Pilates and the Rock Climber:
An exercise program to
Enhance performance and prevent common injuries

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Abstract

It is now widely known that ¾ of injuries sustained by rock climbers are of the overuse variety, not the result of hard falls, and that the three most common sites of non-fall injuries are the fingers, shoulders, and elbows. The risk of such injuries increases with skill level and with the perceived importance of climbing to the individual because the tenacious climber, fearing the atrophy of rest, will often over train, ignore the warning signs of injury, or begin climbing before an injury is fully healed. Proper training of the antagonist muscles is also gaining attention within the community as a way to avoid injury and maintain muscle balance. A dedicated Pilates practice can be of great benefit to the climber who wishes to enhance performance, strengthen core muscles, correct imbalances, improve posture and flexibility, and prevent some common injuries associated with this brutal, beautiful sport.
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Anatomical Analysis: The Shoulder

Shoulder instability is a condition that is becoming increasingly common in high level climbers, and it is no small wonder. A climber places exceedingly high demands on this delicate and complex structure, in turns hanging from it, swinging from it, reaching with it, preventing terrifying falls with it, and requiring stability from it in the form of maneuvers such as the lock-off:

“These circumstances have the potential to result in imbalances in muscle performance and soft tissue length and [are] a primary reason shoulder injuries are common among rock climbers,” (N Am J Sports Phys Ther. 2007 February). Given this, it is essential to understand and teach proper shoulder mechanics to the rock climber. Otherwise, injury is all but imminent.
The shoulder joint (or glenohumeral joint) is a ball-and-socket joint in which the glenoid cavity of the scapula articulates with the head of the humerus (upper arm bone). The interaction of the muscles, ligaments, and capsular structures of this joint is known as scapular humeral rhythm.

The relatively small articular surface of the joint is both its boon – extensive mobility – and its bane – lack of stability. In fact, the intricate web of soft tissue relationships are so essential to achieving stability within the joint that some refer to the shoulder as a “muscle dependent joint.” When these tissues (ligaments, tendons, and muscles) are strong, toned, and moving in harmony, the system works flawlessly. Factors such as injuries, repetitive movements, age, and muscle imbalance can, however, distort and stretch these tissues, compromising the joint and rendering it unstable and resembling an old overstretched rubber band.

The muscles of the shoulder region can be divided into 3 groups: the large shoulder muscles, the scapular stabilizers, and the rotator cuff. In order to better understand their function, let’s break them down by group:

The large shoulder muscles are responsible for gross movements of the arms and include the pectoralis major, deltoids, latissimus dorsi, and teres major, biceps and triceps.
Next, we have the scapular stabilizers: trapezius, rhomboids, levator scapulae, pectoralis minor, and serratus anterior. These muscles connect the bones of the surrounding shoulder area – the head, spine, and ribcage – to the scapulae without connecting directly to the humerus. In this way, they stabilize or move the scapulae in accordance to the needs of the arm. Healthy scapulohumeral rhythm allows the shoulder to move smoothly through its full range of motion without impingement. When this coordination malfunctions, the rotator cuff may work double duty to stabilize and mobilize the arm, leading to an increased risk of overuse injury.

The third group, the rotator cuff (supraspinatus, infraspinatus, teres minor, and subscapularis), connects the scapula to the humerus and is responsible for facilitating the subtle, beneficial shoulder mechanics required for mobility. Because the tendons of these muscles surround and reinforce the joint capsule on three sides, they also provide essential stability to an area whose bony attachments are extremely limited. As the primary stabilizers of the shoulder, these 4 small, deep muscles are extremely important in injury prevention for the rock climber.
Introduction

Despite the fact that adventurous individuals have been scaling mountains and rock faces for at least two centuries, the science of performance rock climbing is still quite new. Perhaps its status as a fringe and almost counter-cultural pursuit, training for climbing was, until a generation ago, strictly a word-of-mouth-endeavor, doled out as “tips” from one climber to another. With the increasing popularity of the sport (projected to skyrocket in coming years), subsequent research, and the efforts of a few “pioneers” such as Erick J. Horst (author of a series of training books for climbers), this is changing.

The old wisdom states that the only way to become a better climber is to climb, and in many ways that still holds true. However, it is now also widely accepted that cross training, especially for the antagonist muscles, is crucial for longevity in the sport, not to mention injury prevention. Currently yoga has greater traction in the climbing community as the go-to cross training activity, but I believe that Pilates is a discipline supremely well suited to enhance climbing performance and correct some of the negative effects of participating in this brutal, beautiful sport.

Rock climbing, especially at the higher levels, requires intense mental focus, graceful and economical movement, and TOTAL body control, not unlike a dancer or a gymnast. A strong core is crucial for efficient movement, maximizing the leverage of the limbs and transferring torque from hand to foot (and vice versa). Regular flexibility training can boost performance by allowing for greater hip turnout, and high stepping and stemming moves, but is also extremely important for bringing balance to the muscle groups and ensuring that tension in one muscle does not inhibit the efficient movement of another. Taking an individual through a complete BASI Block System workout will naturally address these broad concepts as well as highlight individual weaknesses and imbalances.

Posture is another growing concern in this small but rapidly increasing population of lizard-like individuals, and is of particular interest to those who deal in spinal health. Colloquially referred to as “climber’s back” or “gorilla posture,” the hunched shoulders and forward head of the avid climber is similar in presentation to what Dr. Vladimir Janda termed Upper Crossed Syndrome.
Case Study

Ghislaine is a 38 year old, female, mother of 2 who has been rock climbing at an intermediate level since the age of 21. A lifelong athlete, she is generally fit and flexible but has developed a typical climber’s posture. Additionally, her spine has a slight, c-curved scoliosis to the right at L2-L3, with some degree of rotation towards that side. Muscle imbalance from her left to right side is significant. She has a hyperlordotic lumbar curvature with a decreased upper thoracic and cervical curve. She experiences muscle tightness in her neck and shoulders (especially levator scapulae and upper trapezius), pectoralis minor (which pulls her shoulders forward, particularly on the right), psoas (especially the right, which causes low back pain), and quadratus lumborum. Weaknesses include gluteus medius, transverse abdominis, scapular stabilizers (especially serratus anterior), mid- and upper trapezius, hamstrings. Her ankles are weak due to many injuries/sprains. Typical for a rock climber, her pulling muscles are quite strong. She has had some Pilates experience prior to beginning work with me, but has never had private instruction. Her goals include developing a stronger core, balancing her musculature, working to correct her shoulder mechanics and posture, and improving flexibility.

BASI Block System conditioning program:

WARM UP:
- Fundamental: 2-3 Roll Downs for postural assessment then, Pelvic Curl, Spine Twist Supine, Chest Lift, Chest Lift with Rotation, and Leg Lifts/Changes.

FOOTWORK:
Parallel Heels, Parallel Toes, V-Position Toes, Open V-Position Heels, Open V-Position Toes, Calf Raises, Prances, Single Leg Heel, Single Leg Toes
- On Reformer – good for bringing awareness to working symmetrically, as her left side tends to underwork; calf work was very important due to instability and hypermobility at the ankle joint; single leg work good for challenging the imbalances related to her scoliosis.
- On Cadillac – Very good for lengthening out and strengthening her hamstrings; was also beneficial in that she could see and correct ankle supination; added Hip Opener on occasion to open the hip joint.
- Wunda Chair – Excellent work for postural muscles and correcting alignment whilst working on leg strength/balance. Assisted Single Leg work with extended leg on a ball until she developed sufficient strength to hold it on her own.

ABDOMINAL WORK:
- Fundamental – Hundred Prep to work on lumbo-pelvic stabilization, Chest Lift and The Reach on Step Barrel to increase abdominal control, Pike Standing to begin work on scapular stabilization.
• Intermediate – Hundred to increase stamina and work on stabilization, Coordination; Warm Up Series on Cadillac; Cat Stretch Kneeling to add scapular stabilization work, shoulder stretch and back extensor control. 
• Advanced – Torso Press Sit is a great exercise to open up the chest; requires a great deal of abdominal and back extensor control. Full Pike to work antagonist pushing muscles (especially serratus anterior) and develop strong core control.

HIP WORK:
• Fundamental – Basic Leg Springs on Cadillac good for working each leg on an individual spring, which highlights imbalance at the hip and requires her to work symmetrically on both sides. Also Frog, Circles (Down, Up), Openings on Reformer. All increase hip mobility.
• Intermediate – Single Leg Springs – again, working the single leg is good to help her balance her left and right sides; Extended Frog Reverse in place of Openings and Frog on Reformer.

SPINAL ARTICULATION:
• Fundamental – Monkey Original and Tower Prep to increase hamstring flexibility whilst articulating the spine; Bottom Lift to increase hamstring strength.
• Intermediate – Short Spine, Long Spine, Bottom Lift with Extensions to further increase the mobility of the spine.
• Advanced – Tower, Jack Knife to deepen previous work and find additional core control.

STRETCHES:
• Fundamental – Standing Lunge, Ladder Barrel Stretch Series to improve flexibility around her hips; Pole Series, Shoulder Stretch 1 and 2 (2 is especially good to open up the tight overdeveloped muscles of the anterior chest) to improve flexibility around her shoulders.
• Intermediate – Kneeling Lunge; Shoulder Stretch on Cadillac to increase mobility and flexibility and work the rotator cuff muscles.

FULL BODY INTEGRATION:
• Fundamental – Up Stretch 1 and Elephant are excellent for stretching the hamstrings and shoulders whilst working the core muscles and shoulder stabilizers.
• Intermediate – Down Stretch, Up Stretch 2 and Long Stretch all provide the opportunity to work on shoulder mechanics and pushing muscles whilst working on the core. Down Stretch also helps to open up the chest.
• Advanced - Up Stretch 3, Balance Control Back Prep, Balance Control Back, Balance Control Front are all great antagonist muscle work and shoulder/core work; also Sitting Back on the Cadillac to help open and stretch the shoulders
• Bridging on Mat – Shoulder Bridge and Shoulder Bridge Prep are very good for evening out her left/right muscle imbalances and opening the chest. Front Support, Leg Pull Front, Back Support, and Leg Pull Back include shoulder work; Push Up to work the antagonist pushing muscles.
ARM WORK:
• Fundamental – Arms Supine Series to begin work on shoulder mobility and mechanics, Shrugs to begin to teach good shoulder mechanics and to isolate and strengthen the mid and lower trapezius.
• Intermediate – Scapula Glide, Shoulder Adduction Single and Double Arm to isolate shoulder mechanics and teach proper scapulohumeral rhythm; Frog Back provides excellent positioning for her to work antagonist pushing muscles; Shoulder Push and Shoulder Push Single Arm for antagonist work; Arms Sitting Series to work her weakened, overstretched rhomboids; Arms Kneeling Series for balance and core control along with arm work; Arms Standing Series…the entire arm work block is beneficial.
• Advanced – Side Arms Kneeling for pure antagonist muscle training, rotator cuff strengthening, and scapular control. Great series for her, but very challenging. Butterfly to work into obliques and shoulders simultaneously.

LEG WORK:
• Fundamental – Gluteals Side Lying Series and Gluteals Kneeling Series to develop weak gluteal muscles. Leg press Standing for balance and hip extensor strength.
• Intermediate – Hip Opener on Wunda Chair to increase hip flexibility; Frog Back adds shoulder stabilization to leg work; Backward Step Down for gluteal work and balance; Hamstring Curl on Reformer adds back extensor work for balancing the forward orientation of her upper body; Jumping Series to deepen leg, ankle, hip mobility and strength in a dynamic way.
• Advanced – Squats are excellent for also developing the muscles of the upper back; Forward Lunge for lower body control and balance (difficult for her); Single Leg Side Series to deepen lower body control and restore muscle balance to her right and left sides.

LATERAL FLEXION/ROTATION:
• Fundamental - Side Stretch, Side Over Prep, Side Lift, Side Lifts to strengthen obliques
• Intermediate – Mermaid, Side Lift and side Kneeling stretch all incorporate an arm and therefore muscular stabilization at the shoulder/scapulae
• Advanced - Side Pike incorporates shoulder work, as do Side Kick Kneeling, Side Bend and Twist on the Mat

BACK EXTENSION:
• Fundamental – Swan with Magic Circle, Breaststroke Prep and Swan Basic to incorporate shoulders. Breaststroke Prep to build up to Breaststroke.
• Intermediate – Breaststroke to work back and increase shoulder mobility and strength; Cat Stretch to isolate mid and upper back extensors, improving postural deviations; Pulling Straps 1 & 2; Prone 1 & 2; Double Leg Kick and Rocking Prep to open front of shoulders and chest.
• Advanced – Rocking really opens the chest and strengthens the back; Hanging Back will put her in her hanging element, teaching proper shoulder mechanics and scapular stabilization whilst working to strengthen the back and open the tight muscles of the chest.
Conclusion

After several months of working 2 days per week, Ghislaine has drastically increased the awareness of her own body and its imbalances. Her spine is becoming more mobile and she is gaining strength in her core. Her gluteals (especially medius) were particularly weak beginning this work, but she is slowly learning how to utilize them to support her body and posture, thus reducing the strain on her lower back. She reports a decrease in low back pain, particularly after our sessions.

Although her dominant right shoulder is proving to be particularly resistant to change, she is finding it easier to engage the muscles which pull the humerus back into its correct position whilst doing arm and shoulder stabilizing work. She is increasingly more capable of stabilizing her scapulae in exercises which require it, and is beginning to incorporate this new understanding into her efforts at the climbing gym.

Her left side / right side muscle imbalance is a constant struggle against the structural deviation of her spine, but as she continues to develop the muscles of her core, hips, and back, she has more control when transferring weight from one side to the other in exercises such as Shoulder Bridge Prep and Leg Pull Back.

Finally, Ghislain’s posture is getting stronger. She is aware of her forward head and shoulders and now knows which muscles to use when she catches herself falling into old habits. Through the BASI approach to the work of Joseph Pilates she has received some much needed whole body attention, work which she plans to continue and believes is helping her. By following the Block System, she feels confident that she will continue to acquire core strength, increased flexibility, muscle balance and improved posture.
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