

The Basics of a Great Swimming Start

BY G. JOHN MULLEN • PHOTOS BY DEILA CABALLERO

The swimming start is the most explosive point of a race and is estimated to be 30 percent of a sprint 50 race.

There are many different components of a start.

For example, at every major meet, reaction time is calculated and displayed. However, contrary to popular belief, a fast reaction time does not necessarily correspond to a fast 15-meter time.

So, if a fast reaction time does not constitute a good start, what does?

First, let's talk about what data can be calculated with a stopwatch, video camera and a spoonful of patience:

- **Reaction Time:** The duration between the starting signal and when the feet leave the block.
- **Flight Time:** The duration between the feet leaving the block and the hands entering the water.
- **Entry Time:** The duration between the hands entering the water and the feet entering the water.

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- **Underwater Time:** The duration the swimmer spends underwater.
- **Take-off Angle:** The angle between the horizontal axis and the aerial trajectory of the swimmer.
- **Hand-entry Angle:** The angle between the hands and the water when the swimmer enters the water.
- **Shoulder-entry Angle:** The angle between the shoulders and the water when the swimmer enters the water (see Photo #1).
- **Hip-entry Angle:** The angle between the hips and the water when the swimmer enters the water.
- **Ankle-entry Angle:** The angle between the ankle and the water when the swimmer enters the water (see Photo #2).
- **Hip Angle at Hand Entry:** The angle between the hips and the horizontal axis when the hands enter the water.
- **Glide Phase:** The duration between the feet entering the water and the first underwater kick.

START STYLES

At one time, all swimmers used

one swimming start: the two-footed leaner start. This start was taught by every coach and used by every swimmer from the late 1960s through the 1980s.

Nowadays, most athletes use a track start, but as with every sport and every aspect of a sport, there are multiple variations of the same type of start.

As described by French researchers, J. Vantorre et al., in the article, "Different Profiles of the Aerial Start Phase in Front Crawl" (*Journal of Strength and Conditioning Research*, February 2010), most swimmers utilize one of four start cycles:

- **Pike:** provides a long flight time that allows for a delay before the body needs to overcome water resistance, enabling the body to "slice" through the water, resulting in a "pike" aerial trajectory. The pike start leads to minimal splash and a longer underwater phase, but a longer block phase.
- **Flat:** provides a short block phase and higher aquatic resistance, resulting in a "flat" aerial trajectory. Typically, this start has a larger splash and a shorter underwater phase.
- **Flight:** optimizes a short block phase and long flight phase, with high force generated by leg extensors (hamstrings and gluteal muscles) in relation to an arm swing, resulting in a "flight" style.
- **Lift:** initiates with the shoulder instead of an arm swing at takeoff, which lifts the shoulders during the flight time. This start is the least common of the four start styles.

The differences between the styles are vast, but there is no correlation between any of these starts and a faster time to 15 meters by elite swimmers. However, one common



PHOTO #1. Shoulder-entry angle (demonstrated by Emma Malysz)

factor was found: all elite swimmers enter the water at one point with their hands, and the rest of their body (shoulders, hips, feet) follows through the same "hole."

This is essential for a great start, and can be calculated by the hand, hip and ankle angles.

ON THE BLOCKS

Elite swimmers grab, stand and pull in a variety of ways once they are on the blocks.

- **Hands:** The athletes' hands should grip the front of the blocks with all of their fingers and both thumbs. This gives them a larger surface area on the blocks, enabling them to generate more force. The thumb position varies greatly, but elite swimmers have their thumbs wrapped in the front—not on top—of the block.
- **Arms:** Arms should remain completely straight and tensed—not flexed, but tensed and ready to react. Allowing the muscles to be tensed—as opposed to being relaxed—decreases the swimmers' time on the blocks.

Anatomically, flexing the joints puts the muscles in a sub-optimal position by shortening the muscles, thereby decreasing the potential for muscle activation. The elbows should face backward, and the athletes should pull backward on the block with straight arms to move forward.

Anyone who has taken physics knows that "every action has an equal and opposite reaction." If the elbows are facing backward, the action is backward, making the equal and opposite reaction forward, with the

same force applied.

- **Legs:** The legs are the most variable aspect of the start. Comfort and steadiness are essential on the blocks (see **Photo #3**). Swimmers who have great starts know how to distribute their weight evenly between both legs, with their feet facing forward. If their feet face sideways, they will go sideways—remember: equal and opposite reactions!



PHOTO #3. Comfort and steadiness are essential on the blocks (demonstrated by Emma Malysz)

UNDERWATER KICKING

The aforementioned information is the "meat-and-potatoes" of the aerial profile of a start, but all great swimmers utilize underwater kicking.

How does this play a role in the start equation? Dominating underwater begins with the streamline. The glide time during the start is the fastest part of a swimming race.

Swimmers use a short-glide style or long-glide style during the start. A short-glide style is associated with a low takeoff angle (flat start) and minimal time underwater. The long-glide style typically has a high takeoff angle (pike start) and longer underwater time.

Both of these styles can be effective, but if using the long-glide style, proper hydrodynamics are crucial to maintaining maximal velocity for as long as possible.

Determining the best time to start kicking is important to maintain speed throughout the start and breakout. Starting the kick too soon creates drag, which offsets velocity.

One study suggested that elite swimmers should not start their kick until after a full second has passed underwater. However, most long-glide style swimmers only glide for 4-tenths

of a second. Therefore, a good rule of thumb for elite swimmers is they should not kick until their velocity is below their average swimming velocity (roughly two meters per second).

♦ ♦ ♦

When deciding which starting style to use, it is important to remember that comfort and stability are the most important considerations.

With this in mind, here are some generalities—not absolutes—that can help swimmers determine which style suits them best:

- Athletes with a stronger vertical leap and quicker reaction time typically benefit from a flat- or flight-start style. These swimmers usually have superior hand-and-foot coordination, but also may be poor underwater kickers.
- Athletes with more leg power and superb underwater kicking typically use a pike start in combination with long-glide durations.
- Lift starts are atypical and are done by extraordinary athletes who typically were self-taught. These swimmers are explosive and generally have a strong vertical leap. ♦

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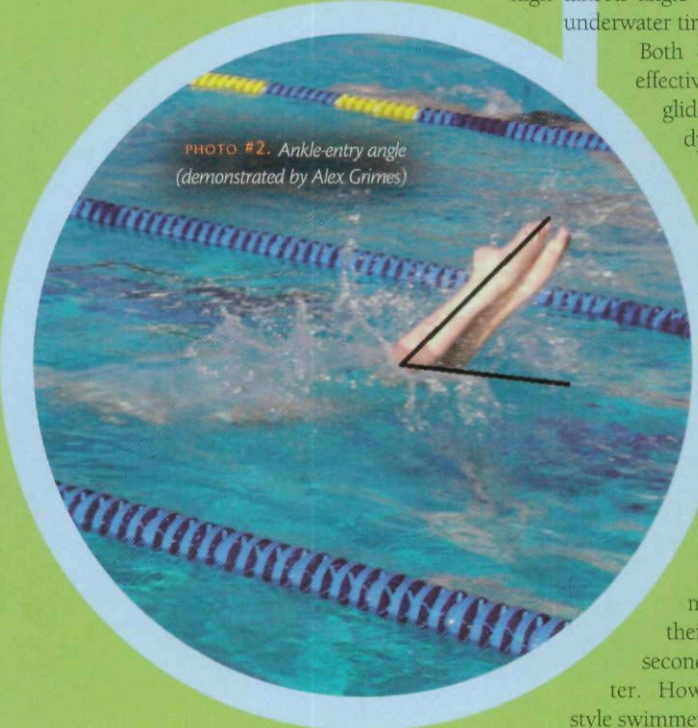


PHOTO #2. Ankle-entry angle (demonstrated by Alex Grimes)

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