

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Introduction

By Scott Rodeo, MD

Chair of the USA Swimming Sports Medicine Committee and Team Physician for the NFL's NY Giants

Pain in the shoulder is common in swimmers. Shoulder function is highly dependent on the coordinated function of many muscle groups. These include the muscles around the shoulder, those that control the scapula or shoulder blade, muscles in the upper and lower back, as well as abdominal and pelvic muscles. Since the shoulder is an inherently unstable joint, muscle forces are critical for maintaining stability, proper motion, and painless function. The repetitive overhead activity of the swimming stroke can result in fatigue of these muscles. This in turn can lead to distinct changes in the function of the shoulder, resulting in the pain that is commonly known as "swimmer's shoulder". One of the major factors causing shoulder pain is overuse and subsequent fatigue of the rotator cuff muscles, scapular muscles, and muscles of the upper and lower back. Consequently, this fatigue can lead to shoulder instability and predispose a swimmer to shoulder pain. The risk of injury and pain is especially true for swimmers who swim with poor technique.

It is well-established that a comprehensive program to develop strength, endurance, balance, and flexibility of the muscles is the most important way to prevent "swimmer's shoulder". The exercises described in this review were chosen to develop these characteristics based on a sound knowledge of the muscles that are most important for optimal shoulder function. These exercises were chosen and reviewed by a panel of physicians, therapists, biomechanists, trainers, and coaches from USA Swimming's Sports Medicine Society. These exercises have been proven to be effective in improving shoulder function for swimmers. These exercises address the three important areas:

- 1) the **rotator cuff**,
- 2) the **muscles that stabilize the shoulder blade**, and
- 3) the muscles of the low back, abdominal, and pelvis that make up the "**core**" of the body – the abdominal and lower back muscles.

It is important to note that these exercises should only be performed by the uninjured athlete. Injured athletes may need to modify the exercises in duration and/ or range of motion depending on the level of pain or impairment the athlete is experiencing.

In doing these exercises, keep in mind that the shoulder does not act by itself when you swim. You use your back, trunk and even your legs to help stabilize the body and help in the pulling movement. You will use many of these same muscle groups as you perform these exercises. Also, these exercises should be performed **AFTER** practice or several hours before you practice. *DO NOT do these exercises right before your workout* since you do not want to fatigue these muscles before you swim.

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Primary Rotator Cuff Exercises

The first group of exercises we want to describe is designed to strengthen the rotator cuff muscles in the shoulder. The rotator cuff is made up of four small muscles deep in your shoulder. When these muscles contract they cause the shoulder to:

Rotate the arm away from the body. This movement is called external rotation.



Rotate the arm towards the body. This movement is called internal rotation.



Lift the arm away from the body. This movement is called shoulder abduction.



Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Exercise #1 - External Rotation

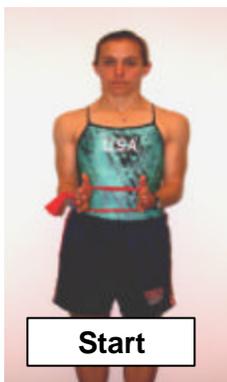
Equipment: To perform this exercise you will need a light to moderate resistance Theraband or surgical tubing. How do you determine what strength Theraband is right for you? Pull on it and if it feels like the resistance is too light – you probably have the right level of resistance. You will be performing many repetitions so a resistance that feels too easy will probably be just right as you start to fatigue.



The Movement: The External Rotation exercise focuses on strengthening the muscles that externally rotate the shoulders. The muscles that perform this motion usually are weak in swimmers. You are going to strengthen both sides of your body in this exercise.

Start by cutting the Theraband and tying it into a loop. The loop should be big enough so that your hands are 6-8 inches apart when your elbows are at your sides and your forearms are parallel to the floor.

Stand up straight with good posture. Do not hunch your shoulders forward. Lift your sternum and your chest towards the ceiling to help set your shoulder blades in the proper position.



Your elbows should be at your sides and should be bent 90 degrees so your forearms are parallel to the floor and your thumbs are pointing towards the sky. Perform the exercise by trying to rotate your hands away from your body like you are pulling taffy apart. The figures to the left show the correct start and finish positions.

Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Focus on squeezing your shoulder blades together before you start this exercise. Feel this squeeze through the ENTIRE exercise. If you do not focus on squeezing the shoulder blades you will be exercising the wrong muscles.



You should take about two seconds to complete each repetition – 1 second as the muscles contract and you externally rotate the shoulders. Then take 1 second as you return to the starting position. Count 1-and-2-and, 1-and-2-and as you perform the exercise to get the correct timing.

You should perform 3 sets of this exercise, resting 30 seconds between each set. Each set should end after 2 minutes or when you are no longer able to maintain correct form. It is time to end the set if:

- the shoulders start to roll forward,
- you use your upper body or wrists to help the motion or,
- you are unable to keep your shoulder blades squeezed together.

It is okay if you are only able to complete a few repetitions at first, but strive for completing 3 sets of 2 minutes. When you can do this, move up to a higher resistance Theraband.

Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Exercise #2 – Full Can Scaption/ Full Can Arm Straight Arm Lifts

Equipment: You do not need equipment to perform this exercise, but as you get stronger, you can use some very light weights. You can make your own weights by filling two small water bottles with sand.

The Movement: The Full Can Exercise gets its name because performing it is like lifting a can without spilling its contents. The exercise strengthens the part of your rotator cuff that lifts the arm. Start this exercise using no weight. As you progress and get stronger you can use very light weights with this exercise, but even the strongest athletes should not lift more than 5 extra pounds.



Stand upright with your feet shoulder width apart and do not allow the shoulders to slump forward. Lift your chest towards the ceiling to help set the shoulder blades in the proper position. Focus on pinching your shoulder blades together and you should feel tension in these muscles for the entire exercise. The figures to the left show the proper posture and starting position.

Raise your arms so that they extend straight out to your sides. Move your hands forward about 1-2 feet so they are now slightly ahead of your shoulders to get in the proper exercise position. This will actually allow you to perform the movement in the same plane of the shoulder blade. Keep your thumbs turned up so they are facing the sky. (See figures to the right).



Lower your hands to your side and then lift them up again so your hands end up level with the top of your head (See the figures showing the start and finish positions for the exercise to the left).

Maintain a steady cadence – Take 1 second to lift your hands to head level and one second to lower the hands back to your sides. As you raise and lower your hands, count slowly 1-up-2-up, 1-down-2-down... Remember to keep your hands and arms ahead of your shoulders and

**Shoulder Injury Prevention
A Series of Exercises for the UN-Injured Swimmer**

**Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002**

keep your shoulder blades together.

Continue this exercise for 2 minutes or until you are unable to lift your arms while keeping your shoulder blades pinched together. Perform 3 sets in this way taking 30 seconds rest between each set.

Shoulder Injury Prevention

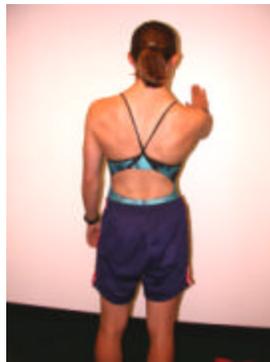
A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Exercise #3 – Ball on the Wall

Equipment: One tennis ball or light medicine ball.

The Movement: The Ball on the Wall exercise is designed to strengthen the muscles that internally and externally rotate the shoulder. You will need a tennis ball or a light medicine ball to perform this exercise.



Facing the wall, stand up straight with one arm extended in front of you so that your palm almost touches the wall. Keeping the elbow straight, “pin” the ball between your hand and the wall. Pinch your shoulder blades together and feel that contraction through the entire exercise.

Roll the ball in small circles in a counter-clockwise motion for 15 seconds. Each circle should take about 1 second to complete. Without stopping, switch directions and make small circles in a clockwise direction.



Control the cadence so that you make one circle each second. Continue this exercise, switching between making clockwise and counter-clockwise circles, until you become fatigued, or 2 minutes, whichever ever comes first.

You know you are fatigued if you can not keep your shoulder blades squeezed together, if you hunch your shoulders, or if you can not hold the ball against the wall. Perform 3 sets, but do not go longer than 2 minutes for each set.

Repeat this procedure for the other arm.

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Primary Shoulder Blade Stabilizing Exercises

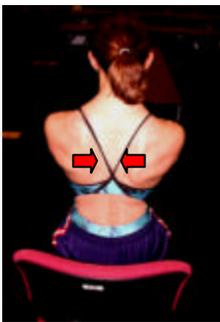
The second group of exercises, the Shoulder Blade Stabilizers, is designed to strengthen the muscles that control how your shoulder blades move. These muscles are found in the middle of your upper back and along your sides. When these muscles contract, they cause your shoulder blades to rotate or slide across your back. They work in coordination with the rotator cuff muscles to control the movement of the shoulder. If these muscles are weak, you can put too much stress on the rotator cuff when you swim.

Exercise #4 – Theraband Rowing

Equipment: One moderate resistance Theraband.

The Movement: Theraband rowing strengthens the muscles that hold your shoulder blades in place. These muscles are important in helping your shoulder joint to move when you swim.

First, make a loop with the Theraband and tie the ends together. The loop should be about 2 feet long. Attach the loop to a doorknob or some other stationary object that will not move when you pull on the Theraband. Sit on a bench or at the edge of a chair. Position the chair so that when your arms are extended in front of you the Theraband is just taut.

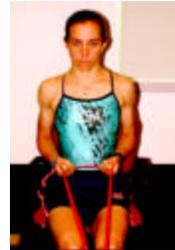
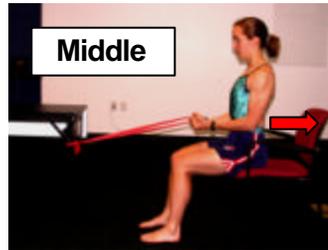
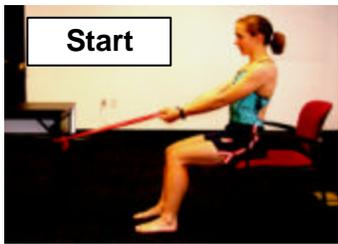


Sit with an upright posture, and lift the chest to help set the shoulder blades in the proper position. Do not hunch the upper back or shoulders.

Pull your hands toward your body. Keep your elbows in and pull your hands to a point between your belly button and your rib cage. Make sure you lead the pull with your elbows. Your palms should be facing upward when you pull towards your chest. See the figure below for proper start, middle and finish positions.

Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002



Remember to focus on squeezing the shoulder blades together with each row and maintaining this contraction for the entire exercise.

Maintain a comfortable cadence, completing 1 complete repetition every 2 seconds. Count to yourself 1-and-2-and, 1-and-2-and taking one second for the contraction and 1 second as you return to the starting position. Perform 3 sets of this exercise. Each set should end when you become fatigued or reach 2 minutes of exercise. Take 30 seconds rest between sets and strive for completing 3 sets of 2 minutes each. Like the other exercises, fatigue is indicated when your posture slumps, or you cannot keep your shoulder blades pinched together.

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

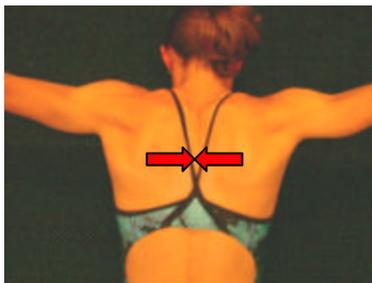
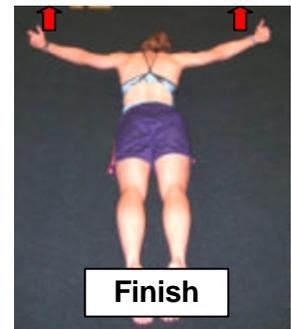
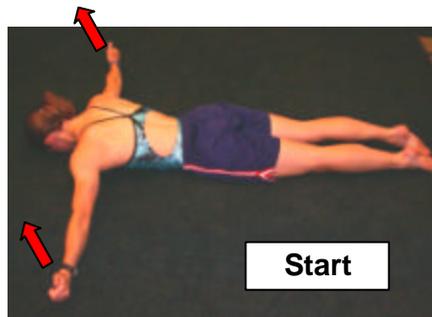
Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Exercise #5 – Hitch Hiker

Equipment: No equipment is needed for this exercise, but as you get stronger, you can use some very light weights. You can make your own weights by filling two small water bottles with sand. These should weigh less than 2 pounds, even for the strongest swimmers.

The Movement: The Hitch Hiker exercise strengthens the muscles that control your shoulder blades as well as your rotator cuff muscles. You can exercise both sides of body at the same time, or choose to do one arm at a time.

Lay on your stomach on the floor. Relax your head and keep it in line with your spine. Put your arms straight out to your sides with your thumbs pointing to the ceiling (It looks like you are hitch-hiking).



While squeezing your shoulder blades together, lift your hands up off the floor and move them slightly towards your head. Use both arms at the same time. You should end up in a position that looks like a “Y” at the end of the exercise. Hold this position for 1-2 seconds and then relax to the starting position. Repeat.

Try to perform this exercise for 2 minutes. If you cannot continue the exercise for 2 minutes, that's okay. When you become fatigued and can no longer maintain your form, rest for 30 seconds. Perform your second and third sets the same way.

If you reach the point where you can complete 3 sets of 2 minutes, perform the exercise while holding some small weights (less than 2 pounds) in your hands. Remember, you can make your own weights by filling small water bottles with sand, and you can also perform this exercise with one arm at a time.

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

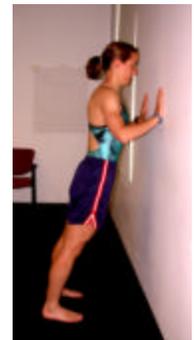
Exercise #6 – Push Ups with a Plus

Equipment: None.

The Movement: This push up exercise strengthens your chest muscles like a normal push up, but there is an added motion at the end that strengthens one of the muscles that stabilizes your shoulder blades. There is a progression to this exercise, which means you will first perform the exercise against a wall while standing. As you get more advanced you can do this exercise while on your knees and then finally in a traditional push-up position.



To start this exercise, stand at arms length away from a flat wall. When you stand up straight your palms should touch the wall. The hands should be shoulder-width, or slightly wider than shoulder-width, apart.



Allow your chest to move towards the wall, as you would into a normal push up position. Once you are in the “down position” push away from the wall. It is important to do this slowly so your hands never lose contact with the wall.



“Plus” Position

When you reach the normal ending position for a push up you want to keep going. This is where the extra action comes in. Continue pushing so that your shoulders rotate forward a bit. It should feel like the center of your back is farther away from the wall than your shoulders, as if you are raising your back like an angry cat. This is the extra motion that strengthens the stabilizers of your shoulder blade.

Hold this position for 2 seconds and repeat the action. Continue each set until you fatigue and start to lose form or until you reach 2 minutes, which ever comes first. Complete 3 sets, resting 30 seconds between each set.

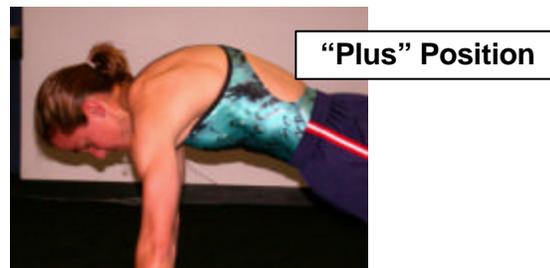
Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

As you become stronger, perform the same exercise when kneeling on the floor.



And eventually you will be able to perform normal push-ups with the extra motion.



Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Primary Core Strength Development

The third series of exercises focuses on developing strength in your abdominal and lower back muscles. These are some of the **core** muscles of your body. The muscles in the core of your body are essential for helping you maintain balance in the water when you swim. Balance is one of the most important skills you can develop. With weak abdominal and lower back muscles you will not be able to achieve a sufficient level of balance using your core. If you are like most swimmers, you will then try to achieve balance by changing your arm position or your stroke pattern. This places added stress on the shoulder and can lead to shoulder problems. There are many abdominal and lower back exercises you can do to strengthen these muscles. We will show you two of these exercises.

Exercise #7 – Dead Bug

Equipment: None.

The Movement: The Dead Bug exercise strengthens your abdominal muscles and gets its name because if you do it correctly you will look like a bug that is flipped over on its back waving its legs in the air.



Lay on the floor and put your hands under your tailbone.

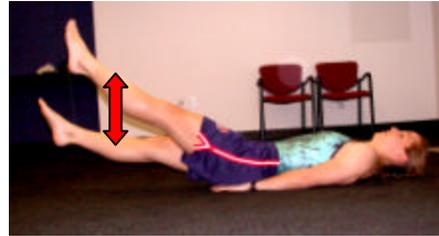
Tighten up your lower abdominal muscles by trying to pull your belly-button in towards your spine. This will help you avoid excessive arching in your lower back. It is important to keep your back **FLAT** on the floor at all times.



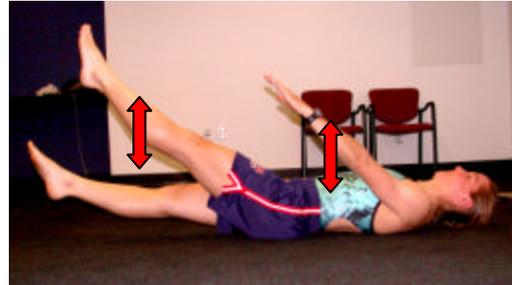
Lift your legs off the floor and perform a light “flutter kick.” Continue this movement for 2 minutes or until you can no longer keep your lower back flat. See the figures below for proper positioning.

Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002



When you master this technique, you can remove your hands from under your tailbone and perform a flutter kicking like movement with your straight arms.



This form of the exercise (using the arms) is more difficult. You must make sure you do not allow the lower back to arch very much to avoid injury and work the appropriate muscles.

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Exercise #8 – Quadruped

Equipment: None.

The Movement: It's called the Quadruped exercise because initially you resemble an animal walking on all fours. When performing this exercise you will strengthen muscles in the lower back and abdominal region and foster strength development between the two sides of your body.

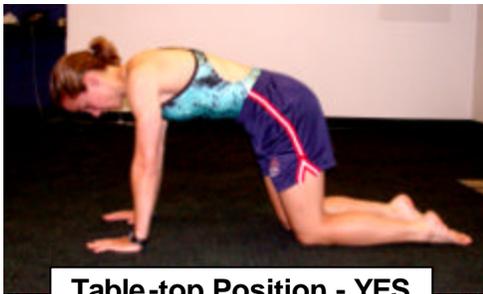
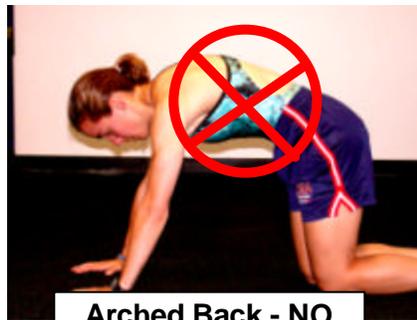


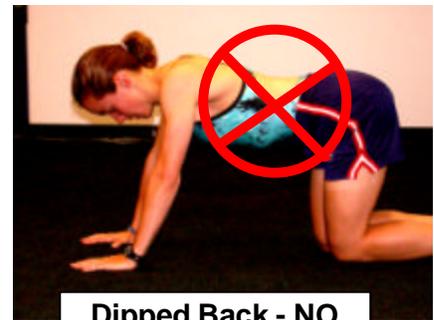
Table-top Position - YES

Start this exercise with your hands and knees on the floor. Get into a "table-top" position by flattening out your back.

There should not be an arch in your back, nor should there be a dip. This will require tightening up your abdominal and lower back muscles. Think about pulling your belly-button in towards your spine.



Arched Back - NO



Dipped Back - NO

Once you've achieved the proper starting posture, simultaneously lift your left arm and right leg – straightening them out so they are parallel to the floor. Hold in this position for a second making sure you maintain a flat back.

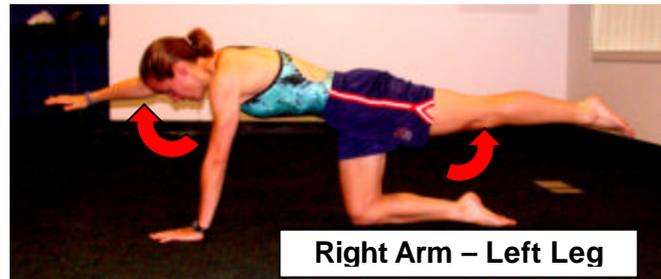


Left Arm – Right Leg

Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Slowly bring the hand and knee back to the floor. Repeat the action lifting the right arm and left leg.



Alternate in this fashion for 2 minutes or until you become fatigued. You are fatigued if you cannot lift the arm or leg parallel to the floor or if you are not able to maintain your flat back posture. Perform 3 sets with 30 seconds rest between each set.

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Stretching

We have talked a lot about strengthening muscles so far. However, stretching is also important to make certain you can use your newfound strength.

Strengthening + Stretching = Function.

By combining the strengthening and stretching exercises, you will help reduce the likelihood of shoulder injury when you swim.

Exercise #9 - Hamstrings Stretch

Equipment: Towel

The Movement: The Hamstrings Stretch engages the group muscles in the back of your thigh. These muscles, the hamstrings, help you bend your knee and also are involved in straightening out your hip. They have a lot of control over the position of your pelvis and therefore impact your body position and balance in the water. You are much better able to control your balance in the water if your hamstrings are loose. This exercise is designed to help you stretch these muscles.

Lay flat on your back on the floor.



Keeping the leg that is not going to be stretched flat on the floor, loop the towel around the ball of your foot. Gently straighten your leg, and pull it towards your body. Do not lock your knee. A slight bend in the knee is necessary for safety reasons, but it should not be bent a lot.



Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Keep your pelvis on the floor and do not rotate your body to help you get your leg closer to your torso. Pull until you feel a moderate stretch in the back of your thigh and hold that position for 30 seconds.



Perform the stretch 2 times on each leg. **You should not feel pain in this stretch or in any stretch. If you feel pain stop the stretch immediately.**

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Exercise #10 – Upper Back Stretch

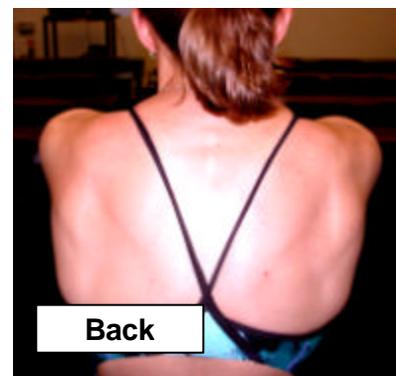
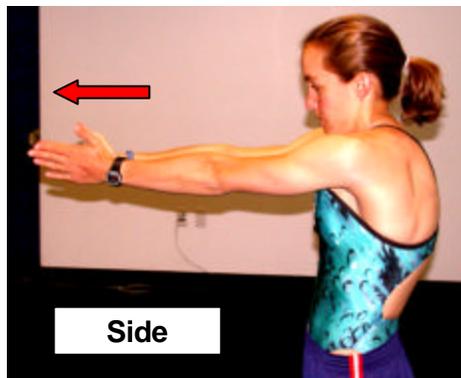
Equipment: None.

The Movement: The Upper Back Stretch targets the trapezius (tra-pee-zee-us) muscle, which connects your neck and your middle back to your shoulder blades. Good flexibility is needed in this muscle in order for the shoulder blades to move normally. This exercise is designed to stretch the upper part of the trapezius muscle since it tends to get tight in swimmers, and a tight muscle may contribute to shoulder pain.



Stand up straight and push the palms of your hands together in front of your chest.

Push your hands straight away from your body while continuing to squeeze your palms together. Try to keep your shoulders from moving upward towards your ears by pushing straight away from the body. Continue to push your hands away from your body until you feel a moderate stretch in your upper back and between your shoulder blades. See the front, side and back views of the stretch below.



Hold this position for 30 seconds and repeat after a 15-second rest. Be sure to breathe (do not hold your breath!) as you perform this exercise.

Shoulder Injury Prevention

A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Exercise #11 – Neck Stretch

Equipment: None.

The Movement: The Neck Stretch is another way to stretch the muscles of your upper back. This stretch targets the upper trapezius muscle.

Stand up straight and do not roll or hunch the shoulders. Place one arm in the small of your back. The elbow should be bent so that the forearm is parallel to the floor. Press your arm into the small of your back to provide some stability for the movement, but you do not have to “grab on” to anything.



Place the other hand on the top of your head. Gently guide your head towards your shoulder, bending it to the side until you feel a moderate stretch on the opposite side of your neck. Remember, bring your head to your shoulder and do not raise the shoulder to meet the head.

Hold this position for 30 seconds. Rest 15 seconds, then repeat.



You can also stretch a different part of the muscle by looking at the armpit of the pulling arm.

Try both to stretch as much of the muscle as possible.

Perform the same stretch on the other side of your body.

Shoulder Injury Prevention A Series of Exercises for the UN-Injured Swimmer

Presented by
USA Swimming and the Sports Medicine Task Force on Swimmer's Shoulder
April 2002

Conclusion

We hope that you will find time to incorporate the exercises described above into your training routine.

If you have difficulty performing a specific exercise or if you have pain while doing an exercise, it is best to stop that exercise and seek advice and an evaluation from a medical professional who has expertise in this area. The USA Swimming web site lists medical practitioners in your area who have experience with shoulder problems in swimmers; this list is available under the Sports Medicine section on the web site. To find a specialist where you live, please log onto the USA Swimming web site at www.usa-swimming.org. Choose "Science and Technology" from the pull down menu on the left side of the page and from there select the "Sports Medicine" link. You may also directly contact USA Swimming for further information on referrals.

Good luck!

Acknowledgements

USA Swimming would like to thank the following professionals for their contributions to this program:

Scott Rodeo, MD
Chair, USA Swimming Sports Medicine Committee

Murray Stephens
Vice President, USA Swimming Technical Committees

Mahlon Bradley, MD
Rick Eagleston, PT, ATC
George Edelman, PT
Paul "Strib" Ellison, MD
Julie Gorman, PT
Scott Heinlein, PT
Margaret Hunt, ATC
Rick Laing, PT
Jim Johnson, MD
Mike Leahy, Chiropractor
Joe Noel, PT
Scott Riewald, PhD
Charlene Boudreau, MS
Ed Ryan, ATC