Loren Seagrave on Acceleration

From *The 2010 Canadian National Sprints Conference*

Velocity founder Loren Seagrave spoke last year at the Canadian National Sprints Conference on the subject of acceleration. I've summarized the first half of his presentation for you here.

Seagrave at IMG Academies

Coach Seagrave begins by showing the first 5 seconds of the Olympic 100m where Bolt set the world record. Loren immediately addresses a frequently asked question regarding the limits of human speed. Loren think's we'll see sub 9.5 times in the 100m over the next few decades. Bolt, Powell, Gay, and others are pushing human limits in monumental ways. Bolt also proved to the world that tall sprinters can have good starts. Powell was the only guy ahead of Bolt in the first 10 meters.

A "New Truth" in Speed

Epistemology is the study of relative truth – you believe you know certain things FOR SURE about athletics, but that truth is limited by our knowledge. There is new truth out there that is now shaping the way Loren thinks about speed, and the revelation occurred to him after a discussion with speed guru Dr. Ralph Mann in December. As a result, Loren is using a new paradigm of teach acceleration, especially as it applies to the advanced technical model.

Speed is the most sought-after commodity in sports, and the ability to teach athletes to be even a little bit faster is something that is valuable and possible. Subcategories of "pure speed" are deceleration, change of

direction, re-acceleration, and conversion (of horizontal momentum to vertical lift). He then breaks down the phases of acceleration: the Start, Pure Acceleration, and Transition. Notably, Loren asserts that **Transition is the phase in which the most mistakes get made at the elite level, and is the toughest to teach.**

Global Considerations for Acceleration

F = MA. If you want to be fast it helps to be light ("you want to have a huge engine but a small chassis"). It also helps to have longer limbs in acceleration because every time you go through a range of motion, you displace your COM a longer distance versus a smaller athlete.

Sprinters don't have jet propulsion. When they're in the air there is no way to accelerate. SO we have to find strategies to get the foot back to the ground in an optimal place to be able to apply more force. You can increase stride length out of the block by simply getting more vertical velocity and increasing takeoff angle BUT that just puts you in the air longer (a no-no during acceleration). So we need a new strategy.

Not only is speed a skill, but so is running the 100 meters. Here's Loren's race-plan that we've used in the USA for the last 10 years and works for (mortal) non-Bolt athletes:

Start	Acceleration		Transition	
	15 meters	5 m	15 meters	5 m
	IN	OUT	IN	OUT
	20 meters		20 meters	
	"Push-Push-Push"		"Drive Taller"	
	Hip Extension – Acceleration		Extension – Max Velocity	

Breaking Down The 100 Meter

At start you need to inhale and Valsalva your abdominal cavity, which increases thoracic pressure and enables you to transfer power better [Ex: if you have to unscrew a pickle jar you instinctively hold your breath]. It also activates baroreceptors in your brain which inhibit some of the inhibitory overrides that keep you from going your fastest. As a result you recruit more motor units.

You push hard for 15 meters, then quickly exhale and re-inhale. Bear down and go again. "In" means go faster than you ever have with good technique and "Out" means exhale. Transition is the bleeding out of acceleration mechanics and the bleeding in of max velocity mechanics. We also know that our nervous system can't fire maximally for more than 5 seconds IF the motor pattern remains the same. So our mechanics NEED to change to increase speed neurologically. During transition we start stepping-over and going from an extension pattern to a flexion pattern (it then flip flops 2 more times as we complete the 100 m). The key is to have a race model that you follow that helps you both switch motor patterns AND focus throughout the race. The internal audio cues ("Push-Push-Push") are essential to shifting gears during the race.

Biomechanics of Pure Acceleration

When left on their own, kids have pretty good sprint mechanics. They only start altering those natural mechanics when they start overthinking it or listening to bad cues (ex: run on your toes). Additionally, when you take the shoes off of athletes they also change their mechanics and start landing with less force.

Once you leave the ground, if your foot dangles behind your body (residual) it's wasting time. **We used to think that athletes had to get "full extension" of the leg behind the body to apply the max force. We now know that that is the basic technical model**. When athletes get to the elite levels and are applying massive amounts of force, research has shown that they can apply the necessary force more quickly and

don't need to fully extend at the hip/knee. At no time should you forcibly flex the ankle to propel forward because as soon as you actively plantar flex it shuts down the triple extension response. Instead, actively explode into the ground and immediately send the message to dorsiflex your ankle in order to stimulate the other half of the crossed-extensor reflex (the flexor part). This will accelerate the thigh not only faster, but sooner. Note: even though it's true, don't tell an athlete that the best sprinters spend more time off the ground, because they'll start cutting their extension short. Big force, Short time, Proper direction, Ideal ROM (not too great not too small).

Loren then goes through the phases of the stride cycle as they relate to acceleration. [Velocity coaches should familiar with this info so I didn't take notes here]

Max Velocity

There is an optimal time that athletes need to recover a limb and this "air time" can be both too long **AND too short**. **The optimal time (regardless of leg length) to be in the air is 0.123 seconds**. **Loren used to believe that you could increase stride frequency and by reducing the amount of time in the air. But point of fact: what he was doing by reducing air time was reducing velocity because they didn't fly through the air as long. I now makes more sense to focus on the ground time.** What we see in acceleration is an inverse relationship between ground time and air time. As ground time decreases air time increases.