Triathlon: Swim

by Tommi Paavola (first published on PTonthenet.com in 2009)

Several great articles have been already written about the energy systems, periodization and general conditioning involved in preparation for a triathlon. The focus of this article is to dive a bit deeper into the training for the swimming portion of a triathlon. More specifically, we will concentrate on the “catch” phase in freestyle swimming in order to gain understanding of how to improve the critical moment of force production in the water. As the biomechanics and technical information of each sport can easily overwhelm, we will focus on the key factors important from a trainer’s perspective. First, let’s briefly summarize a few general principles about the conditioning of a triathlete.

Conditioning Principles

Triathletes need to prepare themselves for the diverse demands of three sports, while mastering the combination of all three events in a sequence. We are all familiar with the enormous training volume and the mileage that triathletes endure on the road and in the pool. When designing an exercise regimen for a triathlete, we should pay attention to these high volume demands.

1. Priority-driven: Pick your fights! Invest the limited time wisely and pursue the main objectives.
2. Quality-driven: The training volume is already high through the sport itself. The conditioning should focus primarily on the quality, not quantity.
3. Sport-driven: Avoid creating an exercise regimen that competes with the sport. Support and supplement without compromising recovery.

Swimming in a Triathlon

Open water swimming in a triathlon is in fact quite different from doing laps in the pool. Many competitive swimmers get an edge by having a great skill of mastering the starts and the turns. This is not the case in the open water environment, where no solid base to push off from or grab onto exists. Also, our main focus is the freestyle stroke as it is no doubt, the most effective way to cover the most distance in the shortest amount of time. Butterfly, breaststroke or backstroke might require a different kind of approach that should be addressed separately.

What’s the “catch” behind the perfect swim?

Did you ever have the feeling of performing your sport while “in the zone,” in that effortless yet efficient state, where all the parts of the body seem to intimately commune in order to produce a perfect sequence of purposeful movements? Me too! Yet not as often as I wish.
If only we could reproduce that state and therefore function and perform to our full potential always. Without question, the “perfect” performance is a result of much more than just biomechanical or physiological details. However, are there any elements of that flawless performance we can identify, analyze and interpret in order to improve an athlete’s probability of performing on a higher level?
Some elite swimmers were asked to describe the feeling they get during a perfect swimming performance. They described the perfect swimming stroke as “putting your hand in a glove,” as if you were able to “catch” or “hold on to” the water and pull the body forward.
On the other hand, when the swimmers’ feel of the water was poor, they described it as the “water flowing through the fingers” and not being able to “anchor” the hand in the water.

Figure 1 - Open Water Swimming

So, where are those critical moments that determine the quality, the power and the feel of the freestyle stroke? One of those moments is the “catch phase.” The “catch phase” is the moment where the swimmer's hand hits the water and extends out, searching for the leverage to pull against.

This is much like the foot hitting the ground when running. The extended arm in freestyle swimming is the moment of truth and determines much of the quality of the stroke and the power within.
Do this exercise while sitting in a chair. Lean slightly forward, extend your arm over your head and reach up with your fingertips. As you keep reaching further up, you will notice your opposite shoulder starting to rotate back. Stop at this stage and imagine having to produce force in various directions through the palm of your hand (the one overhead). In fact, the palm begins to push the water first laterally before progressively “pulling” the body over the arm.

Figure 2 - Catch Phase

This is the critical moment that lays the foundation for the rest of stroke. Can you see how important the stability of the shoulder and the connection with the rest of the chain is at this time?
This is how the “catch phase” is discussed by renowned coaches Jim Montgomery and Mo Chambers: "With a well executed hand entry and extension followed by an effective catch and follow through, your hand will actually come out of the water in front of the point where it entered! The hands of world class swimmers exit the water several feet (about 1 m) in front of their entry points. These swimmers have an incredible amount of shoulder and back flexibility, allowing them to position their hands, forearms and elbows in the catch position much earlier in the stroke. This creates a longer and more propulsive power phase[6]."

Physiological and Biomechanical Principles Beneath the Technique

The success of the dry land training depends on the ability of the trainer or coach to combine the knowledge of the swimming specific information with a fundamental understanding of human function. In my opinion, the most important skill for a trainer is to identify the elements of human function that can be found within the sport technique. That means answering questions such as:

1. Where does force production originate when the arm is extended overhead? (freestyle)
2. Which body parts and anatomical stations need to team work particularly well?
3. What is the relationship between the upper and lower body in movement? (catch and kick)
4. How and where does the stretch shortening cycle occur? (loading and unloading)
5. Which chains or muscle connections are dominant?
6. What is the source or foundation for stability, strength and power?

By looking at the picture of the “catch phase,” we can observe some of the biomechanical basics that are in motion. For example:

1. The arm is extended overhead during the catch phase. Flexibility and stability specific to overhead movements are important.

2. The core stabilizes the center and enables and coordinates the movement of the extremities.
3. Counter action of the legs helps with producing leverage to the stroke.

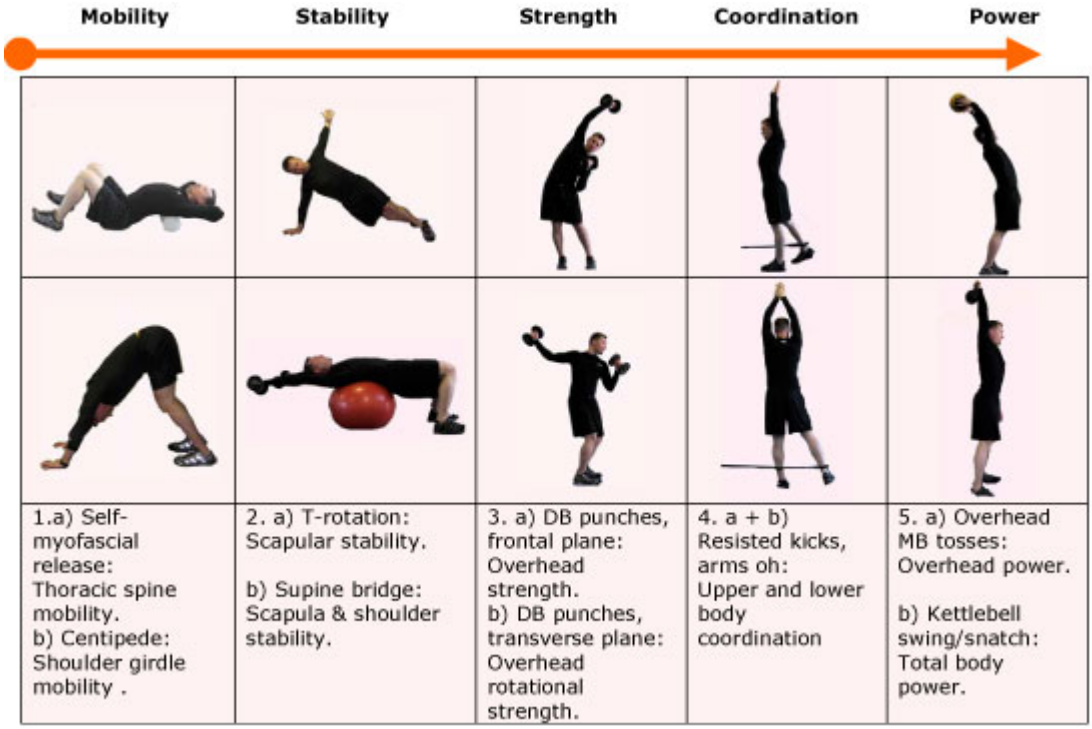
Figure 3 - Coordination

Table 1: Physiological/biomechanical evaluation of the freestyle catch phase

Inefficient, powerless “catch” phase:	Efficient, powerful “catch” phase:
Poor shoulder stability	Good, multiplanar, shoulder stability
Poor connection between core and hands	Strong connection from the core to the scapula and the hand
Poor countermovement of the legs	Coordinated countermovement that enables good leverage

Which exercises do improve the freestyle “catch” phase?
The following is an excerpt from an exercise progression aimed at improving the “catch phase.” The objective is to utilize the three biomechanical criteria (above) of the efficient and powerful stroke. In addition, the exercise program should also fulfill the following general principles of exercise physiology.

1. Specificity within integration: “The arm overhead” incorporated into integrated movements.
2. Multiple motor components included: Mobility, stability, strength, coordination and power.
3. Systematic progression: Easy to hard. Slow to fast.



Conclusion

Many elite swimmers have practically abandoned dry land training, due to negative adaptations that interfere with their swimming technique. It is valuable for a trainer to recognize the elements that can be enhanced on dryland. With the principles of function and the integrated human movement in mind, it is possible to create successful dryland training programs.

Swimming is potentially one of the most challenging sports to effectively improve outside of its natural environment. In water, where the effects of gravity are transformed and ground reaction forces have disappeared, the movement needs to be looked at through a whole new pair of goggles. However, the concepts of human function and integrated movement allow us to develop exercise progressions that hopefully compliment the unbelievable design of the human body, whatever environment it needs to operate in.

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