INJURY PREVENTION IN COMPETITIVE SWIMMERS

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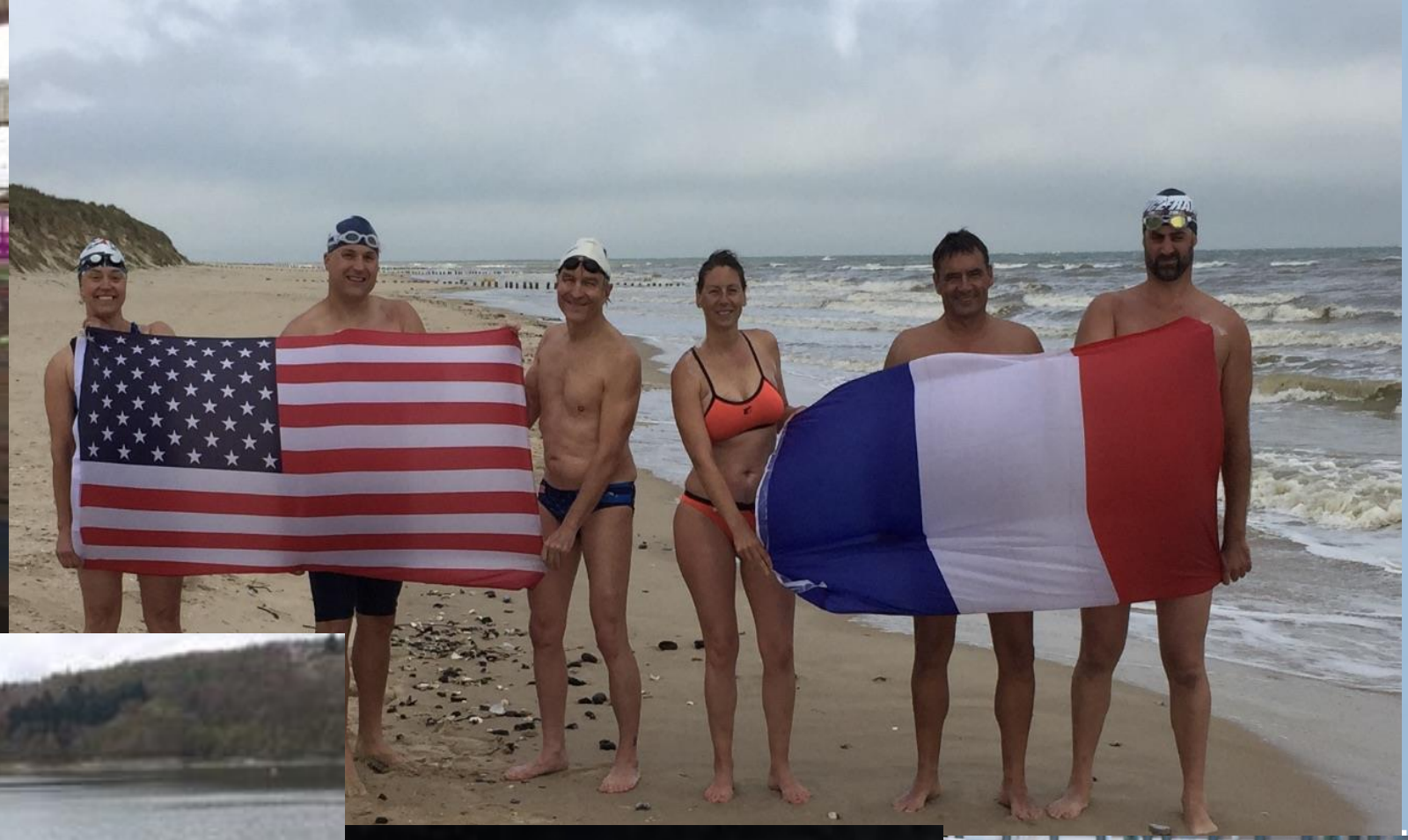


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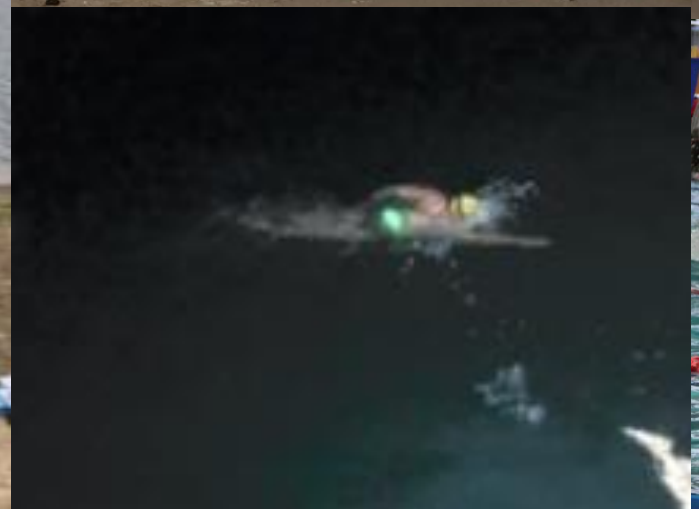
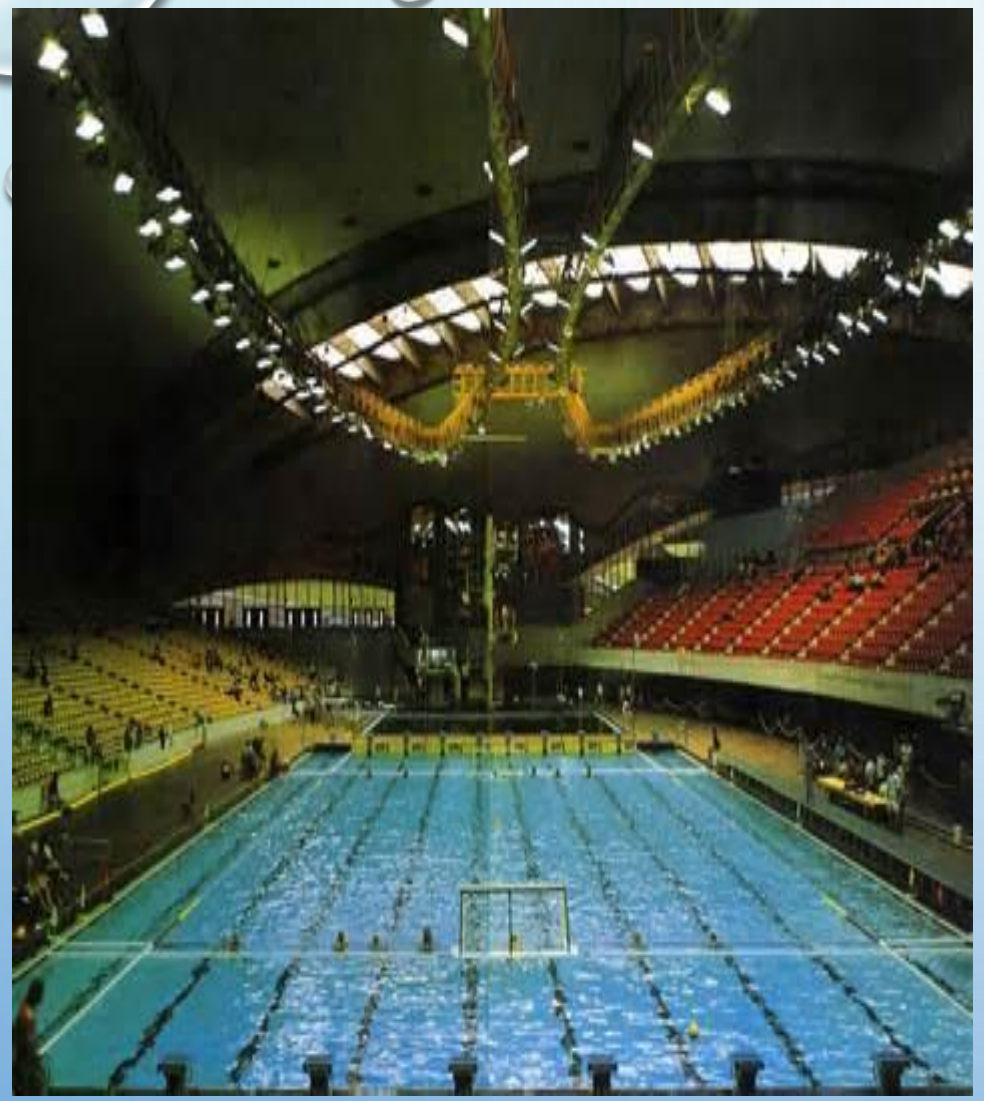
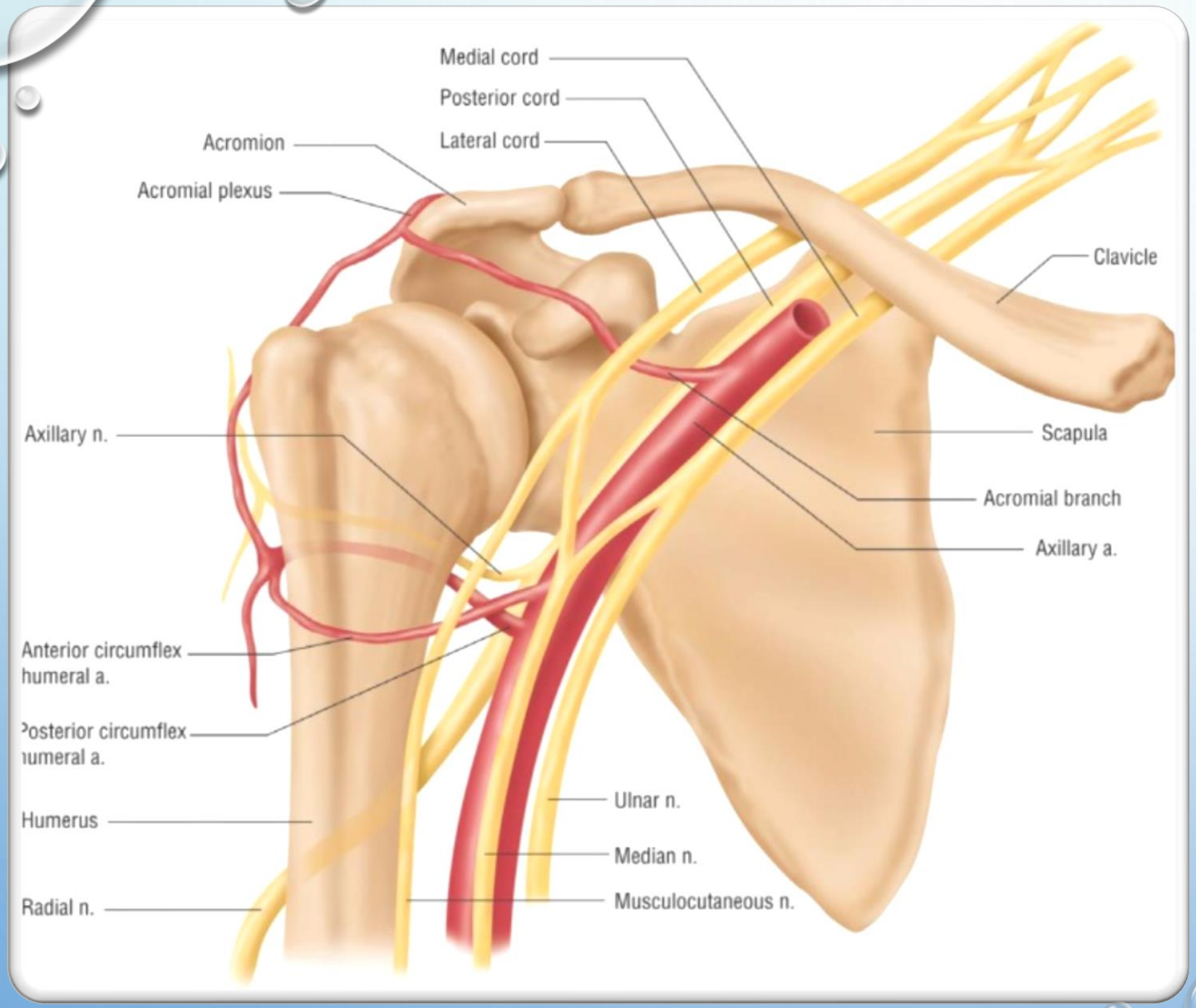



LEADERSHIP
FUN
RESPECT
KINDNESS
SELF
SUCCESS
OPTIMISM
COMMUNITY
ADVENTURE
ACHIEVEMENT
BOLDNESS
HONESTY
GROWTH
COMPASSION
AUTONOMY
CHALLENGE
COMPETENCY
DETERMINATION
BALANCE
CREATIVITY
KNOWLEDGE
FAIRNESS
OPENNESS
INFLUENCE
LEARNING
RESPONSIBILITY

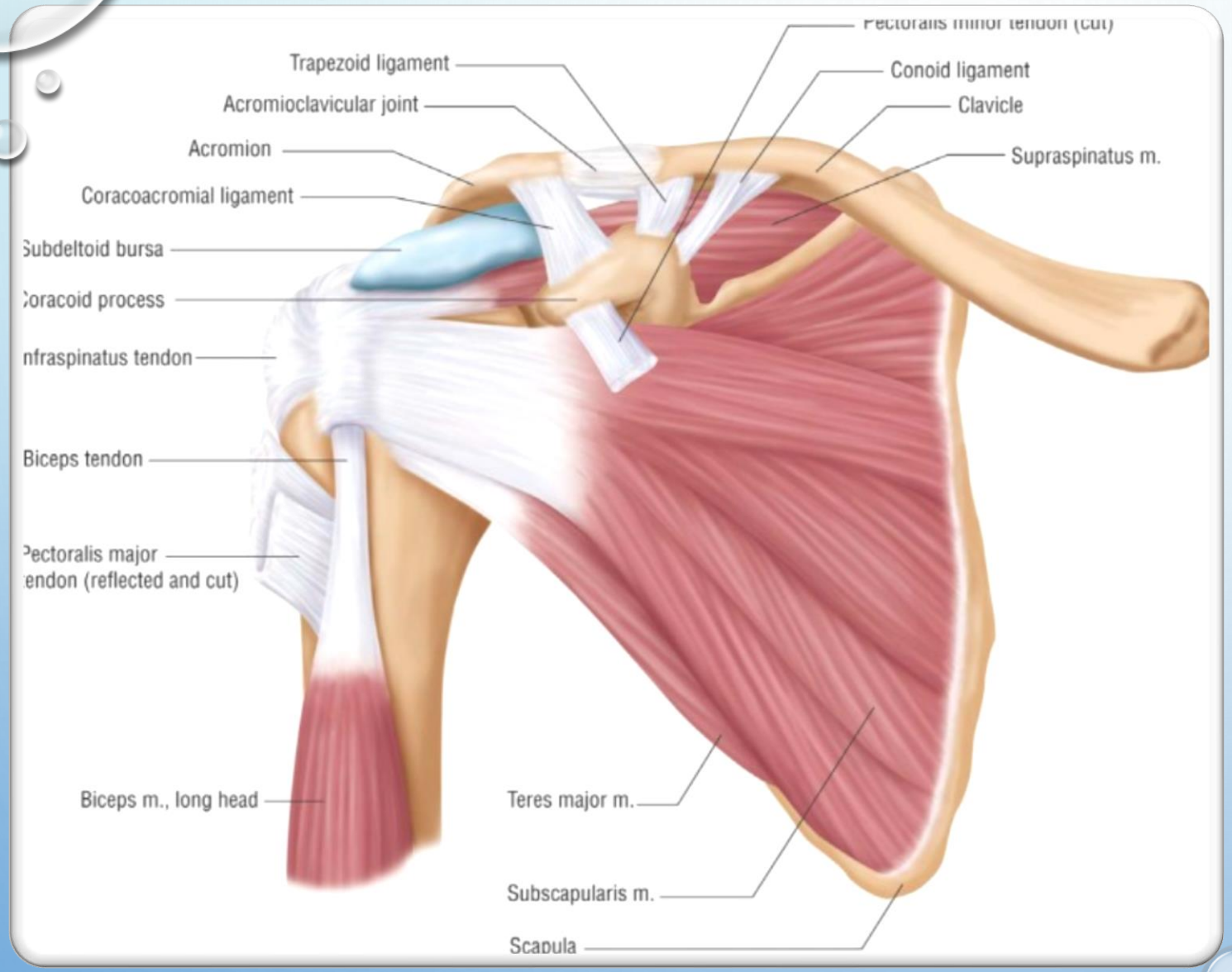


- UP TO 91% OF COMPETITIVE SWIMMERS HAVE COMPLAINED OF SHOULDER PAIN (OLIVOS ME, 2016)
- YEAR ROUND SWIMMERS AVERAGE 6,000-10,000 M PER DAY IN PRACTICE WHICH EQUATES TO 60,000-80,000 M OF TOTAL SWIMMING PER WEEK. THIS EQUATES TO A ABOUT 30,000 ROTATIONS OF EACH SHOULDER PER WEEK (HEINLEIN SA, 2010)
- SWIMMERS SHOULDER; FIRST COINED IN 1978, WAS USED TO DESCRIBE ANTERIOR SHOULDER PAIN DURING AND AFTER WORKOUTS (HEINLEIN SA, 2010)



ANATOMY OF THE SHOULDER GIRDLE

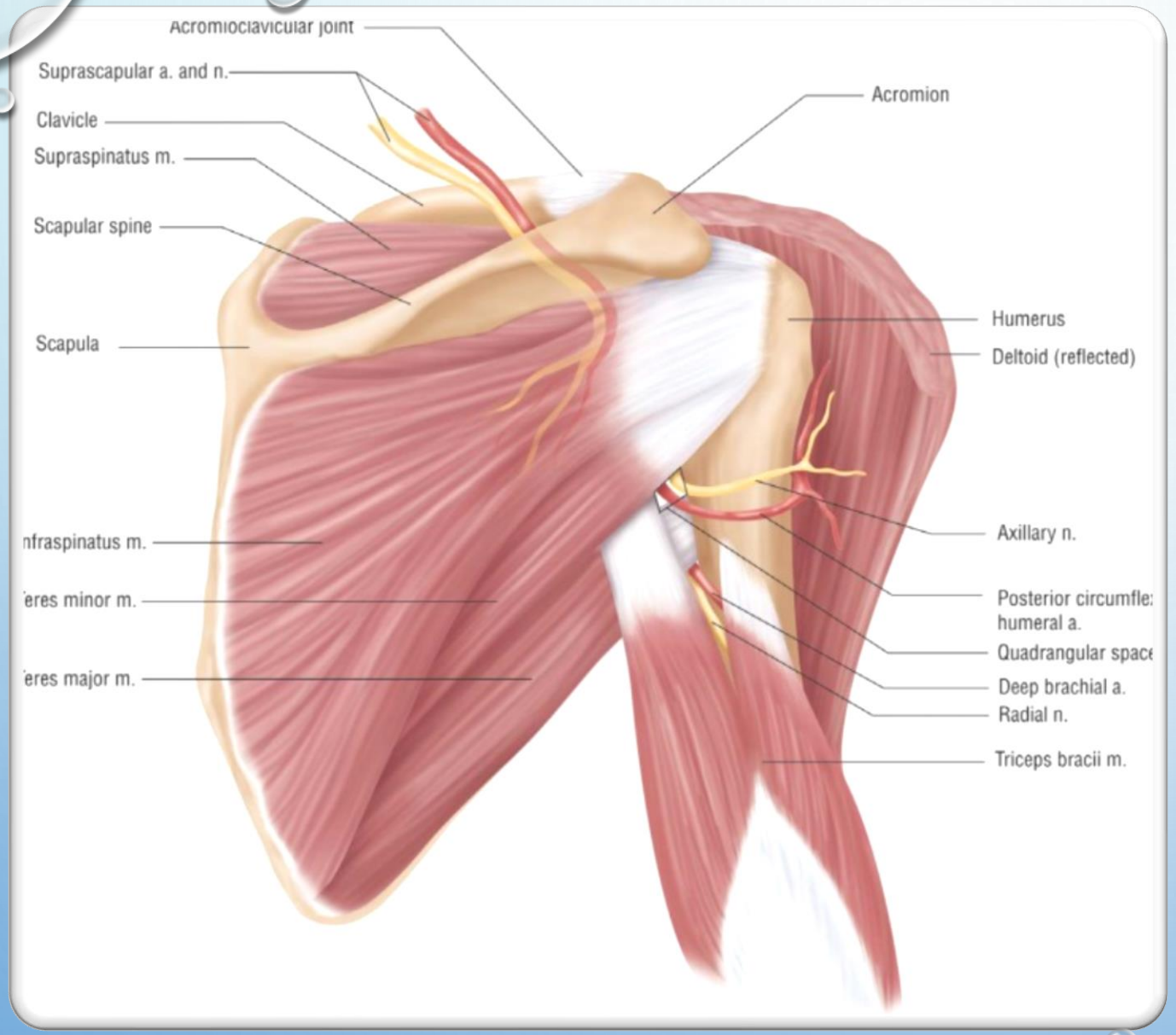
- HUMERUS (GREATER AND LESSER TUBERCLE)
- SCAPULAE (ACROMION, CORACOID, GLENOID FOSSA)
- CLAVICLE
- AUXILIARY ARTERY AND BRANCHES
- NERVE BRANCHES (ULNAR, MEDIAN, RADIAL)



ANATOMY OF THE SHOULDER GIRDLE

ANTERIOR SHOULDER

- ROTATOR CUFF
  - SUPRASPINATUS
  - SUBSCAPULARIS
- BICEPS



ANATOMY OF THE SHOULDER GIRDLE

POSTERIOR SHOULDER

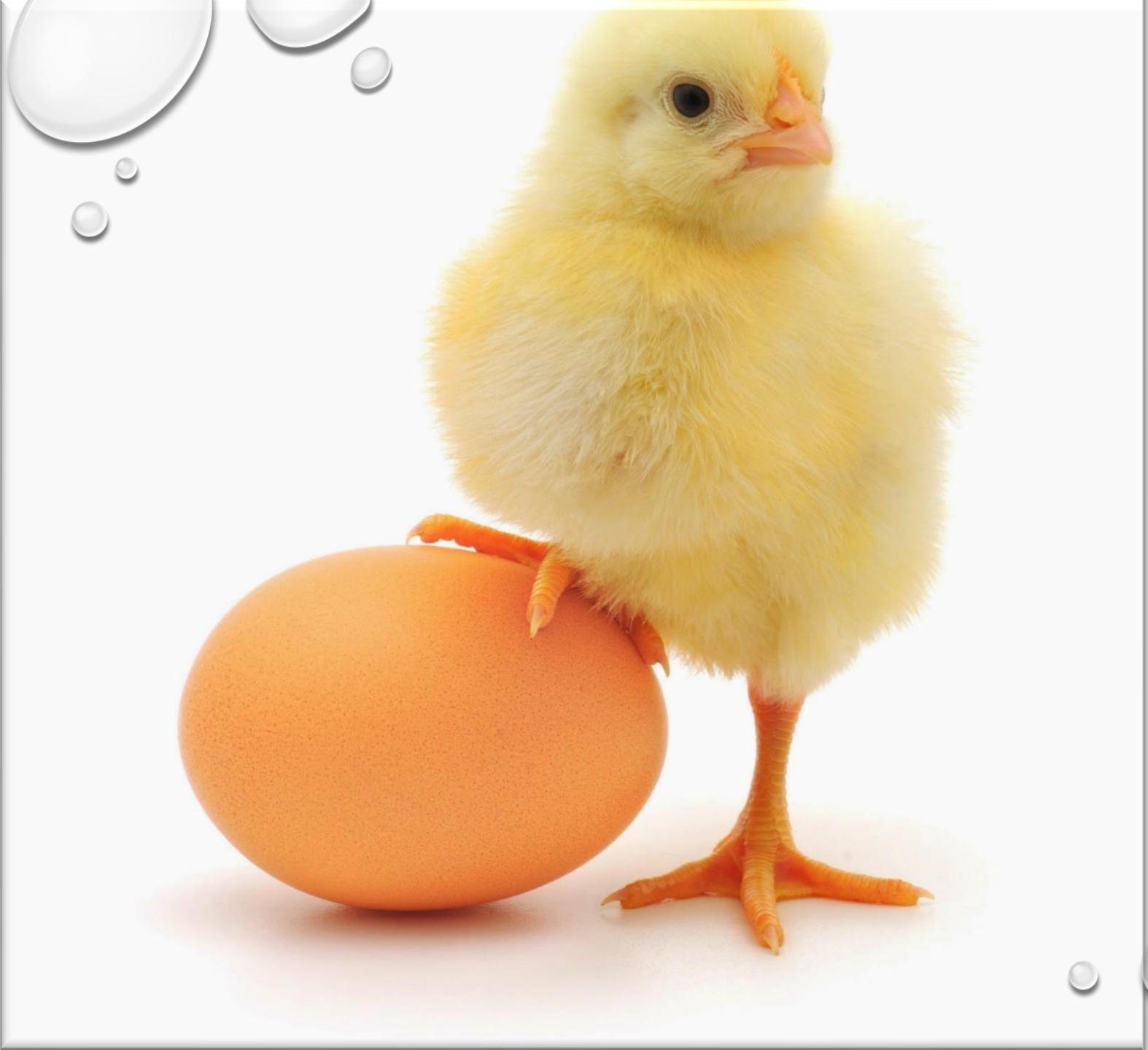
- ROTATOR CUFF
  - INFRASPINATUS
  - SUPRASPINATUS
  - TERES MAJOR
  - TERES MINOR
- DELTOID
- TRICEPS

BIOMECHANICS OF THE SHOULDER GIRDLE

- ONE UNIQUE ASPECT OF SWIMMING MECHANICS IS THAT THE POWER COMES THE MUSCLES OF THE SHOULDER GIRDLE.
- NO GROUND REACTION FORCE TO TRANSMIT THE POWER OF THE MUSCLES. IN CONTRAST, THE BODY IS BEING PULLED OVER THE ARM. THUS, THE ARMS ARE THE PROPULSIVE MECHANISM, MAKING THE SHOULDERS QUITE VULNERABLE. (PINK MM, 1996)

BIOMECHANICS OF THE SHOULDER GIRDLE

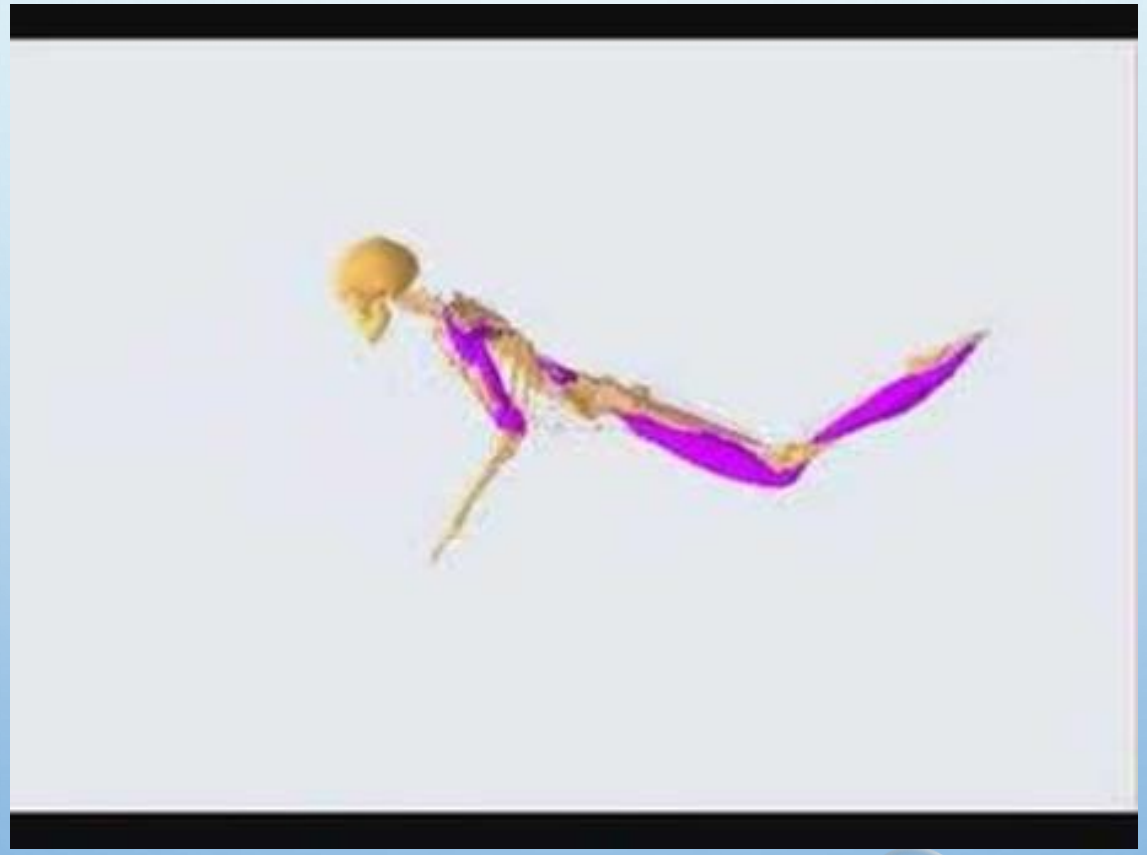
- IN A SURVEY OF 532 COLLEGIATE SWIMMERS AND 395 MASTER SWIMMERS, APPROXIMATELY ½ OF THE SWIMMERS HAVE A HISTORY OF 3 OR MORE WEEKS OF SHOULDER PAIN THAT FORCED THEM TO ALTER THEIR TRAINING, AND MORE THAN HALF OF THOSE SWIMMERS HAD A RECURRENCE. (PINK MM, 1996)
- THE ANTERIOR- SUPERIOR REGION OF THE SHOULDER WAS IDENTIFIED IN 44% OF THE SWIMMERS AS THE AREA OF PAIN. (PINK MM, 1996)



WHY??

- FAULTY MECHANICS?
- PATHOLOGICAL MUSCLE FIRING PATTERNS?
- WEAK OR FATIGUED MUSCLES?

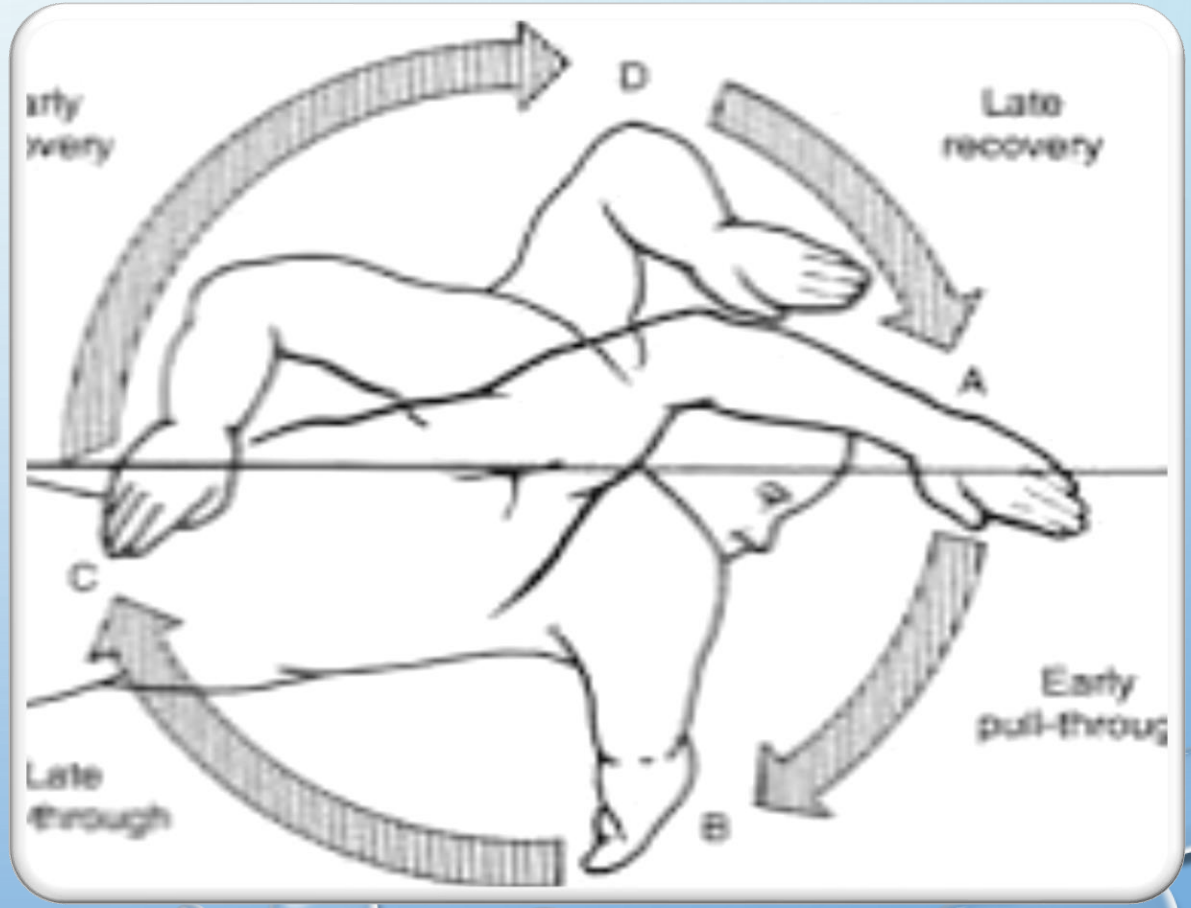
BIOMECHANICS OF SWIMMING



STROKE MECHANICS

PHASES OF FREESTYLE SWIMMING

- EARLY PULL THROUGH PHASE
- MID PULL THROUGH
- LATE PULL THROUGH
- RECOVERY PHASE

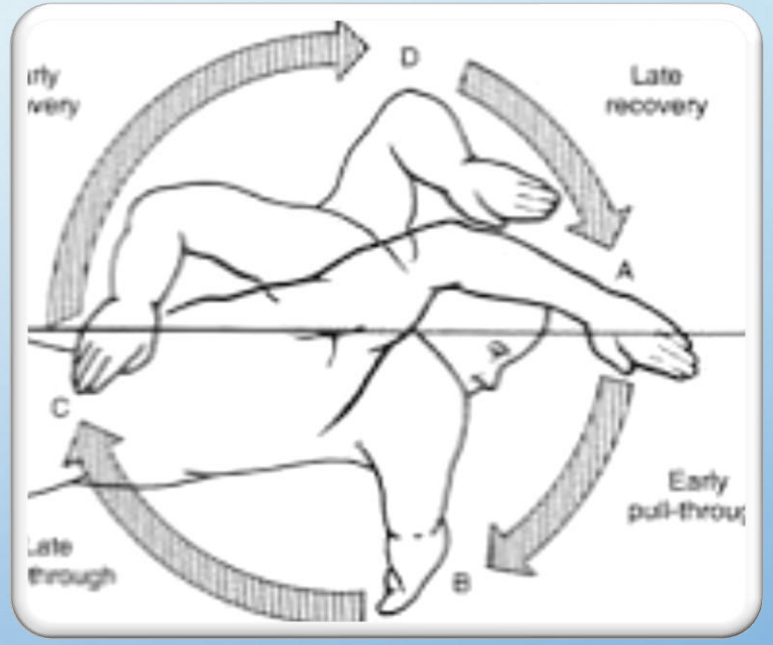


STROKE MECHANICS

PHASES OF FREESTYLE SWIMMING STROKE

SHOULDER PAIN OCCURS MOST FREQUENTLY DURING:

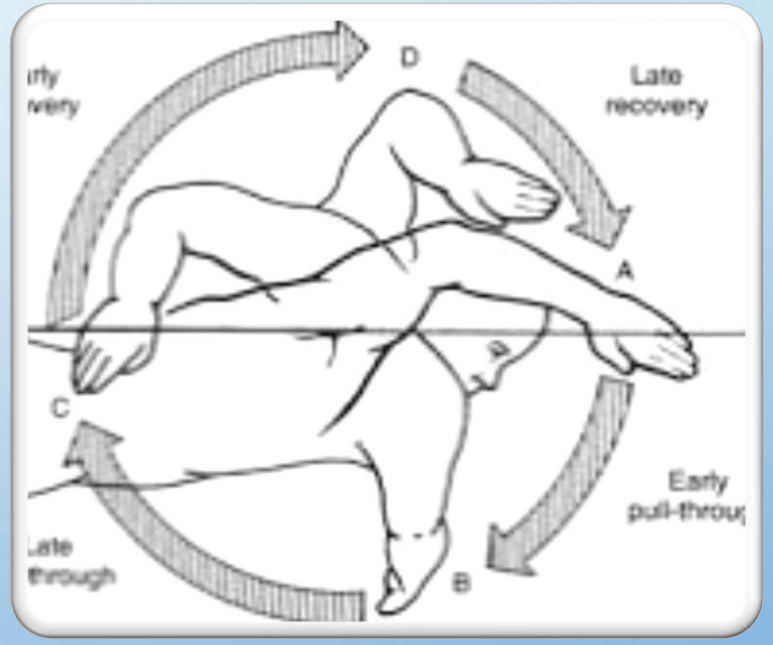
- EARLY PULL THROUGH PHASE
  - HUMERAL HYPEREXTENSION
- MID PULL-THROUGH
  - SHORTEN THE PULL-THROUGH PHASE SEEN AS INCREASED STROKE RATE



STROKE MECHANICS

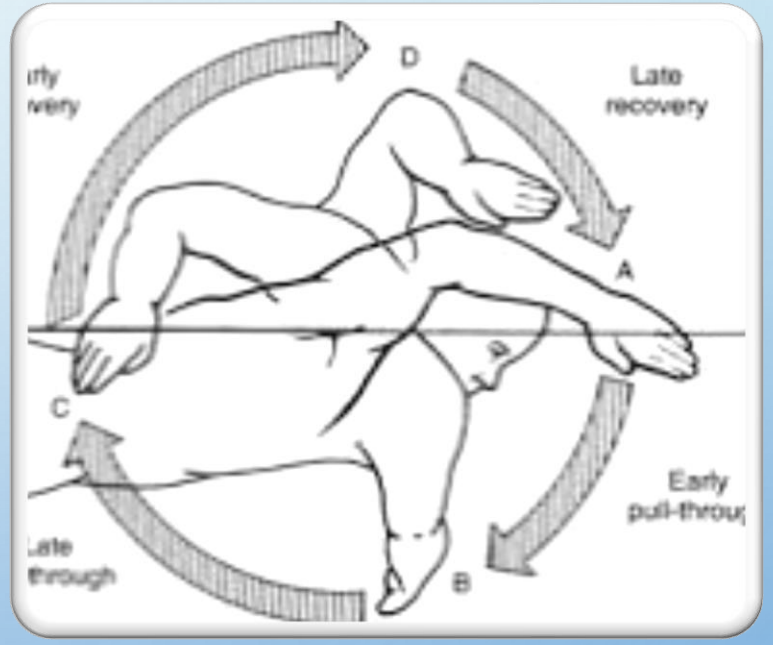
PHASES OF FREESTYLE SWIMMING STROKE

- SWIMMERS WITH PAINFUL SHOULDERS ATTEMPT TO ADAPT THEIR STROKE TO AVOID PAIN
  - WIDE HAND ENTRY
  - OVER ROTATION OF TORSO, ESPECIALLY DURING BREATH CYCLE
  - "CATCH –UP" STYLE SWIMMING



STROKE MECHANICS

- **PHASES OF FREESTYLE SWIMMING STROKE**
  - LATE PULL THROUGH
    - WIDER ARM SWING & DECREASED ELBOW FLEXION
  - RECOVERY
    - OVER EMPHASIZE THE FINISH AND FLICK THE WRIST WHICH INCREASES HUMERAL HYPER EXTENSION

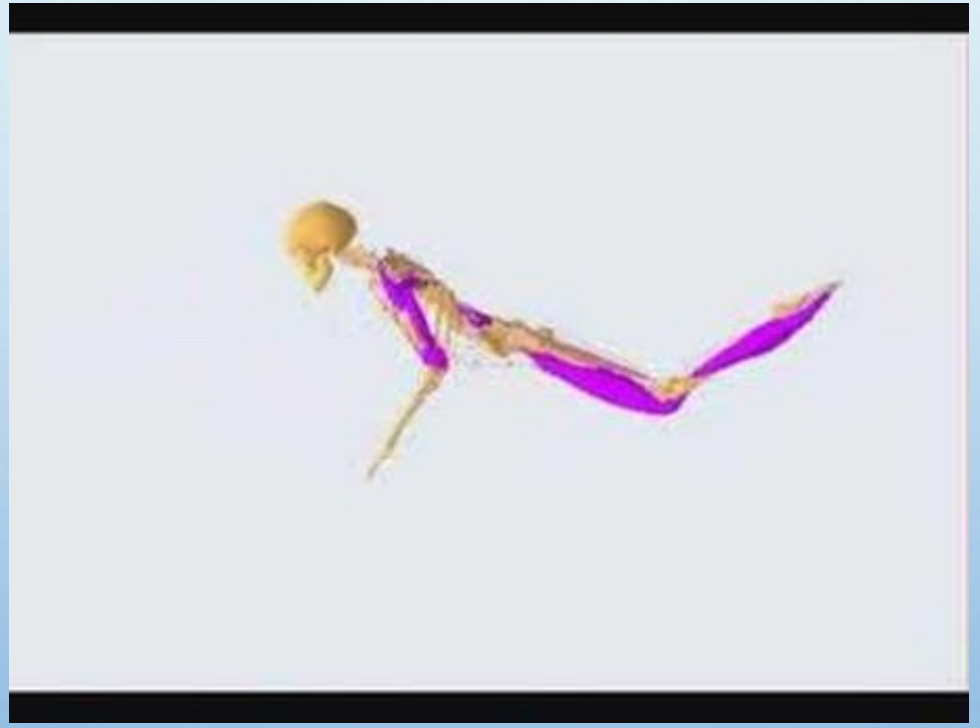


FREESTYLE

24.8% OF TIME SHOULDER IS IN AN IMPINGEMENT POSITION DURING FREESTYLE SWIMMING. (HEINLEIN SA, 2010)

Mechanical Change	Effect on stroke/adaptation due to pain
Wider hand entry and lateral underwater hand motion	• Hand starts wide and slides under the belly • Flatter hand entry • Avoids impingement position • Less force on the shoulder
Shorten underwater reach after hand entry	• Avoids impingement position
leading with the hand, flick the wrist upon exit of the water	• Increasing humeral extension and excessively internally rotating the shoulder
Decreased trunk rotation	• Catch up style swim
Head lift while breathing	• Attempts to get arm out of the water earlier and with less force in final position of stroke
Dropped elbow recovery	• Avoiding painful internal rotation of shoulder
Avoiding humeral hyperextension	• Shorten the pull through phase seen as increased stroke count
Excessive Humeral hyper extension	• Over rotation of the body

BIOMECHANICS OF SWIMMING



BUTTERFLY

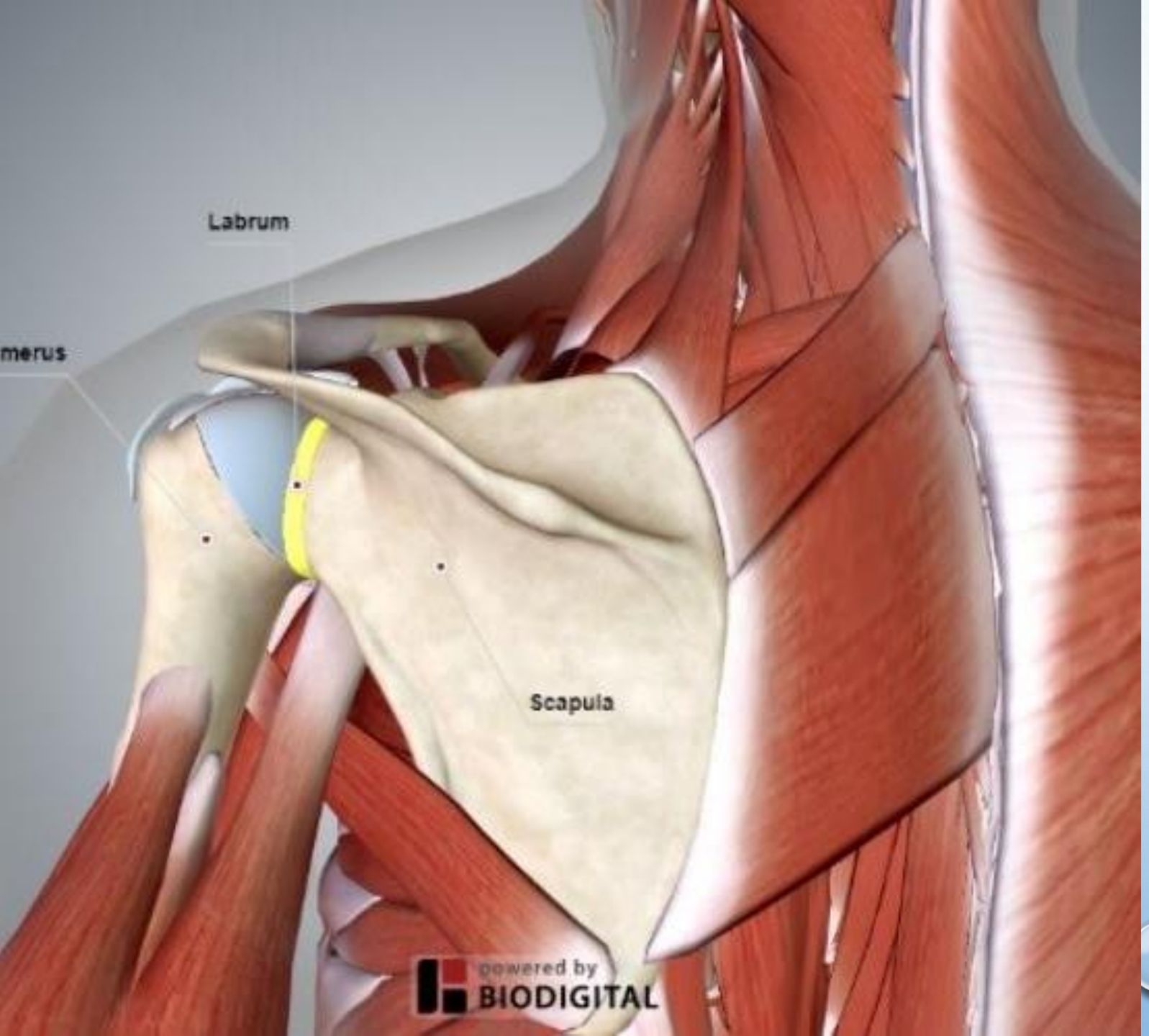
- SWIMMER WILL DEMONSTRATE A WIDER HAND ENTRY DUE TO DECREASED SERRATUS ANTERIOR ACTIVITY. THE SCAPULA DOES NOT UPWARDLY ROTATE AND PROTRACT (PINK MM, 1996)
- DEEP CHEST PRESS PLACES THE SHOULDERS IN A RISKY POSITION OF HUMERAL HYPER EXTENSION (PINK MM, 1996)
- COMMON MISTAKE IS TO FORCEFULLY LIFT THE HEAD TO BREATHE WHICH CAUSES THE SWIMMER TO ARCH THE BACK AND THROW THE HEAD UPWARD.
- THIS CAN STRESS THE SPINE AND LOWER BACK (PINK MM, 1996)

BACKSTROKE

- TO MAXIMIZE PERFORMANCE AND MINIMIZE SHOULDER VULNERABILITY, THE BODY SHOULD BE ROTATING IN SYNCHRONY WITH THE ARM.
- LATE BODY ROTATION MAY LEAD TO HUMERAL HYPER EXTENSION
- SWIMMER SHOULD RELY ON THE LEG KICK AND THE LATE PULL THROUGH TO PROPERLY EXECUTE THE BODY ROTATION (PINK MM, 1996)
- TOO DEEP OF A PULL THROUGH CAN LEAD TO EXCESSIVE HUMERAL EXTENSION BECAUSE THE BODY DOES NOT ROTATE ENOUGH

BREAST STROKE

- DIMINISHED SERRATUS ANTERIOR AND UPPER TRAP ACTIVITY. INCREASED LATISSIMUS, UPPER TRAP, AND SUBSCAPULARIS ACTIVITY DURING PULL-THROUGH (HEINLEIN SA, 2010)
- LEAST NUMBER OF SHOULDER PAIN COMPLAINTS DURING BREASTSTROKE. (PINK MM, 1996)
- THE KICK TENDS TO BE MORE PROBLEMATIC CAUSING ISSUES WITH THE KNEE. (PINK MM, 1996)



COMMON SHOULDER INJURIES

- OF THE 52 SWIMMERS WHO HAD AN MRI, 69% HAD SUPRASPINATUS TENDINOPATHY (HEINLEIN SA, 2010)
- LITTLE INFO REGARDING LABRAL PATHOLOGY IN SWIMMERS.
- RELATIONSHIP BETWEEN LAXITY AND PAIN IS UNCLEAR AND IS LIKELY NOT A PRIMARY CAUSE OF PAIN. (PINK MM, 1996)
- THE RESULTS OF SURGICAL OUTCOMES HAVE BEEN LESS THAN OPTIMAL (HEINLEIN SA, 2010)

Lack of Coaching Education	Conditioning & Training Errors	Playing While Injured or Overtired	Declining Fitness of Children
Grouping Teams by Age Instead of Size	Poor Nutrition	Improper Technique	Growth (bones grow faster than ligaments and tendons)

FACTORS CONTRIBUTING TO SPORTS INJURIES. (MICHELI 2000)

LACK OF COACHING EDUCATION

- THE US IS THE ONLY COUNTRY IN THE MAJOR SPORTING WORLD THAT DOES NOT HAVE A NATIONAL COACHING EDUCATION PROGRAM (MICHELI LJ, 2000)
  - GERMANY HAS (GERMAN SWIMMING FEDERATION , N.D.)
- EDUCATION IS THE CORE OF SPORTS SAFETY:
  - PROGRAM ADMINISTRATORS
  - COACHES
  - PARENTS
  - AND FOR ATHLETES
- BARRIERS (OLIVOS ME, 2016)
  - TIME & COST
  - MODE OF DISSEMINATION
  - EVIDENCE BASED INFORMATION RATHER THAN ANECDOTAL

CONDITIONING AND TRAINING ERRORS

- TOO MUCH EMPHASIS ON WINNING MAY WELL CONTRIBUTE TO THE RISK FOR AN ATHLETE SUSTAINING AN INJURY (MICHELI LJ, 2000)
- NO MORE THAN 10% INCREASE EACH WEEK
  - IN THE AMOUNT OF TRAINING TIME,
  - DISTANCE COVERED, OR
  - NUMBER OF REPETITIONS PERFORMED IN AN ACTIVITY (MICHELI LJ, 2000)

DECLINING FITNESS OF CHILDREN

- NEW INJURY PATTERNS ARE DEVELOPING THAT WERE NOT APPARENT WHEN YOUTH SPENT MOST OF THEIR SPORT AND FITNESS TIME IN FREE PLAY (MICHELI LJ, 2000)
- CHILDREN MAY BE ENCOURAGED TO PARTICIPATE IN SEVERAL DIFFERENT SPORTS, RATHER THAN SPECIALIZING IN A SINGLE SPORT AT AN EARLY AGE
- BEGIN TRAINING 1-2 MONTHS BEFORE THE ACTUAL SEASON BEGINS

FACTORS CONTRIBUTING TO SPORTS INJURIES

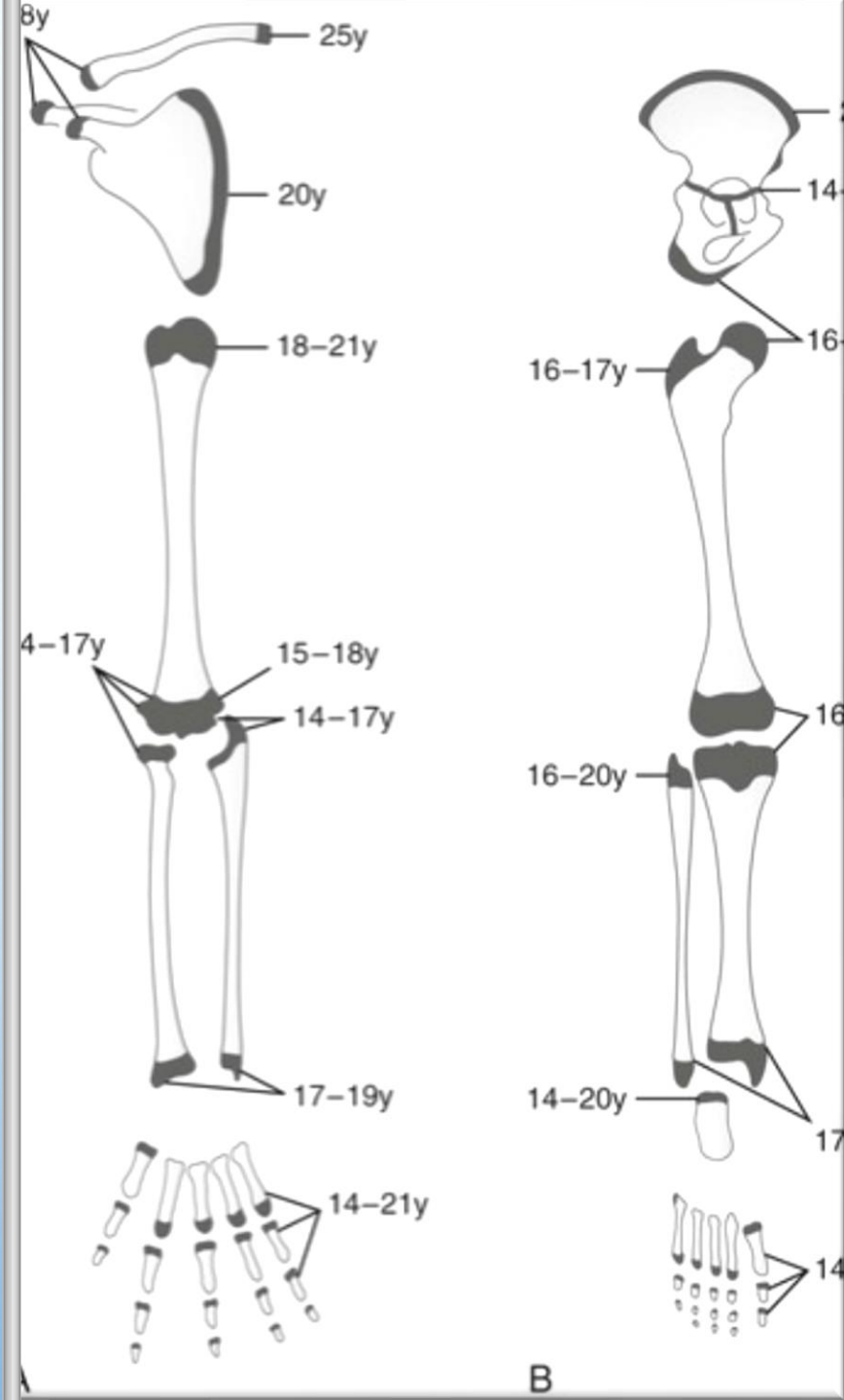
- PLAYING WHILE INJURED OR OVER TIRED
- GROUPING TEAMS BY AGE INSTEAD OF SIZE
- POOR NUTRITION
- IMPROPER TECHNIQUE

ALLOW ACTIVE PLAY

- WHEN YOUNG CHILDREN CONTROL THE INTENSITY OF AN ACTIVITY THEMSELVES, THEY SEEM LIKELY TO STAY WITHIN SAFE RANGES OF ACTIVITY LEVEL. (MICHELI LJ, 2000)
- PARENTS OR COACHES, HOWEVER, OFTEN CONTROL THE INTENSITY OF THE GAME OR TRAINING, AND THIS MAY LEAD TO OVERUSE INJURIES (MICHELI LJ, 2000)

GROWTH (BONES GROW FASTER THAN LIGAMENTS AND TENDONS)

- PHYSICAL IMMATURITY AND THE RISING TREND OF SPORTS SPECIALIZATION AT A YOUNG AGE, YOUTH ATHLETES MAY BE PARTICULARLY AT RISK FOR SPORTS OVER-USE INJURIES (OLIVOS ME, 2016)
- ACCORDING TO AMERICAN ACADEMY OF PEDIATRICS, CHILDREN'S BALANCE AND POSTURAL CONTROL SKILLS MATURE TO ADULT LEVELS BY 7-8 YEARS OF AGE, AND SUPERVISED CONDITIONING PROGRAMS MAY BEGIN WHEN SUCH MILESTONES ARE ACHIEVED (OLIVOS ME, 2016)



Coach Education

20-MIN FUNCTIONAL MOVEMENT TRAINING

THE EXERCISES SELECTED FOR AN HICT CIRCUIT SHOULD FUNCTION TO:

1. PROMOTE STRENGTH DEVELOPMENT FOR ALL MAJOR MUSCLE GROUPS OF THE BODY

2. USE LARGE MUSCLE GROUPS TO CREATE THE APPROPRIATE RESISTANCE AND AEROBIC INTENSITY

3. CREATE A BALANCE OF STRENGTH THROUGHOUT THE BODY (*E.G.*, YOU WOULD NOT WANT TO PRESCRIBE FIVE EXERCISES FOR ONE BODY PART WHILE ONLY PRESCRIBING ONE FOR ANOTHER; CREATING A BALANCE OF STRENGTH AROUND A JOINT IS AN EFFECTIVE WAY TO PREVENT INJURY AND IMPROVE MOVEMENT EFFICIENCY

4. BE IMMEDIATELY MODIFIED OR ADAPTED AS NECESSARY TO INCREASE OR DECREASE EXERCISE INTENSITY

5. BE SAFE AND APPROPRIATE FOR THE PARTICIPANTS IN THE TRAINING SPACE PROVIDED

6. BE INTERACTIVE WITH THE AVAILABLE FEATURES OF THE TRAINING ENVIRONMENT (*E.G.*, STAIRS, BENCHES, WALLS, ETC.)

7. BE EASILY TRANSITIONED TO ACCOMMODATE MINIMIZED REST TIME (KLIKA, 2013)

- DYNAMIC FLEXIBILITY X 15 MIN + WARM UP EXERCISES X 5 MIN (FRANKART 2011)
- TRX BODY WEIGHT RESISTANCE EXERCISE PROGRAM

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