

# Swimming Injuries and Prevention for Coaches

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DPT Student Capstone

# Learning Objectives

By the end of this presentation, coaches will:

1. Understand the statistics behind shoulder pain and the cycle that pain creates
2. Associate shoulder anatomy with potential pathologies causing “Swimmer’s Shoulder”
3. Connect technical problems with shoulder pain
4. Understand how their scope of practice can be used to help swimmers in pain
5. Know several strategies to reduce shoulder stress and muscle pain
6. Understand exercises useful for prevention of shoulder pain
7. Understand the role of stretching and a useful stretching screen

# Who am I?

- 16 years of competitive swimming experience
  - Seacoast Swimming Association under Mike Parrato/Jared Felker
  - American University Swimming and Diving – D1
- UNC Doctor of Physical Therapy Candidate – looking to specialize in sports physical therapy
- 8 Years of coaching experience – currently at ACCH
- Passion for the sport and injury prevention/rehabilitation

# Swimmers are getting injured<sup>2,5,7</sup>

- Prevalence of shoulder injuries in swimmers is 40-91%
- Why?
  - 90% of the propulsive force is generated by the shoulder
  - Upwards of 60,000 meters/week with approximately 30,000 strokes per arm.
- High school/college level athletes have the highest incidence of shoulder pain
  - Directly correlates to number of hours of training per week

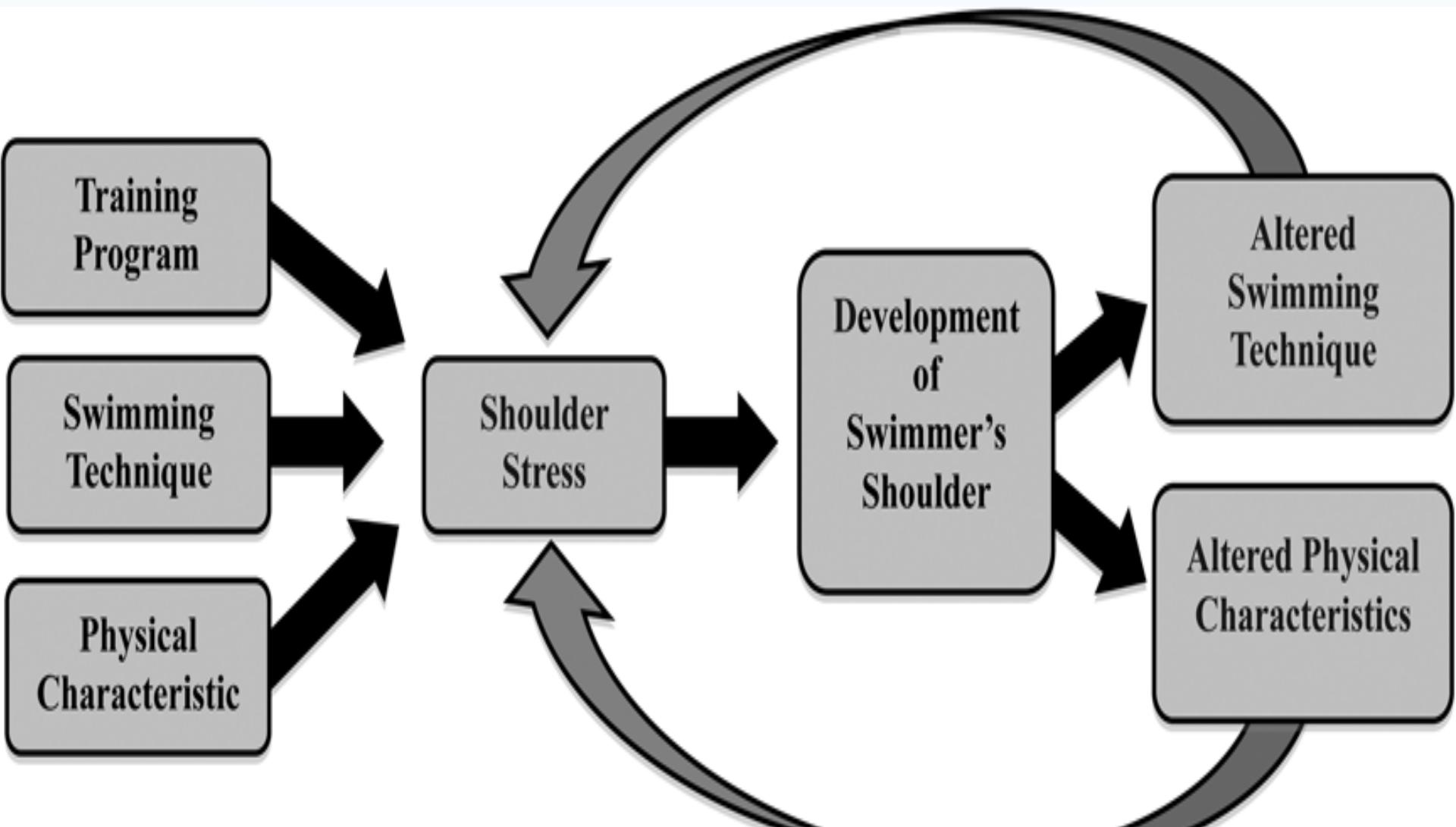
# Swimmer mindset<sup>9</sup>

- Many swimmers are under the impression that shoulder soreness/pain is a normal response to the sport.
- As a result, many reports of shoulder pain go under the radar.
- Swimmers push through pain in belief that it is normal and/or will go away during taper time.
- Many use medications PRIOR to practice in order to accommodate for pain during practice.

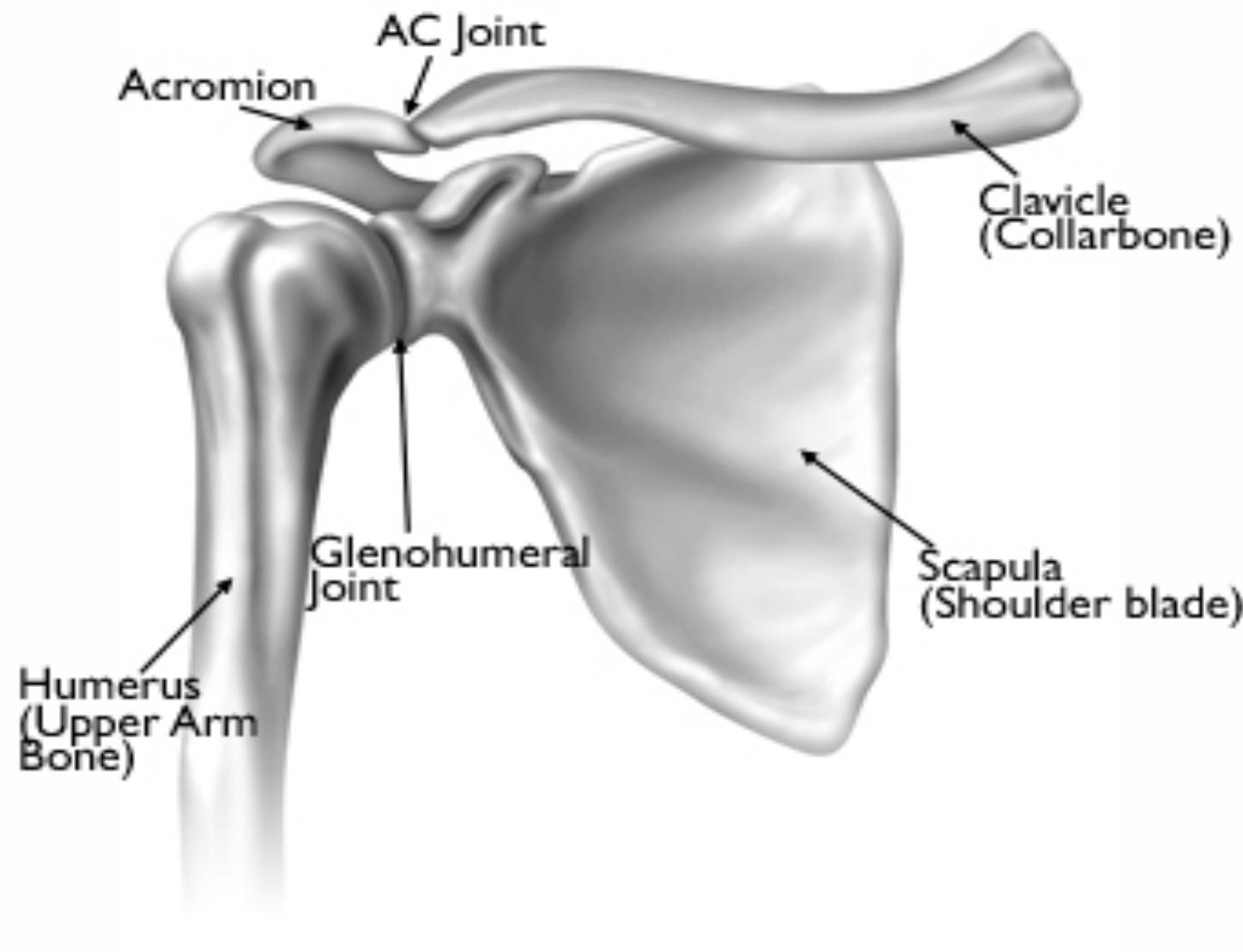
# Attitudes towards injury<sup>9</sup>

- A study in 2013 polled 102 swimmers about pain:
  - 43% believed mild shoulder pain is necessary to complete practice
  - Only 15% disagreed with the statement that taking time off for injury is NOT an option – no one strongly disagreed
  - 87% believed pain will go away during taper time
  - 47% regularly used medications
  - 85% reported any mild shoulder pain in the last year

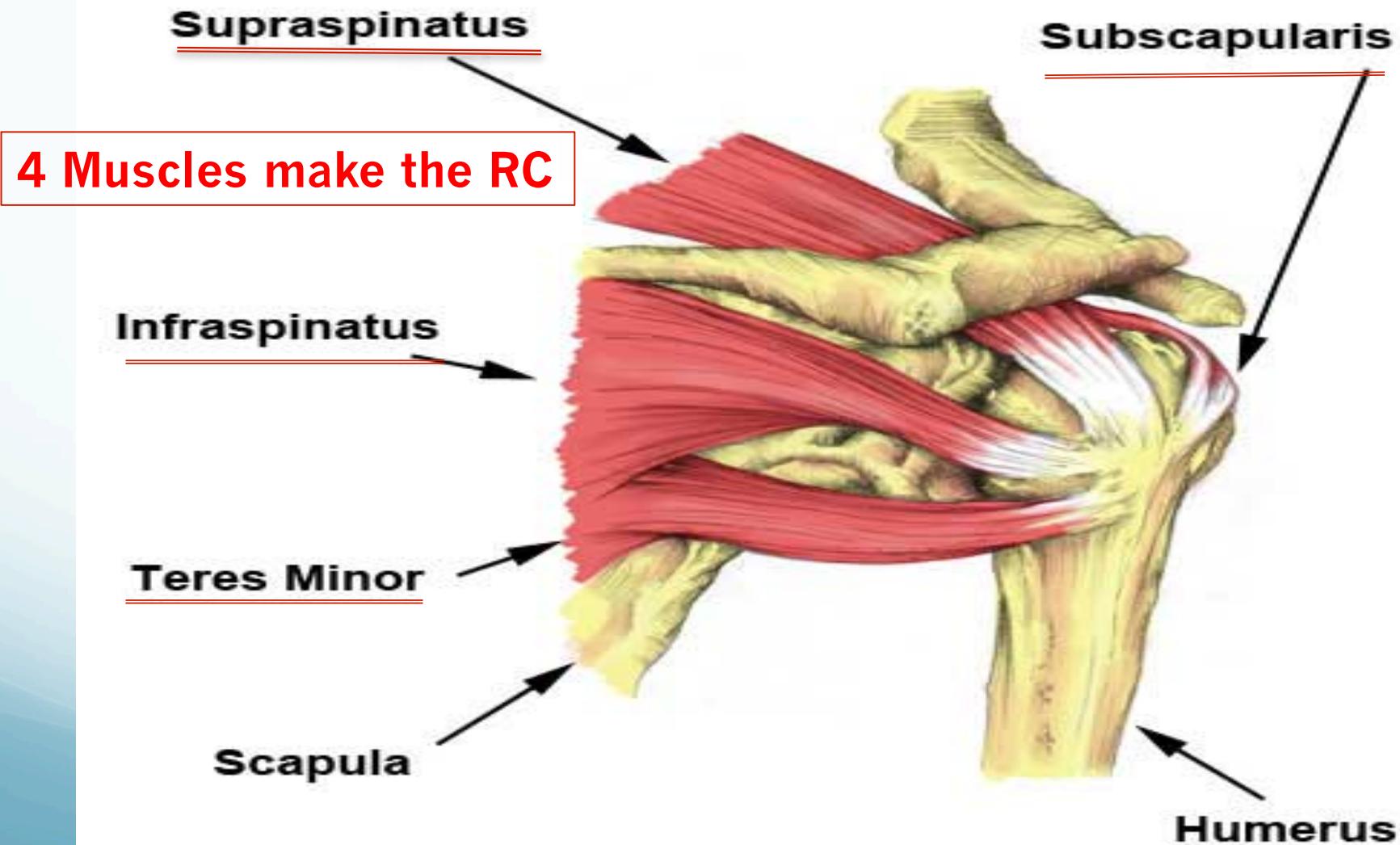
# Viscous Cycle<sup>9</sup>



# Anatomy – Shoulder Joint

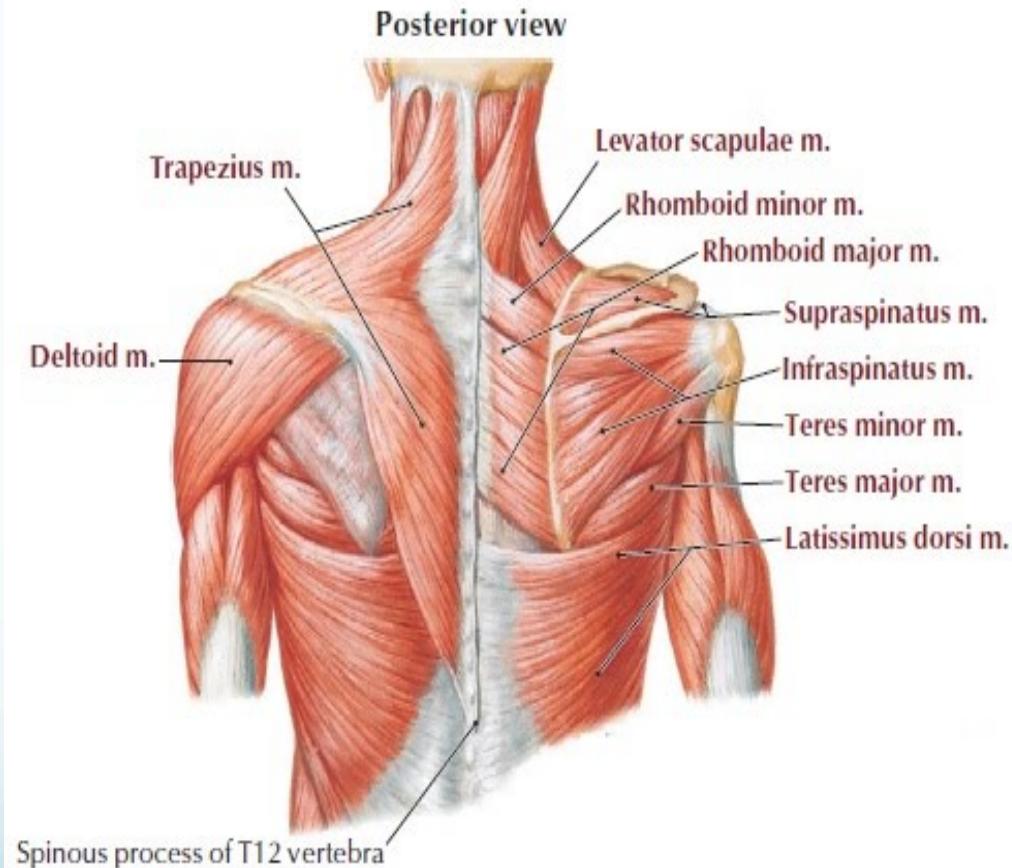


# Anatomy – Rotator Cuff



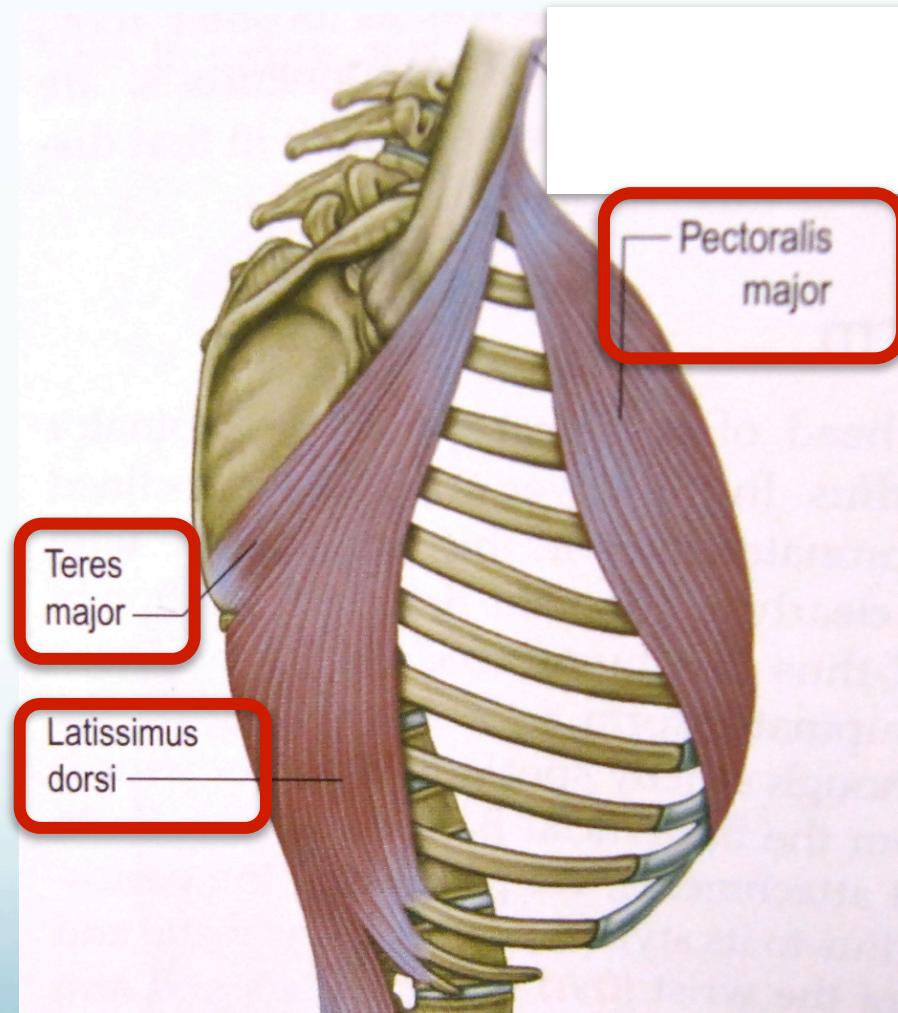
# Anatomy – Scapular Muscles<sup>8</sup>

- Muscles that support the shoulder blade during arm movement
- If not working properly, they can cause pain at the shoulder
- The most important set of muscles associated with swimming



# Anatomy – Swimming Power Muscles<sup>2,5</sup>

- These large muscles work well to propel forward in the water
- Power generators!
- Other muscles work to stabilize
- No stabilization = domination of these two muscles = PAIN!



# What are the injuries? (Swimmer's Shoulder)<sup>2,3,5,6</sup>

- “Swimmer’s Shoulder” catch all term for shoulder pain
- This could include any or all of the following:
  - Shoulder impingement
    - something is pinching somewhere
  - Shoulder laxity
    - the shoulder moves a lot leading to pinching or tearing of structures in the shoulder
  - Tendonitis/tendinopathy
    - Inflammation of a tendon from overuse or repetitive friction
  - Labral damage – tissue that lies within the “socket”

# What do you need to know?

- You do NOT need to know or deeply understand the pathologies on the previous slide
  - It is pretty difficult to specifically diagnose these problems for health professionals
- **Coaches only need to know that something is causing abnormal ball and socket movement or position**

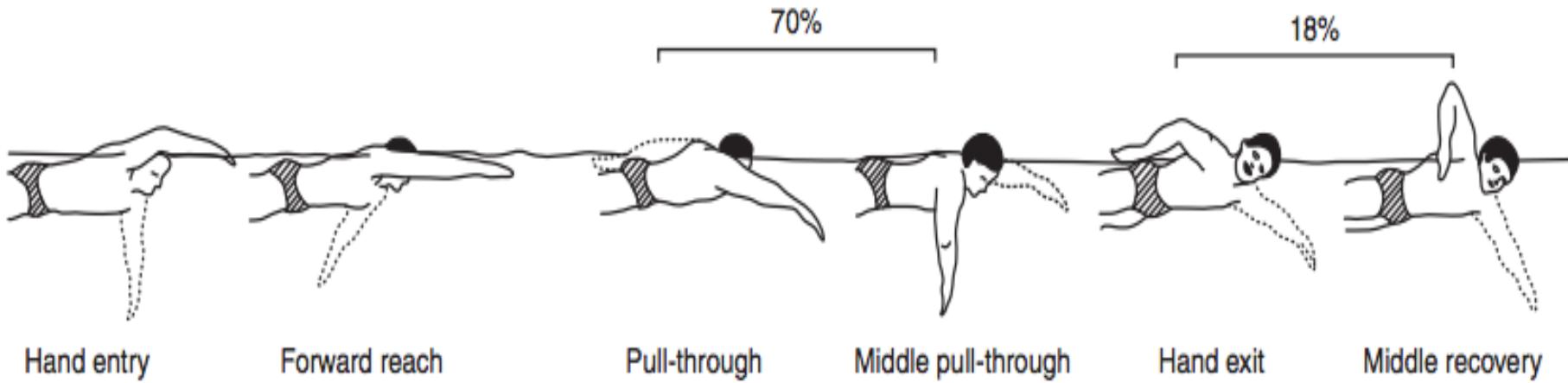
# What can you do to help swimmers avoid/improve pain?

- Coaches are the “first line of defense” for shoulder pain and problems
- What are some things that are within your “scope of practice?”
  - Writing/overseeing practices – yardage, intensity, etc
  - Evaluation of technique
  - Exercise – improving strength/mobility in or out of the pool

# Normal Stroke mechanics<sup>1</sup>

## Six Phases of Normal Freestyle Stroke Cycle

- 1. Hand entry
- 2. Forward Reach
- 3. Pull-through
- 4. Middle pull-through
- 5. Hand Exit
- 6. Middle Recovery



# Common abnormal techniques<sup>8</sup>

## Thumb Entry

- Can cause pinching at the shoulder



## Delayed Hand Entry

- Muscle imbalance; causes over-activity of upper trapezius



# Common abnormal techniques

## Crossover entry<sup>6</sup>

- Can cause pinching on the front of the shoulder



## Sweep under pull

- Can cause pinching on the front of the shoulder



# Common abnormal techniques

## Dropped shoulder pull

- Sign of muscle imbalance



## Elbow led pull

- Adds more stress to the shoulder joint
- Can cause elbow pain



# Common abnormal techniques

## Early Hand Exit

- Sign of weakness or pain avoidance



## Dropped Elbow Recovery<sup>2</sup>

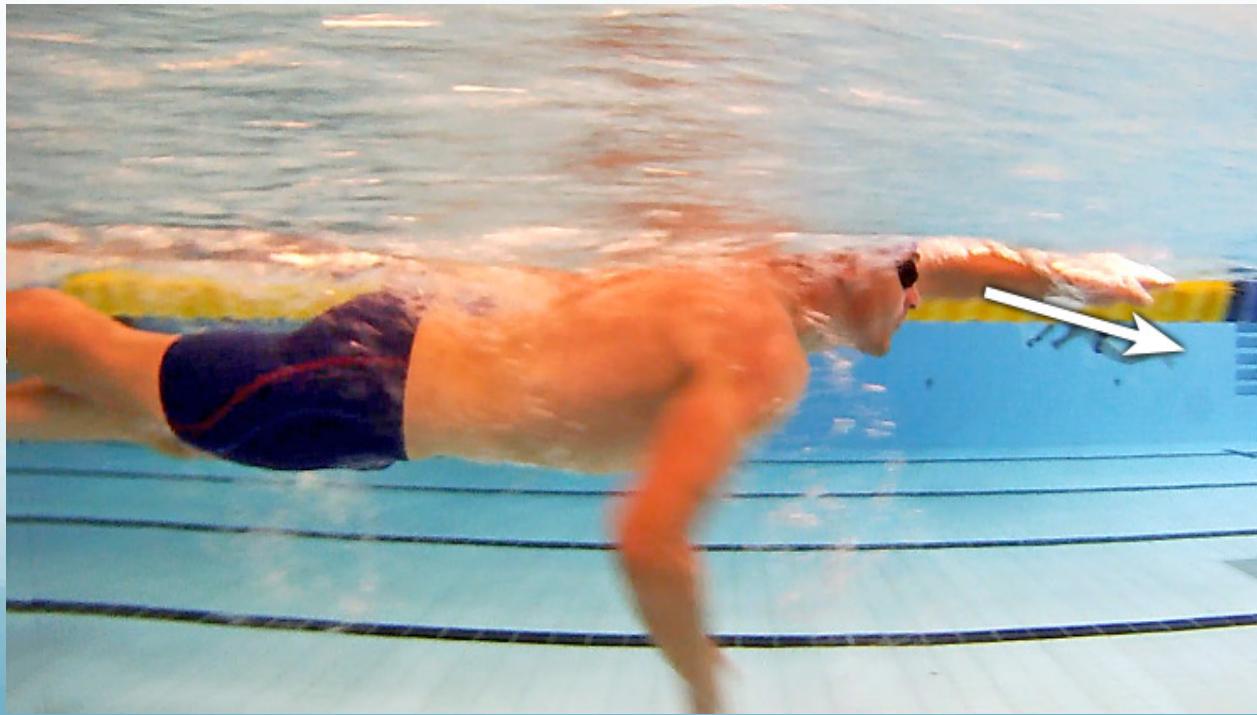
- Sign of existing pain/weakness



# Common abnormal techniques

## Poor Rotation<sup>8</sup>

- Increased stress at the shoulder/increased chance for pinching



## Head Position

- Increased stress at the neck → over-activity of muscles

# What to do when swimmers are in pain<sup>1</sup>

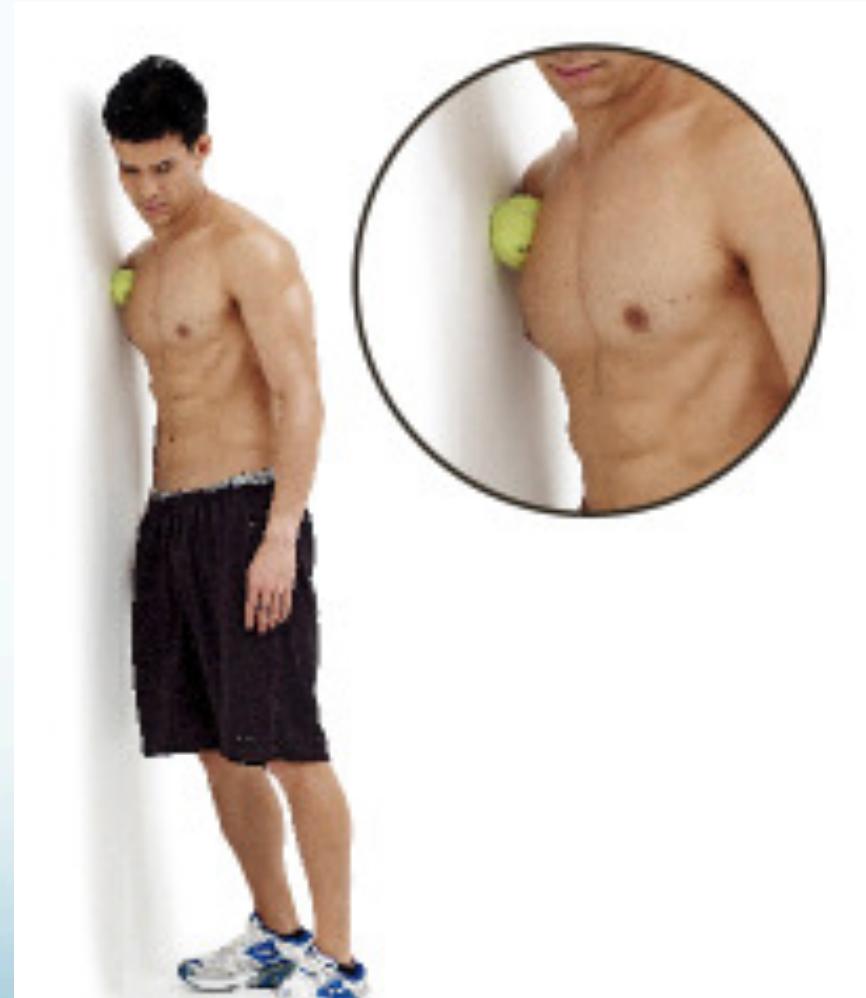
- Not every ache and pain is a significant problem
  - Most of them are just muscle soreness from inadequate warm-up
- Persistent problems spanning multiple practices should set off an alarm
- Questions to ask: Where is the pain? What stroke causes the pain? When during the stroke cycle do you feel pain?

# Muscle pain<sup>10</sup>

- Muscle “knots” or restrictions are a very common cause of acute pain around the shoulder
- These are common for most people and do not necessarily indicate a shoulder problem
- However, ignoring the problem could lead to altered swimming mechanics → pain
- Try releasing it with a tennis ball/lacrosse ball →
  - Common areas in swimmers include: upper trapezius and pectoralis minor<sup>5</sup>

# Muscle “Release”<sup>10</sup>

- Pectoralis Minor Release
- Instructions:
  - Press the tennis ball/lacross ball/fingers etc, firmly into the spot and hold it there for 2-3 minutes
  - Sensation should be uncomfortable, but should feel better after release
- Same concept works for any muscle



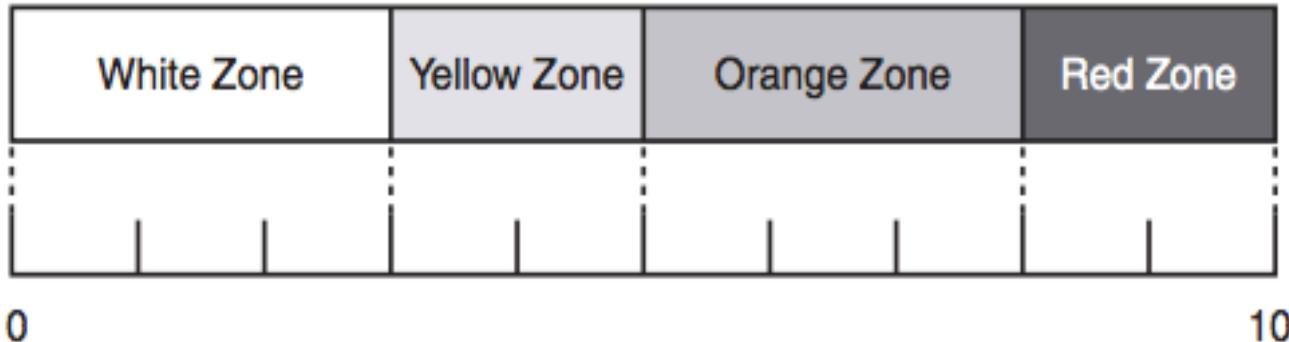
# Change technique<sup>2</sup>

- If your swimmer cannot depict a specific spot, or points to the general shoulder joint, there may be something technically wrong
- This is the time to evaluate technique – take a close look and see what changes you can make
- Focus on the part of the stroke cycle when the pain occurs

# Strategies to reduce stress on shoulder<sup>2</sup>

- Longer/slower warm-up
- Avoid painful strokes temporarily
- No paddles – use fins to reduce workload for the shoulder
- No dry-land training (aside from prevention exercises)
- Kicking with bent elbows
- 3 days of swimming\* rest if approaching orange zone with no improvement seen

# When to refer to a professional<sup>1</sup>



## **White Zone (0-3): Normal level**

- continue to train
- fatigue and soreness during and post-workout
- handle with coach and athlete

## **Yellow Zone (4-5): “Heads-up” level**

- continue to train
- review conditioning program
- handle primarily with coach and athlete

## **Orange Zone (6-8): Rehabilitation**

- consider removing from training

## **Red Zone (9-10): Remove from training**

- refer to physician
- anatomical damage

# Injury Prevention<sup>1,3,6</sup>

- Muscle imbalance causes most shoulder pain associated with pulling
- Exercises here are designed to target the weaker/stabilizing muscles
- No “program” out there, but a lot of good evidence to support general exercises<sup>4,7</sup>
- General rule of thumb – strengthen the back, “stretch” or release the front

# Prevention program routine<sup>1</sup>

- Perform these exercises BEFORE or DURING warm-up
- Example: 6x100 – between each 100, hop out and do an exercise
- Prevention exercises are designed to “wake up” the smaller muscles to support the shoulder during a work out
- They are not meant to cause significant fatigue

# Prevention program – specific exercises<sup>1,2</sup>

## Diagonal Raise w/ Water Bottle

- Start with arm 45° from midline
- Lift water bottle up all the way overhead
- Key is to have the swimmer reach as far out and up as the can during the exercise
- Recommended: 2 sets of 10 repetitions for each arm

## Single Arm Wall Push-Off

- Start with both arms on wall in push-up position
- Make sure arms are pushed out away from the body
- While keeping both arms straight, push one hand on the wall and pull the other one off
- Recommended 2 sets of 10 repetitions each arm

# Serratus Anterior Muscle<sup>1</sup>

- Very important muscle for proper shoulder mechanics
- Weakness/dysfunction with this muscle can lead to “scapular winging” →
- Exercises on last slide target this muscle
- Look out for this!



# Prevention program – specific exercises<sup>1</sup>

## Kick Board Squeeze and Raise

- Hold kick board between hands with elbows bent to 90°
- Push hands into kick board and hold while raising the kick board up over head
- Bring kick board back down slowly and repeat
- Perform for 1 minute at a time

## Prone Swimmer

- Start in prone with arms extended over head off the ground and thumbs up
- Perform a snow angel, bringing arms down by hips and ending with palms facing up
- Do the opposite motion to bring arms back up overhead
- Perform 10 times up and back very slowly

# Prevention program – specific exercises<sup>1</sup>

## Y's and T's<sup>5</sup>

- Start slight bent over position with neutral spine
- “Y” – Bring arms up over head and make a Y with thumbs up
- “T” – Bring arms out to the side to make a T with the body with palms faced down
- Perform 2 sets of 10 repetitions for each Y and T

## Plank

- Plank position on forearms or hands
- Hold neutral spine
- Start from knees and progress to feet
- Hold for 30 seconds to 1 minute

# Is stretching necessary?<sup>1</sup>

- Not for most swimmers!
- Hypermobility is common with swimmers and can often lead to shoulder pain due to the excessive movement
- Shoulder screen on the next slide
  - If the swimmer can do each of these positions with no compensations, shoulder stretching is not necessary
- Other body stretching may be helpful

# Mobility Screen<sup>1</sup>

1. Tight Streamline Position against wall



2. 90/90 (shoulders and elbows at 90°)
  - Palms facing up overhead



3. Standing elbows bent arms rotated 45°



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