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Bike Fit unplugged

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Bike Fit unplugged is the technique I developed based on forty years of conducting Bike Fits. My priority is to preserve airway diameter and function through the Fit process. The process begins with a phone interview. This is to determine if there are injuries that are not appropriate to be treated with a bike fit. This is followed by emailing the client/patient a detailed questionnaire to get a history which includes cycling skills, injuries, and other medical conditions.

We start the fitting process with a musculoskeletal examination conducted by a physical therapist, or trainer with a masters in exercises physiology or comparable degree. This exam is followed by the actual bike fitting. I do all the fitting at the Hospital for Special Surgery (HSS) in the Leon Root, MD Motion Analysis Laboratory (LRMALab). The lab is equipped with a14 camera motion capture system, high speed video, EMGs and force plates. I also have a pulse oximeter, an assortment of lasers a spirometer and a metronome in my toolbox. Specific to cycling, we have an apex sizing bike from England, a rock 'n roll trainer, 2 feedback sports trainers for small wheeled bikes, and a Moulton bicycle from England that's equipped to use as a rolling fit bike and for patients with limited mobility in the hips and knees. It has a low stand over height that one can step through the frame and is equipped with short cranks 1 45s, an adjustable stem, adjustable seat post, and saddles with very long rails. I also have an assortment of handlebars, stems, and saddles in conjunction with a collection of wrenches, Alan Keys, and assorted shop tools required to properly fit bikes.

After the musculoskeletal exam, which includes strength, flexibility and neurological function assessments, we perform the bike measurements required to capture all fit contact points, saddles pedals, and handlebars along with all pertinent frame dimensions. The bike is in place upon a trainer when the examination is conducted. Cleats are checked for wear and adjustments while shoes are checked for proper fit. If foot orthoses or insoles are present, they are also inspected.

The on-bike examination is conducted next. Generally, we start with a warm-up. During the warm-up I use a pair of lasers lined up off the 2nd metatarsal and patella to give me a centerline and the ability to image lateral motion during the pedal stroke. Among the observations I have made over the years, quadriceps make inadequate stabilizers. Poor posture usually affects your ability to breathe well yet most cyclists are set up in a quad dominant position. When fitting, I start at the top looking at airway function and posture trying to find positions where the core is stabilized but breathing capacity is not impaired. When tracking errors of the knees are observed I look at upper extremity mechanics as well as the hips. I have often found the cyclist to be quad dominant with their gluteus minimus and medius on vacation. We also work on opening up the chest to improve title flow and volume. Temporal mandibular joint syndrome (TMJ) affects your airway function and therefore can affect your performance. Rhomboids usually need to be strengthened in the cyclist to help open up the torso and Intercostals.

At this point in the fit we look at use of the diaphragm, breathing and intercostal expansion. We also look at the elasticity of the Intercostal's when the cyclist is breathing on both the hoods and the drops using

different handlebars. We're looking for the loss of elasticity within the Intercostal's if the bars too wide as well as too narrow so we're searching for the sweet spot in the middle. At this point in the fit I am starting to move the cyclist forward and back. The biker is assessed both on and off the saddle looking at which muscle groups are activated as well as the position of the center of mass. In particular I'm looking for how far back we need to go to get Gluteus Maximus and Medius. The goal is to teach mobility --- when you are riding a bike on the road you need to be able to transfer weight back and forth between the wheels. If the bike setup locks you into one position it affects the handling. You need to be able to move forward and back as a rider for climbing and descending and to improve cornering. The cyclist must be nimble on the saddle to maximize the handling characteristics of a bicycle. Being seated in one position eliminates stability. In the process of sprinting I move the cyclist forward and back on the bike. Both help maintain traction as you exit a corner. Observation has taught me that your gluteals are stronger than the quadriceps and over time will produce a more efficient pedal stroke.

One of the pearls of a dynamic bike fit is that the cyclist will change their height over the course of the day --- we're tallest in the morning and shortest in the evening. One may change between 1.5 and 4.5 cm during the course of a day. Therefore, a precise measurement in the morning is less likely to be correct in the evening. This biological drift due to the viscoelastic nature of spinal soft tissues is better served with a 'target range' when bike fitting that accounts for these inherent variabilities. This also calls into question how accurate we need are measuring systems to be for determining frame size and component positions/alignments. A millimeter of error may not be relevant in the context of the biological variability throughout a bike ride. When fitting I look at the body as a series of interconnected mobile adapters and redactors. These articulations are the ankles, knees, hips, shoulders, elbows and wrists. The spine may be considered one large mobile adapter. No joints are looked at in isolation. We take this larger view of joint function when evaluating the cyclist on a bike. Cyclists need to be mobile when on their bike to improve ride quality as well as optimize their own body mechanics through the ability to self-adjust. This is part of the process that I try to teach the cyclist. Furthermore, in my fitting I encourage gastrocnemius soleus complex activation. This is done to help improve venous return to the heart. As described by Starling's law, stroke volume of the heart increases in response to an increase in the volume of blood in the ventricles, before contraction (the end diastolic volume), when all other factors remain constant. A mobile position can potentially lower your heart rate. Cycling is an endurance activity, so my goal is to make the rider as comfortable as possible while improving efficiency.

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