the mobilizations described in this chapter should be performed with care. To explore this topic in more detail, I highly recommend reading the book Neurodynamic Techniques written by the NOI Group.

Ulnar Nerve Mobility Level 2

Instructions

- A** Flex your wrist and fingers forward, bend your elbow to 90 degrees and lean your head to the same side of the bent arm.
- B** Extend your wrist and fingers backward, bend your elbow even further and lean your head to the opposite side of the bent arm.

What It Does

- A** Slackens the ulnar nerve at the neck, elbow, wrist and fingers.
- B** Tensions the ulnar nerve at the neck, elbow, wrist and fingers improving the elongation and excursion of the ulnar nerve.



Radial Nerve Mobility Level 1

Instructions

- A Interlock your hands and fingers together with your elbows slightly bent. The arm with the nerve injury should be on bottom.
- B Bring your elbows upward as high as possible while maintaining interlocked fingers.

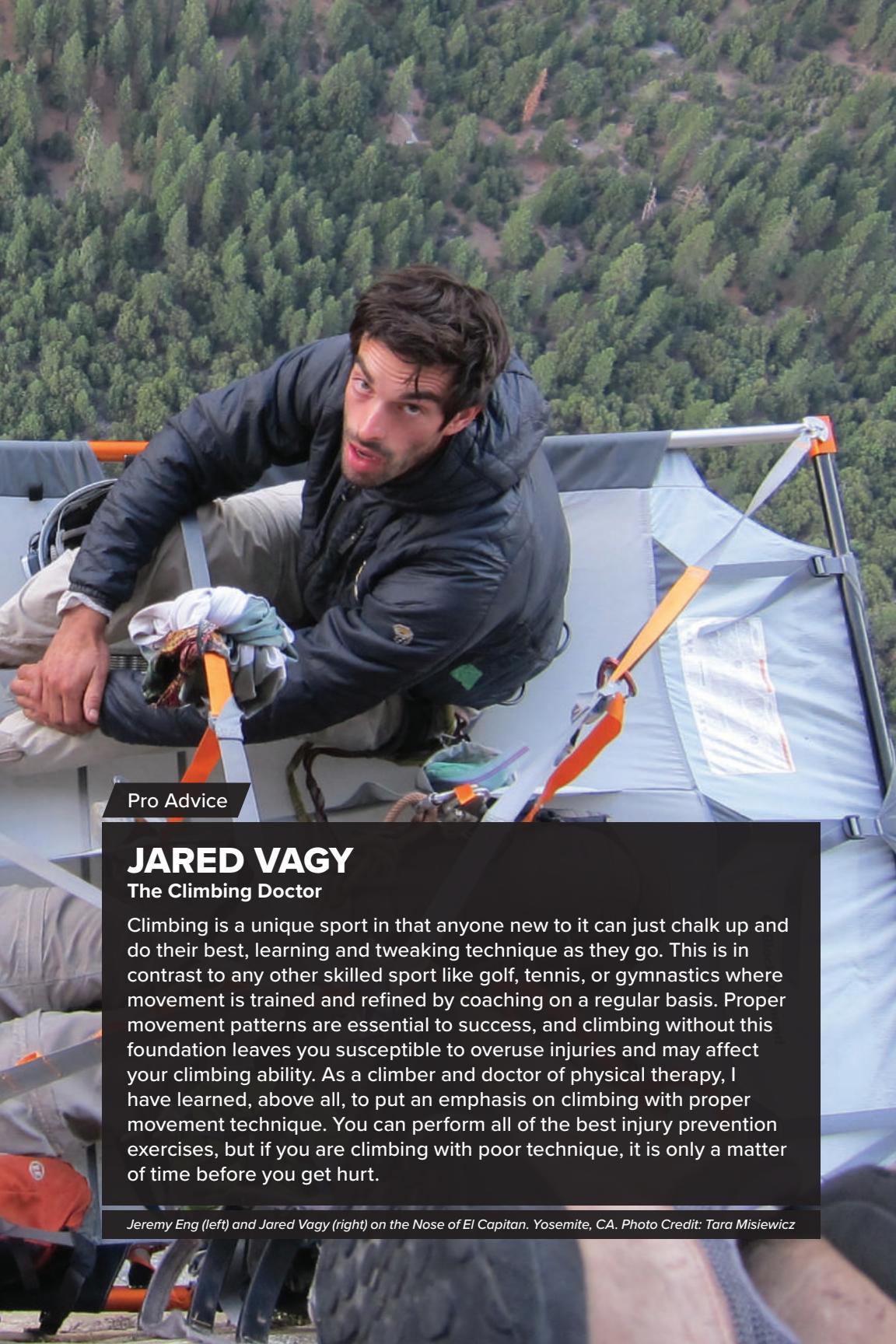
What It Does

- A Slackens the radial nerve at the elbow and tensions it at the wrist.
- B Tensions the radial nerve at the wrist and further slackens it at the elbow improving the excursion of the radial nerve.

Tips

If the nerve is still irritated when performing this exercise, try shrugging your shoulders when you bring your wrists upward. This may slacken the nerve as it exits through the neck and make this exercise easier to perform. If it is still a challenge, only bring your wrists up as far as comfortable.





Pro Advice

JARED VAGY

The Climbing Doctor

Climbing is a unique sport in that anyone new to it can just chalk up and do their best, learning and tweaking technique as they go. This is in contrast to any other skilled sport like golf, tennis, or gymnastics where movement is trained and refined by coaching on a regular basis. Proper movement patterns are essential to success, and climbing without this foundation leaves you susceptible to overuse injuries and may affect your climbing ability. As a climber and doctor of physical therapy, I have learned, above all, to put an emphasis on climbing with proper movement technique. You can perform all of the best injury prevention exercises, but if you are climbing with poor technique, it is only a matter of time before you get hurt.

Jeremy Eng (left) and Jared Vagy (right) on the Nose of El Capitan. Yosemite, CA. Photo Credit: Tara Misiewicz

ABOUT THE FEATURED CLIMBERS



Sasha DiGiulian

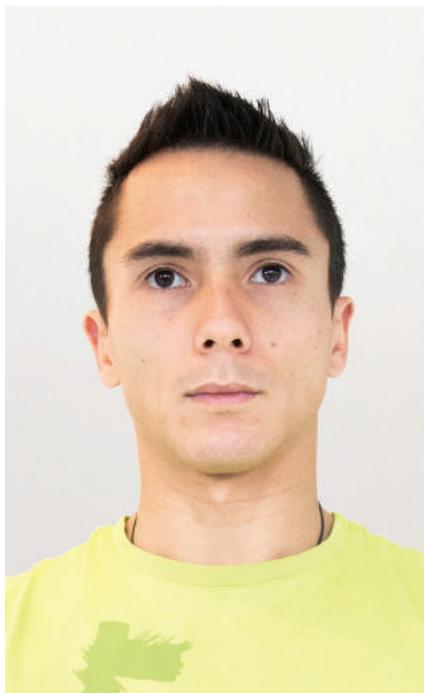
Sasha is the first North American woman to climb the grade 5.14d. She has onsighted multiple 5.14a's, ascended groundbreaking multipitch routes of up to 1,000 feet of 5.14b climbing, and has accomplished multiple first ascents and over 30 first female ascents around the world. Notable first female ascents include Magic Mushroom (5.13a), one of the most difficult routes on the north face of the Eiger, and Mora Mora (5.14b), a 2,300-foot big wall in Madagascar. Sasha is a former indoor rock climbing world champion for the category female overall. She has placed silver in the bouldering world championships and has placed bronze in the duel.



Jonathan Siegrist

Jonathan is a passionate professional climber and global traveler. He spends his years primarily on the road and overseas, constantly on a mission to develop new areas and pursue the challenge and beauty in hard rock climbing. Since he began his journey with climbing at age 18 he has step by step experimented and refined his methods of training for a variety of goals. His list of career highlights includes over 350 5.14s, 5.14 traditional routes, over a dozen 5.15s, boulder problems up to V14 and 5.14 big wall ascents.

ABOUT THE FEATURED CLIMBERS



Sean McColl

Sean McColl is an avid professional climber and Olympian. During his youth career, he claimed 5 Youth World Championship titles; this achievement is unsurpassed in youth climbing history to this day. Since Sean started competing on the World Cup circuit, he has won 4 World Cups and has been on the podium at 29 events. Sean is a 3-time Adult World Champion and has been 2nd and 3rd in the Lead and Boulder Overall rankings. As an outdoor climber, Sean has onsighted 5.14a and climbed multiple 5.14d's. On the bouldering side, Sean is one of a dozen climbers in the world to flash the grade of V13 and redpoint V15.



Josh Levin

Josh Levin is recognized as USA Climbing's most successful youth competitor. He spent his early climbing career accumulating 19 national championship titles, 5 continental championships, multiple USA speed climbing records, and the bronze medal at the 2008 youth world championships. He has won in the pro circuit in bouldering, sport climbing, and speed climbing competitions, establishing himself as one of the most well-rounded competitors in the sport. With over 16 years of climbing experience, Josh has ticked off V12 and 5.14c outdoors, and is the athlete representative on the USA climbing board of directors.

ABOUT THE FEATURED CLIMBERS



Brooke Raboutou

Brooke Raboutou is a multiple time Youth World Champion and Olympian. She is the first United States climber to ever qualify for the Olympic Games. She is the daughter of former climbing World Champions Robyn Erbesfield-Raboutou and Didier Raboutou. Brooke began climbing at the age of 1 and competing nationally at the age of 7. At age 11, she became the youngest person in the world to climb 5.14b. She competed in more than 35 international competitions all before becoming a teenager. Brooke is currently pursuing an education in marketing at the University of San Diego while keeping up with training and competing as a professional rock climber.



Ross Fulkerson

Ross Fulkerson is currently competing on the world cup circuit as part of the US national team. Ross's climbing career began around the age of 6, in the tops of the 80ft redwood trees in his back yard. From there, he went on to win 4 youth nationals and a host of international medals. Along with competition climbing, Ross is passionate about the outdoors. Besides a diverse portfolio of outdoor climbing accomplishments, Ross is a staunch skier, surfer, mountain biker, and student of pretty much every other sport. Ross is currently attending school at UCLA where he is pursuing a neuroscience degree and training full time, with his eyes set on the Olympics.

ABOUT THE PHOTOGRAPHERS

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Their stellar work is worth checking out and you can help support them by purchasing their photographs.

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Professional Life

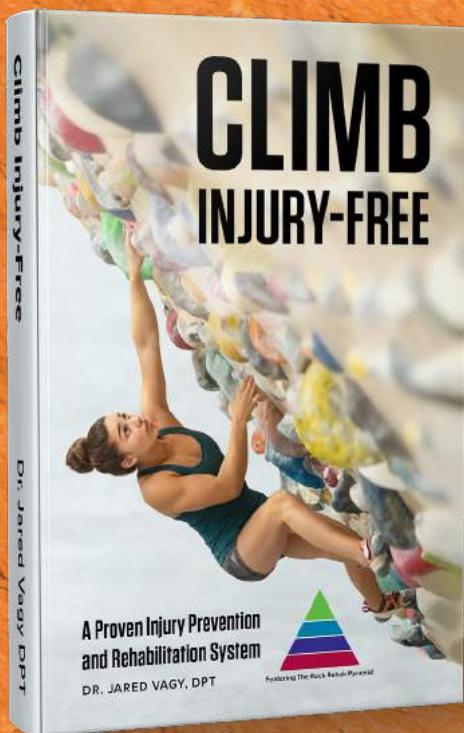
Jared Vagy is a doctor of physical therapy who specializes in treating climbing injuries. In addition to his doctoral degree, he has completed a one-year residency in orthopedics and a one-year fellowship in movement science, totaling nine years of concentrated study. He has published numerous articles on injury prevention and lectures on the topic internationally. Dr. Vagy is a Clinical Assistant Professor of Physical Therapy at the University of Southern California, one of the top doctor of physical therapy programs in the USA. He is a board-certified orthopedic clinical specialist and a certified strength and conditioning specialist.



Climbing Life

Jared Vagy has over 17 years of climbing experience and has climbed all over the world. He is an accomplished rock climber, ice climber and alpinist, and continues to explore the wonders of adventure that these pursuits afford.

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