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SWIMMING REPORT

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## Introduction

Swimming is one of the best and most popular sports worldwide and often requires the entire body to move through water as each stroke requires a set of specific techniques. Competitive swimming is one of the most popular Olympic sports and can especially be enjoyed by high schoolers, aged anywhere from 13 to 17. The goal of the athlete is to try and break a personal time while beating other competitors in the same event.

Although a very popular sport and one that has many health benefits, it can also cause a range of injuries to any given individual. Swimming can also be considered low-impact aerobic exercises, as the water tends to ease muscles and joints, and overall can improve physical performance without the impact on weight-bearing joints.

Injuries such as musculoskeletal (MSK), muscle overuse and concussions can happen. The most common injuries in swimming are the upper body extremities, shoulders, arms, elbows, hips and these can increase lower back pain (LBP). Knee injuries can also happen at any given time. For inexperienced swimmers, other such injuries as submersion and drowning.

An athlete often has tremendous passion and determination to do everything for the sport. Swimming has many psychological benefits, such as reducing stress, ease muscles, and increase positiveness to make a person feel good, and helps a person feel energized.

Swimming can be both mentally and physically exhausting. As a unique sport which happens in water, it can result in different gravitational and resistant forces. Environment factors, such as the water temperature can also play a large role in how the athlete performs. Interestingly water temperature can have deep impacts to how an athlete breath to body functionality.

It takes years of practice to build solid techniques and form the work for the stride or stroke. Speed, strength and performance are key elements, and this can be measured both on the pool deck or on dry land doing warm-up exercises, weight training and cardio, and it is important for any athlete to follow proper swimming techniques which defines how the athlete performs in and out of the water. Certain techniques are essential as each one depends on the other and can include race distance, and stroke ability. Fitness training for swimmers includes getting the athletes in top performance so they can do their best. If an athlete is competitively swimming, or for any type of swimming group, it is still important to get the individual 'ready' for the pool. One advantage is a tall person, and someone who is fairly lean. This type of body composition may have a better advantage to say someone who is overweight. Being tall is an excellent advantage. On a personal level, I know someone who is 6.3' and like me, has done a lot of competitive swimming. Years ago reaching a goal of being 8th in all of Canada.

In competitive swimming the proper techniques and proper physical activities and exercises ahead of the game can all try and prevent injuries in and out of the pool. No one knows when an injury would strike, but what can be done is to try and prevent the injuries from happening. And how do you do that? With proper training ahead of time. Here are some quick techniques to try and prevent injuries:

- Stretch and warm-up
- Eat a balanced diet and drink plenty of water.
- Keep up your cardiovascular fitness and core strength.
- Get enough rest. ...
- Practice good technique. ...
- Treat injuries as they occur and allow the body to completely recover before heading back out

If an injury does strike, depending on what it is, an athlete must try and get back into the activity

slowly. Slow and Steady WINS the race. Don't rush things. Take baby steps and build back up. During this time, physical activity and exercises to further prevent an injury or a re-occur are imperative, and to ensure they are done right. Have an athlete speak to a physiotherapist and sports medicine doctor, or a coach. They can be both a mentor and awesome help. Having sports medicine personnel on the pool deck ready to lend a hand, along with the proper reconditioning and rehabilitation clinic can provide accident prevention, as well provide rehabilitation if an injury occurs.

Speed, distance and performance all have relative impact as to how an athlete does in the water. Physical and physiological requirements are also important factors. Being ready ahead of the game (before jumping in the pool) means doing various physical activities and warm-up exercises on the pool deck or weight room/gym before hand and getting tested to see the level of performance and endurance an athlete has.

Performance tests can indicate how well the person will do, what endurance they have, how strong they are and can indicate powerful methods so they can determine what kind of strength they have. These types of performance tests can monitor heart rate, blood flow and stroke rate etc.

Having the right warm-up exercises and exercise techniques will help both the swimmer perform better and will help to reduce muscle overuse and increase ways to improve maximum strength and power so the athlete can perform best in the water.

Strength training, cardio, weights and other athletic exercises can all prevent injuries, if done correctly. And if these are done correctly, these physical exercises prior to the competitive swim can in fact prevent injuries in the pool. Competitive swimmers try and gain power and control in the pool; to swim faster. Although swimming faster and reaching a goal is not the only focus. The other focus is, of course, the scope of the swim, or how the athlete performs in the water - do they have the right physical form?

For overuse training, it just depends on how much the athlete actually does, as everyone is different. So athletic exercises can be too much for one person (perhaps they suffer from under-training) and then training and the amount of training can be perfect for someone else. Research shows that team sport athletes who performed more than 18 weeks of training before sustaining their initial injuries were at reduced risk of sustaining a subsequent injury, while high chronic workloads have been shown to decrease the risk of injury.

The appropriate amount of high training should overall improve a person's fitness, which in turn may protect against injury, ultimately leading to greater physical outputs and resilience in competition, and a greater proportion of the athlete available for selection to perform competitively.

Resistance training can happen on dry land and on the pool deck, it is also important to get the high schoolers familiar with the water where they also focus on repetitive movements. Repetitive movements especially against the shoulders are in need of first trying to strengthen the shoulders to their maximum ability. Any resistance training exercises to strengthen the joints is vital to ensure proper technique in the pool, but most importantly to avoid any injury to this area.

As a pre-warm up exercise for the athlete, the gym or weight room is a good source for athletic training. It would be important to gently get the athlete to start off small and lite in terms of the weights he/she can handle. Then gradually build up. Lift weights and also do something called pull ups, these would be a good way to strengthen the muscles, as well as the shoulders with range of motion.

The water tends to carry the same focus as the exercises on land. These would entail frequency intensity and movement. Just like on land, correct body position is very important when performing the exercises. Water is great for emphasizing proper body position because it naturally slows down motion. So if there is a weak high schooler, he/she can still obtain maximum power in the pool after solid training.

Below is a list of Warm Up Exercises, Plyometric, Aerobic and other essential components to a great Athlete and a great Swim =

## 15 Minute Warm Up Exercises

Warm up routines prepare swimmers physically and mentally. Most effective when it tries to prevent the onset of injury, but also gain the maximum of performance levels. Competitive warm-up helps to warm the swimmers' muscles, so they have better performance and can swim faster in the water.

### Benefits of Warm-Up Exercises:

- \* Raises heart rate and enables a swimmer's heart to pump larger amounts of oxygen-rich blood throughout their body while swimming.
- \* Mobilizes and increases joints effectively. Increases the swimmer's flexibility and enhances the ROM, range of motion, range of movements.
- \* Engages the muscles and tendons for the physical demands that are about to be placed upon them during physical activity, reducing the risk of injury.
- \* Gives the swimmer confidence to work at maximal effort without the fear of aggravating an old injury.
- \* Provides the swimmer with an opportunity to rehearse the skills taught in order to work at the desired level without the fear of injury.

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### Things to remember for Pre-Warm up:

**Nutrition** – An athlete must eat a hearty breakfast the morning of the competition. Include a healthy balance of carbs and protein to keep you fueled. Pack snacks that prioritize carbs and protein, fruit, sandwiches and juice. Drink lots of water or sports drinks to keep you hydrated.

**Arrive at the Pool Early and On-Time** - This helps the athlete stay focused and reduces any anxiety or nervousness about swimming. This ensures they have enough time to carry out an effective warm-up. An effective warm-up enables them to do your very best in the pool.

**Warm Up Muscles** – This ensures muscles are warm and supple before swimming. Do not stretch cold muscles – it will not help increase flexibility. Go for a quick walk around the pool deck or a gentle swim before starting the warm-up. (These are commonly called blood-flow stretching)

**Prepare Mentally** – Get ready to race. Get focused and mentally rehearse the race from start to finish. Remind yourself you got this! It can help to listen to music with your headphones to get prepared, both mentally and physically.

### Warm Up Routine and Strength Training Exercises

Before jumping into a warm-up routine, a gentle stretch on dry land and/or the pool deck is highly recommended. This helps to raise body temperatures and warm muscles. Get the blood flowing and ease the muscles before diving into the pool.

Each of these stretches are designed to increase flexibility and mobility in shoulders, hips, chest and legs. Doing these simple stretches on the pool deck will help an athlete be more efficient in the water. These warm-up exercises will build up the power an athlete needs to beat their competitor.

Dynamic Stretching Exercises help to warm up the body and raises body temperature. Dynamic stretching consists of a combination of soft tissue work, dynamic mobility, injury prevention, functional movements, and gentle cardio stretches and exercises. These types of exercises should be done for at least 5 minutes each, during a work-out and in between races.

Below are some warm-up exercises and strength training exercise stretches to perform on dry-land and/or on the pool deck prior to any race or competitor event. It is a good idea to also perform some of these in between races while an athlete wait for your next swim.

### **Arm Swing:**

- Stand with one leg slightly more than shoulder width apart from the other. While your knees are slightly bent, lower your head down (look to the ground) and place your forearm above the knee of your forward leg.
- Rotate your opposite arm slowly in a full circle to work the shoulder joint through its full ROM, range of motion
- Repeat for both arms and switch each leg. Place left leg first with right leg behind, and then switch to right leg forward and left leg behind. Repeat 25 times on each side.

### **Arm Rotations:**

- Raise your arms to your side with your elbows bent forward and in line with your shoulders at a 90 degree angle.
- Rotate your arms up to the post position, without dropping your elbows below your shoulders.
- Repeat 10-20 times

### **Shoulder Rotation:**

- Straight arm swim – stand with one foot forward and the other back, Lean forward and rest one elbow on your knee.
- Swing the opposite arm upward and complete a full circle. Switch your footing, and repeat of the same stretch with the other arm.
- Raise each of your arms upward and hold them at 90 degrees. Keep your elbows in line with your shoulders, while you raise and lower your forearms, rotating your shoulders.

### **Arm Circles:**

- Stand straight and place each arms at the side of you, stretching as far as you can go.
- Next rotate each arm and make big circles with your arms, one arm at a time, then try both arms together and make a big circle.
- Raise your arms above your head and down to your side again, Repeat 20 times.
- While standing raise one arm directly forward and upward while the opposite arm stretches upward and behind you. Stretch your arms until they form one smooth line.

### **Wall Press:**

- Stand facing a wall and extend your arm to place your hand against the wall. Next slowly rotate your entire torso away from the wall.
- You should feel the stretch across your chest muscles and your shoulder.
- Rotate back and forth a few times. Switch to the other arm and repeat.

### **Elbow Pull:**

- This warm-up warms up your shoulder muscles and triceps muscles.
- Stand up, raise one elbow upward until it is level with your head.
- With your opposite arm, take hold of your elbow and gently pull backward and inward. You should feel a stretch along the back of the arm, around your armpit and in your shoulder. Repeat 15 times on both arms.

### **Cross-Body Stretch:**

- While standing on the pool deck, or dry land, take one arm and shoulder height and stretch it across your entire body. Use your opposite arm to pull further across your chest.
- Now you should feel the stretch, maybe in the shoulder and chest muscles. Repeat 15 times on both sides.

### **Hips:**

- This will engage in range of motion into the hip joint, and warm up the muscles so you can maintain a smooth swimming stroke.
- Bend one leg and stretch the other straight behind you. You can lean onto a wall to maintain balance.
- Keep chest straight, stand up tall and lean into bending the knee forward. Repeat for the other leg.

### **Hamstring Stretch:**

- Lie on the floor with both knees bent and your feet flat on the floor.
- Keep one leg in front of you, while the other leg is bent.
- Bend your whole body while stretching out your arms above your head trying to hit the top of your toes on your extended leg until you feel a stretch along the back of your leg. (If you can't reach that far, that is okay, but stretch as far as you can in order to be comfortable). Repeat the exercise on the other side.

### **Towel Stretch:**

- Stand with your legs hip-distant apart while holding your towel with both hands behind your back.
- Keep pulling your shoulder muscles down your back as you gently raise the towel upward behind you.
- You should hold the stretch for a few seconds and then relax your arms.
- Repeat a few times. You should feel a stretch across the front of your chest.

### **Angry Cat Stretch:**

- On a floor mat, kneel on the floor and guide your torso towards your heels. Try and keep toes and feet together.
- Arch your back up like an angry cat to round out your spine.
- Keep your back rounded and drop your rear to your heels.
- Reach out in front of you as far as you can go and push your shoulders down into the ground to feel the stretch. Hold for 15-20 seconds.

### **Full Body Stretch:**

- While lying on your back, raise your arms straight up by your ears and keep your legs straight.
- Stretch your arms and legs in opposite directions.
- Then Stand up straight with your feet together.
- Raise your arms above your head and bring your hands/fingers together.
- Keep your shoulder muscles pulled down your back and away from your ears.
- Slowly bend to one side while continuing to look straight ahead. Hold the position for a few seconds, then repeat on the other side. Stretch should be felt in your ribcage and hips.

## Strength Training Exercises and Performance Tests

Fitness to get ready for the pool is an essential component for success in swimming. Certain swimming techniques as mentioned, are essential to see how the athlete performs in or out of the water. Each one depends on the other and can include race distance, and stroke ability.

Fitness training for swimmers include getting the athletes in top performance so they can do their best competitively in and out of the pool. One advantage is a tall person, and someone who is fairly lean. This type of body composition may have a better advantage to say someone who is overweight. Being tall is an excellent advantage.

Speed, distance and performance all have a relative impact as to how an individual will do in the water. Certain performance tests can indicate how well the person will do, what endurance they have, how strong they are and can indicate powerful methods so they can determine what kind of strength they have.

Below are types of performance tests that can monitor heart rate, blood flow and stroke rate etc.

### **Vertical Jump Test / Sargent Jump or Vertical Leap –**

This test is used to measure strength and power of an athlete's legs. Once the swimmer is ready to dive into the pool, they normally stand on a swimmer's block as they get ready to jump. They need to have the form, physical endurance and powerful strides to do it well. Verticals Jump Test is used to test the lower body power, a timed measure test that measures the time of the jump and then calculates the jump height.

The purpose is to measure leg muscle power. Measurements used are a measuring tape or marked wall. The athlete would stand side to the wall and then try and jump to the highest point. The jump test can affect how much muscle power an athlete uses in their knees and legs, and how much bending movement is in the knees. It can also be an effective use of the arms to help strengthen the upper body.

### **Bench Press Test:**

Specific repetition maximum (RM) tests for the upper body using a bench press exercise.

Helps to strengthen the arms, muscles and overall upper body using chest muscle groups. This type of test can be done by simply lifting weights and then the maximum weight lifted is tested and recorded.

Sometimes the score may be useful to calculate a score proportional to the person's body weight. The sequence of lift repetitions should be recorded and then used in subsequent tests to try and reach a goal. Test is easy to perform and often times can be done at the gym before going to the pool deck.

### **Swimming Beep Test:**

Conducted in the water to test the aerobic fitness level of the swimmer. Waterproof speakers are placed in the bottom of the pool and once the swimmer swims lengths, every few seconds the beep goes off.

The test is normally conducted in a 25m pool, starting at a speed of 1 m/sec and increasing by 0.05 m/sec every two minutes.

The swimmer's score is then recorded and the number of laps is recorded. All ages of swimmers can use this test, which tests aerobic fitness levels. One disadvantage, however, is practice and motivational levels can influence the score.

### **V02max Test:**

Advantage for treadmill running involves whole-body exercise and is more likely to produce a higher V02max level. A cycle V02max test provides less movement and is easier to test for accurate push/pull/gas collection, and measurement of heart rate, including the same for swimming.



Oxygen and carbon dioxide analyzers, heart rate monitors and a stopwatch are normally used, including the appropriate ergometer or equipment machine such as a treadmill, bicycle or even a swim bench.  $V_{O2max}$  oxygen level can measure the ventilation and the oxygen levels of the athlete and the maximal levels are determined. Results are presented as either l/min (litres per minute) or ml/kg/min (ml of oxygen per kilogram of body weight per minute). Then the athlete is considered to have reached their  $V_{O2max}$ .

A smart-watch is often used to measure movement, physical endurance and can automatically record these levels while in and out of the pool. Once the recordings are done, they can then be transferred to a Smartphone and PC to view full statistics and analytical data, and be shared with their mentor or swimming coach. These types of tests are a great measure for body oxygen consumption. Works for long-distance runners, cross-country skiers, rowers, triathlon or cycling. The Garmin Fenix smart-watch is amazing to track progress in these areas, including swimming.

### **Swimming $V_{O2max}$ Tests:**

Tested both outside and inside the pool. For outside the water, a land-based treadmill is often used to record treadmill  $V_{O2max}$ , although statistics show that a swimming  $V_{O2max}$  test can be somewhat difficult to conduct, it often has better results for swimming.

### **Max Heart Rate Performance Tests:**

Treadmill walking, running or on a bike is a great way to measure heart rate. The maximum heart rate is the highest number of beats per minute (bpm). For a swimmer, it is a handy measurement tool to measure exercise intensity.  $220 - \text{your age} = \text{your max heart rate}$ . Example: 34 years of age, heart rate is 186 bpm ( $220 - 34$ ).

### **Alternative Methods for Exercises**

#### **High Kneeling and Wall Slides:**

- Start in a half-kneeling position on the floor mat with your legs apart.
- Bend your front knee at 90 degrees and keep your back knee on the floor.
- Keep your chest forward and bring your arms up so your hands are over your head.
- Rotate your torso to the direction of your front leg.
- Keep in this position for a second, and then return to your starting position.

#### **Jumping Jacks:**

- Only do this warm-up exercise on dry-land in a stable environment to prevent injuries and sprains.
- Stand up straight with your arms to your sides.
- Jump as high as you can while raising your hands high in the air. Return them to side upon landing and repeat.
- This warm-up forms the cardio portion, raises body temperature, warms up muscles and raises heart beat.

#### **Push-Ups:**

- Lie on your tummy, on a floor mat with the arms folded at the elbows.
- Place your arms perpendicular to the side your body and put your palms firmly on the floor.
- Try and raise your body off the floor until your elbows are at a right angle, then slowly lower yourself.
- Support your lower body with your toes and maintain a straight back to prevent from straining it.

## Needs Analysis

A needs analysis, stated by Haff, G (2016) is a two-stage process that includes an evaluation of the requirements and characteristics of the sport, and an assessment of the athlete.

Statistics show that resistance training can improve swimming performance. Resistance training in swimming can be defined as the ability of any given muscle group to generate enough muscle force and increase muscle mass (hypertrophy). Resistance training is intended to overload the muscles used in swimming and increase maximal power given by the athlete. Upper body strength is imperative during swimming as the majority of propulsive forces and swimming velocity are generated by upper body muscles.

On the downside, athletes can be prone to injuries most specifically to shoulders and other MSK injuries, and it is imperative during any training that injuries are prevented. The shoulders, arms, knees and hips are used the most to provide a high level of speed and power. Due to the repetitive nature of arm movements both found in training and in competitions, the muscles and tendons surrounding the shoulder and elbow joints tend to be injured due to overuse.

Having the right training, warm-up exercises and swimming techniques can enable a swimmer to perform at maximum power in the pool. Having the right resistance training can actually show improvements in increased stroke length, swimming performance and stroke rate.

### Profile of the athlete:

- Competitive Swimming for High-Schoolers, aged 13-17
- The athlete is well conditioned for his/her sport
- No pre MSK dysfunction
- Cleared for training for competitions
- Training since age 5 up to the middle school to high school, loves the sport and water all year / all-season
- Engaged in excellent arm movements and swimming techniques

### Athlete Training Status:

- Warm-Up Exercises on dry-land and on the pool deck
- Strength Exercises to strengthen muscles and core
- Moderately resistance-trained
- Training Time – frequently during the year, approx. 2-3 times per week
- Swimming techniques – Breaststroke, Freestyle, Butterfly, Backstroke, Front Crawl

### Physical Assessment of Athlete:

Strength, flexibility, power, speed, muscular endurance, and has great body composition in the pool, physical form to do well, with muscle endurance and strength/power.

### Athlete Training Background:

- Starting swimming at the age of 5, worked way up to swimming goals, and middle school and high school level for competitive swimming, performing excellent skills in performing warm-up exercises, strength training exercises
- Just completed a 3x/week resistance training program consisting of warm-up exercises on dry-land and including pre-warm up swimming in water
- 7 exercises (3 core, 4 resistance, 3 lower body, 4 upper body)

During the year, high school athletes enjoy 'going to the pool'. During this time, they also train on dry land using the school's fitness equipment, weight training, cardio exercises and strength training. Once they arrive

early at the pool, pool deck warm-up exercises are recommended. This is so they can competitively compete in the pool using their maximum power and strength.

### **Plyometric Exercises and Agility Drills**

Plyometric exercises should be included in any athlete's weekly regimen. For swimming, medicine balls and plyometric Push-Ups are great anaerobic exercises.

For a swimmer, it is all about strengthening the core, and if they don't have this form correct, injuries can happen such as loss of core stability in the pool. They also tend to experience less efficient kicking and often times gain strain injuries to muscles in both the knees and shoulders. It is so important to follow the proper techniques when any exercise is performed. Having a strong core will help a swimmer gain better form, motion and help them swim longer.

Crunches with a medicine ball can help a swimmer speed up. It is for strength, power and stability. It also helps with better coordination with the arms, knees, legs and core abdominal muscles, which in turn gives the base to generate power and speed in the pool.

Core conditioning on the other hand, has been proven to improve muscle power, kinesthetic awareness, flexibility, posture and also aid in injuries. These exercises with a medicine ball can help build trunk strength. The trunk is defined as the main body part of any athlete, for swimmers that contain the chest, abdomen, pelvis and back. The stronger the core, the better the hip turn and better speed, stability and power a swimmer has when doing any stroke in the pool.

Lower abdominal strengthening should also be done, as a dry-land (or on the pool deck) plyometric warm-up for swimmers. Here, the goal is to strengthen the core, abdominal muscles to help develop increased control of the pelvis by avoiding excessive anterior pelvic tilt and lumbar lordosis. The medicine ball can be done with the pelvis in a neutral position and the spine, ensuring there is good alignment.

Both plyometric exercise and agility go hand in hand. Agility can be defined as an athlete's ability to move at an accelerated pace in one direction and then instantly decelerate and shift position within a matter of seconds. agility exercises can also be done to increase an athlete's performance, coordinator, balance, and speed in the water.

Doing any one of these mentioned exercises, plyometric or agility drills can actually improve the athlete's strength and power in the pool. Every athlete is different, but they all have the main goal in mind to do well and beat their competitor; become faster in their sport.

#### **Plyometric training develops power:**

- High intensity exercise involving explosive movements.
- The muscle is lengthened and then rapidly shortened to develop the explosive capability of the muscle.
- Suitable for well-trained athletes.
- Very effective for developing power.
- Disadvantage - can cause injury if athlete is not in excellent condition.

As per the National Strength Training & Association, Plyometric Exercises are activities that enable a muscle to reach maximal force in the shortest possible time. It is a form of dry-land exercise, with the goal to increase both the swimmer's speed, endurance, power and strength.

For competitive swimming at a high-school level (ages 13-17), each individual or athlete must engage in a number of intense, high-impact exercises which are intended to gain the maximum force and power, so the swimmer does the very best in the pool and tries to beat their competitor. Plyometric exercises are like those of resistance training, but for the swimmer having the maximum of force, power and speed can even help the

athlete dive into the pool from the starting block. This is when they have the muscle power in the lower extremities to help them push off. The stronger they are, when they push off, the faster they are when they first enter the pool, and the greater distance they get before performing the breaststroke or front crawl.

The major goal of any exercise routine is to prevent the risk of injuries. To reduce the risk of injuries and facilitate the performance of plyometric exercises, the athlete must engage in proper techniques and ensure he or she has the strength, speed and balance to do these well and before starting any exercise routine, previous injuries and the history of the athlete must be taken into consideration, like the needs assessment. Sometimes exercises must be customized to suit the athlete.

Warm-Up exercises (like Resistance Training Warm-Up exercises) should be the number one focus, by combining plyometric exercises with resistance training exercises, a swimmer can experience a stronger swim, strength and maximum power in the pool and engage in the most optimal effects for strength & speed.

To get the athlete ready for the pool, at least one hour of Dynamic Plyometric exercises should be done on dry-land, or the pool deck. I would suggest the individual does these at least three (3) times a week.

Plyometric exercises can affect a person's joints, so it is vitally important to do these well. Swimmers should focus on engaging a soft landing, as gentle as possible with their knees slightly bent while using muscles of the lower body. Points of contact include ground reaction force during single-leg lower body plyometric drills, which can place more stress on the lower extremity muscles, connective tissues and joints. For a swimmer, they must focus on a soft landing on a soft surface, they can use a rubber mat, grass or non-slip gym mat.

An athlete must land correctly after any type of warm-up exercise, which consists of jumping, skipping, jogging on the spot. If not done correctly injuries can happen mostly to shoulders, or even weight-bearing joints such as knees, ankles, and hips.

### **Five Dynamic Plyometric Exercises:**

- |          |   |
|----------|---|
| Crunches | <ul style="list-style-type: none"><li>• The athlete should lie on his or her back</li><li>• Hold a Medicine (Plyo) Ball at his or her chest and crunch upwards, with the legs on top of the ball. Next, bring the ball to the knees, squeezing the legs into the chest, while extending the arms to reach forward.</li><li>• Do this for 25-30 repetitions</li><li>• For Strength and Power</li></ul> |
| Squats   | <ul style="list-style-type: none"><li>• Holding a Medicine or Plyo ball above the athlete's head, squat to a straight position.</li><li>• Bend your knees, while holding the Plyo ball above your head</li><li>• Do this for 10-15 repetitions</li><li>• For Power, Endurance &amp; Strength in lower-body</li></ul>  |

- Step or Box Jump
- The athlete can perform low step-ups on a stair or box
  - The stair or box must be strong enough to hold the athlete's weight and it must be secure and safe
  - He or she can step up with one leg first, and then try and jump with both legs onto the stair or box.
  - Once the athlete regains his or her balance, pause for 5 or 10 seconds and step down
  - Do this for 1 or 2 sets at 5 or 10 repetitions each time
  - For Power, Endurance, Balance and Strength in lower-body
- Power Skipping
- The swimmer should start by gently skipping (with no rope)
  - Increase their speed and intensity while, lifting their lead leg as high as they can, while raising their alternate arm as high and as straight as they can.
  - Focus on Balance, pause for 5 seconds, then repeat the exercise.
  - 2-minute warm-up low-intensity set
  - Do this for 1 to 2 sets of 5 to 10 repetitions each
- Plyometric Push-Ups
- He or she should perform standard push-ups
  - Lying on the athlete's stomach, while feet are placed to the ground.
  - Lean on tippy toes and stretch the whole body forward. Use Arms to push up. Once the athlete starts to raise their body by strengthening their arms, they should drive the arms powerfully upwards.
  - The athlete should try and lift their hands as far off the floor as they can and perform a clap.
  - Once they regain balance, repeat the exercise 10 times, with 10 repetitions each set.
  - For Power, Endurance, Balance and Strength

For Swimmers, there isn't really an off-season as swimming can be an all-year-long activity. However, if the swimmers are competing, then of course they would need some downtime to rest, re-energize and think about their next competition. During this time, it is important for any swimmer to continue to stay focused and get mentally prepared for their next competitive swim.

Both speed and agility workouts or training sessions can be done both on dry-land or on the pool deck, or even in the pool. So even if it is off-season (between competitive swims) a swimmer usually loves going back to the pool to continue strength training. Pool workouts can build muscles, increase fitness levels while reducing the effect on overuse injuries.

If using the pool for a workout, an individual can reduce their overall body weight by 10 percent which means that the reduction in weight can increase the ability for the individual to train harder and at higher intensity levels several days in a row, without causing wear and tear on their joints and gain soreness in their muscles. This means that a swimmer can repeat and continuously go to the pool to work out.

Water has proven to be 12 percent more resistant than air because there are no gravitational forces, so for an athlete training in the pool for say 30 minutes, this gives the same effect as a two-hour land-based

workout. Water accommodates resistance, the harder the athlete pushes or pulls through, the more resistance an athlete experiences.

Many dry land or land-based exercises can be done in the pool.

### **Five Agility Drills:**

**Lunges** – this can be done in deep water – forward, backward and side-to-side.

Lunges can increase strength and offer the athlete a chance to gain maximum power - High kicks can be done in all directions and resistance can be added to the legs to increase the intensity of the workout. Water dumbbells can be incorporated for upper body exercises, and paddles can be added for rotator cuff routines and other types of shoulder exercises.

**Box Jumps** – place a box or stool in the water. Jump off the box, land soft and jump up out of the water as high as the athlete can. This can increase endurance, strength, power and agility in legs and surrounding muscles. Imagine when a swimmer jumps into the water. Athletes jump off a block prior to jumping in the pool – it is still important to have the proper form and technique, before jumping in. Height, distance, velocity and angle of entry can affect how much speed a swimmer carries into the water to give them maximum power and speed when swimming.

Once in the pool, I would recommend the athlete warm up by swimming a few gentle, slow and easy laps. Water walking is also good, walk 10 yards forward and then 10 yards backwards. Concentrate on staying on tippy toes while walking baby steps. Swing arms while walking.

### **Lower-Body Exercises to build strength and agility:**

**Hamstring curls** – stand on one leg and perform a hamstring curl with the opposite leg. Alternate legs after 10 reps.

### **Upper-Body exercises to build strength and agility:**

**Breast Stroke Arms** – while in the pool, hold hand paddles or dumbbells. Stand tall and extend arms directly in front of the body then sweep them out to the sides as if you are swimming (but standstill). Recover to starting position and repeat 10 times at 10 reps.

### **Speed and Power:**

**Cross Country Skiing Form** – the athlete coordinates arms and legs in the pool as if they are cross country skiing. This is the increased speed, power and increased power in leg muscles. Standing in the shallow end, stand up straight, vertically aligned and then legs and arms are kept straight. Mimic the cross country skiing position and move the body towards the end of the pool deck. The basic motion is to scissor the legs forward and backward from the hip leading with toes while the arms pull through the water. 25 times at 5-second sprints, 5 reps each time.

**Freestyle with Dolphin Kicks** – this improves coordination between the lower and upper body, to build strength, power and agility.

Swim freestyle, but kick legs like a dolphin (the same motion is used for a butterfly). Keep legs together and toes pointed. Take one dolphin kick for each stroke, making sure to emphasize the forward drive. This improves body coordination, improves the core and helps keep a swimmer's stroke strong.

## Program Design - Aerobic Testing and Training for Swimmers

In competitive swimming any athlete must maintain the proper form or technique, as the whole body moves against the resistance of water. The main strokes used in competitive swimming are breaststroke, freestyle, backstroke, and butterfly.

Cardiovascular fitness is simply cardio. Cardio fitness measures how well a person's body can perform a rhythmic, dynamic activity at a moderate to a high level of intensity for extended periods of time. Cardio is great for burning calories and can help in losing weight, it also improves cardiovascular fitness, which means how well the heart, lungs, and organs consume, transport, and use oxygen through the workouts. CV has a relationship with the respiratory system and skeletal system for optimal fitness levels.

Measuring a Maximum amount of Heart Rate (MHR) a person can gain insight as to the magnitude of effort the athlete is putting in when doing any type of dry-land or in the pool workout, and how it affects the athlete.

**Suggested MHR listed** –  $HR_{Max} = 220 \text{ minus Age}$

1) Moderate to Easy Swimming (50 - 60% of MHR) = These zones are ideal for people who already have some health issues, and further effort on their part will result in deterioration of their health, so important to stay within the zone.

2) Fitness Swimmers (60 – 70% of MHR) = Statistics show that fat levels of the body are reduced with this making this the ideal heart rate zone to lose weight and improve health. Mostly done on a fitness level.

3) For competitive Swimmers – Aerobic Swimming (70 – 80% of MHR) = This zone is ideal as it helps in improving the endurance and strength of the body

4) Anaerobic Threshold Swimming (80 – 90% of MHR) = Recommended to do this on short bursts in the pool, ensuring the athlete competitively swims with power and endurance in mind. This zone tends to improve the working of the CV system and increases lactate tolerance to enable the athlete to fight off fatigue.

5) Red Zone (90 – 100% of MHR) = should only be done in short bursts of high-intensity activity and is only recommended for highly expert professionals.

**Smartwatch Tracking and Testing** - Each athlete who swims in the pool should be wearing a smartwatch, one of these watches, like the Garmin Fenix 7 can monitor oxygen levels,  $V_{O2max}$  levels, and Heart Rate.

**Step Test** – Recommendation is for the athletes to perform a Step Test which involves swimming laps at a set pace followed by the measurement of physiological responses (this type of test can check heart rate, blood lactate levels, perceived exertion). Where the measurement of anaerobic threshold can be determined from the reports.

**Swolf Test** - A Swolf test can also be measured which tests swimming efficiency. The score is obtained by adding together the number of strokes taken in the pool length, and the time it took to swim that length. A lower swolf score equals greater swimming efficiency.

**12-Minute Test** - Requires the athlete to swim for a max distance of 12 minutes.

**Water Temperature** – The water temperature can affect the body physiology and performance, so any testing performed must have the same water temperature otherwise the tests may not be accurate.

**ECG Tests** - If needed, I would also suggest some ECG tests are done, while doctors and key expert people, such as medical providers, perhaps physical therapists/physiotherapists are handy in order to perform a cardiac test which is often performed when an athlete is about to do a rigorous physical activity. This type of test is a highly recommended method to determine if a person is subjected to controlled physiological stress while being monitored by an ECG.

The swimmer must do their workout exercises and train to build swimming endurance. Start slow but continue. If an athlete pushes themselves too quickly or too hard, there's a higher risk of burnout and increased risk of injury. I would suggest they start by perfecting the swimming form and technique. This will help the athlete stay efficient, allowing them to save energy while swimming at a faster speed for accuracy, speed, and performance.

Next, I would gradually increase the duration they are swimming or working out for. Don't rush it, but build up slowly. Slow and Steady WINS the race to get where an athlete needs to be, this ensures the proper techniques are followed and injuries are prevented. Build up the endurance wisely.

Increase the distance a swimmer swims. First, start small then work up to swimming a full 25 m length, then 50 m and so forth. Swim for an hour and increase the frequency, time, and distance.

When exercising on dry-land or the pool deck increase the repetitions and number of sets. (i.e. 8x50 set, 4x100, then 2x200 set and work up to 400 sets).

Take breaks when your body tells you to. Don't overdo it, but remember to have fun and do your best.

Strength training for dry-land workouts and pool deck workouts can build muscle power which helps power the strokes in the pool. By working the arms, core, and legs outside the pool, an athlete continues to build strength and stamina without putting more stress on the body or getting too tired too quickly. Overall better swimming performance will come. Remember these things take time – don't rush it.

**Maintain fitness in Season** – I strongly recommend to hold practice sessions, 1 hour-long swim, and group sessions. Ensure the athlete has rest times to regain mental health, and muscles.

I would recommend they do Aerobic Exercises to build up strength, stability, and stronger muscles which in turn will help them perform stronger and faster in the pool. They can do this by running on the treadmill, going for a bike ride, rowing on a rowing machine, using an elliptical machine and doing plyometric exercises.

### **Periodization and Macrocycles**

In order to have successful athletes, any type of planning is essential. In the sport of swimming, athletes can gain insight into their peak performance with periodizing. This is an exercise program that aims to optimize training during short or long periods of time to produce an athlete's maximum gain in physical performance. The goal is to achieve peak performance, strength, and power when swimming at competitive events.

Macrocycles are a seasonal or long-term plan. In terms of swimming, it is mostly an all-year sport. An annual training plan is the general pathway of the swimming training year which can be considered a macrocycle, which can further be divided into preparatory sessions and periods of training, as mesocycles. These are considered blocks of training. During any type of training low to high volumes of training and intensity is a key component to any swimmer, including having the proper swimming technique and form.

During the plan, coaches must determine the competitive event dates and then work around that to plan and prioritize a training program for the athlete where peak performance and high intensity will help the athlete be more competitive in the pool.

During mesocycles, with a training period of about six to eight weeks, the swimmer can become more effective which helps benefit with body adaptations. The body needs about six weeks to make significant physical and chemical changes in its abilities to provide energy to the muscles, which indirectly increases intensity, strength, and power in the pool. But it is vitally important during these phases to watch for an increase in injuries and illness (if training is done right injuries can be prevented or minimized), and during the program, a re-vamp of swimmers' goals can be adjusted if needed.

The goal during the period of periodization is to increase the athlete's effort, strength, and power.



During the Macrocycle, a swimmer has the opportunity to improve swim technique, improve fatigue resistance, refine their training and performance and practice proper diet and nutrition.

Usually, a competitive swimmer has the winter and spring months to get ready for the big competition, often mid-spring (mid-April), and continues until the end of the summer; where there are a number of events and competitive swimming trials throughout the year. Here in Victoria, B.C., the beginning of April saw the Canadian Swimming Trials where athletes competed for the 2022 World Swimming Championships. Normally the swimming season lasts from September to March and from April to August.

During the year a proper training plan should include:

Aerobic exercises, Anaerobic power, proper stroke techniques, strength and power training on land, in-water power training, emotional preparedness and mental performance, proper nutrition, etc.

### ***Sample MacroCycle for Swimmers –***

A sample microcycle is below - A 7-day plan for ease of planning in the organization and will need to be repeated through out the training weeks and through out the year. The microcycle is broken down from Monday to Sunday of training in any given month and season.

<u>Monday</u>	Objective : aerobic capacity, aerobic and anaerobic endurance Main set(s) : mixed basic, threshold and overload endurance Meters : 4000
<u>Tuesday</u>	Objective : aerobic and anaerobic endurance, speed. Main set(s) : lactate production (300-400m), overload endurance (800m) Meters : 4000
<u>Wednesday</u>	Objective : recovery Main set(s) : basic endurance Meters : 3000
<u>Thursday</u>	Objective : aerobic and anaerobic endurance, speed. Main set(s) : lactate production (300-400m), overload endurance (800m) Meters : 4000
<u>Friday</u>	Objective : aerobic capacity, aerobic and anaerobic endurance Main set(s) : mixed basic, threshold and overload endurance Meters : 4000
<u>Saturday</u>	Objective : aerobic and anaerobic endurance, speed. Main set(s) : lactate production (300-400m), overload endurance (800m) Meters : 3000
<u>Sunday</u>	Rest day
	Weekly total : 22,000m

My Swim Pro has further info with a full Macrocycle break down

> <https://myswimpro.com/blog/2016/02/12/how-to-build-a-yearly-training-plan/Links to an external site.>

Masters Swimming Canada has great info as well -

> <https://www.yumpu.com/en/document/read/43167350/planning-the-training-of-the-adult-athlete-masters-swimming-canadaLinks to an external site.>

## **Rehabilitation and Reconditioning**

In the sport of Swimming; I find even with myself on a personal level, someone who suffers from OA, osteoarthritis in all 4 joints (2 hips and 2 knees) that swimming can be an excellent form of rehabilitation, by simply going to the pool and swimming lengths or doing water walking (aquatic therapy). The water helps to ease muscles and takes the weight off the weight-bearing joints. It can also improve circulation, respiratory rate, metabolism, strength, and flexibility. Swimming is not only fun but also helps to regain movement, power, and speed.

Although my medical condition isn't considered an injury perse, there are many similarities to the rehabilitation and reconditioning aspects and the strength & conditioning program. Inflammation is a big part of joint pain and knowing the right ingredients with exercises, physical therapy, and techniques to manage or maintain a condition is key. This helps to reduce inflammation, ease symptoms, helps regain ROM, range of motion, and functionality of joint movement.

There are 5 stages of Rehabilitation: Control pain & swelling, Improve ROM range of motion and/or flexibility, Improve strength, sport-specific training, and then gradually return to full activity.

Starting with Joint Trauma, Muscle Strains and Microtrauma, over-use of injuries enhance the Inflammatory Response Phase. Any athlete must find that right balance in-between. Too much exercise can increase symptoms and cause inflammatory flare-ups, and too little exercise can cause severe pain and uncomfortable symptoms.

How does one find that balance? - Losing weight, eating a nutritional meal prior to any competitive swimming event, pre and post workout high protein meals, continue with physiotherapy and engaging in an exercise daily program is a major component of the rehabilitation process. Watching what you eat, eating a nutritional diet, and performing a daily exercise routine can enable a person with (or without) OA to regain muscle strength, power, speed, stability, and functionality which are all related, so I would definitely suggest this as part of any rehab. program. I would also encourage the athlete to seek knowledge and treatment from any sports-medicine professional.

Slow and Steady WINS the race, and I also find "finding the balance in-between" is key in order to help maintain and manage symptoms, while preventing further injuries or flare-ups, inflammation of the joints to keep things eased. For an athlete, taking rest days between competition swims is also vitally important, to physical and mentally re-gain strength and prepare for the next event.

### **Summary**

In swimming an athletes goal is to continue to be as active as possible, obtain therapeutic modalities when needed, and slowly build back up for the return of optimal performance.

Every individual is unique in their recovery times, and throughout the rehabilitation process, having an amazing team behind you from sports medicine doctors, orthopedic surgeons, and PT's, the proper form in exercise technique, aerobic, anaerobic, and resistance training is all very helpful to gain knowledge of how to do these exercises correctly which increases ROM, strength, function while limiting pain and flare-ups to make things worse. There is always the issue where an athlete can "do too much too soon", the athlete must find that balance in between.

It is highly recommended for any athlete or high schooler attempting to perform in competitive swimming, to simply communicate carefully and systematically with a sports medicine team members, and then use the proper techniques (exercises, therapeutic modalities, strength, and conditioning programs) to maximize rehabilitation and reconditioning so the athlete can return to their sport quicker, prevent further injuries and engage in the healing phase for optimal speed, performance, and recovery, and over-all continue to do the thing that makes them love the sport, and attempt to beat their competitor in competitive swimming.

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