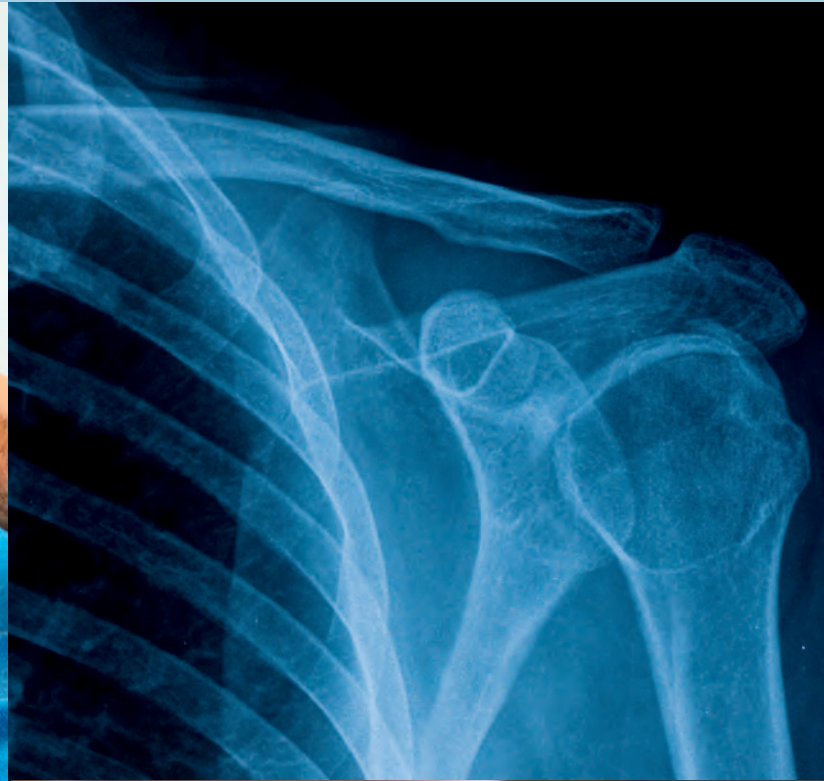




# DUKE SPORTS MEDICINE



**4TH ANNUAL  
WILLIAM E. GARRETT, Jr, MD, PhD  
SPORTS MEDICINE  
RESEARCH DAY**



**JUNE 28, 2023**



## William E. Garrett, Jr, MD, PhD

During his 40+ years of service to Duke University Medical Center and his patients, Dr. Garrett was a consummate physician, clinician-scientist, and teacher. As a specialist in sports medicine for thirty years, he served as the Medical Director of the U.S. Soccer Federation and Team Physician for the U.S. Men and Women's National Soccer teams, as well as many Duke teams.

As a teacher, he has the unique distinction of learning the Outstanding Teacher Award by both the residents at the Duke and UNC Departments of Orthopaedics. He was awarded the Duke Department of Orthopaedic Surgery Master Orthopaedist Award.

Posthumously, Dr. Garrett was inducted into the AOSSM Hall of Fame. Dr. Garrett's research awards include the Kappa Delta Award (ORS), Citation Award (ACSM), the Award of Merit (AOSSM), Excellence in Research in the Category of Basic Science (AOSSM), the Excellence in Research Award (AOSSM), the O'Donoghue Award (AOSSM).

It is his friendship, mentorship, and love of research and Sports Medicine we honor at this event.



**April 23, 1949 – May 4, 2019**



## Bruce Reider, MD

**Bruce Reider, MD**, was born in Queens, New York, and grew up in the New York metropolitan area. He graduated from Phillips Academy, Andover, 1967, where he ran track. He matriculated to Yale University, where he was active in multiple singing organizations and, in 1971, received an AB degree in English Literature magna cum laude and was elected to ΦBK.

After obtaining his MD degree at Harvard Medical School in 1975, he served an internship in general surgery at Columbia Presbyterian Hospital and a residency in orthopaedic surgery at the Hospital for Special Surgery. Dr. Reider completed fellowships under the direction of John Marshall and Russell Warren at H.S.S.; William Clancy, Jr. at the University of Wisconsin; and Werner Mueller at Kantonspital Bruderholz.

Dr. Reider arrived at the University of Chicago in 1981, serving as Head Team Physician to the present day. At Chicago, he founded the sports medicine fellowship and was Director of Sports Medicine for many years. In recognition of his devoted care of the varsity athletes of the University of Chicago for over 3 decades, he was awarded the Starkey Duncan Service Award in 2013. In addition to his duties in Chicago, he has served as a team physician for several other colleges and high schools in the Chicago area and provided team coverage for wrestling and soccer at the national and professional levels.

Dr. Reider attained the position of Professor of Surgery at the University of Chicago in 1997 and now holds the title of Professor of Orthopaedic Surgery, Emeritus. He has made 154 national and international presentations; edited 6 textbooks; and written 23 book chapters, 43 peer-reviewed articles, and, at last count, 181 editorials. The AOSSM has honored him with the Young Investigator, Cabaud and Rovere Awards, the 2013 Kennedy Lectureship, and election to the AOSSM Hall of Fame.

## **Bruce Reider, MD**

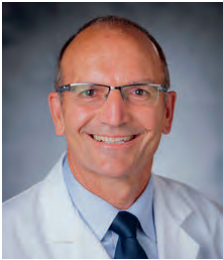
Dr. Reider joined the AOSSM in 1984 and has since served on the research, education, traveling fellowship, nominating, and program committees. He was the AOSSM program chairman from July 1999 to July 2000 and president of the Herodicus Society from 2004 to 2005. He was a member of the first AOSSM-ESSKA traveling fellowship contingent to Europe in 1986 and the Godfather of the 2007 AOSSM-AOSSM delegation to Asia.

Since 2002, Dr. Reider has been editor-in-chief of the American Journal of Sports Medicine and, since 2009, Executive Editor of Medical Publishing for the AOSSM. In those capacities, he serves on the Medical Publishing Board of Trustees and the Board of Directors (ex officio) of the AOSSM. As Executive Editor, he has helped design and initiate three new journals: Sports Health, A Multidisciplinary Approach, the Orthopaedic Journal of Sports Medicine (OJSM), which he also serves as Editor-in-Chief, and the Video Journal of Sports Medicine (VJSM). Since 2021 he has hosted the monthly Easy Reider podcast, where his guests are leading sports medicine personalities from North America and worldwide.

Dr. Reider has been married to his wife, Trish, since 1985 and lives in Chicago. They have two adult children, Carl Eric and Juliana Alexis, both software engineers. Carl is married to Dr. Liliana Montoya, a pediatrician.

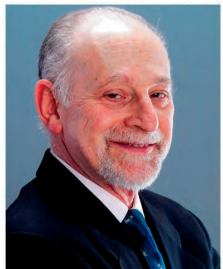


# PRESENTATIONS



## **Opening Remarks**

Annunziato (Ned) Amendola, MD, Professor of Orthopaedic Surgery; Chief, Division of Sports Medicine; Director, Urbaniak Sports Sciences institute



## **Keynote • Sports Injury Prevention: Is It Possible?**

Bruce Reider, MD, Editor-in-Chief, *American Journal of Sports Medicine & Orthopaedic Journal of Sports Medicine*; Professor of Orthopaedic Surgery, Emeritus – University of Chicago



## **Ryan Brooks, PT, DPT, MA, CSCS, USAW-L2**

Physical Therapist Knowledge, Attitudes, and Beliefs on Load-Based Exercise for Lower Limb Tendinopathy



## **Ryan O'Donnell, MD**

Slope Reducing Tibial Osteotomy for Correction of Posterior Tibial Slope in Anterior Cruciate Ligament Reconstruction: A Cohort Study



## **Andrew Sheehan, DO**

Troubleshooting Research Problems – A Current Study on the Effects of Glenohumeral Injections on the Blood Sugars of Diabetic Patients



## **Trevor Lentz, PT, PhD, MPH**

Mental Health Screening in Orthopaedics: Opportunities, Challenges, and Misconceptions

# PRESENTATIONS



## **John Justyn, PT, DPT, CSCS**

Characterization Changes in Knee Joint Loading with Wearable Sensor Technology Following an Experimental Knee Joint Effusion



## **Myra Trivellas, MD**

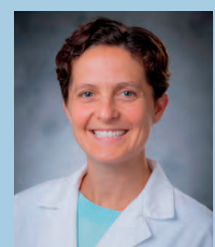
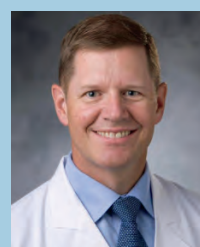
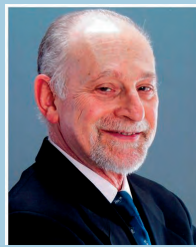
So You Think You Can Judge: Agreement and Reliability in Clinical Phenotyping



## **Rock Vomer, DO, DPT**

Vestibular Therapy in Patients with Sport-Related Concussions

**Panel: Publication, Ethics, and Professionalism**  
**Louis DeFrate, ScD • Bruce Reider, MD**  
**Dean Taylor, MD • Jocelyn Wittstein, MD**



## **Grant Cochran, MD**

Varus Producing Distal Femoral Osteotomy Alters Radiographic Measurements Related to Patellofemoral Instability



## **Elizabeth Bond, MB ChB, FRACS**

Outcomes after Patellofemoral Arthroplasty with a Third Generation Implant



## **Jiodany Perez, MD**

A Retrospective Analysis of Patient-Reported Clinical Outcome Measures for Knee Injections of Platelet Rich Plasma

## Physical Therapist Knowledge, Attitudes, & Beliefs on Load-Based Exercise for Lower Limb Tendinopathy

Brooks R, Lentz T, Cook J, Myers H, Pietrosimone LS

**Purpose/Hypothesis:** Lower extremity (LE) tendinopathy is a highly prevalent overuse injury in jumping athletes, reducing overall physical activity and time lost due to injury. Traditional management of lower limb tendinopathies emphasized notable reductions in external load until complete resolution of symptoms was achieved.<sup>1</sup> Eccentric exercise protocols, particularly for chronically symptomatic tendinopathies, constitute the common standard of care for tendinopathy,<sup>2,3</sup> and are likely one of the most widely implemented treatment paradigms in rehabilitative musculoskeletal clinical practice. However, evidence supporting a continuum of tendon pathology, described by progressive stages of structural pathology, suggests that one-size-fits-all eccentric exercise protocols may not be appropriate to prescribe for all stages of tendinopathy.<sup>4</sup> Emerging evidence demonstrates the positive effects of isometric loading exercise protocol on pain and self-reported function in athletes with patellar tendinopathy.<sup>5-7</sup> In physical therapy, the adoption of emerging evidence around the best practice for exercise-based interventions for lower extremity tendinopathies has been inconsistent and somewhat controversial. This study aimed to query orthopedic and sports medicine physical therapists on knowledge and beliefs about using exercise for tendinopathies. The results of this study will help elucidate physical therapists' perspectives on treating this common musculoskeletal condition and inform future research on implementation strategies for exercise-based interventions.

**Material/Methods:** A 34-question web-based REDCap survey targeting licensed PTs was emailed to the American Academy of Sports Physical Therapy (AASPT) members and the Academy of Orthopedic Physical Therapy (AOPT). Further survey circulation was accomplished via social media platforms. The email invited members to a survey on the knowledge and beliefs around exercise interventions for lower extremity tendinopathies. Survey questions included yes/no Likert scale, multiple choice, and slide scale (-10 being least likely to use; +10 being most likely to use). Descriptive data for participants and measures of central tendency, standard deviations, and frequencies of responses were collected.

**Results:** Respondents (n=284) were primarily white (90.8%) and non-Hispanic (88.1%), with DPT as their terminal PT degree (62.8%). Most respondents were in the early (< 5 years (35.2%)) or late (>20 years (32.6%)) career stages. A combined 53.9% were board certified in orthopedics or sports, while 47.3% reported no specialist certification. Interestingly, while 56.3% of respondents indicated awareness of the continuum of tendinopathy classification, only 30.9% used this classification system to guide patient treatments; 43.6% told a need for more understanding of the continuum altogether. Respondents indicated favoring the following interventions based on the tendinopathy stage: activity modification (early stage), isotonic and eccentric exercise (intermediate stage), and aerobic, isotonic, and eccentric exercise (late stage).

**Conclusion:** The results of this study indicate that most PTs sampled agree that staging tendinopathy is essential for treatment, despite only 31% reporting familiarity with the more recently accepted continuum of the tendinopathy classification system. Furthermore, PTs indicate progressive load-based exercises from tendinopathy's early to late stages.

**Clinical Relevance:** The interventions selected by respondents provide some insight into current practice patterns and interventions chosen based on early, intermediate, and late stages. These may provide



clinicians with a starting place for intervention selection based on the tendinopathy stage. Further research is indicated to evaluate PT diagnostic decision-making and its influence on intervention selection and patient outcomes for individuals with lower limb tendinopathy. Additionally, further exploration of implementation strategies for adopting evidence-based practice guidelines is warranted.

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## Slope-Reducing Tibial Osteotomy for Correction of Posterior Tibial Slope in Anterior Cruciate Ligament Reconstruction: A Cohort Study

O'Donnell R, Long J, Danilkowicz RM, Taylor DC, Toth AP, Amendola A, Lau BC.

**Background:** Anterior Cruciate Ligament (ACL) injuries are common among athletes and individuals engaged in high-demand activities. In recent years, slope-reducing osteotomies, including anterior closing wedge and medial opening wedge high tibial osteotomies (HTO) with biplanar correction, have emerged as potential adjunctive procedures in ACL reconstruction to optimize knee biomechanics and improve clinical outcomes, especially in revision settings.

**Methods:** A retrospective review of medical records at a high-volume tertiary care sports medicine institution was performed on patients undergoing ACL reconstruction with a slope-reducing high tibial osteotomy between January 2015 and December 2022. Patients were treated in either a single staged procedure or in a 2-staged fashion with osteotomy first, followed by ACL reconstruction later. Slope-reducing osteotomies were performed by five different sports medicine fellowship-trained surgeons and were either an anterior closing wedge high tibial osteotomy (ACWO) or a medial opening wedge osteotomy with biplanar correction (BCMWO). The type of osteotomy performed depended on patient alignment factors and the final surgeon's decision. Demographic, radiographic, and patient-reported outcome measures (PROMs) were collected. Radiographic parameters recorded included pre- and post-operative posterior tibial slope (PTS), patellar height, medial proximal tibial angle (mPTA), and time to union postoperatively. PROMs collected included Single Assessment Numeric Evaluation (SANE), Pain scores, International Knee Documentation Committee (IKDC), and Patient-Reported Outcomes Measurement Information System – Physical Function (PROMIS). T-Test and nonparametric Wilcoxon signed-rank test were used for statistical analysis.

**Results:** 17 patients underwent slope-reducing osteotomy with ACL reconstruction with a mean follow-up time of 26.4 months (SD 17.7 months, range 6-57 months) and an average age of 30.9 years (SD 5.4). There were 13 ACWOs and 4 BCMWOs performed. Patients had an average of 2 failed ACL reconstructions before osteotomy (range 0-5). One clinical graft failure in the BCMWO group occurred at 20.12 months postoperatively. The average pre-operative PTS was  $17.2 \pm 3.1$  degrees in the ACWO group and  $18 \pm 3.4$  degrees in the BCMWO group. The average change in PTS in the ACWO was  $13.7 \pm 2.7$  degrees ( **$p=0.001$** ) and  $6.75 \pm 1.3$  degrees in the BCMWO group ( $p=0.066$ ). There was a statistically significant difference in the PTS change between the groups ( **$p<0.001$** ). Preoperative mPTA for the ACWO group was  $88.8 \pm 2.9$  degrees and  $84.3 \pm 4.6$  degrees in the BCMWO group. There was a statistically significant difference in postoperative mPTA between the groups; ACWO  $1.4 \pm 1.9$  degrees and BCMWO  $7.5 \pm 4.4$  degrees ( **$p=0.001$** ). BCMWO had a long time to the final bony union on average than ACWO,  $6.9 \pm 4.8$  versus  $3.4 \pm 1.1$  months ( **$p=0.020$** ). Patients experienced statistically significant improvement in SANE, Pain, and PROMIS scores from pre- to post-operative ( **$p=0.028, 0.008, 0.018$** ), with no difference between the osteotomies. There were six total staged procedures (35.2%) (5 ACWO, 1 BCMWO) with no difference in PROMs, estimated blood loss, or surgical time.

**Conclusion:** High tibial slope reducing osteotomies resulted in satisfactory, improved patient outcomes in this cohort. ACWOs provided a superior reduction of PTS compared with BCMWO, while BCMWO can help correct both sagittal and coronal abnormalities. Surgeons should continue to critically analyze knee alignment in ACL reconstruction, especially in those with multiple previous failures.

## Troubleshooting Research Problems in the A Current Study on the Effects of Glenohumeral Injections on the Blood Sugars of Diabetic Patients

Sheehan AJ, Pyles C, Anakwenze O, Rhodes C, Reinke EK, Ceraulo, AS.

**Introduction:** A study researching the effects on blood sugar levels in diabetic patients after receiving a steroid injection in their glenohumeral joint has been going on at Duke since 2020. Since its inception, it has undergone several changes due to different issues in conducting research. Reviewing these issues and how they were solved for this current research project and future studies is essential.

**Description:** The study began as a randomized controlled trial, where the patients would be administered 1 of 4 possible steroid injections. The patients would have their blood sugar checked or an A1c drawn and then record their daily morning glucose readings for two weeks via Redcaps text messaging. Several pain scores would also be obtained to measure the outcomes of the shoulder injection. Initial problems involved how to measure the patient's baseline fasting glucose and whether an A1c could be received at the clinic, as the clinic was not able to get a blood sugar reading and was not the standard of care. There was then a back order of one of the steroids to be used, dexamethasone. Follow-up studies were changed around to reflect clinical practice better, and several considerations were made into how to best stratify the data based on several variables like how well the patient's diabetes was controlled, gender, and age. Last, a significant change was made to the study due to logistical difficulties in consenting the patient and performing the injection in a manner that would not disrupt clinics. The study was changed to a non-randomized one, where each provider would use whatever steroid they would typically use, allowing the patient to consent to the investigation after the procedure.

**Discussion:** These issues are not unique to this study; In their book on the changing landscape of medical research, the Institute of Medicine devoted a whole chapter to these issues and more that can challenge all the people involved in clinical research<sup>1</sup>. It is essential to identify these issues and attempt to correct them in a way that will not affect research. As Ioannidis et al. state in their paper, "Correctable weaknesses in the design, conduct, and analysis of biomedical and public health research studies can produce misleading results and waste valuable resources."<sup>2</sup> As we examine the changes made to this study, it is essential to ensure that they were done to ensure ethical research conduct while maintaining a high-quality outcome that will ensure that the results are a positive contribution to sports medicine and orthopedics.

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## Characterizing Changes in Knee Joint Loading Following an Experimental Knee Joint Effusion: 3D Biomechanical Data Assessment

Justyn J, Lindsay T, Myers H, Ceraulo AS, Lau BC, Pietrosimone LS

**Purpose/Hypothesis:** A history of a traumatic knee injury results in approximately five times higher odds of developing knee osteoarthritis (OA). Surgical and rehabilitative interventions improve physical function following a knee injury. Yet, many patients demonstrate persistent biomechanical alterations years after the initial injury, negatively influencing self-reported function and joint health. This study aims to evaluate changes in knee joint loading during walking gait following an experimental knee joint effusion using three-dimensional (3D) biomechanics. We hypothesized that knee joint loading would decrease on the effused limb following the knee joint effusion.

**Subjects:** Twelve healthy participants (male=9, female=3) with no history of lower extremity injury volunteered for this study (age:  $25.11 \pm 3.31$  years; height:  $174.56 \pm 8.92$  cm; weight:  $75.60 \pm 11.53$  kg).

**Materials/Methods:** 3D kinematics and kinetics were collected using a 16-camera motion capture system (Vicon Motion Systems, Centennial CO) and two force plates pre- & post-effusion. Participants completed five overground walking gait trials at a self-selected pace which were averaged for analysis. Following pre-effusion biomechanical assessment, the dominant limb knee received a supra-lateral injection of 60mL of saline into the suprapatellar pouch by a licensed physician. Participants lay supine for 5 minutes following the effusion and were moved via rolling chair to the biomechanical capture space to avoid prematurely loading the limb. The post-effusion biomechanical assessment was then completed. Peak vertical ground reaction force (VGRF), internal knee extension moment (IKEM), and negative knee power (KP) were extracted using the Vicon Plug-In Gait model from the initial ground contact to the maximum knee flexion angle during the stance phase. Data for the effused and non-effused limbs before (PRE) and after (POST) knee joint effusion were analyzed via custom MATLAB software. Separate paired-sample t-tests assessed changes in all dependent variables across the two-time points (pre- and post-effusion) with an a priori alpha level of 0.05. Cohen's d effect sizes evaluated the magnitude of differences.

**Results:** The effused limb demonstrated lesser peak VGRF (PRE:  $10.07 \pm 2.01$  N/kg; POST:  $9.65 \pm 1.55$  N/kg;  $p=0.059$ ;  $d=0.488$ ), peak IKEM (PRE:  $0.61 \pm 0.39$  Nm/kg; POST:  $0.55 \pm 0.36$  Nm/kg;  $p=0.084$ ;  $d=0.427$ ) and peak KP (PRE:  $-0.76 \pm 0.66$  W/kg; POST:  $-0.57 \pm 0.50$  W/kg;  $p=0.052$ ;  $d=0.513$ ) following the experimental knee joint effusion, with trends towards statistical significance and minor to moderate effects. There were no statistically significant changes following effusion in the non-effused limb for all biomechanical variables ( $p>0.05$ ).

**Conclusions:** While the results of this study do not indicate absolute differences in gait biomechanics following an experimental knee joint effusion, all biomechanical variables were trending towards statistical significance while still demonstrating minor to moderate effects, which is the expected effect when exploring changes in walking gait following joint injury. These results show promising trends that will confirm our hypothesis when completing analysis with a fully powered study.

**Clinical Relevance:** Early detection of movement alterations will improve preemptive management of patients following joint injury. The results of this study take an essential initial step to the proposed research initiative to develop a real-world monitoring system to monitor biomechanical changes following directly clinician-supervised rehabilitation. Long term, our monitoring system is expected to fill a gap in clinic

care continuum for patients following knee joint injury. Our future research in this area will emphasize the sensitivity of wearable sensor technology to detect gait alteration in healthy and injured populations.

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## **So, You Think You Can Judge: Agreement and Reliability in Clinical Phenotyping**

*Assessing Health Care Providers' Ability to Identify Psychological Phenotypes Among Patients with Musculoskeletal Conditions: An Interdisciplinary Study*

Trivellas M, Jiranek W, Cook C, Roundy P, Reinke EK, Lentz T

**Objective:** This study aimed to evaluate the proficiency of healthcare providers in identifying psychological phenotypes in patients with musculoskeletal conditions. Specifically, we assessed the agreement and accuracy among orthopedic providers when assigning different psychological phenotypes based on clinical vignettes.

**Methods:** Attending orthopedic surgeons, attending sports medicine providers, orthopedic surgical fellows, and physical therapists participated in the study and were presented with clinical vignettes containing information on patients' scores on 11 different psychological questionnaires. Participants were asked to match each vignette to one of four previously established psychological phenotypes derived through latent class analysis (LCA): high distress, low distress, negative pain coping, and low self-efficacy. Phenotypes and relevant psychological measures were thoroughly explained before the survey. Interrater agreement was analyzed using Fleiss' kappa.

**Results:** Overall agreement among the 45 raters was moderate (Kappa = 0.543), with higher understanding observed for low and high distress phenotypes. Additional clinical data such as age, sex, pain, and disability improved agreement (Kappa = 0.617) compared to using only the psychological questionnaire scores (Kappa = 0.404). The lower agreement was observed for low-distress assignments, mainly when less clinical information was available. Participants more familiar with phenotyping and psychological distress had a higher understanding (Kappa = .608) than those with less familiarity (Kappa = .504). After accounting for familiarity, there were no differences in agreement among physical therapists (PTs) and medical doctors (MDs). There was a high average agreement (72%) between raters and the LCA-assigned phenotypes. This accuracy varied depending on the phenotypes, with higher accuracy observed for identifying high-distress and low-distress phenotypes.

**Conclusion:** Phenotyping experience and including demographic and health status information improved agreement among healthcare providers in identifying psychological phenotypes. No significant differences were found based on discipline (MD vs. PT), but a slightly higher agreement was observed among providers with more clinical experience. The accuracy of phenotype assignments was generally high, with better performance in identifying high-distress and low-distress phenotypes. Challenges in assigning low self-efficacy and negative pain coping phenotypes suggest the potential usefulness of decision algorithms or support aids for capturing nuanced psychological profiles related to coping difficulties and low self-efficacy.

Overall, this research provides insights into assessing psychological phenotyping in orthopedic clinics and offers valuable recommendations for improving agreement and accuracy in this domain.

## Vestibular Therapy in Patients with Sports-Related Concussions

Vomer R, Reinke EK, Green C, Martinez C, Potter R, D'Errico C, Rhodes C, Poehlein E, Pyles C, Bytomski J

**Background:** Vestibular/Ocular Motor Screening (VOMS) has been identified as a valuable assessment tool for sport-related concussions. The VOMS can be symptom-provoking in acutely concussed individuals due to the requirement to complete vestibular-ocular reflex (VOR) testing for ten cycles at a speed of 180 bpm. The Duke Sports Concussion Clinic developed an alternative testing method (qVOMS) that measures the number of cycles completed in 10 seconds, allowing individuals to self-regulate their speed.

**Study Design:** Prospective order-randomized trial

**Methods:** Individuals 12 years and older (n=33) evaluated at the concussion clinic were assessed using standard concussion testing protocols. Everyone was randomized to the timing of the VOMS vs. qVOMS (beginning or end of testing protocol).

**Results:** The kappa statistic was 1.00, indicating perfect agreement between the two test variations for identifying individuals with and without a concussion. Although the sample size was small, the resulting Z statistic (4.37) crossed the interim efficacy boundary score ( $\pm 3.89$ ), indicating sufficient sample size to determine that the two tests are equivalent (within  $\pm 0.10$ ).

**Conclusion:** The qVOMS and traditional VOMS can be used interchangeably for diagnosis and symptom monitoring for sport-related concussions.

**Relevance:** The qVOMS can provide objective measures of vestibular improvement compared to only subjective via self-reported symptom provocation in the traditional VOMS. Additionally, the qVOMS offers physical therapists a symptomatic threshold to initiate vestibular interventions following sport-related concussions.

## Does Varus Producing Distal Femur Osteotomy Alter Radiographic Measurements Related to Patellofemoral Instability?

Cochran G, Bond EC, Wittstein J

**Background:** Patellofemoral dysfunction and instability are common presenting complaints in the orthopedic clinic. Predisposing bony anatomy includes trochlear dysplasia, patella alta, enlarged tibial tuberosity trochlear groove (TT-TG) distance, coronal plane knee malalignment, and femoral or tibial malrotation. Varus-producing distal femur osteotomy (DFO) may directly or indirectly alter all or some of these parameters. This study evaluates how varus-producing DFO with graduated block sizes vary the patellar height, TT-TG distance, and patellofemoral congruence angle (PCA). It is anticipated that changes to these parameters can be estimated pre-operatively based on the size of the planned coronal correction.

**Materials & Methods:** Six cadaveric lower extremities were imaged with a CT scan in full extension and 45 degrees of flexion before any intervention. The rectus femorus was then tenodesed to the proximal femur to help maintain the tension of the extensor mechanism. A varus-producing DFO was then performed using 6mm, 10mm, and 14mm correction blocks. Imaging was repeated after each osteotomy alteration, and measurements were taken using standard techniques. Descriptive data were reported using means, standard deviations, and ranges. A two-sided student's t-test was used to determine statistical significance.

**Results:** Starting limb coronal mechanical axis was neutral to moderate varus (23% - 51% tibial width). As expected, each osteotomy expansion increased varus in all measured coronal parameters. The sagittal plane radiographic parameters of the Caton-Deschamps & Insall-Savati index were normal at baseline and not affected by an osteotomy of any size. The axial plane parameters showed mixed results. The baseline patellofemoral congruence angle averaged negative 11 degrees (patellar apex medial to trochlear groove) and was not affected by an osteotomy of any size. TT-TG distance at baseline averaged 16.5mm. TT-TG distance decreased by an average of 1.5, 3.7, and 4.0mm with osteotomy sizes of 6, 10, and 14mm, respectively. The changes seen with 10 and 14mm blocks reached statistical significance ( $P < 0.05$ ).

**Conclusions:** A varus-producing DFO performed in a cadaveric model with baseline varus coronal alignment and baseline medial patellofemoral congruence did not change sagittal radiographic parameters or patellofemoral congruence angle but did decrease the TT-TG distance 1.5 to 4mm depending on the size of the osteotomy.



## Outcomes after Patellofemoral Arthroplasty with a Third-Generation Implant

Bond EC, Zirbes C, Danilkowicz RM, Reinke EK, Amendola A

**Background:** Patellofemoral arthroplasty (PFA) is an attractive option for patients with the isolated patellofemoral disease to reproduce normal joint function while relieving pain, preserving the tibiofemoral joint, and providing longevity. This study assesses the functional outcomes and revision rates of primary PFA with a third-generation implant in a single surgeon case series with short to medium-term follow-up. No studies to date report the results of the Arthrex iBalance™ PFA - a third-generation, low-profile, anatomic on-lay implant.

**Methods:** We retrospectively reviewed the records of 49 patients (70 knees) undergoing PFA with the Arthrex iBalance system by a single surgeon at a quaternary center between January 2015 and September 2022 for demographic and surgical data as well as complications and revision rate. Patients were contacted to collect patient-reported outcome scores (PRO), including the Kujala, Knee Injury and Osteoarthritis Outcome Score [KOOS and KOOS Jr], Single Assessment Numeric Evaluation [SANE], and Forgotten Joint Score [FJS]. A further 43 knees were analyzed from the Arthrex Surgical Outcome System (SOS) database using the KOOS and KOOS Jr scores from pre-operatively to five years post-operative.

**Results:** The population was majority female (81.6%), with an average age of 50 years and an average BMI of 27.4. Bilateral simultaneous procedures were performed in 21 patients (42.9%). A concomitant procedure was performed in 19 knees (34.7%). Of the 70 knees, 15 (18.6%) underwent a further procedure on the operative knee during the follow-up period. Three knees were revised to a total knee arthroplasty (4.3%) at an average time of 2.2 years post-operatively (range 1.7 to 3.2 years). Twenty-two patients from the author's institution (34 knees, response rate 45%) completed the PRO surveys (average follow-up 2.1 years, range 0.3 to 6.5 years). The average SANE score was 83, average Kujala of 72. A higher preoperative Kellgren Lawrence (KL) grade was significantly associated with KOOS symptom ( $p = 0.017$ ), ADL ( $p = 0.02$ ), and QOL ( $p = 0.044$ ) scores, with a higher KL grade being correlated with a higher score in the respective KOOS domain. A higher KL grade was also associated with a higher FJS ( $p = 0.0074$ ). A further 43 PROs were analyzed from the Arthrex SOS cohort with an average KOOS Jr of 71 at three years follow-ups. In both groups, patients reported higher scores in the KOOS subdomains of symptom relief, pain, and activities of daily living (ADL) and lower scores in the sport and quality of life (QOL) subdomains.

**Conclusions:** To our knowledge, this study is the first to examine the outcomes of the Arthrex iBalance™ PFA system. The results show good PROs in this group consistent with other 2<sup>nd</sup> and 3<sup>rd</sup> generation PFA implants and a revision rate like its prosthetic peers. We plan to continue following our patients to report longer-term outcomes of this system.

## A Retrospective Analysis of Patient-Reported Clinical Outcome Measures for Knee Injections of Platelet Rich Plasma.

Perez J, Rhodes C, Reinke EK, Ceraulo AS

**Background/Objective:** Chronic knee pain is a prevalent musculoskeletal condition affecting a significant portion of the population, leading to impaired mobility, reduced quality of life, and increased healthcare burden. Traditional treatment options, including corticosteroid injections, hyaluronic acid injections, and physical therapy, often provide limited long-term benefits and are associated with various drawbacks. Platelet-rich plasma (PRP) is a promising therapeutic option for managing chronic orthopedic injuries. Multiple published clinical studies have demonstrated good results using PRP for chronic knee pain. However, other studies have challenged these results bringing the use of PRP into question. Many factors have been cited as potential causes for the mixed evidence supporting the use of PRP. Some include a lack of standardization for optimal PRP preparation/concentration, dosage, number of injections, and timing. Our study aims to evaluate patient-reported outcome measures using the Patient Reported Outcome Measure Information System (PROMIS) scores for pain interference and physical function of patients suffering from chronic knee pain who received ultrasound-guided platelet-rich plasma (PRP) knee injections.

**Methods and Results:** A retrospective chart review of 31 patients who underwent ultrasound-guided platelet-rich plasma injections of the knee between 2021 and 2023 was performed. Patient-reported outcome measures of pain interference and physical function utilizing the Patient-Reported Outcome Measure Information System (PROMIS) were collected from the EMR before injection and at follow-up visits one month, two months, three months, and six months post-injection. The patient population included 14 females and 17 males, 36 total knees. The average age was 51 years old. We analyzed the data statistically to determine if a statistically significant difference in PROMIS measures for pain interference and physical function was present at each follow-up interval stated above.

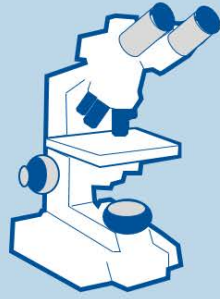
The average Initial PROMIS score for physical function before injection was 43.32 (higher scores representing better function), and the average score for pain interference before injection was 59.4 (lower scores representing less pain interference). Of the 31 patient records obtained, 11 patients had documented PROMIS scores for Pain interference at six months, and 12 had reported PROMIS scores for physical function at six months. No statistically significant change in either pain interference or physical function was noted at the abovementioned intervals.

**Conclusion:** Platelet-rich plasma therapy represents a promising potential treatment option for patients suffering from chronic knee pain. Though our study did not show any statistically significant improvement in pain interference or physical function PROMIS scores, many patients did see significant improvement at follow-up visits from two months up to six months. However, our study was limited by the low sample size, the high number of patients lost to follow-up, and the lack of specificity in the degree of disease severity (i.e., Kellgren and Lawrence's grade for Osteoarthritis). Further studies with larger sample sizes and randomization protocols are required to explore further the potential benefits or lack thereof of using PRP for chronic knee pain.

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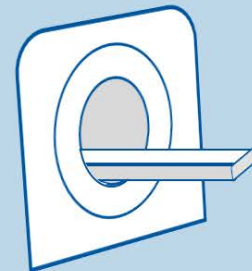
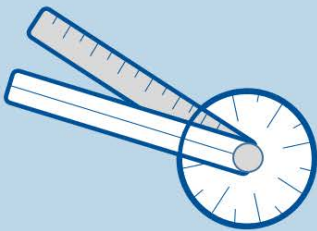
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