

**FROM THE PRESIDENT**



Luke Drayer

As with so many aspects of life, medical advances occur at an astounding rate. Whether you're one of our valued partners in

the healthcare industry or a prospective patient, Drayer Physical Therapy Institute wants to help you sort through the ever-

expanding and ever-changing body of information about musculoskeletal dysfunction – the core of physical therapy.

To that end, we're proud to present the premiere issue of our quarterly newsletter. With each issue, the experienced professionals at Drayer will offer their insight into the newest and best treatments available.

We hope you enjoy reading this issue as much as we enjoyed preparing it. We welcome your feedback, whether it's a comment about these pages or a suggestion for future newsletters. Please contact Susie Spadone at 717-220-2100. 📩

**DRAYER RESEARCH DIRECTOR IS PROFESSOR AT UNIVERSITY OF DELAWARE**



Irene Davis

Irene Davis, director of research for Drayer Physical Therapy Institute, isn't one to run away from a problem. That's especially true if the problem is a running-related injury.

Irene is a professor of physical therapy at the University of Delaware, where she also serves as director of the school's Running Injury Clinic. The clinic – one of only a few of its kind in the United States – provides a diagnostic service to injured runners to help understand the causes of their injuries.

Her research seeks to understand the relationships among lower extremity structure, mechanics and injury, with a focus on stress fractures, anterior cruciate ligament tears and patellofemoral disorders. She has lectured internationally and published writings about lower extremity mechanics during running.

For more information on Irene's research, visit [www.udel.edu/pt/davis/index.htm](http://www.udel.edu/pt/davis/index.htm).

Irene has bachelor's degrees in exercise science from the University of Massachusetts and in physical therapy from the University of Florida; a master's degree in biomechanics from the University of Virginia; and a doctoral degree in biomechanics from Penn State. 📖

**PARTICIPATE IN JOURNAL CLUBS**

Drayer Physical Therapy Institute's commitment to research extends beyond a laboratory setting. We have formed journal clubs as a platform for disseminating Drayer research and critically evaluating and discussing articles published in medical literature.

Clinics – individually or in groups – meet once per month to interpret, critique and discuss a current article in a peer-reviewed journal. This is intended to be a thought-provoking process to distinguish good articles from bad ones, assess the article's applicability to clinical practice and determine

whether we can use the information to improve as clinicians.

We recognize the importance of staying current with a field that is evolving continuously. In addition to our staff, we invite interested physicians to join us. We believe that a close relationship with medical providers only strengthens our common goal of helping our patients get well. 📖

**CORPORATE MISSION STATEMENT**

**TO OUR PATIENTS,**  
WE COMMIT TO PROVIDE THE MOST EFFECTIVE, CLINICALLY SUPERIOR PHYSICAL THERAPY HUMANLY POSSIBLE AT A FAIR PRICE. THE MEASURE OF OUR SUCCESS WILL BE FOUND IN THE TRUST WE BUILD AND IN THE HEARTS OF THOSE WE HEAL.

**TO OUR EMPLOYEES,**  
WE COMMIT TO PROVIDE A POSITIVE, RESPECTFUL, AND FAIR WORK ENVIRONMENT. WE WILL INVEST IN THEIR PROFESSIONAL GROWTH TO ENSURE A COMPASSIONATE AND KNOWLEDGEABLE TEAM OF PROFESSIONALS. THE VIRTUES OF INTEGRITY, HONESTY, AND LOYALTY WILL MAKE UP THE MORAL FIBER THAT BONDS US.

AT DRAYER PHYSICAL THERAPY INSTITUTE WE ARE COMMITTED TO LEADING THE WAY TO GOOD HEALTH – IT IS OUR BUSINESS.

CORPORATE OFFICE  
Hummelstown, PA  
717-220-2100

**CENTERS**

**DRAYER-OWNED**  
LEXINGTON BEAUMONT, KY  
LEXINGTON PERIMETER, KY  
MT. STERLING, KY  
WINCHESTER, KY  
BEL AIR, MD  
SPARTA, NJ  
ALTOONA, PA  
CLEARFIELD, PA  
HARRISBURG (HUMMELSTOWN), PA  
HERSHEY, PA  
LEWISTOWN, PA  
LINGLESTOWN (HARRISBURG), PA  
MECHANICSBURG, PA  
MILFORD, PA  
ROARING SPRING, PA

**DRAYER-MANAGED**  
CHENANGO, NY  
ENDICOTT, NY  
JOHNSON CITY, NY  
MAINLINE PHYSICAL THERAPY (CRESSON), PA  
ORTHOPEDIC INSTITUTE OF PA (HARRISBURG), PA  
RENAISSANCE HEALTHCARE GROUP, (HERSHEY), PA  
UTC REHABILITATION SERVICES, (LEXINGTON), KY

**DRAYER Physical Therapy Institute**

*Leading the Way to Good Health*

SUMMER 2005  
Hummelstown, PA

**Q&A**

**ABOUT PATELLOFEMORAL JOINT PAIN**

Patellofemoral joint pain – also known as patellofemoral joint syndrome – is pain usually in the anterior (front) of the knee but also can be medial (toward the inside of the knee) or lateral (outside). It can be experienced by the young or the elderly, males or females, the active and the relatively inactive. Patellofemoral joint pain usually manifests as a gradual onset of pain that tends to get worse over time.

**HOW DO I KNOW I HAVE IT?**

Patellofemoral joint pain has been described as a syndrome (a cluster of signs and symptoms that point to a particular pathology). Complaints may include pain or difficulty with many of the common activities that are done each and every day: ascending or descending stairs, kneeling, squatting, sitting with your knee bent, rising from a chair and/or sitting for a prolonged period.

**HOW DID I GET IT?**

Usually, there are imbalances between the right and left legs in terms of strength and flexibility that exert potentially abnormal forces through the kneecap (patella). However, poor posture/alignment, abnormal foot mechanics, hip and pelvic weakness, or a change in an individual or athlete's daily regimen also can contribute to symptoms.

**IS IT TREATABLE?**

Yes. A thorough examination from your physician can help you understand your problem and make sure the pain is coming from your knee. Your physician may take X-rays to look at the position of the kneecap and may recommend over-the-counter medications or a prescription medication to help ease your symptoms. The next logical step is to have an evaluation done by a licensed physical therapist.

**WHAT SHOULD I EXPECT IN PHYSICAL THERAPY?**

Your physical therapist should conduct a thorough evaluation following a detailed discussion of the events leading up to current complaint of pain and/or functional problems. The

Continued on Page 2

**CASE STUDY:**

**TREATING PATELLOFEMORAL JOINT PAIN**



Exercise ball activities such as the one above were part of the patient's home rehabilitation routine. Poor trunk and hip control contributed to her knee problems.

**PATIENT:**

A 29-year-old female cashier has a 17-year history with patellofemoral joint pain.

**HISTORY OF INJURY:**

The patient had undergone physical therapy on three separate occasions at other facilities. The treatments emphasized the use of modalities (ice, ultrasound, electric stimulation, taping/bracing), stretching of the lower extremity musculature (leg muscles) and strengthening, primarily of the medial quadriceps. At 16, she underwent an arthroscopic lateral release, which she said worsened her condition. At the time of Drayer seeing the patient, she also complained of chronic low back pain. She had given birth six months prior.

**SUCCESSFUL REHABILITATION INVOLVED PATIENCE, COMPLIANCE AND AN APPROACH THAT FOCUSED ON THE DEFICIENCIES LEADING TO HER DISABILITY.**

**EVALUATION:**

Subjective pain range of 2-4/10 pain at rest increased to 8/10 with squatting, stairs and by the end of her work shift. Patient described pain that was equal in both of her knees, as well as episodes of their "giving way," swelling and causing painful crepitus (cracking/grinding). Inspection revealed an anteriorly tilted pelvis, internally rotated hips, moderate degree of genu valgum and normal foot/ankle alignment. Both patellas were laterally rotated in the trochlear groove. She stood and ambulated with poor lower-extremity, hip and

trunk control. Range of motion of both knees was normal. Both hips were deficient in external rotation. Significant strength deficiencies were noted in the quadriceps, gluteus medius and maximus, hip lateral rotators and abdominals. Soft tissue shortening was observed in the quadriceps, calves, hamstrings, IT band, hip adductors, internal rotators and lumbar paraspinal muscles. Significant palpable tenderness was noted in the peripatellar region.

**ASSESSMENT:**

It was apparent from our evaluation that significant factors other than weakness of the quadriceps (the focus of her previous failed physical therapy interventions) were contributing to her knee problems. Her poor

pelvic and trunk stability needed to be the focus of our early intervention. Creating a more stable pelvis and trunk (known as the "core") with lumbar stabilization exercise would better control excessive force at the knee and combat the recent low-back symptoms. Once core stability was obtained, more lower-extremity strengthening would be added to her rehabilitation program.

**REHABILITATION:**

Early rehabilitation focused on lumbar and hip stabilization with emphasis on "pain-free" stretching of the

Continued on Page 2

## Case study from cover

tight structures. Each session was concluded by icing the knees. No efforts were made to strengthen the lower extremity secondary to pain experienced in attempting to do so.

After two weeks of therapy, greater pelvic and hip control allowed initiation of simple closed chain strengthening with emphasis on pain-free patellofemoral exercise followed by ice.

At one and one-half months, patient progressed to performing more challenging trunk and lower-extremity exercise, which she did through to her discharge at two and one-half months. At this time, she was properly versed in her home exercise routine, which focused on exercise ball activities followed by ice. The patient reported no resting pain and tolerable 0-2/10 with squatting, stairs and by the end of her work shift. She no longer complained of low back pain.

**SUMMARY:**

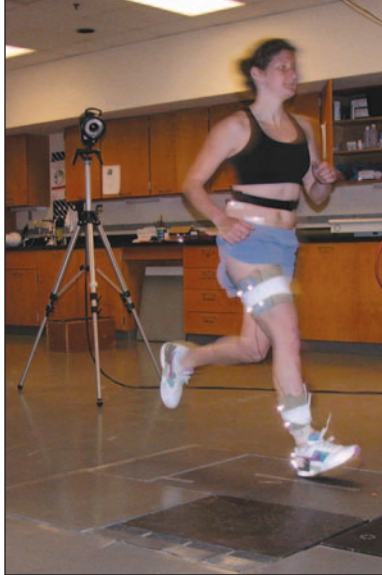
The patient's poor trunk and hip control were major contributors to her chronically problematic knees. Because she could provide only limited proximal stability, her knees were continually exploited by their unfavorable positioning, particularly during weight-bearing activities. Her successful rehabilitation involved patience, compliance and an approach that focused on the deficiencies leading to her disability. Fourteen months after her rehabilitation she continues to do well. ▀

## Q&amp;A from cover

evaluation may include watching how you walk, testing the strength in your legs, and assessing your flexibility. After discussion with you, the physical therapist will develop a structured therapeutic exercise program to help correct any of the findings relative to strength, flexibility, posture, and/or abnormal foot mechanics. You also will discuss any activity modification that would be necessary outside of physical therapy. ▀

## RESEARCH ABSTRACT

## LOWER EXTREMITY MECHANICS IN PATIENTS WITH PATELLOFEMORAL JOINT PAIN



The study focused on female runners between the ages of 18 and 45 who run 20 miles per week.

By Irene McClay Davis, Tracy A. Dierks and Reed Ferber

**INTRODUCTION**

Patellofemoral joint pain (PFP) is one of the most most prevalent knee injuries a runner sustains. Women have been noted to be twice as likely to experience PFP than their male counterparts. Women have also been consistently noted to have greater Q-angles. A greater Q-angle is thought to increase the lateral component of the quadriceps force vector, thereby increasing the tendency for lateral maltracking.

It has been reported that females exhibited significantly greater hip adduction and internal rotation as well as greater knee abduction (valgus) during running than males. Increased knee abduction (valgus) likely increases the functional Q-angle and predisposes one to greater risk for patellar malalignment. Excessive femoral internal rotation can also lead to a relative lateral malalignment of the patella.

The purpose of this study was to compare, prospectively, the 3-D kinematics of the hip and knee in female runners who later develop PFP to the mechanics of healthy controls who do not develop this pain. It was hypothesized that runners who went on to develop PFP would exhibit greater hip adduction and internal rotation, lesser knee internal rotation (due to greater hip internal rotation) and greater knee abduction (valgus) than runners who do not develop PFP.

**METHODS**

Female runners between the ages of 18 and 45 years and running a minimum of 20 miles per week are included in the study. Subjects ran along a 25 m runway at a speed of 3.65 m/s ( $\pm 5\%$ ). Kinematic data are collected (120 Hz) with a six-camera Vicon Motion Systems (Oxford, UK) motion analysis system. Five trials were averaged for analysis. One-tailed independent t-tests were conducted on the data. Due to the preliminary nature of the data, an alpha of 0.10 was used for significance.

To date, nine females have gone on to develop PFP following their gait assessment. Nine healthy, uninjured females in the same study served as controls (CON). The PFP females were 33.4 years old and ran an average of 27 mpw. The CON were 29.9 years and ran 29 mpw.

**RESULTS AND DISCUSSION**

It is interesting to note that while excessive rearfoot eversion is thought to be associated with PFP, the values were identical between groups.

Peak hip adduction was greater, as expected in the PFP subjects. In addition, the hip was in greater internal rotation

at footstrike, and remained in greater internal rotation throughout stance.

Another interesting finding was the significantly greater Q-angle noted in the PFP subjects. This structural difference coupled with the subtle kinematic differences could significantly alter the distribution of loading across the patellofemoral joint. Differences in hip kinematics suggest that the hip should be addressed in patients with PFP.

**CLINICAL RELEVANCE**

In the past, patellofemoral joint pain has been thought to be related to a lateral maltracking of the patella. This places the patella against the lateral femoral condyle resulting in increased patellofemoral joint contact forces. However, more recently, there has been suggestion that the problem is not always from a lateral maltracking of the patella, but a medial maltracking of the femur. That is, the femur moves into excessive adduction and internal rotation. This results in the same effect of increasing the force of the patella against the lateral femoral condyle. This concept has been supported by the current study, which found that patients who develop patellofemoral joint pain exhibit greater hip adduction and internal rotation when they run. This finding provides a rationale for addressing the hip in patients with patellofemoral pain syndrome. Clinicians should include an assessment of hip strength and stability in these patients and develop interventions that address any deficiencies noted. If the underlying mechanism of the pain is appropriately addressed, the risk of recurrence should be significantly reduced. ▀

## RUNNING INJURY CLINIC: IMPROVING DIAGNOSIS THROUGH FOCUSED ASSESSMENT

Running is one of the most popular fitness activities. However, because of its repetitive nature, overuse injuries are common – 25 to 65 percent of runners experience running-related injuries each year.

Runners tend to be dedicated to their sport, often continuing to run through pain and developing secondary, compensatory injuries. Many runners end up in physical therapy and physician clinics. Before a treatment plan can be developed, the therapist must develop a sound clinical hypothesis that explains the source of the injury. Running injuries have many factors. Therefore, the evaluation of the injured runner often takes more time than can be allotted during a typical office visit. These patients often have sought help from multiple medical professionals, with little success.

Offering a separate running injury clinic – such as the one at the University of Delaware (see Page 4) – dedicated to the evaluation of injured runners may provide a more efficient way to service this population.

Ultimately, all runners have a threshold for injury that depends on their structure, mechanics and amount of training. For example, one runner may have poor alignment and mechanics, but only runs 10 miles per week. Another may have minor issues with alignment and mechanics, but runs marathons. Therefore, it is crucial that an evaluation address each of these factors. The evaluation can be conducted by a single physical therapist, or by a team consisting of a physical therapist, physician and podiatrist. This will vary among clinics depending on the skills and the resources available.

The assessment should begin with a detailed history of the patient's running injuries, as well as any others that may influence running mechanics. In addition, a detailed description of the patient's training regimen should be obtained. This includes mileage run per week, days run per week, surfaces (both indoor and outdoor), competitive distances (10K,

The measures taken also will be dictated, in part, by the injury the runner has sustained. The lower quarter assessment should include some subset of the following: foot and ankle alignment and range of motion; knee (patellofemoral and tibiofemoral) and hip joint alignment and range of motion; and specific manual muscle testing when appropriate. Finally,

The clinician must have a good working knowledge of normal running mechanics in order to identify abnormal gait patterns. These skills are best improved through practice.

Once the assessment is complete, the clinician or team must assimilate the information and develop a clinical hypothesis upon which treatment recommendations will be based. These recommendations may include a musculoskeletal program (stretching, strengthening, functional rehabilitation); footwear (running shoe prescription); foot orthoses prescription; training recommendations; and gait retraining.

A referral for additional medical consultation may be needed. For example, a runner's anterior knee pain while running may be related to excessive knee valgus. This may be a function of hip muscle weakness; a program of hip strengthening and gait retraining would be recommended. If there is reason to suspect osteoarthritis of the patellofemoral joint, the patient first may be referred to an orthopedic physician to determine whether continued running is recommended.

Because of the relatively subtle nature of running injuries, determining their etiology often takes time and patience on the part of the clinician. The running injury clinic provides an ideal environment in which to evaluate these patients. While problem-solving the injured runner's case may be challenging, the process can be professionally stimulating and the results personally rewarding.

For more information about running injury clinics, please contact your local Drayer center or Irene Davis, Drayer's director of research, at 302-831-4263. ▀

### A RUNNING MECHANICS ASSESSMENT IS BEST PERFORMED WITH THE PATIENT ON A TREADMILL.



marathons) and speed work. The runner's footwear should be assessed for wear patterns and model (cushion, stability, or motion control). If foot orthoses are used, they should be examined for overall condition and described in terms of materials, posting and other additions (padding, extensions, etc.)

Because anatomy influences the way we move, the next step is to assess the runner's structure, alignment and range of motion. It is best to begin with an overall examination of the runner's posture. This should include all segments from the foot up to at least the pelvis, and should be viewed from the front, side and back. This helps the clinician determine where to focus the structural assessment.

assessment of the single leg squat provides much insight into the function of the lower extremity during weight-bearing.

Because the injury occurred when the patient was running, it is critical that his running mechanics be assessed. This is best performed with the patient on a treadmill being recorded by a video camera. This allows the clinician to assess the running gait carefully while the runner remains relatively stationary. The gait should be viewed from the front, side and back. The clinician should observe all segments throughout all phases of gait. Videotaping the runner allows the therapist to analyze the gait in slow motion, which facilitates the identification of abnormal gait patterns.