



High Performance Center Presents :

POSITION
POWER
PERFORMANCE

Mastering Bike Fit

Bike
Body
HPC

Choosing the right-sized bicycle based on body dimensions is a pivotal factor that greatly influences the joy of the ride and keeps injury-free. Equally crucial is fine-tuning the shoe cleat positioning, which serves as the primary point for transferring power





using **cleat wedges** in cycling is to address abnormal foot mechanics during pedaling. Competitive cyclists often face injury risks due to deviations from optimal movement patterns. **Cleat wedges** aim to improve lower limb alignment, increase midfoot contact, and offer better arch support. Their application seeks to enhance kinematics, power output, and alter plantar pressures, potentially reducing knee joint forces. This approach optimizes the foot/pedal interface to efficiently transmit forces and minimize negative effects on the knee, pelvis, and spine, promoting a more linear cycling motion.

01 Cleat wedge

02 Bike Measur ment



A bike that fits well and is right for your height, flexibility and riding style is a bike you'll love riding. A bike that fits poorly can lead to inefficient riding, muscle aches and pains, and general discomfort that might discourage you from riding as long or as far as you want.



Measurements include:
Saddle Position (Saddle Height/ Saddle Setback /Saddle model and width),
Grip Position (Grip Drop, Grip Reach),
Brake levers mostly based on hand size ,
Crank length, Handlebar width and model ,
Pedal model and Shoe model.
Aside from bike size, the correct fit means that the bike type also fits the rider properly. With this in mind, knowing the different bike types is crucial to getting the correct bike.

3-1 Posture analysis

The correct riding posture is unique to the individual. what may be comfortable for one cyclist, may be quite the opposite for another. because every posture consist of different sizes for arms, legs, torsos and any other parts of the body as well as varying degrees of body flexibility, different range of motion of joints in kinematic chain and different leg length. Posture analysis help to measure these factors of body and try to improve and optimize body posture.

By maintaining the correct cycle position, the advantages are:

- Greater comfort
- Avoid or manage injuries aggravated when riding a bike.
- More efficient riding
- Improved bike handling

The observation, analysis and management of movement are necessary elements in addressing movement system impairments. **movement constructs related to aspects of motor control such as symmetry, speed, alignment and amplitude.**

3-2 2D motion analysis

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fitting begins with an in-depth analysis of the biomechanics of the cyclist.

This involves measuring and evaluating joint angles, body movements, pressure points and other parameters to understand how the rider interacts with their bike.

The **2D motion** capture system is measure the markers location for angular kinematic analysis in hip, knee and ankle joints in related to upper body in sagittal and frontal plane. Also one of the most important advantage of **2dma** is cheaper than pro 3dma, so we recommend for using in your first bike fitting session.

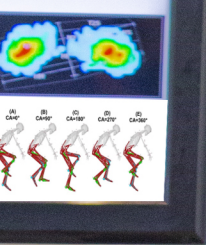


03-3 Physical Examination

cycling is an extremely demanding endurance sport characterized by its cyclic nature, large training volumes, and high intensities. The activity is comprised of several different disciplines with clear physiological differences according to the typology of the cyclist and the particularities of the event (length, elevation gain, mass, or individual start, etc.)

physical examination are a series of tests assess the five components of physical fitness that make up total fitness:

cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. A review of medical and cycling history with a thorough off bike physical assessment of flexibility, lower extremity and core strength, balance and posture in order to identify any restrictions or deficits that may impact cycling potential.



03-4 Pelvic Pressure Scanner



The process accurately measures how pressure is distributed on the saddle to determine which saddle and rider position is optimal for a rider's comfort and performance. This effectively takes the guesswork out of which saddle to purchase.

Optimal pressure testing results will exhibit even pressure throughout the posterior/saddle interface with measured pressure values within safe norms for circulation and nerve health. This means that when riding, the sit bones will be supporting the rider's weight and there will be little to no pressure on the perineal or pubic bone area when riding in an athletic or dynamic riding position. This is extremely important for both men and women as it is essential that these sensitive areas of nerves and blood vessels are not damaged. Alteration of the effective seat tube angle (ESTA) may affect muscle activation patterns of the lower limbs in cycling. It is important to note that a suitable position on the bike guarantees a good joint dynamic balance.

Elite Bike Fitting



When approaching cycling as a sport, the focus shifts to elevating measurement standards and perfecting the process to attain the most efficient biomechanical solutions.

The ultimate goal is to optimize the body's kinetic system, minimizing any energy wastage during the force transmission cycle



1-BODY

- Physical Examination
- Body 3d Scanner
- Composition
- Dynamic Foot Scanner



2-BIKE

- Peddalling Technique
- imu sensors
- power performance test
- Equipment



3-AEROFITT

- CDA
- Equipment



1-BODY

-Physical Examination



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2-Body 3dScanner



a 3D body scanner plays a significant role in enhancing the performance, safety, and overall well-being of athletes in various sports with calculate Accurate Measurements that provides precise and detailed measurements of an athlete's body, which is crucial for understanding their biomechanics.

It eliminates potential human error in manual measurements, ensuring that the data collected is reliable and consistent. allows for a visual representation of the athlete's body, which aids in the analysis of movement patterns, posture, and joint angles. By analyzing body scans, coaches and sports scientists can identify areas for improvement in an athlete's technique or form, leading to enhanced performance.





Female Specialist

Moreover, we offer a nurturing and inclusive environment tailored specifically for **women athletes**, particularly in **Islamic Countries**, facilitating their body assessment, marker attachment, and body composition analysis.



The presence and guidance of accomplished **female athletes** in cycling serve as inspiring models, encouraging **girls, women**, and other underrepresented groups to consider the biomechanical state of their bodies and strive for enhanced posture. The initial phase entails a comprehensive **physical assessment**, motion analysis, and the re-alignment and strengthening of the body, guided by expert advice from bike fitter. This process amalgamates knowledge with practical experience to optimize performance, prevent injuries, expedite recovery, and attain peak athletic potential.





3-BODY Composition



A cyclist's body shape indicates physical attributes that can provide a competitive advantage. Identifying and monitoring these physical attributes, both those genetically inherited and acquired through training, can help us understand a cyclist's performance, to quantify their response to training, and to identify future champions. Although optimal body dimensions are not the only components necessary for a cyclist to excel in sport, many believe they are vital prerequisites for success.

There is a necessity to measure body asymmetries in road cycling as it can directly impact the performance level. Get In-Depth Info About Balance and Posture, This is incredibly useful for:

- Athletes in training
- People with workplace injuries
- People recovering in physical therapy

Being able to track the minutia in balance and posture can empower clients to become more engaged with their recovery or training.

They can map out exactly how to make it to the next step and check off milestones as they come.





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4-Dynamic Foot Scanner

A dynamic foot scanner and cycling are related through the analysis of a cyclist's foot mechanics while pedaling.



The scanner captures real-time data about how a cyclist's feet interact with the pedals, measuring pressure distribution, alignment, and movement patterns. This information can be used to optimize bike setup, improve pedaling efficiency, reduce the risk of injuries, and enhance overall cycling performance. The scanner helps cyclists and professionals understand how the feet impact the cycling biomechanics, leading to better customization of equipment and technique for an optimal riding experience. The data will show abnormalities and asymmetries in your feet, areas of high pressure within the foot which may be associated with pain in the lower limbs. It also has the ability to monitor progress and improvements over a period of time. It catches data the eye can't see - making this much more accurate.



2-Bike



Pedalling Technique

The meeting of foot and pedal is the primary interface between human and bicycle. Good technique increases the efficiency with which the power that we generate is turned into forward movement. It also helps avoid injury, both by avoiding unnecessary strain on joints and ligaments and by promoting an even strengthening across the leg and core muscles. You might also include more technical considerations such as type of pedal, cleat position and the amount of float afforded by the cleat binding. **optimizing pedaling technique is a continuous process that requires practice and adaptation.** Working on your technique can lead to better performance, reduced fatigue, and a more enjoyable cycling experience.

IMU Sensors

allowed us to capture and analyze human movement in an ecological way with hardly any interference in it. allow us to measure accelerations and angular velocities of the body segments to which they are attached to estimate joint kinematics.

IMUs are sensing devices that incorporate at least two (and often three) types of sensors to measure a host device's location in three-dimensional space.

Data and subject motion are displayed in real-time with graphs and a skeletal avatar which Synchronize with other softwares.



Power Performance Test



The Cycling Performance Test measures the maximum average power you can maintain for 60 minutes.

The test can be used to determine your individual cycling power zones. When you have your individual power zones figured out, it's easier to optimize your training.

The test is also good for tracking your cycling performance development over time that consist of VO2Max, Lactate or functional threshold, Peak Power Output (PPO).

Performance tests done on cyclists can be argued as one of the most important parts of a successful training plan.

Performance testing can be used to give us insight into multiple areas of a cyclist's abilities, such as, potential during competition and training status.



Equipment

All about the creative and leading companies in the field of producing cycling products that makes:

- Less resistance
- More aerodynamic
- Enhance power transfer





3-Aero Fitt CdA



As you ride, you slam into air particles, which get compressed when you hit them and then become spaced out after they flow over you. The difference in air pressure from your front to your back creates a drag force. Aerodynamic shapes reduce this pressure drag by minimizing that difference in pressure and allowing the air to flow more smoothly over your front and reduce the low-pressure wake behind you. CdA is a measure of how well a rider turns their power into speed on the bike.

A lower CdA means you're more efficient and produce more power on the bike. It's important to keep your CdA as low as possible in order to improve your cycling performance.

There are many factors that can affect your CdA, including weight, clothing and position on the bike. CdA is a measure of how aerodynamically efficient you are as a rider.

It's determined by your shape and texture, and multiplied by your frontal area.

aim of the aerobike fitting session is to help the rider develop a position on their bike that offers a suitable, sustainable blend of comfort, power and low aerodynamic drag.

The session also helps the rider see the effects that their own body position and posture has on drag and helps them practice developing a posture that offers the lowest aerodynamic resistance to reach the optimal aerodynamic position on a bike.



Equipment



One of the most important things to reach good aerodynamic position on TT bike is, aero handlebar and body center of mass (COM) . when rider reach to the optimal position need to be on race peak performance

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Peak Performance



Following comprehensive kinematic assessments of the body, we then concentrate on fine-tuning muscle and joint functionality.

By employing precise body modeling and feedback analysis within a kinetic framework, a collaborative environment is created aimed at enhancing the performance of professional athletes and teams



**SCALE
MODELING**



**PEDALING
TECHNIQUE**



**PERFORMANCE
TRAINING**

Peak Performance

1-Scale Modeling



Scaling is performed based on a combination of measured distances between x-y-z marker locations and manually-specified scale factors. The scaling step scales the mass properties (mass and inertia tensor) of the model, as well as the dimensions of the body segments. Many of the elements attached to the body segments, such as muscle are also scaled. By matching up anatomic landmarks on a generic model with anatomic landmarks we measure in our lab, we can stretch and squish the generic model to match your body—the scaled model will be the same height, the same weight, and will even have any asymmetries (e.g. a leg length discrepancy) that you have.

Scaling a model in OpenSim with motion data, EMGs and in some cases synchronized with IMUs for a cyclist is essential for achieving accurate biomechanical simulations.

This accuracy, in turn, can aid in performance improvement in several ways:

- Personalized Training Plans for tailored training plans that target specific muscle groups and movement patterns.
- growing age children
- Optimized Bike Setup
- Injury Prevention
- Technique Refinement
- Muscle-Specific Training
- Energy Expenditure Optimization
- Rehabilitation and Return from Injury

Real-time or post-ride analysis using the scaled model can provide immediate feedback to the cyclist and coach.

This allows for ongoing adjustments and improvements in training plans and technique.

If a cyclist experiences an injury, a scaled model can be used to understand how the injury affects their biomechanics.



2-Pedaling Technique

Optimization

after scaling the model in OpenSim, optimization techniques can be applied to further enhance the performance of a cyclist. Here are some ways optimization can be used:

- Muscle Force Optimization**
- Joint Angle Optimization**
- Biomechanical Parameter Estimation**



Optimization is a method for estimating muscle activations and muscle forces that satisfy the positions, velocities, accelerations, and external forces of a motion. As with any analysis or simulation, the quality of the Optimization results largely depends on the inputs: the model, motion, and forces. Optimization is trying to compute muscle forces that generate the accelerations seen in the input kinematics.

Muscle analysis / Joint Reaction

3-Performance Training

Neuromuscular Training

Neuromuscular training, put simply, is training your brain and your muscles to work synchronously and efficiently. To perform a task, your brain recruits specific motor units to contract your muscles.

Lap 4			
DSS (L/R)	3.9 : 0.4	0.0 : 0.0	44.9 : 13.0
Foot AR (Q1) (L/R)	17.3 : 16.1	1.0 : 0.0	43.5 : 37.1
Foot AR (L/R)	45.6 : 54.1	36.0 : 43.4	61.6 : 64.2
Leg AR (L/R)	55.6 : 59.0	47.7 : 51.2	62.8 : 68.4
Leg Smoothness (L/R)	8.2 : 9.2	2.0 : 2.0	39.5 : 30.7
Pelvic Angle	1.9	1.5	2.3



With neuromuscular efficiency, we want your brain to recruit exactly the right motor units at exactly the right time and in the most efficient manner possible. Over time, these small differences in recruitment patterns can make a BIG difference. On the other hand, the best way to develop good neuromuscular power is to increase efficiency. If we recruit extra muscles we don't need or recruit them at the wrong time, we will consume more oxygen, expend unnecessary energy, and hit our ceiling sooner. Just compare the smooth, quiet pedal stroke of a pro cyclist to that of a newbie cyclist to visualize the difference.





3-Performance Training

Corrective Exercise

Our bodies are constantly adapting to our environment and the activities we do. Over time, this can lead to movement patterns that are inefficient and can cause pain or injuries. Poor posture, balance, and body coordination are all common problems that can lead to pain and injury. Corrective exercise is a type of physical therapy that is used to improve posture, balance, and coordination.

It is often recommended for people who have experienced pain or injuries, or who have poor body mechanics. Having a good range of motion, strong muscles, and good coordination can help you move more efficiently and perform better at your sport or activity. Corrective exercise can help to improve all of these things, which can help you to perform your best.



Corrective exercise can help improve your coordination by strengthening your muscles and improving your sense of balance. This can help you move more smoothly and efficiently, and it can help prevent falls and injuries. Corrective exercise can help improve your posture by stretching tight muscles and strengthening weak muscles. This can help to restore normal movement patterns and improve overall function. Cycling is predominantly one motion — pedalling — with a limited range of movement, using the same muscles repeatedly. If you don't address imbalances through exercises and conditioning, your injury risk increases. It's also a factor in finding yourself riddled with lower back pain, neck pain, knee pain or wrist pain.



Thanks For Watching