

PERFORMANCE VOLLEYBALL CONDITIONING

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Postural Priorities- Rib Cage Influences on Volleyball Blocking Mechanics

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Lisa was a member of the University of Nebraska volleyball team from 1995-1997. She was introduced to the science of Postural Restoration as a patient under the care of Ron Hruska. She had suffered from long-standing injuries sustained during her collegiate volleyball career and found success with the treatment techniques she learned at the Hruska Clinic and later received from the Postural Restoration Institute. Lisa returned to practice physical therapy at the Hruska Clinic Restorative Physical Therapy Services in Lincoln, Nebraska after completing her Doctorate of Physical Therapy from the University of Nebraska Medical Center in Omaha. Lisa is a member of the American Physical Therapy Association.



Lisa Bartels



Footwork, quickness, vertical jump and the ability to read the opponents offense are all important aspects that contribute to an effective block in volleyball. Just as important, is the ability to position the arms and hands in a way that effectively seals the net and channels the opponents attack. How the arms and hands are positioned is directly dependent on rib cage mechanics. Mechanically speaking, the optimal volleyball blocking strategy would simultaneously incorporate flexion of the thoracic spine, internal rotation of the ribs, and protraction of the shoulder blades. Many competitive athletes cannot coordinate these mechanical components because their rib cage is simply not in a position that allows them to. The purpose of this discussion is to breakdown the rib cage and scapula mechanics needed for effective blocking which will provide the reader with significant insight on appropriate training strategy. This discussion is second in a three part series; the first of which provided a general overview of rib cage and scapula mechanics, as well as a typical compensatory movement strategy often seen in the volleyball shoulder that increases the propensity for pain and injury.

A volleyball athlete must be able to achieve a neutral resting position of their thorax or rib cage so they can move the ribs into a state of exhalation during the blocking maneuver. Many volleyball players cannot achieve a neutral rib cage because the left and right polyarticular muscle chains of the thorax, which include the diaphragm and psoas, become pulled and positioned into suboptimal length tension relationships for biomechanical reasons discussed in the previous article. When the thoracic spine extends, the ribs externally rotate and the fibers of the left and right diaphragms are pulled

from a cylindrical dome-shaped position to a more straight vertically oriented position. If a volleyball athlete has excessive tone and strength in musculature that pulls the thoracic spine into extension, without appropriate antagonistic activity, the ribs will always remain in an externally rotated state. Thus the diaphragm will remain in a state of inhalation and faulty compensatory mechanics will ensue to provide respiration. Specifically, the back, chest and neck musculature will be recruited for lung inflation, which will further promote extension of the thorax and external rotation of the ribs. The ribs in this position elevate in the front and descend in the back. This altered rib position will result in loss of the convex rib surface required for optimal scapula thoracic congruence. The scapula is therefore directed into a passive protracted position and the length tension relationships of the scapular stabilizers are now also sub-optimal. Active protraction in this postural alignment is not possible and the athlete's ability to reach over the net is significantly compromised.

Initial treatment and training strategy should focus on establishing and promoting appropriate diaphragmatic function, particularly on the left, so that thoracic flexion is actually possible. An athlete will not be able to adequately flex the thoracic or mid back levels of the spine if they do not possess the proprioceptive awareness of the left diaphragm for inhalation. If the ribs remain in external rotation because the spine remains in extension, the diaphragm will adapt to a dyssynchronous postural role, in which it remains in a vertically splinted position. Performing maximum exhalation, particularly against positive air pressure is a great neuromotor retraining technique that can be used to restore synchronous diaphragmatic pumping by pulling the elevated externally rotated ribcage down into internal rotation with maximum abdominal recruitment for exhalation. At this point the athlete has achieved a state of exhalation in which the diaphragm is in a resting cylindrical dome shaped position. It can now be neuromotorly recruited to contract for inhalation, instead of for postural anti-gravity support. Excessive tone in the neck, chest and back will begin to normalize, particularly once the athlete utilizes diaphragmatic breathing during dynamic functional activity. (Figure 1 and Figure 2)

Once diaphragmatic activity has been established, it can be integrated into activities that maximize active thoracic flexion. Active thoracic flexion promotes the required convexity for the scapula thoracic joint by positioning ribs under the scapula. Squatting, if performed correctly, is an extremely effective way to promote thoracic flexion because it inhibits back extensors by

engaging the gluteals, quadriceps and abdominals. It is extremely easy to inappropriately engage the back extensors for glute activity while the squat is being performed. If an athlete cannot maintain a neutral pelvic position while descending into a squat position without rotating into a lordotic position because of recruitment of the back extensors, they should not be performing this lift as part of their training regimen. Excessive neuromotor tone or strength in the back extensors (i.e. the latissimus dorsi) is the predominant reason the rib cage essentially pulls away from the scapula and scapular thoracic congruence is lost. (Figure 3 and Figure 4)

Most volleyball athletes who possess average jumping ability and above average height can easily position their arms and hands above and over the volleyball net. How long the block is maintained, as well as the degree of downward angle the arms and hands form, however, makes all the difference between blocking the opponents attack, getting used or missing the attack entirely. The optimal volleyball blocking strategy should simultaneously incorporate flexion of the thoracic spine, internal rotation of the ribs and protraction of the shoulder blades. Protraction of the shoulder blades is reaching. Efficient blocking is reaching. Many common training and strengthening activities utilize pushing and pulling mechanics, such as bench press, lat pull downs, rowing, etc. Reaching is a specific movement strategy that is very different from pushing and pulling.

With a neutral rib cage and functional ability to flex the thoracic spine, the scapular stabilizers, specifically the lower trap and triceps, can be appropriately recruited and trained to retract the scapula which has been in a compensated passive protracted position. A retracted scapula is now in a position to actively protract. The serratus anterior, which attaches to the medial angle, vertebral angle and inferior angle of the scapula and spans to the outer surface and upper border of ribs 1-8, can now be trained to protract or pull the scapula forward on the rib cage during reaching activities. One of the best training strategies that maximizes shoulder blade protraction and serratus anterior neuromotor recruitment, in conjunction with squatting and thoracic flexion, is a Standing Resisted Wall Reach. Ironically this training position closely resembles the block position. (Figure 5, 6, 7 and 8)

In summary, many volleyball athletes are hindered in their ability to effectively position the arms and hands over the net during volleyball competition because of postural discord and faulty neuromotor mechanics. However, with appropriate training strategies, optimal mechanics can be restored in most athletes fairly quickly because they are coordinated. The same athletic ability that has given them success in sports will be equally important in restoring optimal biomechanics. Implementing training strategies that maximize shoulder protraction during concomitant thoracic flexion with diaphragmatic breathing will enable your athletes to reach and set a viable block during the ascending and descending phases of the block jump.

More Information Please!

Please note that techniques provided in Figures 1 through 8 are only examples of the many non-manual Postural Restoration Institute™ techniques that could be considered appropriate for addressing the underlying biomechanical deficit described. For more information and references, please visit www.posturalrestoration.com.

Figure 1 - 90-90 Hip Lift with Right Arm Reach and Balloon

1. Lie on your back with your feet flat on a wall and your knees and hips bent at a 90-degree angle.
2. Place a 4-6 inch ball between your knees.
3. Place your right arm above your head and a balloon in your left hand.
4. Inhale through your nose and as you exhale through your mouth perform a pelvic tilt so that your tailbone is raised slightly off the

mat. Keep your low back flat on the mat. Do not press your feet flat into the wall instead dig down with your heels.

5. Place your right hand straight up in the air and place a balloon in your left hand.

6. Take a deep breath in through your nose, as you exhale into the balloon reach towards the ceiling with your right arm.

7. Hold this position and pause 3 seconds with your tongue on the roof of your mouth to prevent airflow out of the balloon.

8. Without pinching the neck of the balloon and keeping your tongue on the roof of your mouth, inhale again through your nose and exhale into the balloon while reaching further towards the ceiling with your right arm.

9. Hold this position and pause 3 seconds.

10. After the fourth breath in, pinch the balloon neck and remove it from your mouth. Let the air out of the balloon.

11. Relax your arm and pelvis and repeat the sequence 4 more times.



Figure 1

Figure 2 - Sidelying Swiss Ball with Apical Expansion and Balloon

1. Place a Swiss ball of appropriate size against a wall.

2. Lie on your left side with your left forearm on the ground and place a balloon in your right hand.

3. Place your right leg out in front of you and your left heel against the wall.

4. Turn your left toes up towards the ceiling and lift your left foot off the ground. You should feel your left inner thigh engage.

5. Keeping your left leg up, inhale through your nose and slowly blow out into the balloon.

6. Pause three seconds with your tongue on the roof of your mouth to prevent airflow out of the balloon.

7. Without pinching the neck of the balloon and keeping your tongue on the roof of your mouth, take another breath in through your nose.

8. Slowly blow out again as you stabilize the balloon with your hand.

9. Do not strain your neck or cheeks as you blow.

10. After the fourth breath in, pinch the balloon neck and remove it from your mouth. Let the air out of the balloon, relax and stand up slowly.

11. Repeat sequence 2 more times.



Figure 2

Figure 3 - Standing Supported Left AF IR Bilateral Squat

1. Stand against a desk or counter and place your left foot on a 2-inch block.

2. Place your hands on the surface in front of you and round your back.

3. Keeping your back rounded, attempt to place an equal amount of weight through both legs as you straighten your left knee. You should feel the muscles in the front of your left thigh and left hip

engage.

4. Maintaining an equal amount of weight between both legs, squat down by bending both knees as you keep contact with your right shoe arch. You should feel the muscles on the front of both thighs engage.

5. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.

6. Relax and repeat 4 more times.

Option:

1. Perform steps 1-4.

2. Slowly straighten both knees as you continue to maintain an equal amount of weight between both legs.

3. Continue to squat up and down on both legs until you have performed 10 repetitions.

4. Relax and repeat 2 more times.



Figure 3

Figure 4 - Reverse Squat

1. Stand away from a wall.

2. Squat down until your knees are maximally bent.

3. Reach forward with your hands as you attempt to maintain your bodyweight through your heels not your toes. Your back should be rounded and relaxed.

4. Keeping your hands reaching forward and your back rounded, slowly begin to raise your bottom up by straightening your knees as you push through your heels.

5. Continue to stand up as your back stays maximally rounded. Once you are upright, your knees should still be slightly bent.

6. Relax and repeat 4 more times.



Figure 4

Figure 5 - Paraspinal Release with Left Hamstrings

1. Place both of your palms on a 3-4 inch block and place your feet directly out in front of you.

2. Pull your shoulder blades down and back and dig both of your heels into the floor as you bring your hips up and off the floor by pushing through your arms. You should feel the muscles on the back of your thighs engage.

3. Once your hips are in the air, round your back by tucking your bottom up or in.

4. Continue to dig both of your heels into the floor as you move your hips slightly forward or away from the block.

5. Keeping your hips forward and your shoulders down,



Figure 5

pick your right foot off the ground. You should feel the back of your left thigh engage.

6. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.

7. Relax and repeat 4 more times.

Figure 6 - Bench Hooklying Thoracic Pull Ups

1. Lie on a bench with your knees bent and your hands gripping a bench press bar.

2. Pull your shoulder blades down and together.

3. Inhale through your nose and exhale through your mouth performing a pelvic tilt so that your tailbone is raised slightly off the bench. Keep your back flat on the bench.

4. Keeping your shoulder blades pulled down and your hips raised slightly off the mat, begin to pull your body towards the bar. Keep your back and neck straight with your trunk as you come up. You should feel the muscles in the back of your shoulder blades engage.

5. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.

6. Relax and repeat 4 more times.



Figure 6

Figure 7 - Standing Resisted Wall Reach

1. Place tubing securely in door slightly below shoulder level.

2. Stand with your heels 7-10 inches away from the wall.

3. Stand up straight with a ball between your knees and feet lined up with each other.

4. Place your hands through the loops of the tubing with your palms facing down.

5. Straighten your arms out in front of you and round your back, engaging your abdominals.

6. Once you can feel your abdominals working begin to squat as you squeeze the ball.

7. Squat down until your bottom touches the wall (do not fall back into wall).

8. Inhale through your nose.

9. As you exhale through your mouth reach forward and downward as your back stays rounded.

10. Hold arms steadily in this position as you inhale again and expand your back.

11. Exhale and reach forward further with your arms.

12. Complete 2 more breaths in and out reaching further each time you exhale.

13. Stand up while keeping arms straight, back rounded, abdominals and inner thigh muscles engaged.

14. Relax and repeat 4 more times.



Figure 7

Figure 8 - All Four Belly Lift

1. Position yourself on your hands and knees and arch your back so

that it is rounded.

2. Maintaining a rounded back, raise your knees off the mat until your legs are straight.

3. Shift your weight to your left side and raise your right hand slightly off the mat. You should feel the muscles in your left shoulder blade engage.

4. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.

5. Place your right hand back on the mat and shift your weight to your right side.

6. Raise your left hand slightly off the mat to feel the muscles in your right shoulder blade engage.

7. Hold this position while you take 4-5 deep breaths in through your nose and out through your mouth.

8. Relax and repeat 4 more times with each arm.



Figure 8