

Shoulder Injury Prevention for Competitive Swimmers PowerPoint Notes:

Noelle Martin

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- As swimmers and coaches, we understand the demanding scheduling in competitive swimming.
- The average competitive swimmer practices 5-7 times a week and averages about 6,000 – 10,000 meters per day. Double practices (2 practices a day) multiple times a week are also common. In a week, the total yardage ranges from 60,000 – 80,000 meters. With an average stroke count of 8-10 per lap, shoulder rotation occurs more than 30,000 times in a week!
- The majority of swim training is freestyle. And about 90% of the propulsive force comes from the upper extremity, specifically the shoulder.
- Therefore, a tremendous amount of stress is placed on the shoulder joint causing shoulder pain and swimmer's shoulder, which can lead to shoulder injuries. ^{1,4}

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- “general term for an overuse condition that leads to shoulder pain and inflammation of the rotator cuff and biceps tendon” ¹
- “swimmer's shoulder” can be triggered by: decreased muscle strength and endurance, muscle imbalances, altered scapular kinematics, improper swimming technique, poor posture, fatigue, and overuse → may place the swimmer at risk for injury
- Swimmer's shoulder can also be caused by subacromial impingement involving the rotator cuff tendons, bicipital tendon, or subacromial bursa ¹¹
 - o Primary impingement: compression of the tissues between the acromion and greater tuberosity. The cause is likely due to a tight posterior capsule
 - o Secondary impingement: impairments caused by increased anterior glenohumeral laxity, ROM with ER > IR. There is an increased demand on the rotator cuff and long head of the biceps to decrease humeral elevation and anterior translation of the humeral head
- Failure of the rotator cuff and scapular stabilizers to maintain the humeral head in the glenoid fossa → excessive humeral head migration and either increased tensile stress on the tendons or compression of the tendons. → muscle fatigue → alter stroke mechanics
- References: 1, 2, 4, 11

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- Answer: NO!
- Shoulder pain vs. shoulder soreness—use the 0-10 VAS to help measure and differentiate between the two
- Need to take shoulder pain complaints seriously

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- All answers are false
- A study examined the beliefs of shoulder pain during swim training¹

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- 85% mild pain, 61% moderate pain, 21% severe pain
- Only 14% sought medical treatment
- 72% used pain medication; 47% used it regularly
- Significant relationship between moderate and severe pain to the attitudes and beliefs of swimming with pain
- Consequences of prolonged shoulder pain and medication usage → shoulder injury, unable to practice or compete, stomach problems

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- Changes occur when pain is present that increases the risk of injury. (Ex: altered motor control, neuromuscular adaptations, altered muscle firing pattern and inhibition of scapular stabilizers = scapular dyskinesis) It also impedes swimming performance.
- Swimmers automatically change swim technique to avoid painful movement patterns and altered muscle activation patterns place additional stress on other joints and muscles, which can lead to further pain and injury = vicious cycle
- Competitive swimmers are at risk of shoulder injuries due to the repetitive nature of the sport and risk factors listed
- Reference: 1

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- This figure shows the many factors that contribute to “swimmer’s shoulder” and the vicious cycle that can occur¹

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- Coaches role in prevention of shoulder pain and injuries:
 - Identify the risk factors
 - Take action by making modifications
 - Implement a shoulder injury prevention program – due to the relatively high incidence of shoulder pain and the risk for injury, and injury prevention program should be implemented as additional training to prevent shoulder pain and injuries
 - Prevention is key! And early injury detection while swimming

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- The factors in red in the right column are the ones you (coaches) can modify directly; the factors in blue will be addressed by the shoulder program
- The development of shoulder pain also produces these postural, muscular, and stroke changes as an adaptation
- Scapular dyskinesis: impaired scapular control, when the scapula or shoulder blade does not move the way it is supposed to

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- References: 11-20

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- Address stroke technique to minimize extra stress on the shoulder, optimize movement patterns and efficiency in the water ^{5,11}
 - o Poor technique = more stress on shoulder, predispose to impingement
 - o Faulty mechanics
- Coaches are swimming experts and should teach proper stroke technique and recognize any stroke deviations during practice
- Look for altered technique due to discomfort or pain: shallow pull, dropped elbow, wide glide, decrease body roll
- These changes in stroke technique place additional strain on the shoulder musculature and are signs of adapting to discomfort and/or weakness → shoulder pain and injury
- Breathing pattern- coaches should encourage bilateral breathing (side to side) to promote symmetrical side to side musculature and limit stress concentration on one shoulder ^{8,9}
- References: 5, 8, 9, 11

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- Picture on left⁶: this position is compressing the tissues under the acromion; the lever arm of this pull is shorter = pull less water
- Picture on right⁶: shoulder is in a more neutral position = less stress directed at it

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- These sets of pictures⁷ are good examples of what NOT to do. These came from a triathlon website so there are other technique issues, but we will focus on certain aspects (hand entry, glide/midline, catch and pull phases)
- Picture top left: forceful downward catch = increases stress at the shoulder by pushing the water down instead of past the swimmer, the legs also sink → need to activate the core to maintain body position and not rely on the UE
- Picture lower left: straight arm pull = increases stress at the shoulder, need to be very strong to do this effectively, wide pull = not as efficient
- Picture middle right: straight arm pull = increases stress at shoulder by placing it into an impingement position by crossing midline, also stretches posterior musculature, this is not a good position to pull

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- Picture on left⁷: thumb first entry = internally rotates the shoulder = impingement position and increases stress
- Picture on right⁷: fingertip entry = correct because it remains a neutral shoulder position

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- Picture on left⁷: crossing midline = impingement position (flexion, adduction, internal rotation), stretches back and increases stress
- Picture on right⁷: shows a good body roll = avoid impingement position, at a mechanical advantage for the pull = decrease load at the shoulder
- Optimal body roll: keeps arm in the same plane as the scapula, reduces stress of soft tissues in the anterior shoulder region; also allows greater lengthening of abdominal oblique muscles, shoulder adductors/medial rotators, and scapular retractors at the beginning of the pull phase = muscles at a mechanical advantage

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- Practice modifications = decrease the load and stress at the shoulder
- Training volume
 - o Need time for healing, if not, then micro damage → macro damage → injury
- Kick– with or without a kickboard; need to consider and instruct the swimmer on the proper shoulder and arm positioning so it doesn't cause and contribute to further pain (using a kickboard can place the shoulder into subacromial compression via elevation and IR)
- Equipment changes = example stop using hand paddles, add fins, kickboard but can also kick without it
 - o Hand paddles: increase the load, force, and stress by increasing the surface area and resistance to movement
 - o Fins: decrease the load at the shoulder by increasing the propulsion force at the legs
 - o Kickboard: decreases load at shoulder, but can cause subacromial compression
- Change strokes
 - o Stressors are placed in different locations = stress location not quite as repetitive
 - o Fly: enter impingement position at pull, but get majority of the propulsion from hips and legs
 - o Back: stress is localized at the anterior capsule
 - o Breast: less tensile forces on rotator cuff because there is no pull past the hips
 - o Free: shoulder avoids true impingement via body roll
- Stroke drills- break down the stroke and reinforce proper technique
- Encourage and refer to physical therapy!!
- Reference: 11

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- Main goal of the prevention program is to prevent shoulder pain and injuries. The prevention program will increase muscle strength, improve timing and activation of muscles, improve posture, and decrease shoulder pain and injuries

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- Swimming alone causes muscle imbalances– this ratio may have a stronger relationship to the development of abnormal scapular kinematics, poor posture, shoulder pain, and risk of injury compared to general strength deficits.¹⁹
- I have created this program based off of the available research¹²⁻²⁰
- A season long intervention may result in greater strength improvements, improve long term outcomes, and prevent injuries¹²
- Swimmers need to understand the importance of shoulder injury prevention program to gain adherence. Swimmers need to recognize the various types of pain, understand what constitutes “bad pain” and report it to the coaches and parents so that proper interventions can occur → limited time out of the pool

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- Will address the other risk factors: muscle weakness, muscle activation patterns, scapular dyskinesis, and poor posture

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- Phase 1: 1st – 5th week
- Phase 2: 6th – 11th week
- Phase 3: 12th – 16th week
- These phases will coincide with the goals in swim training and the racing schedule
- Each phase will present with more progressive strengthening exercises and a different variation of a stretch
- Necessary adjustments will be made if exercise progression is not indicated
- With shoulder strengthening– muscle activation patterns, scapular rhythm
- Core activation/abdominal strengthening– the body is linked together, need to improve core stability through whole body movements

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- Resistance:
 - o Somewhat of a trial and error process for each swimmer
 - o Want them to complete 3x10-15 reps with the last set and reps being more difficult
 - o Once it becomes easier, need to increase the resistance
- Exercise Program references: 12-20

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- Weeks 1-5
- Goal: introduce the exercises to the athletes and ensure they have proper technique and muscle activation patterns
- Side lying ER & IR will be with weights

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- Push up plus can start with incline on the wall → progress to steeper incline → on the floor (on knees → toes)
- Progression based on proper technique, no pain or discomfort, level of perceived effort

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- Resistance: start at about 2lbs or 50% of 5 rep max^{13,17}

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- Resistance: weight will be greater than ER, 50% of 5 rep max^{13,17}

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- Weeks 6-11
- Goal: significant strength gains
- Standing ER & IR + rows will be with Theraband or tubing
- Progression: proper scapular rhythm, no pain or discomfort, level of perceived effort

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- Can add resistance (dumbbell) to this exercise

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- Weeks 12-16
- Goal: maintain strength gains and prepare for swim meets
- ER in standing with Theraband or tubing – if discomfort, stop and modify
- Progression: proper scapular rhythm, no pain or discomfort, level of perceived effort

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- These exercises can be added once the swimmers have proper scapular muscle activation and rhythm throughout the program. These exercises will further challenge scapular stabilization and core activation.^{11,22}

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- Previous research¹²⁻²⁰ shows that strengthening interventions that focus on functional exercise, posture, and muscular balance can increase strength and reduce the incidence of shoulder pain
- This shoulder injury prevention program has good potential to reduce the risk of shoulder pain and injuries and allow continued swimming participation. Participation in the prevention program is the only way to gain the benefits and shoulder health and protection. Therefore, coaches should highly encourage participation.