Do Not Ignore Your Cyclist Shoulders!

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Dr. Win Chang, Founder of ShoulderSphere

The Problem

In the world of cycling that varies from a casual summer tour to more aggressive competitive cyclocross, and everything in between, such as road racing, criterium racing, cycle speedway, velodrome track cycling, mountain bike downhill, mountain bike cross country, or freestyle BMX, the emphasis has always been either on equipment performance or leg strength and cardio-pulmonary conditioning. For obvious reasons, these are important areas of concern for any serious cyclist. However, has anyone ever seen a competitive cyclist with no arms?

Aside from crashes, common areas of complaint among cyclists are the neck, the knees, the groin-buttocks, hands, and back. But intuitively, all cyclists, either consciously or unconsciously, are aware of the importance of strong shoulders. In golf,

you drive for the show, but putt for the dough. In cycling, I'd say you pedal for the course, but shoulders for the finish.

All cyclists can obtain similar high performance bikes, are fairly equal in leg strength and cardio-pulmonary conditioning, however, the winning edge difference lies in their rotator cuffs. The cyclist is only as strong as his/her weakest link.

Do not let your weak link be your rotator cuff.

This article will shed light on *why* you need to train for *what* you should train — your rotator cuff. Additionally, *why* train the way *how* you should train.

Functional Shoulder Anatomy

The shoulder joint is not a ball-and-socket joint. The hip joint is. The hip is a ball inside the caged enclosure of a bony socket. A true ball and socket joint. This caged enclosure limits the hip's range of motion, but provides great stability.

The shoulder "joint" does not have a bony socket, in fact, it is just the mating surfaces of a hemispheric ball against a flat disc-like surface of that part of the shoulder blade bone called the glenoid. It is surrounded by a flimsy pocket-like material called the capsule. What really maintains the position of the shoulder is the set of four tendons called the rotator cuff tendons (originating from the rotator cuff muscles) that grab the top of the arm bone, the humerus, contracting together, they pull the arm toward the glenoid to maintain alignment.

The shoulder, being not enclosed inside a bony socket, allows our ability to place our hands virtually anywhere in space. In exchange for this evolutionary trait of nearly unrestricted arm motion, by default, comes with increased shoulder instability.

With any movement in the shoulder, or even just supporting weight, such as when in the leaning position on the handlebars of the bike, there is a constant shoulder dislocating force of pushing the shoulder out of the confines of the shoulder joint.

The single most important structure that keeps the shoulder joint stable is the rotator cuff. The rotator cuff is consisted of four separate muscles, one from the front of the shoulder, three from the back of the shoulder. Although four muscles, from four locations, they converge together on top of the arm bone (humeral head) and function essentially as *one muscle, acting in unison.* The simultaneous contraction of these four muscles *compress* the humeral head and essentially lock the arm bone against the glenoid. This is called "glenohumeral joint compression", or "centration" effect — the joint is compressed in a centered position. Any relative weakness in one of the rotator cuff muscles will lead to off-centered movement of the humeral head during shoulder motion. When repeated many times, this will lead to shoulder pain, tendinitis, labral tears, and ultimately even rotator cuff tears.

In order to ensure shoulder stability, all four muscles must contract synergistically in a balanced manner. With just the right amount of tension from each muscle, the humeral head is centered and compressed against the glenoid. The tendons must be rigid enough to maintain the joint compressed, but at the same time, must also be flexible enough and yield to shoulder movements. A difficult task indeed.

The Challenge Faced By Cyclists

Legs propel, shoulders support.

Spending an hour on the bike on the flats, albeit challenging at a 30 mph pace, a much under appreciated and rarely mentioned task is the amount of work done by the shoulders. Strong shoulders allow efficient arm movement. Proper arm movements and arm position enable optimal aerodynamic body positioning. Strong shoulders also aid in the forward propelling bike.

Shoulder strength is predicated on rotator cuff strength. Cyclists do not, and should not, weight train like a bodybuilder. The exception being Cyclocross where one is required to carry the bike over obstacles. After all, it is still the strength of the rotator cuff that ultimately determines strength of the shoulder to carry and lift bikes.

The leaning posture of arms on the handlebar creates a constant superiorly directed axial loading force. This driving force pushes the shoulders upward trying to dislocate the shoulders upward. Short of dislocation, this superiorly directed force stresses the ligament above, the labrum. Diagnoses such as labral tear, impingement, and bursitis all eminate from an inadequate rotator cuff to prevent this superiorly directed destabilizing force.

A most important appreciation is the amount of biomechanical forces that are transmitted across the shoulder joint with any motion. When the bike is not being propelled, with the arms just leaning and supporting the body on the bike, one may assume 1/4 of body weight equivalent force across each shoulder (the seat supports rest of the body weight). However, when the leg pedals to propel the bike, each downward push is greater than body weight force depending on the gear level. A counterbalance pull must be exerted by the arms. This translates easily to a shoulder dislocating force of 2-3 times body weight with each pedal downward. Greater than 3 times body weight in hill climbs. For a 150 lb rider, this is equivalent to a pressure of over 300 lb that the rotator cuff must keep in check for that one hour spent on the bike on the flats. Higher in hill climbs.

In cyclocross where there is lifting and carrying the bike involved, even greater requirements are needed for rotator cuff strength. Lifting a 17 lb cyclocross bike and carrying it over a 10 foot distance is doing a work load of 170 ft-pounds. Assuming the bike is being carried in the hand rather than being rested on the shoulder; the leverage

effect being 10 times the distance where the rotator cuff muscles are inserted in the shoulder. This translates to a rotator cuff work load of 1,700 ft-pounds!

The ability of the arm to support weight and lift objects is predicated on a stable shoulder joint. Like the tires on a Formula 1 race car that keep the car on the track, your rotator cuffs keep your shoulder centered in the joint.

SLAP Tears - A Unique Proposition

An entity unique to all athletes is the SLAP tear. SLAP stands for *S*uperior *L*abrum *A*nterior and *P*osterior tear. It is a detachment of the top part of the fibrocartilaginous rim from the shoulder socket (glenoid) where the biceps tendon attaches. Tears can occur from 1) a direct fall onto an outstretched arm, 2) repetitive superiorly directed dislocating force with inadequate shoulder stability, or 3) reflexive biceps muscle eccentric contraction creating tensile stress on the biceps anchor in an unstable shoulder. The common link for all shoulder pain and SLAP tear is a weak rotator cuff.

All cyclists are at risk to SLAP tears due to the constant superiorly directed shoulder dislocating force from force-counter-force against the downward pedal as well as from simply supporting the rider's body weight.

How To Improve Cyclist's Shoulder Performance

The cornerstone for all shoulder injury prevention and performance programs is to strengthen the rotator cuff. Traditionally these have involved pulling elastic bands or lifting dumbbells. However, more important than to "strengthen" the four rotator cuff muscles, is to "train" how the four muscles *function in unison* to effect the desired movement. Therein lies the difference between "strengthening" and "training". Strengthening gets the muscle strong; training gets the muscle functional for a specific activity.

Shoulder performance among well conditioned cyclists has more to do with "motor control", *not* motor "strength". Strong shoulders will get you no where unless you have control. Elastic bands and weights do "strengthen" the rotator cuff muscles; however they do not "train" for function. Function is functional activity across multiple planes of motion, such as moving the arm from side to side during rides. When the shoulder moves through multiple planes of motion, each rotator cuff tendon must be responsive to changes in shoulder direction, shoulder acceleration, and shoulder deceleration. Shoulder joint stability throughout all ranges of shoulder motion can only be achieved by coordinated synergistic activation of all four rotator cuff muscles. Just like a well orchestrated symphony, all four muscles must work together as *one functional muscle unit.* This "one" functional equivalent muscle unit exerts a constant and well balanced

glenohumeral joint compression force through all planes of motions. This maintains shoulder joint stability throughout all planes of motion and ensures shoulder performance.

The ShoulderSphere Technique

Rather than pulling rubber bands or lifting dumbbells in a “linearly” directed fashion in one of four “directionally” based movements - the push, pull, lift, or the press; ShoulderSphere (Figure 1) is the only rotator cuff exercise device in the world that strengthens and trains ALL four of the rotator cuff muscles simultaneously in a rotational manner. Linear movements only work on one muscle, one plane, and one direction at a time. These are nonfunctional and may result in imbalanced muscle strengthening.

The use of ShoulderSphere involves active rotation of the ball inside the globe of the ShoulderSphere. When rotating the ball inside the globe in a circular motion, all surrounding muscles must work in a synchronized and balanced fashion in unison in order to to make this circular motion. Any rotator cuff shut down or imbalance will cause the ball inside the globe to drop and bounce rather than to rotate, which provides an immediate biofeedback to the user’s rotator cuff engagement. Additionally, when using the ShoulderSphere, the user’s wrist is locked in the splint by the strap, all the work needed to rotate the ball must all come from the four rotator cuff muscles. The elbow only goes up and down. The wrist, being locked, cannot compensate to rotate the ball. Therefore, all the rotation must come from the rotator cuff.... the rotator cuff *rotates.* These features make ShoulderSphere a most unique rotator cuff exercise device which provides the most selectively isolated rotator cuff workout of any technique available.

The Electronic Power Tracker

A special feature of ShoulderSphere is the attached electronic power tracker (the blue box in Figure 1). This electronic tracker gives real-time display of the power of rotator cuff muscles during workouts. Power is equal to arm velocity. Green light equates to low power for endurance workout, red light equates to high power workout for high intensity interval training style exercises (HIIT).

The power tracker is activated by active spinning of the ball inside the ShoulderSphere. The DIRECTION of spin does not matter. Since this is “circular” training, as long as the ball spins, ALL rotator cuff muscles are engaged. The principle of ShoulderSphere workout is to maintain a continuous smooth spin of the ball inside the ShoulderSphere throughout the entire training session. Avoid allowing the ball to bounce, which signifies one or more of the rotator cuff muscles has been shut down, thus the chain of the circle has been broken.

THE POWER TRACKING LIGHT—

Fast spinning makes the power light turn on in red, lower power velocity spin changes it to green. A test, and means of tracking one’s progress with power improvement, is one’s ability to maintain the tracker lit in red for 30-60 seconds continuously. This is high intensity interval training. Fun gauge regarding one’s own progress. GREEN light can be thought of as endurance training; RED light as power training. Activity translational equivalents can be thought of as that when the power tracker light is

maintained in red for 3 second while using the larger ShoulderSphere (A7 model), it is equivalent to the rotator cuff engagement required to stabilize a shoulder dislocating force of 300 lb. (such as in vigorous hill climb); when the light is lit in green, it is equivalent to the rotator cuff engagement against a shoulder dislocating force of 100 lb. as in riding on flat terrain.

Strengthening vs Training

ShoulderSphere can be used either as a pure rotator cuff strengthening device (in “static mode”), or as a training device (in “dynamic mode”). “Static mode” technique to strengthen the rotator cuff is performed by active rotation of the ball inside the globe without concurrent arm motion. “Dynamic mode” training technique is performed by moving the arm through various planes of motion while at the same time rotating the ball inside the globe (which actually also strengthens the rotator cuff muscles at the same time). Dynamic mode specifically trains the responsiveness of the rotator cuff muscles to adjust to the changing directions of multiplanar shoulder movements. All four rotator cuff muscles are trained to function as *one muscle unit*, not separately as four, to maintain glenohumeral joint compression at all times. This trains motor control and constant rotator cuff engagement for those ranges of motion.

The following video depict “Static mode” training - https://youtu.be/eT8s1yrWedg

“Dynamic mode” training - for motor pattern simulation training, as in this “power-5” movement pattern anticipating various positions the arm has to dynamically respond to —
https://youtu.be/Q_sOsUCLg_s

Perform 5 cycles, 2 sets, with each arm twice a week will surely bulletproof your shoulders and amplify performance, be it either road racing or cyclocross.

Here is combined dynamic shoulder workout with stationary bike training —
https://www.instagram.com/p/BWrteW4D9mp/?utm_source=ig_share_sheet&igshid=17p2ee30xb86m

In Conclusion

Strong shoulders are just as important as strong legs for all cyclists. Legs propel, shoulders support. You pedal for the course, but shoulders for the finish.

More important than shoulder strength, is shoulder control. Control comes from coordinated responsive rotator cuff muscles that function as one muscle unit, not as 4 separate muscles.

ShoulderSphere is the most efficient and effective rotator cuff training device you will ever need. It is also hands down the toughest rotator cuff exercise you will love.

To learn more about ShoulderSphere and how you can integrate various strengthening and training techniques to suit your needs, please visit www.ShoulderSphere.com and follow us on Instagram or Twitter @ShoulderSphere.

Dr. Chang is available for any questions or suggestions at Win@ShoulderSphere.com.