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Cameron Elliott

B.App.Sc (Physio)

PHYSIOTHERAPY ASSESSMENT OF SWIMMERS

Cameron Elliott

SWIMMING IN AUSTRALIA

- Over 160,000 adults participate in organised swimming and with female participation rates (59.5%) higher than males (40.5%)
- Second in popularity as a recreational sporting activity only to walking.
- More than half of these people swim more than once a week and the likely hood of swimmers to participate in other sports is higher than almost any other sport.

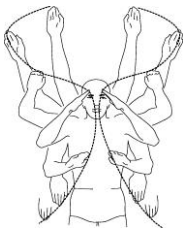
- Australian Bureau of Statistics 2007

SWIMMING FAST

- Although fitness and strength are important parts of making a good swimmer, good technique and an ability to move smoothly through water is what often defines a great swimmer from a good swimmer.
- Using their hands/ arms as anchors swimmers propel themselves forward by 'grabbing' onto the water like an anchor and pulling/pushing themselves over that anchor.

SNAPSHOT OF SWIMMING HISTORY

- The study of the mechanics of swimming was revolutionized by Counsilman (1971) with his experiment which lead to the theory that propulsion in swimming was achieved using force generation principles that are similar to the effects of a hydrofoil. i.e. as the hand moves through the water, the water over the back of the hand and arm would flow faster than the water on the underside of the hand/ forearm causing a pressure differential between these two areas- creating a 'lift' of the hand/forearm that creates a form of anchor in the water while the bodies muscles pull the body over this anchor.



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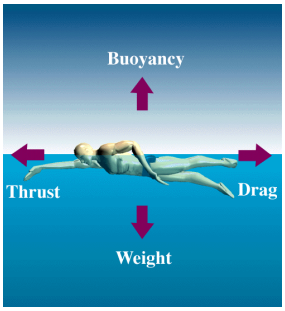
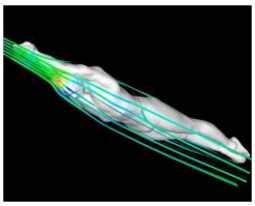
FORCES ACTING ON A SWIMMER



GREATEST PROPULSION FORCE

REDUCING DRAG

- The swimmer attempts to minimize drag by trying to maintain as streamlined position of the body as possible. This position allows them to try to combat the effects of drag by interrupting the least amount of water flow as possible



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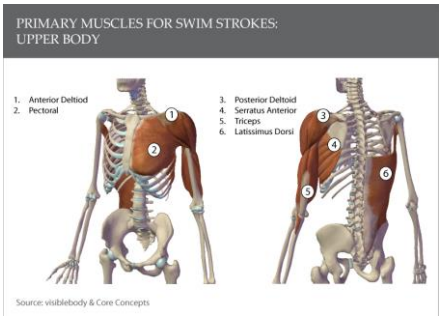
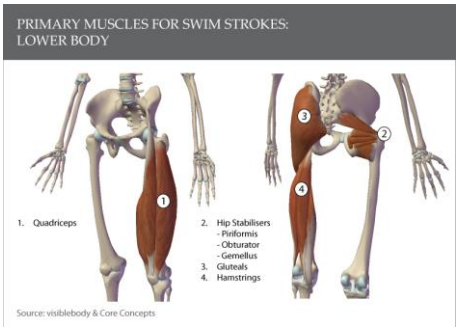
MUSCULAR SYSTEMS



MUSCULAR SYSTEMS



WHICH SWIMMER HAS APPROPRIATE STABILITY?

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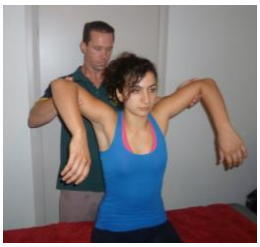
CLINICAL IDEAS

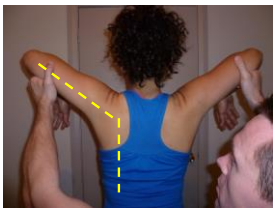
- Like all activity, the swimming stroke is an integration of the whole **kinetic chain**. If any one 'link' in this chain does not perform effectively then another joint/ link in the chain will compensate in its movement patterns.
- **Flexibility** is a key component to the elite swimmers body (eg: large amounts of internal rotation to gain the 'high elbow' in swimming). It can be tricky at times to know how much is too much but some ideas are offered in the talk.
- **Pathology** cannot be ignored (eg: does shoulder impingement pain result from irritated soft tissue structures (sub-acromial bursitis) or are other tendonopathies/ partial tears present?
- **Posterior capsule tightness** commonly accepted to be a large contributor to shoulder overload injuries. Very common in swimming.

ABDUCTION WITH INTERNAL ROTATION

- A measure of the swimmers ability to achieve and maintain a high elbow throughout a stroke cycle
- Best if done by two testers
- Patient seated and facing away from the examiner
- Abduct arms of swimmer while their elbows stay at 90˚ flexion
- Test both shoulders to avoid lateral flexion of spine
- **Result of between 150˚ and 170˚ seems to be acceptable**

ABDUCTION WITH INTERNAL ROTATION





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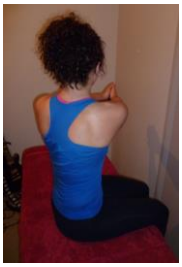
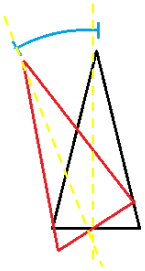
THORACIC ROTATION



THORACIC ROTATION



GLENO-HUMERAL INTERNAL ROTATION

- Prone:
- Patient prone with arm hanging off edge of table, elbow flexed to 90˚
- Support upper arm with one hand and other hand is used to retract and stabilise shoulder girdle and hold. (This must be maintained at all times)
- Swimmer asked to rotate arm so hand moves toward/ away from the physiotherapist ' as far as you can'
- Second person measures the line of the ulnar against vertical
- **An ideal measurement would be 40˚ to 50˚ of internal rotation**
- Supine:
- Patient supine with arm off edge of bed, elbow flexed to 90˚ and humerus supported
- Similar cues to above, therapist can use hands to stabilise shoulder girdle and prevent protraction of the shoulder during test

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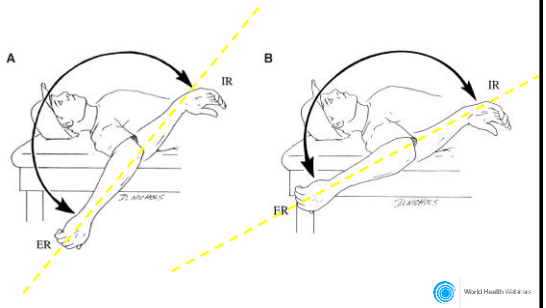

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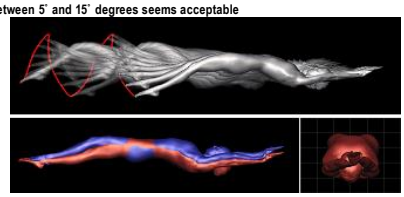
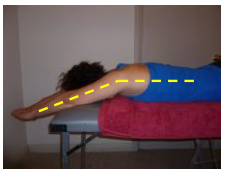
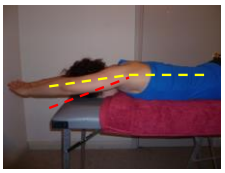
COMBINED ELEVATION

- Test of thoracic spine extension, shoulder elevation and the ability to draw the shoulders behind the body
- Patient lies prone and in 'Streamline' position (elbows locked straight and thumbs held together)
- Patient asked to lift arms as high as they can wile keeping their body in contact with the bed.
- **Between 5˚ and 15˚ degrees seems acceptable**



COMBINED ELEVATION

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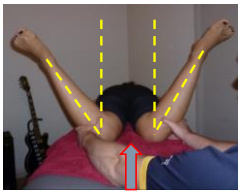
COMBINED HIP INTERNAL ROTATION AND TIBIAL EXTERNAL ROTATION



COMBINED HIP INTERNAL ROTATION AND TIBIAL EXTERNAL ROTATION

HIP EXTENSION

- Swimmer lies prone
- One examiner holds leg with 90˚ of knee flexion
- Examiner lifts leg slowly until movement is detected in the lumbar spine or in the pelvis
- Second examiner measures line of femur compared to horizontal
- **20˚ to 30˚ of extension seems to be ideal**

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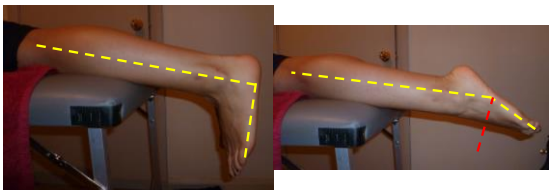
ANKLE PLANTAR FLEXION

- Ask swimmer to point their toes and the angle between the line of the leg and the line of the toes is measured.
- **Greater than 160˚ is ideal**

ANKLE PLANTAR FLEXION



STRENGTH IMBALANCE

- Commonly found, usual pattern is a strength deficit in ER's compared to IR's
- Clinically strength can be measured as a 'break' test to gain a MVC value (with dynamometer) however repeat tests may show an early fatigue (Beach et al 1992)
- Strength ratio of Internal: External → 1.5:1 (Whiteley 2010)
- May not be present in the painful swimmers shoulder – if so pay particular attention the results of the previously mentioned tests when clinically reasoning.

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Exercise in Cancer Patients

Catherine Granger
Physiotherapist