Sports Injury Risk Management

REDUCE HAMSTRING INJURY

Biodex System 4 - Test Protocols and Research with athlete-proven results.

Evolution of a Successful Hamstring Rehabilitation Protocol to Reduce Hamstring Injury Recurrence

Timothy F. Tyler, PT, ATC details the compelling research that Nicholas Institute of Sports Medicine and Athletic Trauma (NISMAT) performed over two years. This white paper reexamines current rehab protocols, reviewing evidence-based studies and examining causes of hamstring strain in an attempt to improve current rehabilitation methods.

The orthopedic surgeons and therapists at NISMAT began seriously questioning conventional hamstring rehabilitation strategy. If it was as effective as commonly believed, athletes should not experience the high rate of recurrence reported internationally in a wide range of professional and amateur sports.

As a result of those observations, and those of others who have attempted with different degrees of success to reduce recurrent hamstring injury, the NISMAT team has developed a new lengthened-state eccentric dynamometer-based rehabilitation strategy for isolating the injured leg, and objectively determining when an athlete is ready to return to play. That protocol has been validated with a prospective 50-subject peer reviewed study in which all compliant patients have been free of recurrent hamstring injuries at least two years later.

Read the full study [www.biodex.com/wp/16134](http://www.biodex.com/wp/16134)
**PRODUCT CLOSE UP • SYSTEM 4 DYNAMOMETER**

**Versatility & Adaptability**

More than 30 years have passed since Biodex introduced the world's first multi-mode computerized robotic dynamometer.

That event and subsequent “firsts” have made the Biodex System 4 the dynamometer of choice in the most distinguished clinics and research facilities around the world.

Sports and orthopedic medicine, pediatric medicine, neurorehabilitation, older adult medicine, industrial medicine, and researchers depend on Biodex to provide consistent, accurate, objective data. Objective data that provides the best outcome for their patients... objective data that supports their research... objective data that separates their facility from the rest.

**Sports and Orthopedic Medicine**

The System 4 ensures that you provide the best outcomes for shoulder dysfunction, knee osteoarthritis, lateral ankle sprains, patellofemoral dysfunction and anterior cruciate ligament. Other capabilities include preseason screening, injury prevention and athletic performance enhancement.

For more product information [www.biodex.com/S4](http://www.biodex.com/S4)

**TECHNICAL BRIEF**

**Modern Robotic Dynamometry**

Bill Galway, Business Development Director, Biodex Medical Systems, Inc.

The dynamometer is experiencing a new resurgence as the need for objective data and the markets for which it serves expand.

Read the full study [www.biodex.com/roboticdynamometry](http://www.biodex.com/roboticdynamometry)

**NEW DEVELOPMENTS • BEYOND SPORTS MEDICINE**

**SYSTEM 4 PRO™**

Performs total range of positions and exercises.

Featuring a positioning chair with 360 degrees of rotation, motorized seat height adjustment and superior stabilization, the System 4 Pro™ only requires 64 square feet of operating space. Standard attachments: ankle, knee, shoulder, elbow, wrist and hip. Optional attachments: hamstring, back extension/flexion, linear closed-chain, upper extremity and an array of work simulation attachments.

**SYSTEM 4 MVP™**

A mid-point compromise, without compromise.

Designed for front-to-back chair adjustment, side-to-side dynamometer positioning, and fully assisted dynamometer height adjustment, the System 4 MVP requires 64 square feet of operating space. Standard attachments: ankle, knee, shoulder, elbow and wrist. Optional attachments: hamstring, back extension/flexion, linear closed-chain, upper extremity, hip and array of work simulation attachments.

**SYSTEM 4 QUICK-SET™**

Designed for knee, ankle, shoulder, elbow & wrist.

If space and budget are primary concerns, the System 4 Quick-Set™ is what you need. This system requires only 32 square feet of operating space yet still ensures maximum patient stabilization. It features a fixed-height positioning chair with 360-degree rotation and front/back travel for easy patient setups. Standard attachments: ankle, knee, shoulder, elbow and wrist. Optional attachments: hamstring, back extension/flexion, linear closed-chain, upper extremity, hip and array of work simulation attachments.

**System 4 Software Update**

- Test protocols for pre-screening & managing hamstring injuries*
- Enhanced Data Export Utility
- Expanded and updated isokinetic normative data
- Exported Data Parser

Download the latest version at [www.biodex.com/S4-software](http://www.biodex.com/S4-software)

*Upgrade path available for existing System 4 and System 5 dynamometers.

**Application – Workforce Performance**

Objectively determine the ability to perform an occupation

**Application – Warrior Performance**

Used by military special forces for injury prevention and performance optimization

**Upper Extremity Attachments for Biodex System 3 and 4**

Specially designed for hemiparetic patients with upper extremity limitations. The attachments promote neuro recovery aiding to improve quality of life.

**Application – Hamstring Strains**

Dynamometer software quantifies an athlete’s propensity for injury or reinjury – with objective test protocols. Upgrade paths available for older models.

**Advantage Software**

Comprehensive, easy-to-use, feature-rich software for human performance testing and rehabilitation.

Now with enhanced features. Upgrade paths available.

**Application –**

**Advantage Software**

Capture and document every step of the rehabilitation process with Advantage Software.

**Application –**

**Advantage Software**

C om prehensive, easy-to-use, feature-rich softw are for hum an perform ance testing and rehabilitation.

Now w ith enhanced features. Upgrade paths available.
Baseline tests are performed on athletes *preseason* to establish an individual athlete’s pre-injury performance.

Today, the proper management of concussion should include baseline of the following:

- Balance Assessment
- Cognitive Assessment
- Graded Symptoms Checklist

The NCAA® and NATA® have identified these as the three essential assessment pillars.

When combined, these preseason baseline tests can provide a comparison point for cognitive function and objectively quantified balance for athletes. In the case of a suspected concussion, it is these baseline tests to which post-injury assessments are compared, providing the objective data necessary to track recovery.

“A decreased ability to maintain balance is one of the hallmark signs of concussion.”
**CASE STUDY • BALANCE SYSTEM™ SD**

Aurora Sports Medicine Institute uses integrated approach in the Management of Concussion including the Biodex Balance System SD for objective balance assessment.

**Aurora Sports Medicine Institute (ASMI)** is the sports medicine branch of Aurora Sheboygan Memorial Medical Center, in Sheboygan, WI. As the premier sports medicine provider in southeastern Wisconsin, ASMI is the premier choice of physically active individuals for preventative and rehabilitative care of orthopedic and sports injuries.

Adam Brill is an Athletic Trainer at ASMI and plays a large role in program development at the institute. He is also the head Athletic Trainer at Plymouth High School in Plymouth, WI, where he is focused on performance enhancement and injury prevention for all their student athletes.

“We knew the general parameters in the management of concussion, but we wanted to develop a formal system and put some strong policies in place,” explains Brill. “We met as an athletic training team to review the Zurich Consensus Statement on Concussion in Sport that was published in 2009. That’s where we drew a lot of our information from. We also had a great team of pediatricians who provided their expertise and who we shared our ideas with.

As a rule, athletes are very competitive and hate to be shown their functional deficits. The Biodex Balance System shows their proprioceptive weakness and challenges them to improve. The Balance System test mode provides a standard baseline to evaluate the athlete in a static or dynamic nature. The computer generates a printout of the standard deviations of correctional mistakes and the percentage of time the athlete stays in a particular quadrant. It then compares this to normative balance data that Biodex has provided. This allows the objective measures of the athlete to be trained, and then easily reevaluated and assessed to quantify proprioceptive improvement.

The Biodex Balance System is the only piece of equipment in our clinic that can objectively measure and compare to normative data the proprioceptive deficits of a patient. It also works well as a simple training tool, providing a challenging and competitive way to motivate athletes.

In my opinion, the Biodex Balance System is a very cost-effective choice of capital equipment for most physical therapy or athletic training facilities. I would highly recommend this product to any orthopedic clinic, athletic training room, rehab clinic or balance clinic because of the true objective measurements and normative data the system offers to both patient and clinician.”

**PEER PERSPECTIVE**

**Hughston Clinic**

Research • Education • Treatment

“I have used the Biodex Balance System for two years with a wide variety of patients ranging from geriatrics to professional athletes. It is a great resource to have in the clinic when dealing with hip, knee, and ankle dysfunction patients, and is especially beneficial with the athletic population.

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**Balance Assessment gets thumbs up from High School Athletic Director**

Increase the sensitivity of your concussion evaluations by adding objective Balance Assessment - from baseline to post-injury.

Scott Stein is the athletic director and head football coach at Sun Valley High School. “The baseline testing that we’ve done in the last couple of years has been excellent for us as athletic directors and coaches in understanding our kids. The new information that we’re getting – from concussion screening to the equipment that they’re wearing – allows us to get more involved in protecting the lives of the student-athletes that are playing sports for us,” said Stein.

**Balance testing is going to be a big part of keeping our kids safe and healthy.**

“The Balance testing for concussion is a big part of understanding when a student-athlete can come back to play safely. It’s come all the way down from professional sports and is now at the high school level. In Union County, balance testing is going to be a big part of keeping our kids safe and healthy.”

**Upper Body Cycling for Athletes**

When an athlete sustains an injury or undergoes surgery, the right equipment can encourage exercise without negatively impacting recovery. The Biodex Upper Body Cycle (UBC) fits this mold perfectly for both upper and lower body injuries.

Considered one of the most versatile devices in the Biodex Kinetic Chain product lineup, this upper body ergometer offers ROM exercise, strengthening and conditioning for a wide range of athletic diagnoses:

- Impingement Syndrome
- Medial and Lateral Epicondylitis
- Ulnar Collateral Ligament Reconstruction
- Multidirectional Instability
- SLAP Lesions
- Pectoralis Tears
- Posterior Glenohumeral Instability
- Acromioclavicular Sprains
- Elbow Dislocations

Because the system is self-powered and self-charging, it can be used virtually anywhere – from clinic to sidelines.

**Range of Motion (ROM)**

Perfect for ROM activity post injury or surgery, the UBC acts like a CPM for the shoulder or elbow. The unaffected arm provides the “push” allowing the affected arm to be exercised in a continuous passive motion. Glenohumeral ROM can be enhanced and maintained through the use of endurance training on the UBC. Elbow ROM can be facilitated and maintained as well.

**Strengthening**

While supporting full ROM, the UBC effectively builds shoulder strength post-injury. Scapulothoracic stability can also be enhanced through muscular endurance activities provided by the UBC. The combination of muscular endurance and strength training enabled by this unique ergometer are key to providing stability of the glenohumeral joint.

**Alternative**

Conditioning for someone with a lower body injury is easily performed on the UBC. Interval “wind sprints” using this system can be effective when an athlete is non-weight bearing or unable to walk or run as a result of an injury or surgery. In the case of a serious lower body injury, the seat can be removed to accommodate a wheelchair while helping to maintain cardiovascular conditioning.
CASE STUDY • SYSTEM 4 DYNAMOMETER

EXCERPT

Biodex System 4 Strikes Tone with Athletes, Doctors, Trainers

Summit Medical Group

From left to right, Samantha Zimmerman, Dr. John Hurley, MD and PJ Ritter consider the Biodex Multi-Joint System 4 a significant tool for shoulder and knee rehabilitation. “The big advantage,” according to Hurley, “is that in addition to testing, it allows for muscle strengthening using isokinetic resistance exercises where the joint pushes against a constant resistance at varied speeds”.

Jersey Sports Medicine and Rehab in Morristown, NJ, is part of Summit Medical Group (SMG), and specializes in orthopedic and sports-related rehabilitation.

“It really is busy around here most days,” explains Michael Dunne DPT, ATC, as he greets yet another rehab patient entering the room. “Each therapist sees a full case load, but we don’t mind the full schedule. Our philosophy here is that everyone is getting back to something - football, tennis, volleyball, soccer, golf, lacrosse, running, walking upstairs, etc. When it’s busy here, that just means a lot of people are getting closer to their goals.”

“The Biodex Multi-Joint System 4 is one of our best tools in keeping things running smoothly and returning patients to task,” explains P.J. Ritter, who manages the three Jersey Sports Medicine and Rehab clinics.

We use it for baseline testing of knee and shoulder patients, to educate patients about their specific injuries in terms of strength and progress, and to build strength with post-operative knee and shoulder patients. It’s also a great motivational tool.”

According to Ritter, it really helps to explain to knee and shoulder patients exactly what they are recovering from, and how their rehabilitation will progress over time. Discussing strength deficits and bilateral comparisons helps, of course, but showing patients actual numbers generated on the Biodex Multi-Joint System 4 really drives home the talking points and allows patients to see improving results charted from week to week.

“When we do a Biodex baseline test and then follow-up with a progress report, we can say to the patient: ‘Look, there is a 25% decrease in muscle strength at this point in your range of motion and here’s what we need you to do to make this better.’ It’s really impressive when you can see quantifiable numbers and graphs, especially if you come back a few weeks later with a progress report and show the patient that deficit has decreased to 15%. ‘Come on,’ we’ll tell them, ‘if you can get that bilateral deficit to 10%, we can talk about getting you back on the field!’ Tell that to just about anyone - athlete or not - and they’ll keep pushing forward.”

Return to Sport (RTS) After ACL Surgery

Quad Strength

To increase the chances of successful and safe return to sport after ACL reconstruction, specific criteria have been developed. Studies have shown that healing time and certain factors, including more symmetrical quadriceps strength prior to return to sport reduces the reinjury rate. Decreased quad strength is a great predictor for decreased function after ACL reconstruction.

The objective test protocols offered with the Biodex System 4 provide valuable, isolated muscle-performance data. Test results, combined with established targeted outcomes, can be used for strengthening the quadriceps and aid with the return-to-sport decision.

Download Article at www.biodex.com/sportsinjury

Likelihood of ACL Graft Rupture: not meeting six clinical discharge criteria before return to sport is associated with a four times greater risk of rupture

Polyvios Kyritsis, Roald Bahr, Philippe Landreau, Riadh Miladi, Erik Witvrouw

Knee Extensions

“The great concern about the safety of OKC knee extensor training in the early period after ACLR may not be well founded.” (Morrissey MC 2000).

There are two easy ways in which you can modify knee extensions to ensure limited/reduced strain on the ACL when using knee extensions:

1. Limit the range to 90° - 40°.
2. Put the shin pad more proximally (move it mid-shin instead of distal shin).

The tensile force on the ACL is approximately half when the resistance pad is positioned mid-shin vs. by the ankle (Pandy MG 1997).

Each patient has a unique recovery. In this article, Mr. Treubig describes how knee extensions play a big role in providing his patients with increased quad strength, and regain it quicker. Download the article for his specific protocol on how he progresses patients using knee extensions beginning the 4-6 week mark.

Download Article at www.biodex.com/sportsinjury

Why You Should be Using Knee Extensions After ACL Reconstruction

Dennis Treubig

PEER PERSPECTIVE

“One piece of the equation I consider especially important is our Biodex Multi-Joint System. I really like it for the isokinetic capability, but I use it in the other modes as well. It is very useful as an exercise-based rehabilitation tool. I was always taught that exercise is the most important part of physio, and this is one of the few machines with a plug that actually provides exercise modality. The Biodex Multi-Joint System is especially well suited to producing numerical data in terms of isolated muscle strength. The numbers generated during isokinetic tests have significant meaning and serve as pointers to help show where an injured patient is in terms of stability control and muscular control, providing insight as to when a patient can safely progress to more functional activities or even return to play.

Isookinetic testing, strengthening and rehabilitation are for us very much a preparation phase in terms of getting ready for active rehabilitation related to the game. It continues on as we progress through the rehabilitation regime and to actually playing. After the player returns to the field, it is used as a follow-up and strengthening mechanism for one to two years after many types of injury. The system is especially well-suited for lower limb rehabilitation.”

David Ferrer, MSC, MCSP, SRP
Blackburn Rovers Senior Physical Therapist for English Premier League Football Club, Blackburn, UK
BIODEX NEWS

BIODEX
Biodes Medical Systems, Inc.
20 Ramsey Road, Shirley, New York, 11967-4704

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May 30 – June 1, 2018 • Minneapolis, MN

NATA • Booth #8030
June 27 – 29, 2018 • New Orleans, LA

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