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Lower Extremity Kinematics of Females With Patellofemoral Pain Syndrome While Stair Stepping

t **ST UDY DESI GN:** Cross-sectional case-control design.
t **BACK GRO UND:** Although the etiology of patellofemoral pain syndrome (PFPS) is not completely understood, there is some evidence to suggest that hip position during weight-bearing activities contributes to the disorder.
t **OBJECTI VE:** To compare the knee and hip motions (and their coordination) during stair stepping in female athletes with and without PFPS.
t **METHO DS:** Two groups of female recreational athletes, 1 group with PFPS (n = 10) and a control group without PFPS (n = 10), were tested. All participants ascended and descended stairs (condition) at 2 speeds (self-selected comfortable and taxing [defined as 20% faster than the comfortable speed]), while the knee and hip angles were measured with a magnetic-based kinematic data acquisition system. Angle-angle diagrams were used to examine the relationship between flexion/extension of the knee and flexion/extension, adduction/abduction, and internal/external rotation of the hip. The angle of the knee and the 3 angles of the hip at foot contact on the third step were compared between groups by means of 3-way analyses of variance (ANOVA), with repeated measures on speed and condition.
t **RES ULTS :** Group-by-speed interaction for knee angle was significant, with knee flexion being greater for the PFPS group for stair ascent and descent at a comfortable speed. Both the angle-angle diagrams and ANOVA demonstrated greater adduction and internal rotation of the hip in the individuals with PFPS compared to control participants during stair descent.
t **CONCL USION :** Compared to control participants, females with PFPS descend stairs with the knee in a more flexed position and have the hip in a more adducted and internally rotated position at foot contact during stair stepping at a comfortable speed. *J Orthop Sports Phys Ther 2010;40(10):625-632. doi:10.2519/jospt.2010.3185*
t **KEY WOR DS:** *hip, knee, patella*

Effect of Posture on Acromiohumeral Distance With Arm Elevation in Subjects With and Without Rotator Cuff Disease Using Ultrasonography

Nitin Kalra, Amee L. Seitz, N. Douglas Boardman III, Lori A. Michener

DOI: 10.2519/jospt.2010.3155

STUDY DESIGN: Controlled laboratory study. **OBJECTIVES:** To examine the effects of altering posture on the subacromial space (SAS) in subjects with rotator cuff disease and subjects without shoulder pain. **BACKGROUND:** Poor upper quadrant posture has been linked to altered scapular mechanics, which has been theorized to excessively reduce SAS. However, no study has examined the direct effects of altering upper quadrant posture on SAS. We hypothesized that upright posture would increase and slouched posture would decrease the SAS, as compared to a normal posture, when measured both with the shoulder at rest along the side of the trunk and when maintained in 45° of active shoulder abduction. **METHODS:** Participants included 2 groups: the subjects with shoulder pain and rotator cuff disease, as diagnosed via magnetic resonance imaging (n = 31), and control subjects without shoulder pain (n = 29). The SAS was imaged with ultrasound using a 7.5-MHz linear transducer placed in the coronal plane over the posterior to midportion of the acromion. The SAS was measured on ultrasound images using the acromiohumeral distance (AHD), defined as the shortest distance between the acromion and the humerus. The AHD was measured in 2 trials at 2 arm angles (at rest along the trunk and at 45° of active abduction) and across 3 postures (normal, slouched, and upright), and averaged for data analysis. **RESULTS:** Two mixed-model analyses of variance, 1 for each arm angle, were used to compare AHD across postures and between groups. There was no interaction between group and posture, and no significant main effect of group for either arm position. There was no significant main effect of posture for the arm at rest ($P = .26$); however, there was a significant main effect of posture on AHD at the 45° abduction arm angle ($P = .0002$), with a significantly greater AHD in upright posture (mean AHD, 9.8 mm), ascompared to normal posture (mean AHD, 8.6 mm). **CONCLUSION:** The effect of posture on SAS, as measured by the 2-dimensional AHD using ultrasound of the posterior to middle aspect of the SAS, is small. The AHD increased with upright posture by 1.2 mm compared to normal posture, when the arm was in 45° active abduction.

J Orthop Sports Phys Ther 2010;40(10):633-640, Epub 6 August 2010. doi:10.2519/jospt.2010.3155

KEY WORDS: impingement, posture, rotator cuff, shoulder, subacromial space

The authors examine the effects of altering posture on the subacromial space (SAS) in subjects with rotator cuff disease and subjects without shoulder pain.

Pain Response Classification Does Not Predict Long-Term Outcome in Patients With Low Back Pain Who Are Sick-Listed

David Christiansen, Kristian Larsen, Ole Kudsk Jensen, Claus Vinther Nielsen

DOI: 10.2519/jospt.2010.3388

STUDY DESIGN: Prospective cohort study nested in a randomized clinical trial. **OBJECTIVE:** To investigate the prognostic value of pain response classification at initial physiotherapy examination in patients with low back pain (LBP) who are sick-listed. **BACKGROUND:** Recurrent and chronic LBP accounts for a substantial proportion of all absence from work. In predicting outcome in patients with LBP, psychosocial factors are thought to play an
important role, while findings from clinical examination seem to be of more limited value. Mechanical evaluation, using repeated end range spinal movements that result in specific pain responses, has been shown to be of some value. **METHODS:** The study included 351 patients sick-listed because of LBP with or without sciatica. Prior to clinical examination, the patients completed a comprehensive questionnaire including questions on pain, function, and psychosocial factors. The physiotherapy examination included a standardized mechanical evaluation. Patients were classified into 3 groups according to their pain response: centralization, peripheralization, or no response. Outcomes were obtained by national register data, medical records, and a postal questionnaire at 1 year. **RESULTS:** At 1-year follow-up, 65% of the patients had returned to work. All pain response groups showed significant and clinically important improvements in both pain and disability. No significant differences were found between painresponse groups in any outcome measure. Results remained unchanged after adjustment for potential confounders. **CONCLUSION:** The prognostic value of pain response classification seems limited in patients sick-listed from work because of LBP. **LEVEL OF EVIDENCE:** Prognosis, level 1b.

J Orthop Sports Phys Ther 2010;40(10):606-615, Epub 6 August 2010. doi:10.2519/jospt.2010.3388

KEY WORDS: centralization, low back pain,

Functioning and Disability in Patients With Hip Osteoarthritis With Mild to Moderate Pain

Karin Rydevik, Linda Fernandes, Lars Nordsletten, May Arna Risberg

DOI: 10.2519/jospt.2010.3346

STUDY DESIGN: Cross-sectional study. **OBJECTIVE:** To compare functioning and disability in patients with hip osteoarthritis (OA) not candidates for surgery, to a matched control group, and thereby to examine the relationship between the functioning and disability components used in this study in patients with hip OA. **BACKGROUND:** It is well known that patients with severe hip OA have deficits in functioning and disability. However, in patients with hip OA not candidates for surgery, the knowledge regarding functioning and disability is sparse. **METHODS:** Twenty-six patients (12 men, 14 women; mean age, 60 years) with radiographic and symptomatic hip OA were matched to 26 controls without hip pain. The following variables were measured: muscle strength using isokinetic peak force, hip passive range of motion, submaximal aerobic capacity using a cycling test, walking ability using the 6-minute walk test, self-reported pain, stiffness, and physical function using the Western Ontario and McMaster University Osteoarthritis Index, and health-related quality of life using the SF-36. **RESULTS:** The patients with hip OA had mild to moderate pain, as indicated by the Western Ontario and McMaster University Osteoarthritis Index, and significantly lower knee extension strength (mean difference [95% confidence interval {CI}]: –19.5 [–34.3, –4.7] Nm). Hip range of motion was significantly less in the patients with hip OA, with mean (95% CI) differences of –10° (–14°, –6°) for extension, –18° (–26°, –11°) for flexion, –9° (–14°, –4°) for abduction, –2° (–5°, 0°) for adduction, –16° (–23°, –9°) for internal rotation, and –21° (–28°, –14°) for external rotation. The patients with hip OA walked a significantly shorter distance in 6 minutes (mean difference, –75 m; 95% CI: –131, –20 m). There were no significant differences in hip extension/flexion, knee flexion, ankle dorsiflexion/plantar flexion muscle strength, or aerobic capacity between the 2 groups. There were significant associations between body function and activity components. **CONCLUSION:** Physical therapists should consider including quadriceps-strengthening and hip range-of-motion exercises when developing rehabilitation programs for patients with hip OA, with mild to moderate pain, aiming to improve functioning and reduce disability.

J Orthop Sports Phys Ther 2010;40(10):616-624, Epub 1 September

A Comparison of Hip Strength Between Sedentary Females With and Without Patellofemoral Pain Syndrome

Eduardo Magalhães, Thiago Yukio Fukuda, Sylvio Noronha Sacramento, Andrea Forgas, Moisés Cohen, Rene Jorge Abdalla

DOI: 10.2519/jospt.2010.3120

STUDY DESIGN: Cross-sectional study. **OBJECTIVE:** To compare the hip strength of sedentary females with either unilateral or bilateral patellofemoral pain syndrome (PFPS) to a control group of sedentary females of similar demographics without PFPS. **BACKGROUND:** It has been suggested that hip muscle weakness may be an important factor in the etiology of young female athletes with PFPS. This syndrome is also common in sedentary females and it is unclear if similar findings of hip weakness would be present in this population. **METHODS:** Females between 15 and 40 years of age (control group, n = 50; unilateral PFPS, n = 21; bilateral PFPS, n = 29) participated in the study. Strength for all 6 hip muscle groups was measured bilaterally on all subjects using a handheld dynamometer. **RESULTS:** The hip musculature of sedentary females with bilateral PFPS was statistically weaker (range, 12%-36%; *P*<.05) than that of the control group for all muscle groups. The hip abductors, lateral rotators, flexors, and extensors of the injured side of those with unilateral PFPS group were statistically weaker (range, 15%-20%; *P*<.05)than that of the control group, but only the hip abductors were significantly weaker when compared to their uninjured side (20%; *P*<.05). **CONCLUSION:** This study demonstrates that hip weakness is a common finding in sedentary females with PFPS.

J Orthop Sports Phys Ther 2010;40(10):641-647, Epub 27 May 2010. doi:10.2519/jospt.2010.3120

KEY WORDS: chondromalacia, handheld dynamometry, knee, patella

The authors compare the hip strength of sedentary females with either unilateral or bilateral patellofemoral pain syndrome (PFPS) to a control group of sedentary females of similar demographics without PFPS.

Insufficiency Fracture of the Pubic Rami

Lance M. Mabry, Michael D. Ross, Michael A. Tall

DOI: 10.2519/jospt.2010.0416

The patient was an 87-year-old woman referred to a physical therapist for right buttock and lateral calf pain of insidious onset that had been present for the past 3 weeks. She also complained of a 5-day history of right anterior hip/groin pain. Due to concern for a recent fracture of the right hip or pelvis, based on prior radiographs and the patient's medical history, radiographs were ordered that demonstrated new superior and inferior right pubic rami fractures. An orthopaedic surgeon was immediately consulted who diagnosed the patient with insufficiency fractures of the right pubic rami. The patient was instructed on toe touch weight bearing with a walker for the right lower extremity, and the orthopaedic surgeon recommended treatment by the physical therapist, as well as a reevaluation of the current management strategies for the patient's osteoporosis.

J Orthop Sports Phys Ther 2010;40(10):666. doi:10.2519/jospt.2010.0416

KEY WORDS: hip, osteoporosis, pelvis, radiographs

The patient was an 87-year-old woman referred to a physical therapist for right buttock and lateral calf pain of insidious onset that had been present for the past 3 weeks. An orthopaedic surgeon diagnosed the patient with insufficiency fractures of the right pubic rami.

Effects of Recovery Method After Exercise on Performance, Immune Changes, and Psychological Outcomes

Douglas L. Stacey, Martin J. Gibala, Kathleen A. Martin Ginis, Brian W. Timmons

DOI: 10.2519/jospt.2010.3224

STUDY DESIGN: Randomized controlled trial using a repeated-measures design. **OBJECTIVES:** To examine the effects of commonly used recovery interventions on time trial performance, immune changes, and psychological outcomes. **BACKGROUND:** The use of cryotherapy is popular among athletes, but few studies have simultaneously examined physiological and psychological responses to different recovery strategies. **METHODS:** Nine active men performed 3 trials, consisting of three 50-kJ "all out" cycling bouts, with 20 minutes of recovery after each bout. In a randomized order, different recovery interventions were applied after each ride for a given visit: rest, active recovery (cycling at 50 W), or cryotherapy (cold tub with water at 10°C). Blood samples obtained during each session were analyzed for lactate, IL-6, total leukocyte, neutrophil, and lymphocyte cell counts. Self-assessments of pain, perceived exertion, and lower extremity sensations were also completed. **RESULTS:** Time trial performance averaged 118 ± 10 seconds (mean ± SEM) for bout 1 and was 8% and 14% slower during bouts 2 (128 ± 11 seconds) and 3 (134 ± 11 seconds), respectively, with no difference between interventions (time effect, $P \leq .05$). Recovery intervention did not influence lactate or IL-6, although greater mobilization of total leukocytes and neutrophils was observed with cryotherapy. Lymphopenia during recovery was greater with cryotherapy. Participants reported that their lower extremities felt better after cryotherapy (mean ± SEM, 6.0 ± 0.7 out of 10) versus active recovery (4.8 ± 0.9) or rest (2.8 ± 0.6) (trial effect, $P \leq .05$). **CONCLUSION:** Common recovery interventions did not influence performance, although cryotherapy created greater immune cell perturbation and the perception that the participants' lower extremities felt better. **LEVEL OF EVIDENCE:** Performance enhancement, level 2b.

J Orthop Sports Phys Ther 2010;40(10):656-665, Epub 13 May 2010. doi:10.2519/jospt.2010.3224

KEY WORDS: active recovery, cryotherapy, high-intensity exercise, hydrotherapy

Neuromuscular Training Improves Performance on the Star Excursion Balance Test in Young Female Athletes

Alyson Filipa, Robyn Byrnes, Mark V. Paterno, Gregory D. Myer, Timothy E. Hewett

DOI: 10.2519/jospt.2010.3325

STUDY DESIGN: Controlled cohort repeated-measures experimental design. **OBJECTIVES:** To determine if a neuromuscular training program (NMTP) focused on core stability and lower extremity strength would affect performance on the star excursion balance test (SEBT). We hypothesized that NMTP would improve SEBT performance in the experimental group and there would be no side-to-side differences in either group. **BACKGROUND:** The SEBT is a functional screening tool that is used to assess dynamic stability, monitor rehabilitation progress, assess deficits following an injury, and identify athletes at high risk for lower extremity injury. The SEBT requires lower extremity coordination, balance, flexibility, and strength. **METHODS:** Twenty uninjured female soccer players (13 experimental, 7 control) participated. Players trained together as a team, so group allocation was not randomized. The SEBT was administered prior to and following 8 weeks of NMTP in the experimental group and 8 weeks of no NMTP in the control group. A 3-way mixed-model ANOVA was used to determine the effect of group (experimental versus control), training (pretraining versus posttraining), and limb (right versus left). **RESULTS:** After participation in a NMTP, subjects demonstrated a significant improvement in the SEBT composite score (mean ± SD) on the right limb (pretraining, 96.4% ± 11.7%; posttraining, 104.6% ± 6.1%; $P = .03$) and the left limb (pretraining, 96.9% ± 10.1%; posttraining, 103.4% ± 8.0%; $P = .04$). The control group had no change on the SEBT composite score for the right (pretraining, 95.7% ± 5.2%; posttraining, 94.4% ± 5.2%; $P = .15$) or the left (97.4% ± 7.2%; 93.6% ± 5.0%; $P = .09$) limb. Further analysis identified significant improvement for the SEBT in the posterolateral direction on both the right ($P = .008$) and left ($P = .040$) limb and the posteromedial direction of the left limb ($P = .028$) in the experimental group. **CONCLUSION:** Female soccer players demonstrated an improved performance on the SEBT after NMTP that focused on core stability and lower extremity strength. **LEVEL OF EVIDENCE:** Performance enhancement, level 2b-.

J Orthop Sports Phys Ther 2010;40(9):551-558, Epub 6 August 2010.

Knee Extensor Dynamics in the Volleyball Approach Jump: The Influence of Patellar Tendinopathy

Shawn C. Sorenson, Shruti Arya, Richard B. Souza, Christine D. Pollard, George J. Salem, Kornelia Kulig

DOI: 10.2519/jospt.2010.3313

STUDY DESIGN: Controlled laboratory study using a cross-sectional design. **OBJECTIVES:** To evaluate knee joint dynamics in elite volleyball players with and without a history of patellar tendinopathy, focusing on mechanical energy absorption and generation. We hypothesized that tendinopathy would be associated with
reduced net joint work and net joint power. **BACKGROUND:** Patellar tendinopathy is a common, debilitating injury affecting competitive volleyball players. **METHODS:** Thirteen elite male players with and without a history of patellar tendinopathy (mean ± SD age, 27 ± 7 years) performed maximum-effort volleyball approach jumps. Sagittal plane knee joint kinematics, kinetics, and energetics were quantified in the lead limb, using data obtained from a force platform and an 8-camera motion analysis system. Vertical ground reaction forces and pelvis vertical velocity at takeoff were examined. Independent sample t tests were used to evaluate group differences (α = .05). **RESULTS:** The tendinopathy group, compared to controls, demonstrated significant reductions (approximately 30%) in net joint work and net joint power during the eccentric phase of the jump, with no differences in the concentric phase. Positive to-negative net joint work and net joint power ratios were significantly higher in the tendinopathy group, which had a net joint work ratio of 1.00 (95% CI: 0.77, 1.24) versus 0.76 (95% CI: 0.64, 0.88) for controls, and a net joint power ratio of 1.62 (95% CI: 1.15, 2.10) versus 1.00 (95% CI: 0.80, 1.21) for controls. There were no significant differences in net joint moment, angular velocity, or range of motion. Peak vertical ground reaction forces were lower for the tendinopathy group, while average vertical ground reaction forces and pelvis vertical velocity were similar. **CONCLUSION:** Patellar tendinopathy is associated with differences in sagittal plane mechanical energy absorption at the knee during maximum-effort volleyball approach jumps. Net joint work and net joint power may help define underlying mechanisms, adaptive effects, or rehabilitative strategies for individuals with patellar tendinopathy.

J Orthop Sports Phys Ther 2010;40(9):568-576, Epub

Reliability of Shoulder Internal Rotation Passive Range of Motion Measurements in the Supine Versus Sidelying Position

Jason B. Lunden, Mike Muffenbier, M. Russell Giveans, Cort J. Cieminski

DOI: 10.2519/jospt.2010.3197

STUDY DESIGN: Clinical measurement, reliability. **OBJECTIVE:** To compare intrarater and interrater reliability of shoulder internal rotation (IR) passive range of motion measurements utilizing a standard supine position and a sidelying position. **BACKGROUND:** Glenohumeral IR range of motion deficits are often noted in patients with shoulder pathology. Excellent intrarater reliability has been found when measuring this motion. However, interrater reliability has been reported as poor to fair. Some clinicians currently use a sidelying position for IR stretching with patients who have shoulder pathology. However, no objective data exist for IR passive range of motion measured in this sidelying position, either in terms of reliability or normative values. **METHODS:** Seventy subjects (mean age, 36.8 years), with (n = 19) and without (n = 51) shoulder pathology, were included in this study. Shoulder IR passive range of motion of the dominant shoulder or involved shoulder was measured by 2 investigators in 2 positions: (1) a standard supine position, with the shoulder at 90°of abduction, and (2) in sidelying on the tested side, with the shoulder flexed to 90°. **RESULTS:** Intrarater reliability for supine measurements was good to excellent ($ICC_{3,1}$ = 0.70-0.93) and for sidelying measurements was excellent ($ICC_{3,1}$ = 0.94-0.98). Interrater reliability was fair to good for the supine measurement ($ICC_{2,2}$ = 0.74-0.81) and good to excellent for the sidelying measurement ($ICC_{2,2}$ = 0.88-0.96). The mean (range) value of the dominant shoulder sidelying IR passive range of motion was 40° (11° to 69°) for healthy subjects and 25° (–16° to 49°) for subjects with shoulder pathology. **CONCLUSIONS:** For subjects with shoulder pathology, measurements of shoulder IR made in the sidelying position had superior intrarater and interrater reliability compared to those in the standard supine position.

J Orthop Sports Phys Ther 2010;40(9):589-594, Epub 22 April 2010. doi:10.2519/jospt.2010.3197

KEY WORDS: glenohumeral joint, goniometry, motion, rehabilitation

The authors aim to compare intrarater and interrater reliability of shoulder internal rotation (IR) passive range of motion measurements

Achilles Pain, Stiffness, and Muscle Power Deficits: Achilles Tendinitis

Christopher R. Carcia, RobRoy L. Martin, Jeff R. Houck, Dane K. Wukich

DOI: 10.2519/jospt.2010.0305The Orthopaedic Section of the American Physical Therapy Association presents this sixth set of clinical practice guidelines on Achilles pain, stiffness, and muscle power deficits that are characteristic of Achilles Tendinitis. These clinical practice guidelines are linked to the International Classification of Functioning, Disability, and Health (ICF). The purpose of these practice guidelines is to describe evidence-based orthopaedic physical therapy clinical practice and provide recommendations for (1) examination and diagnostic classification based on body functions and body structures, activity limitations, and participation restrictions, (2) interventions provided by physical therapists, (3) and assessment of outcome for common musculoskeletal disorders.

J Orthop Sports Phys Ther. 2010:40(9):A1-A26. doi:10.2519/jospt.2010.0305

KEY WORDS: APTA, clinical practice guidelines, ICD, ICF, Orthopaedic Section

The Orthopaedic Section of the American Physical Therapy Association presents Achilles tendinitis clinical practice guidelines linked to the International Classification of Functioning, Disability, and Health (ICF).

Tissue motion pattern of ventral neck muscles investigated by tissue velocity ultrasonography imaging. **Peolsson M, Brodin LA, Peolsson A**
European journal of applied physiology

201007 109(5):899-908 Language: eng Country: Germany School for Technology and Health, Royal Institute of Technology (KTH), Stockholm, Sweden. We designed this experimental study to investigate tissue motions and thus infer the recruitment pattern of the ventral neck muscles [sternocleidomastoid (SCM), longus capitis (Lca), and longus colli (Lco)] at the C4-C5 level in healthy volunteers during isometric manual resistance of the head in flexion in a seated position. This exercise is used in the physiotherapeutic treatment of neck pain and is assumed to activate the deep ventral muscles, but the assumption has not been clearly evaluated. Neck flexors of 16 healthy volunteers (mean age 24 years, SD 3.7) were measured using ultrasonography with strain and strain rate (SR) tissue velocity imaging (TVI) during isometric contraction of flexor muscles. TVI involves using Doppler imaging to study tissue dynamics. All three muscles showed a deformation compared to rest. Except for the initial contraction phase, Lco exhibited a lower strain than Lca and SCM but was the only muscle with a significant change in SR between the phases. When the beginning of the contraction phase was analysed, Lco was the first to be deformed among most volunteers, followed by Lca and then SCM. The exercise investigated seems to be useful as a "stabilizing" exercise for Lco. Our suggestion is that in further research, Lco and Lca should be investigated as separate muscles. TVI could be used to study tissue motions and thus serve as an indicator of muscle patterning between the neck flexors, with the possibility of separating Lco and Lca. PMID: 20238224

Resistance training induces supraspinal adaptations: evidence from movement-related cortical potentials. **Falvo MJ, Sirevaag EJ, Rohrbaugh JW, Earhart GM**

European journal of applied physiology Add to My Journals List

201007 109(5):923-33 Language: eng Country: Germany Program in Physical Therapy, Washington University School of Medicine, 4444 Forest Park Ave, Campus Box 8502, St. Louis, MO 63108, USA. Mjfalvo@wustl.edu Early effects of a resistance training program include neural adaptations at multiple levels of the neuraxis, but direct evidence of central changes is lacking. Plasticity exhibited by multiple supraspinal centers following training may alter slow negative electroencephalographic activity, referred to as movement-related cortical potentials (MRCP). The purpose of this study was to determine whether MRCPs are altered in response to resistance training. Eleven healthy participants (24.6 +/- 3.5 years) performed 3 weeks of explosive unilateral leg extensor resistance training. MRCP were assessed during 60 self-paced leg extensions against a constant nominal load before and after training. Resistance training was effective ($P < 0.001$) in increasing leg extensor peak force (+22%), rate of force production (+32%) as well as muscle activity (iEMG; +47%, $P < 0.05$). These changes were accompanied by several MRCP effects. Following training, MRCP amplitude was attenuated at several scalp sites overlying motor-related cortical areas ($P < 0.05$), and the onset of MRCP at the vertex was 28% (561 ms) earlier. In conclusion, the 3-week training protocol in the present study elicited significant strength gains which were accompanied by neural adaptations at the level of the cortex. We interpret our findings of attenuated cortical demand for submaximal voluntary movement as evidence for enhanced neural economy as a result of resistance training.

Strength training in endurance runners. **Taipale RS, Mikkola J, Nummela A, Vesterinen V, Capostagno B, Walker S, Gitonga D, Kraemer WJ, Häkkinen K**

International journal of sports medicine Add to My Journals List

201007 31(7):468-76 Language: eng Country: Germany Department of Biology of Physical Activity, University of Jyväskylä, Finland. ritva.taipale@jyu.fi This study examined effects of periodized maximal versus explosive strength training and reduced strength training, combined with endurance training, on neuromuscular and endurance performance in recreational endurance runners. Subjects first completed 6 weeks of preparatory strength training. Then, groups of maximal strength (MAX, n=11), explosive strength (EXP, n=10) and circuit training (C, n=7) completed an 8-week strength training intervention, followed by 14 weeks of reduced strength training. Maximal strength (1RM) and muscle activation (EMG) of leg extensors, countermovement jump (CMJ), maximal oxygen uptake (VO(2MAX)), velocity at VO(2MAX) (vVO(2MAX)) running economy (RE) and basal serum hormones were measured. 1RM and CMJ improved ($p<0.05$) in all groups accompanied by increased EMG in MAX and EXP ($p<0.05$) during strength training. Minor changes occurred in VO(2MAX), but vVO(2MAX) improved in all groups ($p<0.05$) and RE in EXP ($p<0.05$). During reduced strength training 1RM and EMG decreased in MAX ($p<0.05$) while vVO(2MAX) in MAX and EXP ($p<0.05$) and RE in MAX ($p<0.01$) improved. Serum testosterone and cortisol remained unaltered. Maximal or explosive strength training performed concurrently with endurance training was more effective in improving strength and neuromuscular performance and in enhancing vVO (2MAX) and RE in recreational endurance runners than concurrent circuit and endurance training.

The Magic of the Temporals

When I teach cranial anatomy I like to ask people to pick a favourite bone towards the end of the course! The top contenders are always the temporals and sphenoid, with the ethmoid or maxillae often up there somewhere. In the next few issues I will tell you a little bit about why they top the charts!

I'll start with the temporals. There are two of them and they appear, from the outside of the skull, to be mainly circular, with a few other things happening at the front. We have what's known as the squamous part of the bone that articulates with the frontal, parietal and occipital in front, above and behind the ears. This part is covered by the temporalis, one of the four jaw muscles (the other 3?). Heading out front is the start of the cheek bone, more properly called the zygomatic process as it heads to meet with process of the zygomatic bone that gives us our high definition (or not!) cheek bones. Just behind and below the start of this we can find the external acoustic meatus…. or earhole if you prefer. Following that in gets much more interesting, but before we venture inwards lets just notice the notch for head of the mandible right in front of this, the mandibular fossa, that gives the only moving joint of the cranium, the jaw or temporomandibular joint. If you put your fingers one cm in front and one downwards from the ear hole and then open the mouth wide you should be able to feel the movement of the mandible as it both hinges and glides forward a little. Just behind the ear hole and the pinna of the ear is the lump of bone that makes up this corner of the cranium. If you get the chance, compare yours with a newborn's. Remember that some parts of some bones get formed by muscle 'stressing' the attachment point? This area attaches a muscle any therapists among you will certainly know – sternocleidomastoid (though anatomists are now happy to just call it sternomastoid if you prefer). It is important in holding up the head so newborns have very little of the lump until they reach this stage, after which it forms quickly. It is called the mastoid process. Sternomastoid is not the only muscle to attach there though and have an effect on the alignment of our temporal bones; we also have a small hyoid muscle, the posterior belly of the digastric, and a back muscle, longissimus capitus. So the temporal bone and head can get pulled in a few directions! But let's see what is so interesting about the deeper part of the bone. First, if you were to take an individual temporal, you may be surprised by just how much more of it there is on the inside of the cranium. This section is called the petrous (l: 'rock') part of the bone and really is quite chunky. Within it, at the end of the external acoustic meatus we would find the ear drum. This 'tympanic membrane' does indeed work a little like a drum, vibrating when sound waves 'hit' it, which causes a reaction in the cavity the other side of it, the middle ear. Another cool thing about this bone is that it is inside here that you find the 3 smallest bones of the body, so amazingly perfectly formed to resemble a hammer, anvil and stirrup! (Malleus, incus, stapes.) Between them they ramp a comparatively small vibration up by about 20 x and cause a bigger reaction on the much smaller membrane that lines the 'oval window', nudging the 'endolymph' in the fluid filled cavity of the inner ear. This section leads us into the 'snaillike' cochlear, where fluid vibration is 'turned into' nervous excitement to take impulses to the brain and create our hearing!

As if that's not enough, these inner ears of our temporals each also house 3 semi-circular canals, tiny, looped tunnels in the bone that also contain endolymph, the movement of which creates yet more nervous excitement that lets our brain know where our head is – literally. The canals on each side are set up at a slightly different angle so we actually have 6 'grid-points' from which our brain can work out our position. All this nervous excitement requires the presence of a few million (actually I have no idea exactly how many - don't think anyone has counted precisely – but quite a lot) neurons to take messages back to the brain, and this function is beautifully taken on by the vestibulocochlear nerve. Vestibulo- bit refers to the balance part and -cochlear to the hearing part. Since this goes to the brain from the inner ear it's also got to get there… In a real skull you can actually see the tiny, tiny tunnels that lead from the inner ear into the larger 'internal acoustic meatus', through which the nerve passes to reach the brainstem. Best of all, after the internal acoustic meatus that carries the facial nerve alongside the vestibulocochlear nerve, there is yet another section of tunnel that the facial nerve travels alone – the inner & middle ear bypass! – before it exits via a tiny hole called the 'stylomastiod foramen'. This exit point is inside of (medial to) the mastoid process of the bone and between it and another interesting, inch long, pointy projection of bone tissue called the styloid process. As the nerve exits its main branches then go through the parotid salivary gland (another story…) and to muscles of the face. So squamous parts, petrous parts, hearing, balance, tubes and tunnels, the only synovial joint of the skull…. Does that make it a contender? Next time… the maxillae!

Caroline Barrow

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CONSIDERATIONS OF PELVIC FLOOR MUSCLE DYSFUNCTION IN TREATMENT OF PELVIC PAIN, LOW BACK PAIN AND INCONTINENCE

Submitted by Gail Apte, PT, OCS, ScD, Lubbock, Texas.

It is becoming increasingly apparent that appropriate treatment for low back pain, and in particular sacroiliac joint pain, requires assessing the function of the pelvic floor muscles. These muscles shouldn't be considered only in cases of urinary incontinence as they appear to contribute to postural and respiratory functions as well as urinary continence. Pelvic floor muscles (PVM) generate and control intra-abdominal pressure in conjunction with the abdominal muscles and the diaphragm. Intra-abdominal pressure regulation plays a role in stabilizing the lumbar spine. In addition, the PFM contribute to sacroiliac joint stiffness via compressive forces generated to provide force closure of the Sacro-iliac joint.[1]

In normal function the Pelvic floor muscles need to act in a coordinated fashion such that contraction creates an elevation of the pelvic floor as well as the base of the bladder. Thompson et al. conducted a study to assess muscle activation patterns of the abdominal and pelvic floor muscles in incontinent women and age matched controls; thirteen continent and 13 incontinent women participated.[2] Several parameters were measured during a voluntary pelvic floor contraction and a valsalva maneuver. Outcome measures included:The position of the bladder base was monitored with use of trans-abdominal ultrasound.

1. Pelvic floor and abdominal muscle, costal muscle and diaphragm activity was recorded with surface EMG.
3. Intra-abdominal and vaginal pressure was measured with an intra-vaginal pressure probe.
4. The strength of pelvic floor muscles was recorded via manual vaginal palpation.

All measurements were conducted with a full bladder with subjects lying in a supine position. The subjects were asked to perform a 'drawing in and lift of the pelvic floor muscles' for a sustained effort of 3 seconds. Additionally all subjects were asked to perform a maximal straining valsalva effort with forced expiration.

Normalized EMG data was analyzed using the three-way repeated measures ANOVA to compare the activity between three conditions (rest, PFM contraction and Valsalva). Significant interactions were further subjected to post hoc pair wise comparison using linear contrasts. The symptomatic group's data was further analyzed for change in vaginal and intra-abdominal pressure during the two tasks using student's *t*-test. The difference in change in IAP and VP during the various tasks between groups was further subjected to a two-way ANOVA.

The results demonstrated a significant difference in activation of the various muscles in symptomatic compared to asymptomatic women. During a PFM contraction, the bladder base was seen to be elevated in the asymptomatic group. Conversely, the bladder base was depressed in the symptomatic group. Valsalva demonstrated increased activation of the PFM and EO in the symptomatic group compared to the asymptomatic group and compared to resting levels. In general, women in the symptomatic group activated the abdominal, chest wall, and PFM globally with a resultant bladder base depression in spite of the contraction of the PFM. The asymptomatic women activated specific, appropriate muscles such that the PFM contraction led to a bladder base elevation, a necessary condition to maintaining continence.

According to the authors, "the symptomatic group displayed altered muscle activation patterns when compared to the asymptomatic group. The symptomatic women lacked a local strategy for activation of the PFM, instead using muscle substitution patterns activating all the muscles of the abdomino-pelvic cavity." This study illustrates the need for selecting exercises based on specific patterns of activation as

well as delaying general exercises programs or loaded exercises until isolated activation of PFM has been mastered.

The pelvic floor also plays an important role in gait as related to movement of the pelvis and sacroiliac joints. Counternutation which occurs during gait is assisted by muscles of the pelvic floor, while nutation is assisted by the multifidi and deep erector spinae muscles. In cases of SIJ laxity the function of these muscles will become increasingly important, but if they are weak, function in an in-coordinated way, or are hypertonic low back and pelvic pain may result.

An investigation has been published that describes the postural and respiratory functions of the pelvic floor muscles during a variety of movements.[3] The authors investigated whether the pelvic floor muscles (PFM) exhibited a feed-forward activation during challenges to spinal stability, whether such an activation was dependent on the direction of movement, or magnitude of movement. They also measured the pelvic floor activity during prolonged tasks to see if the muscle contraction is sustained, and whether respiration has an influence on activation of the PFM.

EMG recordings from one male and six females with normally functioning pelvic floor muscles were made with surface electrodes. Recordings were made from the pelvic floor muscles, gluteus maximus, hip adductors, medial hamstrings, internal obliques and rectus femoris during arm movement tasks consisting of single repetitions of shoulder flexion or extension; rapid shoulder movements of flexion and extension; quiet and increased dead space breathing, and repetitive arm movements with breathing. Recordings were also made from PFM, abdominal and erector spinae during inspiration and expiration. Additional measurements of gastric pressure and anal pressure were made via an internal transducer inserted into the stomach and balloon transducer within the anus.

Statistical analysis using a repeated-measures analysis of variance (ANOVA) compared EMG onset of muscles during movement, and between inspiration and expiration.

Results confirmed that the pelvic floor muscles (PFM) are “active as a component of the preprogrammed postural adjustment that prepares the body for predictable perturbations.” The magnitude of activity appears to be related to the magnitude of the task. More intense level of activity demonstrates a higher level of activation of the PFM. Additionally, PFM activity appears to be modulated during quiet breathing but the modulation appears to be associated with abdominal muscle activity rather than with changes in the intra-abdominal pressure. Pelvic floor muscle activity appears to be greater during expiration than during inspiration. The authors conclude that “the data suggest that PFM are controlled by a number of integrated networks in the nervous system, but their activity is coordinated to perform multiple tasks concurrently.”

Finally, an investigation was done measuring the intensity of pelvic floor muscle contraction during a variety of sitting postures in parous women.[4] The authors conducted an observational study of the level of activity of the pelvic floor and abdominal muscles in slump supported sitting, upright unsupported sitting and very tall unsupported sitting. Intra-vaginal and surface EMG electrodes were used to measure activity of the pelvic floor muscles, internal obliques and external obliques in eight healthy women. The subjects average age was 46, and the average number of pregnancies was 2.8. Muscle activity was recorded for 10 seconds over two to three trials of each posture in a randomized fashion.

The root mean square of a 400 ms segment of EMG data was analyzed for pelvic and abdominal muscles. Data from each set of trials for each condition was averaged and a repeated measures ANOVA was conducted to examine differences in the PFM and abdominal muscles in the three sitting postures. A priori simple contrasts tested for statistical significance between the three sitting postures.

Muscle activity in the pelvic floor muscles was significantly greatest in very tall upright sitting and upright sitting, and the least in supported slump sitting. Abdominal activity for internal and external obliques was also greater in the more upright positions but did not reach statistical significance. Six of eight subjects reported a sensation of greatest PFM activity in very tall unsupported posture followed by upright unsupported and least sensation in the slump supported positions. The authors conclude that investigators interested in treating women with urinary incontinence and weak pelvic floor muscles should assess optimal pelvic floor activation positions for rehabilitation.

When the findings of these studies are taken into consideration, it appears that the pelvic floor may be maximally activated in a very tall upright position with expiration. This may become the initial position for activation of a weak pelvic floor, advancing to other positions such as upright sitting and slump sitting as the patient improves. In cases of pelvic ring or sacroiliac hypermobility, application of a pelvic belt may assist by providing external stability as part of the rehabilitative process. In addition, the multifidus muscles may need to be emphasized to promote nutation of the SIJ to stabilize the hypermobile or unstable SIJ and to minimize lumbosacral pain as a result of loss of stabilizing function of the PFM.

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RAISED PARASPINAL MUSCLE ACTIVITY REDUCES RATE OF STATURE RECOVERY AFTER LOADED EXERCISE IN INDIVIDUALS WITH CHRONIC LOW BACK PAIN

Healey EL, Fowler NE, Burden AM, McEwan IM. Arch Phys Med Rehabil. 2005;86:710-15.
Abstracted by John Hoops PT, COMT from St. Paul, Minnesota

The intervertebral discs contribute about 20% of total body height. The discs of the spine narrow when subjected to compressive forces; the resultant loss in height is referred to as decreased stature. The narrowing of the discs occurs because of a loss of water within the disc. Previous research has established that stature loss occurs after loaded e exercise, and that subjects with chronic low back pain recover this loss in stature less quickly.1 The authors of this study investigated the loss of subjects' height after walking on a treadmill with a weighted vest. They measured how quickly the subjects regained the lost height upon lying down in a sidelying position. The authors also wanted to investigate what effect lumbar paraspinal muscle activity had on stature loss and recovery.

In this study 20 patients with chronic low back pain and 20 age, gender, body mass index, and activity level matched controls were compared. All subjects walked for 20 minutes on a treadmill at similar speeds while they wore a weighted vest (10% body mass). After walking they rested for 40 minutes in a relaxed sidelying posture. Stature was measured using a stabilometer which was shown to be reliable (intraclass correlation coefficient =.99). In addition surface EMG was used to measure activity in the lumbar paraspinals. Height and EMG measures were taken prior to walking, after walking, during, and after the rest period.

The results were that both controls and patients lost an equal amount of height after walking, about 5 millimeters. The back pain patients regained significantly less of the loss in height after the 40 minutes of rest. The back patients also had significantly more muscle activity in the lumbar spine during the rest period. The authors concluded that the increase in muscle activity may be the cause of the decreased ability to regain lost height due to spinal compression loads created by lumbar paraspinal muscle contraction.

IAOM-US Comment
One of our senior faculty, Omer Matthijs, PT, has been studying disc hydration and re-hydration. He has developed a treatment proposal that uses the discs" tendency to repeatedly hydrate and dehydrate to control pain and promote disc health by maximizing the patients' ability to move fluid in and out of their discs. The discs rely on movement of fluid through diffusion to take in nutrients, and expel waste products. The best example of this is the documented increase in height people experience when arising from a night in bed.2,3 The basis of this treatment proposal is to promote an environment where the disc can move fluid in a pain-free way.

How that is done depends on the patient. Flexion postures and exercises will be used for patients who have pain in extension, and extension exercises and postures for patients who have pain in flexion. For patients with pain when the disc is hydrated, in the morning for example, dehydrating maneuvers are used. If patients have pain in the evening, after prolonged standing, or after intense physical activity, re-hydrating activities are given. For example, if a patient with an internal disc disruption frequently wakes in the morning with pain, they would be instructed to do dynamic exercise that would help dehydrate the disc upon waking up. Generally dehydrating exercises involve dynamic movement, muscle activity, avoid end range positions, and are done with the spine vertical.4

Examples could be standing pelvic tilts either anterior or posterior, whichever the patient tolerates better. Non-weight bearing exercises can also be dehydrating, and these could include sub-maximal prone press ups, side bridging, supine pelvic tilts or quadruped pelvic tilts. The important principle is to move the spine in the direction that is least painful, use dynamic muscle activity because muscle contraction will promote compression on the spine and expulsion of fluid, and to keep movements submaximal. Movements to end range may decompress a part of the disc, and thus create a tendency to imbibe fluid.5

A different patient may complain more of pain when their disc is dehydrated, such as later in the day, after physically demanding activity like athletics or running, or after prolonged standing.6 These patients may do well if they perform re-hydrating exercises or positions. Exercises that re-hydrate are best done non-weight bearing, are static positions that don't require muscle activity of the back extensors, and often need to be maintained for 10 to 20 minutes. This could include prone on elbows, supine lying with legs supported in 90 degrees of hip flexion, "prayer stretch" position, or sidelying in flexion or extension, whichever the patient prefers. A patient with chronic or recurrent discogenic low back pain who likes to run should be encouraged to do so if they can do it with minimal increase in pain. But, they may feel better the rest of the day after their run, and help maintain the health of their lumbar discs if they use the following principle. Even if they are not painful after running, it has been shown that running is a dehydrating activity.7

So, they would be instructed to lie down in a comfortable position for 20 minutes after they run. We have had patients who run in the morning, feel good, go to work and sit at their desk and have considerable pain by mid day. They have noticed less pain at work if they follow their morning run with a re-hydrating position. An alternative scenario is a runner who can only run pain-free for 15 minutes. They may be instructed to sit on a park bench in a reclined posture for 10 minutes to re-hydrate their disc after 10 minutes of running, and then resume running. Sitting in a supported slouched posture can be a position of relatively low intradiscal pressure because the lower lumbar spine is not vertical.8,9 This position also follows the other requirements of a rehydrating activity: it is prolonged, static, and does not require activity of the back extensors. The examples above are some concepts we can immediately try with our patients in the clinic.

These principles are now covered in more detail in our lumbar spine courses. An additional benefit of encouraging our patients to promote dehydration/re-hydration of their discs described is that it may have beneficial prolonged effects on the health and metabolism of their discs. One study supported this notion that exercise may improve the discs ability to dehydrate and re-hydrate. Subjects with chronic low back pain underwent intense physical training, and afterward, they had improved ability to gain height upon waking in the morning.10 After 4 days of exercise, these patients were 4 mm taller in the morning. After three weeks of training they were 7 mm taller upon waking. There was significant correlation between gain in height and decreased pain and improved Oswestry scores. So, it seems that the discs improved their ability to re-hydrate at night as a result of the increased physical activity. This improved re-hydration could well result in a disc that will better withstand the stresses placed upon it.

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TABLE TOP RELOCATION TEST - NEW CLINICAL TEST FOR POSTEROLATERAL ROTATORY INSTABILITY OF THE ELBOW*Arvind C, Hargreaves D. J Should Elbow Surg. 2006;15(4):500-501. Abstracted by Matt Radelet, MS, ATC, CSCS from Tucson, Arizona*

Elbow instability is an uncommon finding in any patient. When instability is present, the likelihood is that it involves a posterolateral rotatory instability (PLRI) of the radial head secondary to compromise of the lateral collateral ligament complex. The authors assert that elbow pain resulting from this instability is poorly understood and is underdiagnosed. In a previously published paper, O'Driscoll commented that clinical assessment of this instability is difficult and advocated the use of a pivot shift test to aid in diagnosis.1 O"Driscoll also noted that many posterolateral rotatory instability patients complain of weakness and/or pain when pushing through the elbow, such as when pushing up from a chair.
Building on this "push up test", these authors describe a new test which may aid in the clinical diagnosis of PLRI. The table top relocation test is performed in 3 parts. In the first part, the patient places the hand of the affected arm over the side of a table or countertop with the forearm in supination. The supinated position keeps the elbow pointing laterally.
The patient then pushes down into the table allowing the elbow to flex. In PLRI cases, the patient's pain and/or apprehension will be recreated at around 40° of flexion as the radial head subluxes posteriorly. This process is then repeated with the examiner"s thumb preventing subluxation of the radial head during the loaded elbow flexion (Fig. 1). In part 3 of the test, the examiner's thumb is then removed while the patient is in the loaded position; in PLRI cases, the patient"s pain and/or apprehension should again manifest.Fig. 1: Examiner's thumb preventing radial head subluxation
These authors briefly report on 8 cases of PLRI they treated over a three year period. All 8 cases were diagnosed based on a positive pivot shift test. All 8 also exhibited a positive table top relocation test. Six of the 8 subsequently underwent reconstruction of the lateral ulnar collateral ligament complex; in all 6 cases both the pivot shift and table top relocation test were negative post-surgically.

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These authors readily admit that their subject group is very small. Nevertheless, this new test, when used in conjunction with a complete evaluation, may be helpful in identifying patients suffering from PLRI. Many clinicians do, in fact, find the pivot shift test difficult to perform. Much like testing for the glenoid labrum, it is likely beneficial for us to have a battery of tests to rely on during our evaluation.
The table top relocation test for the elbow is analogous to the relocation test for the shoulder: when the head of the humerus moves out of position in relation to the glenoid, the patient"s pain is present; relocating the humerus relieves the pain; finally, allowing the humerus to again move out of position and recreate the pain confirms a positive test.
The authors also comment that unlike the press-up test, the table top relocation test will differentiate PLRI patients from those who have articular pathology. Patients with elbow articular problems may also complain of pain during loading of the joint. However, this pain should not be changed by the stabilizing force of a thumb on the radial head. Unfortunately, the authors did not comment on any other pathology that was found in the 6 surgical elbows.
It would be interesting to know if there were any other consistent surgical findings in these elbows, as well as how long these patients had suffered from their elbow pain.

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PAINFUL JERK TEST: A PREDICTOR OF SUCCESS IN NON-OPERATIVE TREATMENT OF POSTEROINFERIOR INSTABILITY OF THE SHOULDER

Kim SH, Park JC, Oh I. Am J Sports Med. 2004;32(8):1849-1855.

The jerk test has been used as a diagnostic test for posterior-inferior instability of the shoulder. Pain may or may not be associated with posterior clunking during the jerk test. The purpose of this study was to evaluate the presence or absence of pain with the jerk test as a predictor of the success of non-operative treatment for posterior-inferior instability of the shoulder, and to identify the pathological lesion responsible for the pain in the jerk test.

The study was a retrospective review of prospectively collected data. Eighty-one patients (89 shoulders) who had posterior-inferior instability with a positive posterior clunk during the jerk test were treated nonoperatively.

All patients had a clunk with the test, but not all necessarily had pain. The patients were divided into 2 groups according to whether or not they had pain with the jerk test: the painless jerk group (54 shoulders) and the painful jerk group (35 shoulders). Response to the non-operative treatment was evaluated after at least a 6 month rehabilitation program.

Patients who did not respond to the rehabilitation underwent arthroscopic examination to identify any pathologic lesions. All of these unresponsive shoulders were found to have variable degrees of posteroinferior labral lesions.

The jerk test is described as follows: The patient is seated and the examiner stabilizes the scapula with one hand; with the other hand, the examiner grasps the elbow of the affected side and abducts to 90° with internal rotation; an axial load is applied through the humerus while the arm is horizontally adducted. In a positive test, there is a sudden "clunk" or jerk as the head of the humerus slides off the back of the glenoid. A second clunk or jerk may be experienced if the arm is then returned to the starting position and the humerus repositions into the glenoid. The painful jerk group had a higher failure rate with nonoperative treatment ($P < .001$) compared to the group that had a painless clunk during the jerk test. In the painless jerk group 50 shoulders (93%) responded to the rehabilitation program after a mean of 4 months. Four shoulders (7%) were unresponsive to the rehabilitation. In the painful jerk group, 5 shoulders (16%) were successful with the rehabilitation, whereas the other 30 shoulders (84%) failed. All 34 shoulders that were unresponsive to the rehabilitation had a variable degree of posterior-inferior labral lesions. The authors concluded that the jerk test is a hallmark for predicting the prognosis of non-operative treatment for posterior-inferior instability.

IAOM-US Comment

In our 2nd quarter newsletter this year, we discussed another article by Dr. Kim. In that article, he was able to document that those subjects who had pain with the jerk test, or an alternative test he proposed, had posterior labral lesions when the shoulders were examined arthroscopically.1 So, the authors' contention is that a painful clunk with the jerk test, or the Kim test as it was called, are indicative of a posterior labral lesion and a poorer prognosis for conservative care. We would still recommend a trial of conservative care including rotator cuff strengthening, serratus anterior and lower trapezius training, joint specific treatment to hypomobilities in other parts of the elevation chain including the sternoclavicular and acromioclavicular joint and the thoracic spine.

For a detailed description of some recommendations for rehabilitating the unstable shoulder, see the IAOM quarterly newsletter: 1995, volume 11, which can be accessed through the archived Quarterly Newsletters section on the IAOM website (www.iaom-us.com). This topic is also covered in more detail in the IAOM shoulder course. Still, the results of this study provide useful information in patient education and in clinical expectations about prognosis. When a posterior labral lesion is suspected in a patient with a painful clunk test, we should not be surprised if our patient ends up requiring surgery.

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IS THERE AN ASSOCIATION BETWEEN ARTICULAR CARTILAGE CHANGES AND DEGENERATIVE MENISCUS TEARS?

Christoforakis J, Pradhan R, Sanchez-Ballester J, Hunt N, Strachan R. Arthroscopy. 2005;21(11):1366-1369. Abstracted by Robert Moss MPT, COMT from Aurora, Texas

The authors of this study examined the association between meniscal lesions and articular cartilage changes in 497 subjects (353 men and 144 women) ages 16 to 76. Medial meniscal tears were found in 323 knees while lateral meniscal tears were found in 174 knees during arthroscopic evaluation. Pathology was recorded on a standardized form in which articular surface changes and meniscal lesion were represented.

Cartilage lesions were defi ned using the Outerbridge classifi cation system as detailed below.1 The authors of this study claimed types V and VI are considered degenerative tears although there is not a lot of evidence to support this. The average age of the patients was 40.4 years at the time of surgery. Subjects who demonstrated complex and horizontal cleavage meniscal tears (303) were on average 44.8 years old. Subjects with "other" meniscal pathology (194) were 33.6 years old. The age difference between groups was statistically signifi cant. Eightyone percent (403) of the patients demonstrated at least one chondral lesion and this incidence was signifi cantly higher in subjects with complex and horizontal cleavage meniscal tears.

Subjects were further divided into groups according to their Outerbridge classifi cation. Group one (280 patients, 56.3%) consisted of grades I and II while group two (217 patients, 43.7%) included grades III and IV. Subjects in group two had a higher incidence of complex and horizontal cleavage tears compared with other patterns of meniscal tears. A second chondral lesion was found in 262 (52.7%) of the subjects. The incidence of having a second chondral lesion was signifi cantly higher in those with complex and horizontal meniscal tears.

The increased incidence of chondral lesion and severity of the lesion in subjects with complex and horizontal cleavage tears suggests that degenerative meniscal tears are not as benign as previously thought. Older patients who present to the clinic with degenerative meniscal tears are likely to also have signifi cant articular cartilage pathology. Although the authors had a large sample size of symptomatic subjects, the history, examination, radiological fi ndings, concomitant injuries and activity level of the patients was incomplete. The authors suggest that new age-related categories of chondral damage are emerging.

IAOM-US Comment

Christoforakis et al present objective data associated with complex and horizontal meniscal tears as they relate to cartilage lesions and age. Four out of fi ve patients had chondral lesions in the presence of any type of meniscal tear. Although the average age of all subjects was 40.4 years, the ones with complex and horizontal meniscal tears were 44.8 years compared to the younger subjects with other types of meniscal tears. Clinicians should be cognizant of this fi nding as older patients presenting with a meniscal tear may also have signifi cant chondral lesions. The prognosis may not be as favorable and the rehabilitation program should be advanced slowly with unloading techniques in a partial weightbearing environment (aquatics, total gym, etc). The patient should receive adequate education regarding the diagnosis and prognosis. Joint specific treatment should be initiated if limitations of motion or pathological end-feels are detected to reduce the amount of loading imposed on the menisci during knee function. Mobilization of the menisci relative to the femur and tibia, as instructed in the IAOM-US knee course, are applicable in these cases.

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CASE REPORT: RAPID PROGRESSION OF CHONDRAL DISEASE IN THE LATERAL COMPARTMENT OF THE KNEE FOLLOWING MENISCECTOMY

Alford J, Lewis P, Kang R, Cole B. Arthroscopy. 2005;21(12):1505-1509. Abstracted by Robert Moss MPT, COMT from Aurora, Texas

The authors of this study present two cases involving progressive cartilage disease within 12 months of undergoing a partial meniscectomy of the lateral meniscus. Case one was a 16-year old male who suffered a non-contact twisting injury during soccer. Two months after injury he underwent a subtotal lateral meniscectomy. Articular surfaces of the tibiofemoral joint were unremarkable. His postoperative rehabilitation was uneventful and he began a progressive return to sports. During this

Grade 0 Normal cartilage
Grade I Cartilage with softening and swelling
Grade II Partial-thickness defect with fissures on the surface that do not reach subchondral bone or exceed 1.5 cm in diameter
Grade III Fissuring to the level of subchondral bone in an area with a diameter more than 1.5 cm
Grade IV Exposed subchondral bone
Type I Flap tear
Type II Radial tear
Type III Bucket Handle tear
Type IV Tear of discoid meniscus
Type V Horizontal Cleavage tear
Type VI Complex tear consisting of at least 2 of the other types of tears combined

period he began to experience lateral compartment pain and activity-related swelling without trauma. A repeat MRI at 7 months post-op was performed that revealed a focal chondral lesion on the lateral femoral condyle. The patient also presented with quadriceps atrophy, lateral joint line tenderness, mild effusion and pain with compression, rotation and valgus stress. Due to the skeletal immaturity (open physis) it was decided to attempt a course of “relative rest” consisting of a lateral un-loader brace, closed-chain activity and straight-line conditioning.

At nine months post-op another MRI was performed that showed increasing edema in the subchondral bone of the lateral tibial plateau and a grade IV lateral femoral condyle lesion. At this time the decision to operate was made to curtail the rapid progression of chondral disease. During the second surgery, approximately 10 months after the meniscectomy, a grade IV kissing lesion (10x12mm) on the posterior femoral condyle was discovered along with a grade IV tibial plateau lesion (5X5mm). Treatment included microfracture for the tibial lesion, lateral meniscal transplant and an osteochondral autograft transplant for the femoral component. Postoperative care consisted of non-weightbearing ambulation for 2 weeks in a hinged knee brace locked in extension. At 6 weeks the patient was ambulating with one crutch.

A normal gait pattern was established at 12 weeks and at 16 weeks the patient was participating in pain-free running and agility drills. Radiographs at 24 months revealed complete integration of the allograft and chondral plug.

Case 2 involved a 43 year-old male orthopedic surgeon who was an avid runner with a 6 month history of lateral joint line pain, clicking and swelling after activity. Two cortisone injections provided temporary relief of symptoms. Arthroscopic evaluation revealed a complex horizontal lateral meniscal tear with several fl aps at the popliteal tendon extending into the junction of the middle and anterior horn. A subtotal lateral meniscectomy was performed and the articular cartilage was found to be pristine. No other pathology was discovered. A few weeks after the initial meniscectomy symptoms remained unchanged and a second surgery was performed to remove unstable residual lateral meniscus tissue. No change in the articular cartilage was discovered. Postoperative care was unremarkable with a gradual return to jogging. The patient then developed lateral knee pain and swelling. At 5 months an MRI was performed that revealed degenerative changes on the posterior twothirds of the lateral femoral condyle. The defect was estimated to be 20x20mm with a tibial defect of 3mm in diameter. Examination revealed a mild effusion, full range of motion, positive McMurray's sign and lateral joint line tenderness. At 5 months from the initial surgery diagnostic arthroscopy was performed to determine the appropriate treatment option (autologous chondrocyte implantation or allograft chondral transplantation). The lateral meniscus was nearly absent except for a small amount of the anterior horn. The tibial plateau demonstrated grade II articular changes

along with a 24x24mm focal grade IV chondral lesion on the posterior lateral femoral condyle. It was decided to use the allograft with lateral meniscus transplantation due to the desire for a rapid return to work. At seven months post-op from the initial surgery a 25x25x8mm fresh osteochondral allograft was used along with a meniscus transplant. The patient was non-weightbearing for 8 weeks and used a continuous passive motion machine for 6 weeks. Further rehabilitation was unremarkable and he resumed skiing and running at 16 months. At a 3-year follow up the patient was painfree.
The authors conclude that patients who have undergone a lateral meniscectomy should be treated as a high-risk population due to the potential for rapid chondral disease. They propose that meniscal transplantation, osteochondral transplantation,and chondrocyte implantation are surgical options available to those patients who develop degenerative joint disease after meniscectomy. Appropriate rehabilitation is paramount after these surgical techniques.

IAOM-US Comment

Alford et al present two interesting cases of lateral knee pain after a partial meniscectomy. They allude to the fact that the unique anatomy of the lateral compartment may contribute to the rapidly progressing cartilage deterioration. The lateral tibial plateau is slightly convex. The convex on convex relationship of the lateral compartment is perhaps made more vulnerable after meniscectomy due to increased motion and stress. When a part of the stabilizing mechanism is lost, aphysiological stresses are imposed on the chondral surfaces lending to fissuring and focal defects. Clinicians should be aware of the potential for rapidly progressing chondral defects after subtotal meniscectomy, especially in the lateral compartment. Postoperative care should include a thorough evaluation of knee stability including the posterior lateral corner. Unloading exercises (Total Gym, pool or pulley system) should be prescribed along with open kinetic chain activity to maintain mobility. The patient should be educated regarding diagnosis, prognosis and potential for recurring symptoms.

Taken together the two studies above demonstrate the interplay between meniscal lesions and knee joint arthrosis. Christofrakis et al suggest that the issue is undecided. They cite experimental studies showing that meniscal lesions can lead to degenerative joint changes,1,2,3but clinical studies are more controversial.4,5,6,7 Previous research has suggested that horizontal and complex meniscal tears as defi ned above, are more likely to result in degenerative joint disease. 8,9.10

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Role of Kabat physical rehabilitation in Bell's palsy: a randomized trial. **Barbara M, Antonini G, Vestri A, Volpini L, Monini S**

Acta oto-laryngologica Add to My Journals List

2010 130(1):167-72 Language: eng Country: England Department of Sensory Organs - Otorhinolaryngology Unit, II School of Medicine, Sapienza University, Rome, Italy. Maurizio.barbara@uniroma1.it CONCLUSION: When applied at an early stage, Kabat's rehabilitation was shown to provide a better and faster recovery rate in comparison with non-rehabilitated patients. OBJECTIVE: To assess the validity of an early rehabilitative approach to Bell's palsy patients. PATIENTS AND METHODS: A randomized study involved 20 consecutive patients (10 males, 10 females; aged 35-42 years) affected by Bell's palsy, classified according to the House-Brackmann (HB) grading system and grouped on the basis of undergoing or not early physical rehabilitation according to Kabat, i.e. a proprioceptive neuromuscular rehabilitation. The evaluation was carried out by measuring the amplitude of the compound motor action potential (CMAP), as well as by observing the initial and final HB grade, at days 4, 7 and 15 after onset of facial palsy. RESULTS: Patients belonging to the rehabilitation group clearly showed an overall improvement of clinical stage at the planned final observation, i.e. 15 days after onset of facial palsy, without presenting greater values of CMAP. PMID: 19430987

Stretch for the treatment and prevention of contractures. **Katalinic OM, Harvey LA, Herbert RD, Moseley AM, Lannin NA, Schurr K**

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2010 9:CD007455 Language: eng Country: England Rehabilitation Studies Unit, Northern Clinical School, Sydney Medical School, The University of Sydney, PO Box 6, Ryde, NSW, Australia, 1680. BACKGROUND: Contractures are a common complication of neurological and musculoskeletal conditions, and are characterised by a reduction in joint mobility. Stretch is widely used for the treatment and prevention of contractures. However, it is not clear whether stretch is effective. OBJECTIVES: To determine the effects of stretch on contractures in people with, or at risk of, contractures. SEARCH STRATEGY: Electronic searches were conducted on CENTRAL, DARE, HTA (The Cochrane Library); MEDLINE; CINAHL; EMBASE; SCI-EXPANDED; and PEDro (April 2009). SELECTION CRITERIA: Randomised controlled trials and controlled clinical trials of stretch applied for the purpose of treating or preventing contractures were included. DATA COLLECTION AND ANALYSIS: Two review authors independently selected trials, extracted data, and assessed risk of bias. The primary outcomes of interest were joint mobility and quality of life. The secondary outcomes were pain, spasticity, activity limitation and participation restriction. Outcomes were evaluated immediately after intervention, in the short term (one to seven days) and in the long term (> one week). Effects were expressed as mean differences or standardised mean differences with 95% confidence intervals (CI). Meta-analyses were conducted with a random-effects model. MAIN RESULTS: Thirty-five studies with 1391 participants met the inclusion criteria. No study performed stretch for more than seven months. In people with neurological conditions, there was moderate to high quality evidence to indicate that stretch does not have clinically important immediate (mean difference 3 degrees ; 95% CI 0 to 7), short-term (mean difference 1 degrees ; 95% CI 0 to 3) or long-term (mean difference 0 degrees ; 95% CI -2 to 2) effects on joint mobility. The results were similar for people with non-neurological conditions. For all conditions, there is little or no effect of stretch on pain, spasticity, activity limitation, participation restriction or quality of life. AUTHORS' CONCLUSIONS: Stretch does not have clinically important effects on joint mobility in people with, or at risk of, contractures if performed for less than seven months. The effects of stretch performed for periods longer than seven months have not been investigated. PMID: 20824861

Improvements in dynamic plantar flexor strength after resistance training are associated with increased voluntary activation and V-to-M ratio. **Ekblom MM**

Journal of applied physiology (Bethesda, Md. : 1985) Add to My Journals List

201007 109(1):19-26 Language: eng Country: United States Biomechanics and Motor Control Laboratory, Department of Neuroscience, Karolinska Institutet, and The Swedish School of Sport and Health Sciences, Stockholm, Sweden. maria.ekblom@gih.se The aim of this study was to investigate if, and via what mechanisms, resistance training of the plantar flexor muscles affects voluntary activation during maximal voluntary eccentric and concentric muscle actions. Twenty healthy subjects were randomized into a resistance training group (n = 9) or a passive control group (n = 11). Training consisted of 15 sessions of unilateral mainly eccentric plantar flexor exercise over a 5-wk period. During pre- and posttraining testing, dynamic plantar flexor strength was measured and voluntary activation was calculated using the twitch interpolation technique. The soleus Hoffman reflex (H-reflex) was used to assess motoneurone excitability and presynaptic inhibition of Ia afferents, whereas the soleus V-wave was used to test for changes in both presynaptic inhibition of Ia afferents and supraspinal inputs to the motoneurone pool. H-reflexes, V-waves, supramaximal M-waves, and twitches were evoked as the foot was moved at 5 degrees /s through an angle of 90 degrees during passive ankle rotations (passive H-reflexes and M-waves) and during maximal voluntary concentric and eccentric plantar flexions [maximal voluntary contraction (MVC) H-reflexes, M-waves, and V-waves]. Training induced significant improvements in plantar flexor strength and voluntary activation during both concentric and eccentric maximal voluntary actions. Soleus passive and MVC H-to-M ratios remained unchanged after training, whereas the soleus V-to-M ratio was increased during both concentric and eccentric contractions after training. No changes were found in the control group for any of the parameters. The enhanced voluntary strength could be attributed partly to an increase in voluntary activation induced by eccentric training. Since the passive and MVC H-to-M ratios remained unchanged, the increase in activation is probably not due to decreased presynaptic inhibition. The increased V-to-M ratio for both action types indicates that increased voluntary drive from supraspinal centers and/or modulation in afferents other than Ia afferents may have contributed to such an increase in voluntary activation. PMID: 20448031

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Do Cortisone Shots Actually Make Things Worse?

By GRETCHEN REYNOLDS

In the late 1940s, the steroid cortisone, an anti-inflammatory drug, was first synthesized and hailed as a landmark. It soon became a safe, reliable means to treat the pain and inflammation associated with sports injuries (as well as other conditions). Cortisone shots became one of the preferred treatments for overuse injuries of tendons, like tennis elbow or an aching Achilles, which had been notoriously resistant to treatment. The shots were quite effective, providing rapid relief of pain.

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Then came the earliest clinical trials, including one, published in 1954, that raised incipient doubts about cortisone's powers. In that early experiment, more than half the patients who received a cortisone shot for tennis elbow or other tendon pain suffered a relapse of the injury within six months.

But that cautionary experiment and others didn't slow the ascent of cortisone (also known as corticosteroids). It had such a magical, immediate effect against pain. Today cortisone shots remain a standard, much-requested treatment for tennis elbow and other tendon problems.

But a major new review article, published last Friday in The Lancet, should revive and intensify the doubts about cortisone's efficacy. The review examined the results of nearly four dozen randomized trials, which enrolled thousands of people with tendon injuries, particularly tennis elbow, but also shoulder and Achilles-tendon pain. The reviewers determined that, for most of those who suffered from tennis elbow, cortisone injections did, as promised, bring fast and significant pain relief, compared with doing nothing or following a regimen of physical therapy. The pain relief could last for weeks.

But when the patients were re-examined at 6 and 12 months, the results were substantially different. Overall, people who received cortisone shots had a

much lower rate of full recovery than those who did nothing or who underwent physical therapy. They also had a 63 percent higher risk of relapse than people who adopted the time-honored wait-and-see approach. The evidence for cortisone as a treatment for other aching tendons, like sore shoulders and Achilles-tendon pain, was slight and conflicting, the review found. But in terms of tennis elbow, the shots seemed to actually be counterproductive. As Bill Vicenzino, Ph.D., the chairman of sports physiotherapy at the University of Queensland in Australia and senior author of the review, said in an e-mail response to questions, “There is a tendency” among tennis-elbow sufferers “for the majority (70-90 percent) of those following a wait-and-see policy to get better” after six months to a year. But “this is not the case” for those getting cortisone shots, he wrote. They “tend to lag behind significantly at those time frames.” In other words, in some way, the cortisone shots impede full recovery, and compared with those “adopting a wait-and-see policy,” those getting the shots “are worse off.” Those people receiving multiple injections may be at particularly high risk for continuing damage. In one study that the researchers reviewed, “an average of four injections resulted in a 57 percent worse outcome when compared to one injection,” Dr. Vicenzino said.

Why cortisone shots should slow the healing of tennis elbow is a good question. An even better one, though, is why they help in the first place. For many years it was widely believed that tendon-overuse injuries were caused by inflammation, said Karim Khan, M.D., Ph.D., a professor at the School of Human Kinetics at the University of British Columbia and the co-author of a commentary in The Lancet accompanying the new review article. The injuries were, as a group, given the name tendinitis, since the suffix “-itis” means inflammation. Cortisone is an anti-inflammatory medication. Using it against an inflammation injury was logical.

But in the decades since, numerous studies have shown, persuasively, that these overuse injuries do not involve inflammation. When animal or human tissues from these types of injuries are examined, they do not contain the usual biochemical markers of inflammation. Instead, the injury seems to be degenerative. The fibers within the tendons fray. Today the injuries usually are referred to as tendinopathies, or diseased tendons.

Why then does a cortisone shot, an anti-inflammatory, work in the short term in noninflammatory injuries, providing undeniable if ephemeral pain relief? The injections seem to have “an effect on the neural receptors”

involved in creating the pain in the sore tendon, Dr. Khan said. “They change the pain biology in the short term.” But, he said, cortisone shots do “not heal the structural damage” underlying the pain. Instead, they actually “impede the structural healing.”

Still, relief of pain might be a sufficient reason to champion the injections, if the pain “were severe,” Dr. Khan said. “But it’s not.” The pain associated with tendinopathies tends to fall somewhere around a 7 or so on a 10-point scale of pain. “It’s not insignificant, but it’s not kidney stones.”

So the question of whether cortisone shots still make sense as a treatment for tendinopathies, especially tennis elbow, depends, Dr. Khan said, on how you choose “to balance short-term pain relief versus the likelihood” of longer-term negative outcomes. In other words, is reducing soreness now worth an increased risk of delayed healing and possible relapse within the year?

Some people, including physicians, may decide that the answer remains yes. There will always be a longing for a magical pill, the quick fix, especially when the other widely accepted and studied alternatives for treating sore tendons are to do nothing or, more onerous to some people, to rigorously exercise the sore joint during physical therapy. But if he were to dispense advice based on his findings and that of his colleagues’ systematic review, Dr. Vincenzino said, he would suggest that athletes with tennis elbow (and possibly other tendinopathies) think not just once or twice about the wisdom of cortisone shots but “three or four times.”