

## **Strength training for swimming and injury prevention**

*What role can strength training play in injury prevention?*

Strength training and its cousin flexibility training serve two main purposes when viewed through the prism of swimmer performance. The primary purpose of strength training is to improve the load bearing capabilities of muscles and tendons and to reduce the time-to-fatigue of muscles. In other words the purpose is to increase force production (commonly called “strength”) and increase the amount of time that force can be produced before the muscle grows tired due to nervous system fatigue and metabolic fatigue. The primary purpose of flexibility training is to improve the elasticity and range of motion of these muscles and their related joints (re: tendons and ligaments). In swimming, these translate into being able to “reach farther” and “pull” more water with each stroke.

Knowing this, ultimately strength and flexibility training can help prevent injuries by a) helping muscles “shoulder” the bulk of the workload over the body’s connective or soft tissues – tendons and ligaments, and b) increasing the range of motion so that muscles, tendons, and ligaments aren’t overstressed quite as easily. While muscle strains are relatively common in athletes, they also heal relatively quickly. Damage to tendons and ligaments (called strains and sprains respectively) are more severe as the blood flow to these tissues is less, requiring more time to heal and thus, less time to train for your event, at least in the short term.

*What are some of the most common swimming injuries that may be avoided through strength training?*

Most common swimming injuries - related to the shoulder muscles and tendons – can be avoided with proper training methods. Because swimming is a highly technical sport the first step is to make sure you are using proper technique. The next proper training method would be to avoid overtraining. Overtraining is taking on too much, too soon,

and/or without enough rest and recovery. If you back off at warning signs of injury (multiple days of sore shoulders or any strange crunching or popping noises in the joint) you can stave off more serious injury.

Most swimming injuries are a result of long term overtraining resulting in chronic tendonitis of various shoulder tendons, and/or which culminate in an acute injury like a labral tear or rotator cuff tendon strain. What has happened is that the applicable muscle(s) grows exhausted over repeated sessions, unable to handle the repeated stresses (repetitive trauma), and the associated soft tissue becomes damaged.

On occasion a well-trained swimmer will make a huge effort or one-time technique mistake and severely injure a muscle or tendon, but this is much less common.

Some swimmers also experience back pain, usually lower muscular back pain. This can be mitigated by strengthening the core muscles (the abdominal groups, hip, and erector spinae muscles) and making sure you alternate the direction of your flip-turn, which is the most likely culprit of lower back pain with regard to swimming.

*What exercises do you recommend? How many sets/reps?*

There are a bunch of exercises which can probably help. I write *probably* because swimming itself is the number one exercise to do to grow 'stronger' for swimming and to help avoid injury in swimming. Athletes should build up their frequency, duration, and intensity slowly and methodically, taking proper rest periods and proper nutrition.

That being writ I am a fan of the following kinds of exercises and do recommend them for my athletes:

- Lateral shoulder raises – rotator cuff exercise
- Front shoulder raises – rotator cuff exercise

- Seated rows – scapula stabilizer muscles
- Dips – lats, rotator cuffs, triceps, scapula stabilizers
- Pull ups – virtually all muscles of the upper body and abdominal/core muscles (lat pulldowns as a backup but this does not stress the core in the same way as pullups)
- Push ups – primarily pectoral and triceps which have a role in swimming
- Any and all exercises which work the core muscles – the abdominal group (transverse abdominis, internal oblique, external oblique, rectus abdominus), erector spinae, hip flexors, and hip extensors. Done via exercises like planks, bridges, Russian twists, v-situps, lunges with twists, and bodyweight resistance exercises or otherwise what most swim coaches would refer to as dry-land exercises.

Sets and reps are a very individual issue due to athletic age (time in the sport, re: experience), real age, and time limitations. In my opinion, any is probably better than none. In general, 2-3 sets of 8-15 reps at 50-70% load is a safe range to get the benefit of strength training for the express purpose of helping to reduce injury, without experiencing undue muscle breakdown or becoming injured as a result of strength training itself.

If you are doing something more like a circuit (several stations done one time) then spending 1 minute or so at each station suffices.

Using a TRX strap-type system and just your bodyweight, you could simulate just about every exercise you need.

*How do you know you have set enough weight/resistance?*

Talk to a personal trainer or coach as this is not something you want to err on. If it hurts it is most likely too much and could result in injury from strength training, and if it feels really easy it is probably too little to provide any benefit

*How often should a swimmer do this routine?*

Again this answer depends on individual issues, but in general 1-2 x a week during the main season and 2-3 times a week during the off season. In general, you can do more strength training or add more resistance during the off season as you won't be quite as worried as muscle breakdown and recovery time if you are not swimming as much during that period. Muscle breakdown is not bad in itself as that is how we grow stronger over time via repair and rebuild; however in season the specificity of training principle requires you should be focused primarily on swimming, and if you are super sore from strength training you won't swim very well.

*Do you recommend strength training all year round or just in the off season? How much time should you take off or strength training before a big competition?*

I recommend it year round with periodic one to two week off periods just to allow a mental and physical break from the stress of "having" to train. This is an individual issue as if you are training properly, taking in proper nutrition, and getting enough sleep there should be no undue (injurious) risk to your muscles and soft tissue if you train every week of your life.

*Can this also lead to better swimming performance? If so, how?*

Yes, in two main ways: If you avoid injury, you can train consistently and frequently, graduating to higher levels, longer workouts, and tougher intervals, resulting in better

race day performance. If you can improve the load bearing capabilities and elasticity of your muscles and connective tissue, you can maximize your 'reach' and the amount of force you can produce with each stroke, leading to more distance covered per stroke and thus, faster swimming times. :-)

A few articles for further reading:

<http://www.unm.edu/~lkravitz/Article%20folder/fatigueUNM.html>

[http://en.wikipedia.org/wiki/Muscle\\_fatigue](http://en.wikipedia.org/wiki/Muscle_fatigue)

<http://en.wikipedia.org/wiki/Push-up>

<http://en.wikipedia.org/wiki/Tendon>

[http://www.cmcrossroads.com/bradapp/docs/rec/stretching/stretching\\_2.html](http://www.cmcrossroads.com/bradapp/docs/rec/stretching/stretching_2.html)

<http://www.conquestchronicles.com/pages/labral-tear-shoulder>

<http://backandneck.about.com/od/anatomyexplained/p/abdominalmuscle.htm>

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