



# Swimming Overuse Injuries

## Introduction

Swimming is a great sport enjoyed by all age groups at all levels of ability. It is a unique sport, in that it combines upper and lower extremity strength exercises with cardiovascular training in a non-weight bearing environment. Swimmers are unfortunately prone to injuries. Most swimming injuries are classed as overuse injuries and relate to faulty [biomechanics](#). The most common swimming injury regions are the shoulder, neck, lower back and knee.

Wanivenhaus et al (2012) <sup>[1]</sup> highlighted in a study into epidemiology of swimming injuries that "An understanding of swimming biomechanics and typical injuries in swimming aids in the early recognition of injury, the initiation of treatment, and the design of optimal prevention and rehabilitation strategies." <sup>[1]</sup>



Swimming overuse injuries usually arise from one or a combination of the below:

- Poor stroke mechanics
- Poor breathing technique
- Poor flexibility or range of motion of neck or lower back
- Hyper flexibility of joints with insufficient muscular stabilisation
- Decreased [rotator cuff](#) or scapular muscle strength
- Insufficient core strength/stability
- Decreased hip muscle strength
- Overtraining
- Insufficient rest periods



Stretching is important for swimming because of the great range of muscles used when you're in the water. Unprepared muscles don't perform as well as muscles which have been warmed up ahead of exercising. A good stretching regime including at a minimum:

- posterior shoulder stretch
- [pectoral](#) stretch
- long head [biceps](#) stretch
- upper thoracic spine mobility stretch
- [latissimus dorsi](#)

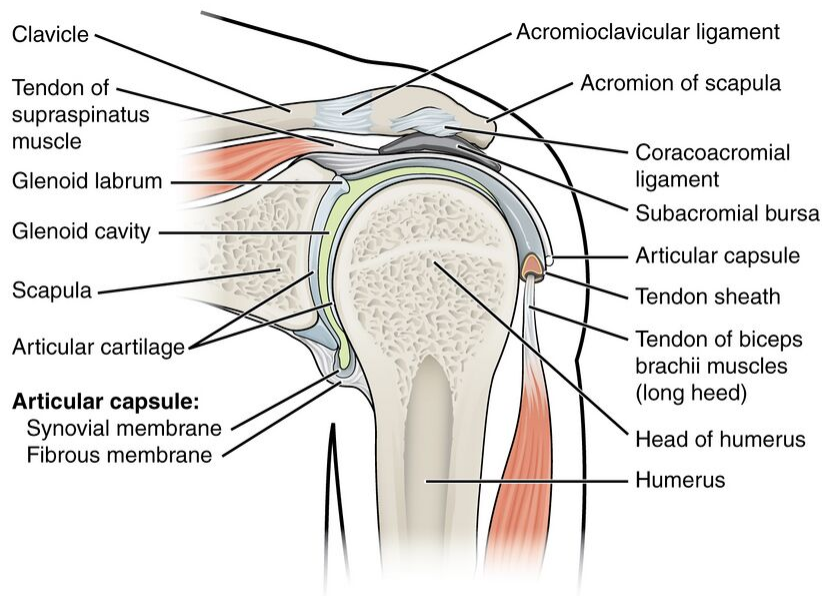
Note - The above list gives a guide to what to look for in each of the specific conditions listed below. This page does not give full physiotherapy procedures, instead providing great links to the sites that will have relevant information.

What are common swimming injuries?



[\[2\]](#)

## Swimmers Shoulder



Shoulder pain is the most frequent orthopaedic injury in swimmers, with a reported prevalence between 40% and 91% in elite swimmers.<sup>[1]</sup> Swimmer's shoulder is a condition with a gradual onset due to repetitive activity and can be classified as microtrauma. Swimmer's shoulder usually presents as [subacromial impingement](#) involving the [rotator cuff](#) tendon, [bicipital tendon](#), or subacromial bursa.<sup>[3]</sup>

Primary subacromial impingement involves compression of these structures between the acromion and greater tuberosity (due to usually a tight posterior capsule causing the [humeral head](#) to migrate anteriorly) or abnormal acromial morphology. However, primary impingement syndrome is less common in competitive swimmers than secondary impingement.<sup>[3]</sup>

Secondary impingement occurs through a series of impairments, usually in a swimmer with increased anterior glenohumeral laxity (shoulder ROM in swimmers often exhibit excessive external rotation and limited internal rotation). This shift in ROM towards increased external rotation is an adjustment to the demands on the glenohumeral joint allowing anterior laxity and greater demand on the rotator cuff and the long head of the biceps to reduce humeral head elevation and anterior translation.<sup>[3]</sup>

Chronic swimmer's shoulder can result in pathology of the rotator cuff, [glenoid labrum](#), and long head of the biceps.

## Subjective examination

Should provide information about the area, symptom description, and behaviour of the symptoms in patients with swimmer's shoulder. Questions to ask include <sup>[3]</sup>

- site of pain (easy to localise or broad region) and or neurological sensations
- irritability of condition (pain level, time to provoke, latency of pain)
- current training program, recent changes, changes in stroke technique
- has swimmer had stroke assessment /correction sessions

## Objective examination

Include<sup>[3]</sup>

- [postural](#) impairments of the shoulder girdle i.e.
  - increased [thoracic kyphosis](#)

- decreased cervical lordosis
- protracted [scapulae](#)
- internally rotated/anterior humeral head.
- strength of scapular stabilisers, rotator cuff muscles, [latissimus dorsi](#), [trapezius](#)
- length of shoulder girdle muscles and soft tissues (noting laxity or restrictions)
- AROM shoulder looking for i.e. painful arc, excessive laxity, altered scapulohumeral rhythm
- PROM tests, including [Sulcus sign](#), [relocation test](#), apprehension sign
- see also [Subacromial Impingement Cluster](#), [Subacromial Pain Syndrome](#)

## Physiotherapy

Swimmer's shoulder is a condition that may be prevented with adequate screening that can identify impairments and training errors that may lead to symptoms. If a swimmer presents with symptoms identify the most likely impairments or training errors and rule out any significant tissue pathology. A comprehensive rehabilitation program should be instituted that includes strengthening of the rotator cuff and scapular stabilizers, stretching anterior chest musculature that may be shortened, and modifying, if necessary, the training regime<sup>[3]</sup>. If improper swimming technique was implicated ensure stroke correction training takes place.

For specific physiotherapy recommendations regarding treatment see relevant section in [Rotator Cuff Tendinopathy](#), [Subacromial Pain Syndrome](#), [Anterior Shoulder Instability](#), [Evidence Based Interventions for Shoulder Pain](#), [Manual Techniques For the Shoulder](#), [Kinesiology Taping](#).

## Swimmers Back

The spine is also a recognized site predisposed to injury in the elite swimmer, mainly associated with butterfly swimmers ( 33.3%-58%) and breaststroke swimmers (22.2%- 47%), figures varying from differing studies.

As swimming athletes are positioned horizontally in the water, gravity and buoyancy forces are traveling through the body with the potential to cause changes at the lumbar spine. Due to the undulating motion (lumbar extension) utilised in butterfly and breaststroke, there is potential for developing pain secondary to stress on the joints<sup>[4]</sup>.

Causes include



- Hyperextension of the lumbar spine during freestyle and butterfly
- poor kick technique
- stress fractures are a potential cause in young swimmers
- disc degeneration and facet joint degeneration in the older swimmer. A 2007 study hypothesising that "Excessive competitive swimming activities accelerate lumbar disk degeneration" this activity may exaggerate lumbar intervertebral disk degeneration, especially in the L5-S1 intervertebral segment.<sup>[5]</sup>
- improper timing of this butterfly stroke increases strain on low back the possibility of neck, shoulder, or back pain.
- poor flexibility of the spine and low back

- insufficient core strength to maintain straight alignment of body in water
- aggressive weight training using poor techniques
- overuse of devices e.g. paddles on hands, fins, kick boards- exposing the [open kinetic chain](#) of swimming to different loads and exaggerating lumbar lordosis
- tightness in the hip flexors or inadequate body roll during swimming may lead to compensation at the lumbar spine.

## Physiotherapy

A thorough assessment of mobility of the spine, hips, pelvis, and arms are essential.

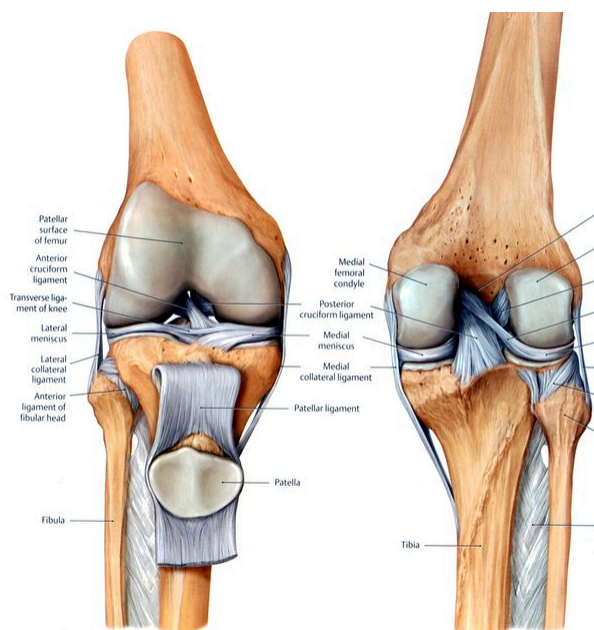
Treatment includes

- Correction of muscle imbalances (such as tight hip flexors, weak glutes and core)
- optimization of pelvic and joint mobility both in static (without movement) and dynamic (with movement)
- Practicing correct stroke technique with the guidance of a coach to improve performance and protect from musculoskeletal injuries including those of the low back (especially important in the breaststroke and butterfly, the swimming styles with the greatest incidence of LBP).
- spinal stabilization exercises,
- advocate avoiding sudden increases in training volume and overuse of devices
- [lumbar spine](#)
- [core stabilisation](#)
- [low back pain](#) from hyperlordosis
- [low back pain](#) guidelines
- [low back pain](#)

Note - If a swimmer develops new low back pain that persists and the swimmer is without a history of low back pain further investigation may be needed. If a [spondylolysis](#) occurs, the swimmer may need a longer duration of modified activity (3-6 months) and core stabilisation training.

## Swimmers Knee

[Knee](#) pain figures range from 34% to 86% for a single knee episode, being highest in breaststrokes, <sup>[1]</sup>



Knee pain is caused mainly during breaststroke swimming. Repetitive stress is placed on the medial knee produces pain during the whip-like motion. The breaststroke kick is a high valgus load produced during sudden flexion-extension, adduction and external rotation of the knee against the hydrodynamic environment, resulting in stress to the medial compartment. Hence a strain occurs to the medial collateral ligament and compression on the lateral knee (possibly causing sprain on the MCL; irritation of the medial plica; bursal irritation at the muscular insertions of the adductor and hamstring muscles). Strain injuries may also present in the adductor muscles (adductor magnus and brevis, especially)<sup>[6]</sup> Other knee injuries include patellofemoral pain, and medial synovitis. Treatment will focus on elimination of inflammation. Rehabilitation should focus on stabilisation exercises for hypermobile joints, postural correction, strengthening and flexibility.<sup>[7]</sup>

A 2008 study found the 200 - 400 m breaststroke events increase the risk for knee overuse injuries more than other strokes or distances. Additionally training for more than four times a week increases the risk twofold for knee and fourfold for shoulder overuse injuries.<sup>[8]</sup>

A 2004 study looking at competitive swimmers interestingly reports that breaststroke swimmers are at significant risk of: groin injury; groin injury is positively correlated with increased magnitude of breaststroke training; and groin injury may prevent participation in practices and competitions.<sup>[9]</sup> So take the time to assess then groin and complete length of hip adductors, not just distally.

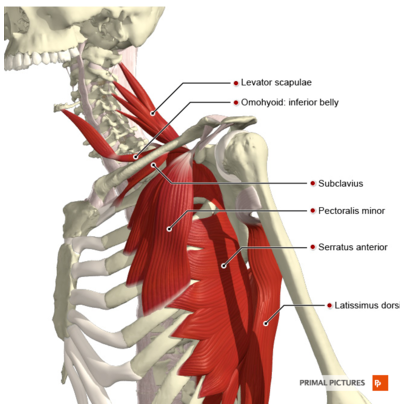
## Physiotherapy

Be sure to address in assessment all the points bulleted in introduction.

For specific assessment and treatment of the injuries arising at the knee see

- [Adductor Tendinopathy](#)
- [Medial Collateral Ligament of the Knee](#)
- [Pes Anserinus Bursitis](#)
- [Knee Injury Prevention](#)

## Swimmers Neck



Neck pain is mainly seen in the older athlete. It may be due to facet joint arthritic change, and disc degeneration +/- nerve root irritation. Muscle innervation and sensation to the shoulder region is predominantly derived from the C5/C6 nerve roots. If these nerve roots are irritated due to degenerative change in the neck, shoulder complaints can arise. Arthritic change may limit neck rotation making correct breathing patterns difficult. Swimmers who unilaterally breathe are more prone to neck pain. Looking forward rather than directly downward and extending the head too high when taking a breath increases the load on the neck and create pain.

## Physiotherapy (see links)



- [Cervical Osteoarthritis](#)
- [Cervical Radiculopathy](#)
- [Mechanical Neck Pain](#)
- [Neck Pain: Clinical Practice Guidelines](#)

## Conclusion



Swimming can be a great sport for recreational swimmers up to elite swimmers. As a physiotherapist help swimmers overcome their injuries and liaise with trainers, coaches and physicians for the best results.

## Additional Viewing

To correct an elite swimmer's stroke you should be trained in swimming coaching. However, to help recreational swimmers, take a look at the video below to get some pointers regarding freestyle, the most commonly used (and misused stroke).

### How to prevent injuries in swimming



[10]

## References

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