

ERGONOMIC ADVANCEMENTS IN STATIONARY BIKE DESIGN

The 1970s have been called the running decade, the 80s were characterized by aerobics and the 1990s were the decade in which consumers embraced exercise equipment (SGMA Report). However, throughout the years, indoor stationary cycling has been a continual favorite among exercisers. Advancements in indoor bicycles, such as computerized consoles, heart rate monitoring systems and ergonomically correct designs have helped sustain the exercise bike's popularity. Today, stationary bikes are designed to meet the needs of recreational users, the mountain biker and even the elite racer.

IMPORTANCE OF CYCLING MECHANICS

Every cyclist prefers an efficient and comfortable ride. One of the most important factors of a good riding experience is an ergonomically correct bike design. Christine "CC" Cunningham, National Cyclo-Cross Racer and owner of PerformEnhance Sport and Adventure Training, notes the "proper bike design minimizes rider discomfort and allows the rider to maintain proper position throughout workout." Proper positioning enables the riders to decrease wasted energy and premature fatigue, increase pedaling proficiency, reduce the risk of overuse injuries and enjoy a more comfortable ride overall.

Guidelines for Proper Riding Form

- Ride in an upright position
- Line up the spine and pelvis when riding
- Distribute your weight evenly over the seat, pedal and handlebars
- Place balls of the feet comfortably on the pedal
- Keep knees in during pedal stroke, moving directly in line with the foot
- Fully extend arms to support the upper body without locking elbows and leaning on hands
- Keep wrists in a natural, comfortable position on the handlebars
- Adjust your seat properly – knees should be slightly bent at the bottom of the pedal stroke

WHAT TO LOOK FOR WHEN CHOOSING A STATIONARY BICYCLE

The Life Fitness Business Management Bike Team commissioned a study by Concordia University in River Forest, Ill., conducted by Lois Klatt, P.E.D., and Daniel Kirchhoff, M.A. The research focused on ergonomically correct bike design for users of different shapes and sizes and all cycling purposes.

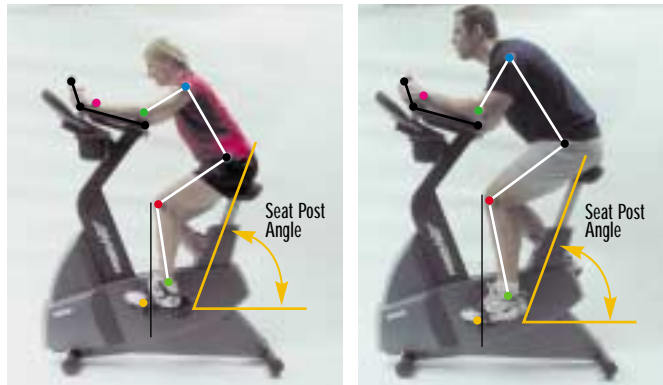
Key Findings from this study and others include the following:

Angled Seat Post

One of the most important factors in bike design is the angle of the seat post. The seat post should be angled to achieve proper "Knee Over Pedal Spindle" or KOPS. When the rider is seated comfortably with the crank arm in the horizontal position, the knee should be directly in line with the pedal's axle (see picture below). Dr. Klatt and Kirchoff found that for proper KOPS positioning, the seat post angle should be approximately 70-75 degrees to ensure proper knee positioning, reduce pressure on the knee, and increase pedaling efficiency for all types of users.

KOPS Positioning (Knee Over Pedal Spindle)

Positioning Criteria: knee should align with pedal spindle with pedal in forward most position



Wide Pedals

When riding, the foot naturally pronates and the tibia rotates inward. Bike pedals must be wide enough for feet of all sizes to fit comfortably and allow the pronation and rotation movements. When the foot is restricted from such movements, unnecessary stress is placed on the knee. Having pedal room for all foot sizes encourages pedaling with the knee directly over the foot, therefore eliminating undue stress on the knees and ankles. Pedals also should be wide enough to allow the feet to be positioned so that the widest part of the foot — normally the ball of the foot, sits directly over the pedal axle for a safe, stable ride.

Ergonomically Designed Handlebars

Correctly designed upright and racing-style handlebars will enhance comfort, allow proper form while riding as well as accommodate a variety of users. A bell-curved front handlebar permits the wrists to fall in a more natural position, allowing a

better holding position and alleviating stress on the wrists, hands, elbows, shoulders and upper back. Racing style handlebars with elbow pads decrease pressure on the elbows and provide forearm support for the rider. Ergonomic handlebars also assist the cyclist in keeping an upright position while riding and help maintain a straight line between the spine and pelvis. The width of the handlebars upright or racing style should be similar to the width of the rider's shoulders. A shoulder-width handlebar design will decrease misalignment of the back and hips and increase overall comfort for the rider.

Wide Range of Resistance Levels

A wide range of resistance levels allows cyclists of all levels to ride safely and effectively. A low starting resistance allows beginning exercisers or those in rehabilitation programs to exercise at a correct and safe level without putting undue stress on the knees or cardiovascular system. A high resistance allows highly fit riders and/or athletes to train at an effective conditioning level.

Proper Seat Design

With proper seat support on a bicycle, a cyclist can ride more comfortably, eliminate wasted energy and minimize fatigue. An ergonomic design should have a convex shape with swept-back sides and a level horn. A convex shape supports the body and decreases side-to-side motion, evenly distributing body weight from left to right. The swept-back design reduces rubbing and chafing of the inner thigh and significantly increases knee and hip range of motion. A horn parallel to the ground reduces the pressure on the uro-genital areas of the body. Together, all these factors enhance the comfort of the ride and create a better overall cycling experience.

Vertical Seat Adjustments

Having the proper seat height is extremely important for a biomechanically correct and comfortable ride. To find the proper seat adjustment, Cunningham recommends allowing almost full knee extension without pelvic rocking from side to side when pedaling. Choosing a cycle that offers a greater range of seat adjustments in small increments will help ensure proper seat adjustment and riding position, regardless of the leg length of the rider.

All these findings were incorporated into the new Life Fitness 9000 Series Lifecycle® upright exercise bikes, designed to heighten cyclist experience with unsurpassed comfort and provide the ultimate riding experience. The new Lifecycle exercise bikes design includes:

- Widened pedals to accommodate all users
- Properly angled seat post
- Ergonomically designed handlebars
- Wide range of resistance from 20 to 500 watts
- Twenty-six vertical seat adjustments
- Ergonomically designed Comfort Curve™ bike seat



R E F E R E N C E S

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