

Proteus™ by Boston Biomotion

TRADITIONAL EXERCISE

It seems as if we have been using the same types of resistance exercises since the dawn of fitness, and many for good reason. Resistance training through foundational, coordinated exercises like the deadlift, squat variations, and upper body pulling and pressing motions have been cornerstones to physical development for years. Advancements in exercise techniques have allowed strength and conditioning coaches, physical therapists, and personal trainers tremendous variation as to which joints, muscles, and movements are targeted and how resistance is applied. Despite the growing number and variations of exercises and types of resistance via bands, chains, cables, and more, there has always been a unifying and limiting factor: gravity.

For those brave enough to think back to high-school physics, remember that gravity acts upon all objects on earth in a manner that pulls them toward the center of our planet. In simple terms, objects are pulled straight down to the ground. Now think of your exercise equipment: dumbbells, barbells, cables, bands, chains, and more. When you are squatting, deadlifting, or pushing and pulling with your upper body, the resistance you interact with acts in accordance with your ability to overcome gravity acting on all of the weight you are lifting. While you may sway or move along other planes of motion, the resistance is along one path only.

Bands and cable exercise machines offer some additional variables to challenge athletes because of their ability to manipulate the direction from which the resistance is being applied. This has enabled users to experience resistance along each plane of movement, dependent upon the anchor point and trajectory of the resistance itself. This is the current forefront of the modern resistance training capability: resistance in one direction alone.

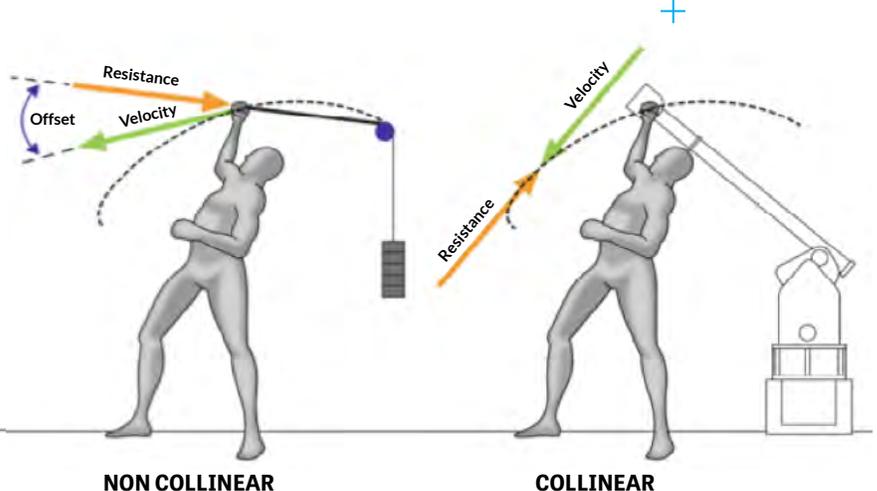
COLLINEAR RESISTANCE: BREAKING FREE FROM THE CHAINS OF TRADITION

The development of Collinear Resistance abolishes the aforementioned limitations of traditional resistance training. Collinear Resistance was recently developed by Boston Biomotion's team, using elements from CEO Sam Miller's father, Larry, during his time as a Visiting Scientist at MIT's Newman Biomechanics Lab. There was a vision in mind in the development of the technology to provide relevance to the direction in which an athlete moves, rather than simply rely on the singular direction of resistance or gravity. Traditional means of resistance cannot account for this, while Collinear Resistance is able to accommodate fluid resistance along and between all planes of motion. The three-part system of the patented technology realizes this capability by making rapid adjustments to their magnetic particle brakes. This enables the direction of the constant resistance to change dynamically and directly in response to the directions the athlete is moving in three-dimensional space. Proteus™ has eliminated the limitations of up or down, to or from, in or out when exercising.

- Ultra Fluid
- Magneto Resistance
- Simultaneous multi-vector resistance

Imagine you are immersed in a fluid while executing an exercise or sports skill. Collinear Resistance allows the user to experience resistance that directly opposes the path of motion at all points along that path. With traditional resistance exercise methods, the user is constrained to experience resistance in a singular direction along the predetermined, singular path of resistance. Because Collinear Resistance opposes the velocity vector at all points along a dynamic movement path, the user is liberated to perform seamless movements along and between all planes of motion against resistance.

Collinear Resistance enables the user to perform seamless, dynamic movements with fluid-like resistance, unlike the constrained movements of traditional forms of resistance exercise.

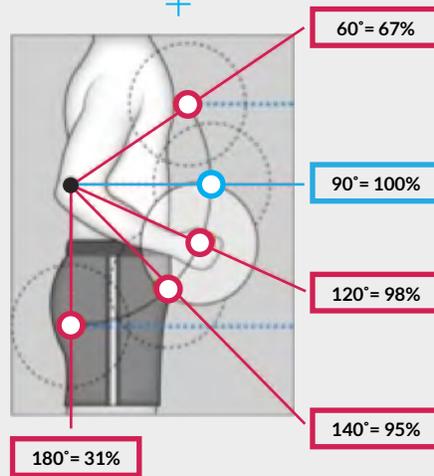


BENEFITS OF COLLINEAR RESISTANCE

What does this capability translate to for the athlete? Because resistance levels are maximized at every point along a movement path, muscular efficiency is fully realized along the entire path of the motion. This is in direct contrast to traditional dumbbell, cable, and banded exercises where muscular force variations occur due to the effects of gravity and line of pull. The traditional dumbbell biceps curl is a perfect example of this, as 100% muscular exertion and efficiency is only realized at one point along the movement path where the lever arm (your forearm) is the longest. While you may have picked up a set of 40-lb dumbbells to do curls with, you are only experiencing the full force and full muscular efficiency against the 40-lbs when you have reached the halfway point at 90-degrees.

With Proteus™ and Collinear Resistance, you experience 40-lbs of resistance along the entire movement pathway at every angle, much like moving within and against a fluid. Imagine now that you are able to adjust the viscosity of that fluid, increasing or decreasing the amount of resistance your athlete experiences when trying to move through the liquid.

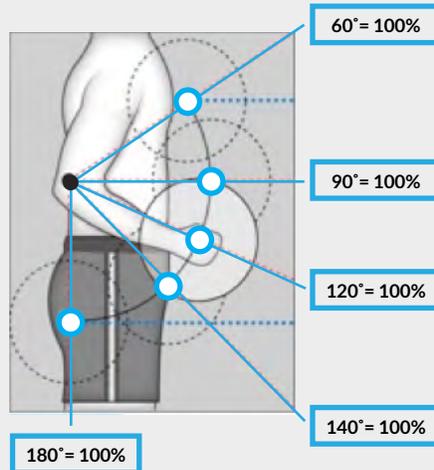
At every point along any path of motion, Collinear Resistance enables resistance directly opposing the path of motion.



DUMBBELL, CABLE & BAND INEFFICIENCY

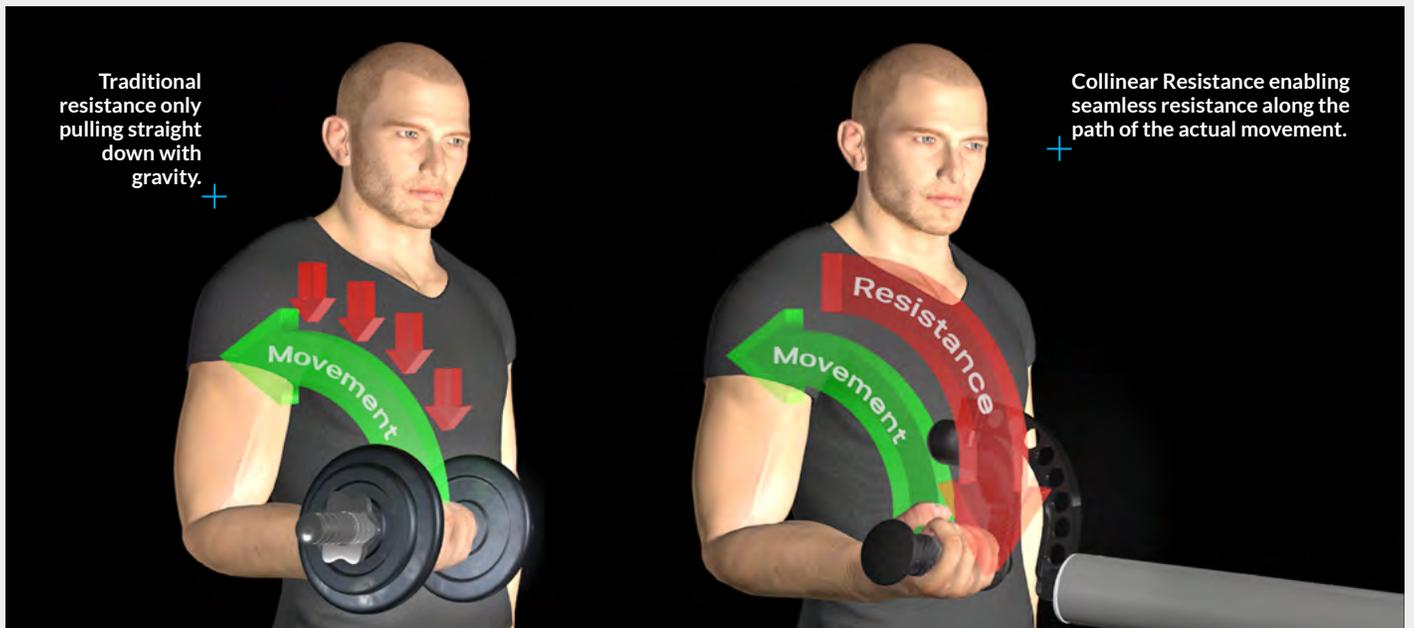
Exercise and rehab equipment involving cables, weights, or pulleys, only optimize muscle exertion and efficiency at one point. In a dumbbell curl, this point occurs when resistance, which is gravity, opposes the path of motion, halfway through the lifting motion.

Variation in force relative to the angle of contraction [from Wilmore and Costill, 1994]



BOSTON BIOMOTION'S EFFICIENCY

Our device optimizes muscle exertion and efficiency. At every point along any path of motion, the resistance directly opposes the path of motion. This is called collinear resistance. We believe this will produce more fatigue-resistant muscle groups around complex joints, like the shoulder or knee.



Proteus™ enabling athletes and coaches to perform sport specific warm ups before practice and competition.

PHYSICAL THERAPY'S EVOLUTION WITH COLLINEAR RESISTANCE

The realm of physical therapy and rehab is no stranger to traditional exercises for targeting specific muscle groups and movements. In fact, much of therapeutic exercise is geared to targeting parts of the whole before being integrated into gross motor patterns. The versatility of Proteus™ allows practitioners to accommodate a full range of traditional exercises, while at the same time allows for the integration of more complex, sport-specific patterns as well. Instead of doing endless resistance-band exercises for the intrinsic musculature of the scapula and shoulder, physical therapists can use these same movements with Proteus™ and, thanks to Collinear Resistance, seamlessly transition to the portion of a gross motor skill or sports skill where these intrinsic muscles are on display.

Clearly, the specific rehab goal of tissue remodeling by performing targeted exercises for muscle groups and motor units is still critical. It should be noted, however, that exposing these muscles and motor units to their recruitment patterns in optimal doses of gradually increasing resistance and intensity is something that traditional exercises alone cannot offer. Performance of the actual sport skill is the ultimate benchmark, but just like the General Physical Preparedness (GPP) and Specific Physical Preparedness (SPP) phase transition in strength and conditioning, Proteus™ enables the same bridge in physical therapy. Practitioners can now expose their athletes and clients to sport-relevant motor patterns and movements while having complete control over the resistance of the movements in part or in whole.

GETTING WARMED-UP WITH COLLINEAR RESISTANCE

How valuable is it to not only improve the integrity of one link of the kinetic chain, but also be able to improve the connection of each link in the chain simultaneously? Proteus™ can accommodate traditional resistance exercises and have the athlete seamlessly transition to a sport-relevant motor pattern. By utilizing Collinear Resistance, physical therapists and strength and conditioning coaches alike can build and repair athletes above and beyond traditional expectations. Think of how valuable this is when warming up for practice, games, matches, or competition.

The concept of Postactivation Potentiation (PAP) has been utilized in therapy and training for years. The central concept of PAP deals with recalling the acute contractile history of a motor unit in order to positively affect the subsequent rate of the force developed by the muscle. Think of it this way: with PAP you perform an activity that loads up a group of muscles and when you remove the extra load in an activity immediately after, you help the muscles contract with greater power. Ever seen a baseball or softball player warming up in the batter's circle swinging a bat with added weight? When the batter steps up to the plate, they can swing the bat with greater speed and power. This is the use of PAP in action!

Utilizing PAP in other sports-related skills can be difficult, as either the velocity of the activity may be a limiting factor to safely achieve the PAP effect. Additionally, applying seamless resistance to a coordinated sports-skill is not possible with traditional equipment. Proteus™ allows the athlete to entertain all new domains of warm up routines for sport specific skills thanks to Collinear Resistance. Before the baseball or softball player ever picks up a bat, they can execute a generalized whole-body warm up, followed by a series of partial and whole swings with Proteus™. Now the athlete has achieved a state of PAP in the coordinated motor units involved in swinging a bat. The same concept is now possible for pitchers, quarterbacks, tennis players, golfers, track and field throwers, and many more. Throwing and swinging athletes can prepare and warm up their bodies in more targeted, sport-relevant motor patterns.

THE DIFFERENCE MAKER: COLLINEAR RESISTANCE

The advancements in training methods that Collinear Resistance provides are a giant step forward for athletes, trainers, and coaches across athletics. The traditional, foundational exercises in sports training and rehab will remain, but with Proteus™ the process now has the teeth to translate to actual skill performance.