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Volume 25 Number 5

Published by Physicians
In Physical Medicine and Rehabilitation

May 5, 2017

SAUNA AND RISK OF ALZHEIMER'S DISEASE AND OTHER DEMENTIAS

Previous studies have suggested that sauna bathing is associated with better cardiovascular and circulatory function. This study investigated the association between sauna bathing and the risk of Alzheimer's disease (AD) and/or other dementias.

Subjects were 2,327 randomly selected men 42 to 60 years of age, who underwent baseline examinations between 1984 and 1989. All were assessed for tobacco use, blood pressure, alcohol use, body mass index, serum lipids, diabetes, physical activity and sauna use. The patients were followed for a median of 20.7 years for new cases of AD and/or other dementias.

Of the participants, 601 reported having a sauna bath once per week, 1,513 at a rate of two to three times per week, and 247 at a rate of four or more times per week. Compared to those using sauna once per week, the relative risk of dementia was 0.78 for those in the two to three times per week group and 0.38 for those in the four to seven times per week group. The hazard ratios for AD compared to the once per week group were 0.8 for the two to three times per week group and 0.41 for the four to seven times per week group. Multivariable analysis revealed that those in the four to seven times per week group had a 66% reduction of dementia and a 65% reduction of AD, as compared to those experiencing a sauna once per week.

Conclusion: This study of middle-aged Finnish men found a strong, inverse association between sauna bathing and the risk of Alzheimer's disease and other dementias. This association occurred independently of known risk factors.

Laukkanen, T., et al. Sauna Bathing is Inversely Associated with Dementia and Alzheimer's Disease in Middle-Aged Finnish Men. *Age Aging*. 2017; 46: 245-249.

PHYSICAL ACTIVITY AND ADIPOSITY RELATED INFLAMMATION

While it has been well established that physical activity is associated with decreased cardiovascular morbidity and mortality, the mechanisms of this are not completely understood. Some have suggested that the anti-inflammatory effect of physical activity may be among the factors. This study evaluated the association between physical activity and obesity-related inflammatory markers.

Data were obtained from the Multi-Ethnic Study of Atherosclerosis (MESA), a longitudinal study of adults 55 to 84 years of age who were free from clinically apparent cardiovascular disease at the time of enrollment (2000 to 2002). Participants returned for follow-up clinic visits at two, four and six years after the baseline visit. Data collected at all visits included standard questionnaires concerning sociodemographics, ethnicity and health history. Body mass index (BMI) was determined, with waist and hip circumference and blood pressure also measured. Data collected also included physical activity assessments, blood samples and CT determined visceral and subcutaneous adiposity. The data were reviewed to determine associations between physical activity and adipokines.

Subjects were 6,814 adults with an average age of 64.7 years, and an average BMI of 28.2 kg/m², with one third having a BMI of greater than 30 kg/m². Multivariable adjusted linear regression revealed that a one standard deviation increment in

moderate-to-vigorous physical activity was associated with higher adiponectin (6.7%), but lower leptin (9.5%), resistin (5.2%), TNF- α (4.9%) and IL-6 ($p < 0.05$ for all comparisons). The association with adiponectin was attenuated by central adiposity.

Conclusion: This large study found that moderate to vigorous physical activity is associated with a more favorable profile of inflammatory markers, independent of risk factors for cardiovascular disease, including abdominal subcutaneous and visceral adiposity.

Vella, C., et al. Physical Activity and Adiposity-Related Inflammation: The MESA. *Med Sci Sports Exer*. 2017, May; 49(5): 915-921.

BETA ALANINE AND JUDO PERFORMANCE

As muscle acidosis is considered a major cause of fatigue during high intensity, intermittent exercise, nutritional strategies aimed at attenuating muscle acidosis have been a focus of intervention. This study reviewed the effect of amino acid beta-alanine, which participates in the synthesis of carnosine, which acts as a hydrogen buffer within the muscle pH transit range.

Twenty-three, well-trained, male judo competitors were randomized to receive either beta alanine at two, 800 mg tablets, four times per day, or a placebo, for four weeks. Performance of the competitors was assessed before (PRE) and after (POST) supplementation, beginning with a five minute sparring match, followed by three successive tests of the number of throws performed in the Special Judo Fitness Test (SJFT). Blood samples were collected, immediately after warm-up, after the sparring match, and after the SFJT.

Athletes in the supplement group had a greater number of throws per

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SJFT test, as well as total number of throws throughout the three SJFTs ($p < 0.05$). Blood pH and HCO_3^- were reduced after exercise, with no between group differences. Post-hoc analysis revealed a within-group effect for BA with every SJFT ($p < 0.001$). In contrast, the number of throws per set in the placebo group did not change from PRE to POST in any of the SJFT measurements (all $p > 0.05$).

Conclusion: This study found that four-week supplementation with beta alanine can improve judo related performance in well-trained judo athletes.

De Andrade Kratz, C., et al. Beta-Alanine Supplementation Enhances Judo-Related Performance in Highly Trained Athletes. *J Sci Med Sport*. 2017, April; 20(4): 403-408.

EFFECTS OF IBUPROFEN AND RESISTANCE TRAINING ON BONE AND MUSCLE

Chronic inflammation is thought to be a contributing factor to the loss of bone and muscle mass with aging. This study assessed the combined effects of progressive resistance training and ibuprofen supplementation on bone strength and density.

Subjects were randomized into one of four groups, including 1) resistance training combined with ibuprofen 400 mg after exercise, 2) resistance training combined with placebo, 3) flexibility training combined with ibuprofen or 4) flexibility training combined with placebo. All participants were provided supplements of calcium and vitamin D. The resistance strengthening program included two sets of eight to 12 repetitions to fatigue for a total of 12 machine and dumbbell exercises.

Exercises were focused on the hip, lumbar spine, distal radius and tibia. At baseline, the participants underwent evaluations of bone structure and volumetric density by peripheral quantitative computed tomography (pQCT), through anthropometric measurements, and by assessing cross-sectional area content and density for total and trabecular bone and estimates of bone strength in compression.

Subjects were 69 women. Exercise with ibuprofen decreased

the average total bone content in comparison to exercise only ($p = 0.032$) and ibuprofen only ($p = 0.050$). Resistance training with ibuprofen decreased total bone content (-1.5%) at the distal radius as compared to resistance training alone ($p = 0.03$) and ibuprofen alone ($p = 0.05$). The resistance training group had preserved muscle density more than did the stretching group.

Conclusion: This study found that ibuprofen taken immediately after exercise has a negative effect on distal radius bone mineral mass, while resistance training and ibuprofen taken alone prevent bone loss.

Duff, W., et al. Effects of Ibuprofen in Resistance Training on Bone and Muscle: A Randomized, Controlled Trial in Older Women. *Med Sci Sports Exer*. 2017, April; 49(4): 633-640.

LIFE EXPECTANCY OF DIFFERENT OLYMPIC ATHLETES

Previous studies have demonstrated favorable mortality outcomes among elite athletes, when compared to the general population. However, this has not held true for all sports. This study was designed to determine whether survival differs between elite ectomorph and mesomorph athletes.

Publicly available data were used to identify the top ten male and female athletes in Olympic high jump, discus, marathon and 100 m runs from 1928 to 1948. Internet searches were used to identify age at competition, height, weight, country of origin and date of death. Outcome measures included all-cause mortality, expected survival and country of origin.

Of the 429 athletes followed, the date of death was identified for 336. The observed versus expected survival was greatest for high jumpers (7.1 years for women and 3.7 years for men), and lowest for sprinters (-1.6 years for women and 0.9 years for men). A multivariate analysis demonstrated that the greatest survival was for high jumpers and marathon runners, as compared with discus throwers and sprinters ($p = 0.005$). Controlling for weight reduced the survival benefit of high jumpers over discus throwers, but

had little effect on the survival benefit of marathon runners versus sprinters.

Conclusion: This study of Olympic athletes found that high jumpers and marathon runners live longer than the general population, while 100 meter runners do not.

Lee-Heidenreich, J., et al. Differences in Life Expectancy between Olympic High Jumpers, Discus Throwers, Marathon and 100 M Runners. **BMC Sports Sci Med Rehabil.** 2017. 9: 3.

CARDIOVASCULAR RISK FACTORS AND STROKES IN YOUNG ADULTS

Between 1938 and 2007, stroke was the third leading cause of death the United States, dropping to fifth in 2013. This study evaluated the hospitalization rates for acute stroke, as well as associated risk factors among adults 18 to 64 years of age.

Data were obtained from the National Inpatient Sample (NIS), which represents approximately 20% of all community hospitals participating in the Healthcare Cost and Utilization Project (HCUP). From these data, ICD-9 codes were used to identify hospitalizations for hemorrhagic and ischemic stroke. Trends in stroke hospitalizations over time were assessed by age and gender.

The prevalence of acute ischemic stroke hospitalizations increased from 2003-2004 through 2011-2012 for age groups: 18 to 34 ($p < 0.001$), 35 to 44 ($p < 0.001$) and 45 to 54 ($p < 0.001$), but not for those 55 to 64 (0.44). Across all age groups and both genders, the prevalence of three or more traditional stroke risk factors roughly doubled. No significant changes were seen in the hospitalization rates for ICH by age, race/ethnic group or gender from 2003-2004 through 2011-2012. During these same time periods, hospitalization rates for SAH were found to have declined among all age groups, although this finding was significant only among those 45 -54 years of age, who were male ($p < 0.01$), non-Hispanic whites ($p = 0.045$) and non-Hispanic blacks ($p = 0.006$).

Conclusion: This study found that hospitalization rates for acute ischemic stroke increased among adults 18 to 54 years of age between 2003-2004 and 2011-2012, with

concurrent increased rates of traditional risk factors.

George, M., et al. Prevalence of Cardiovascular Risk Factors and Strokes in Young Adults. **JAMA Neurol.** 2017, April 10. doi:10.1001/jamaneurol.2017.0020,

ELITE SPORTING ACTIVITY AND HIP OSTEOARTHRITIS

Male athletes in certain elite level sports appear to be at an increased risk of hip osteoarthritis (OA) later in life. This phenomenon differs from knee OA, as there is often no history of any preceding associated hip injury. This systematic review investigated the association of sporting activity with the development of hip OA.

Medical databases were reviewed for studies involving male participants in competitive sports activities who were diagnosed with hip OA. From these studies, pooled rates of outcomes of hip OA were calculated. Eleven studies were chosen, all investigating the rate of OA in male participants relative to controls. Of these, soccer was most commonly investigated sport along with long distance running.

Participation in elite-level impact sports was associated with a two- to nine-fold increased risk of hip OA. The studies investigating competitive long distance running demonstrated inconsistent results

Conclusion: This systematic review demonstrated that patients with a history of participation in certain elite level impact sporting activities are at a significantly higher risk of developing hip osteoarthritis.

Vigdirchick, J., et al. C. What is the Association of Elite Sporting Activities with the Development of Hip Osteoarthritis? **Am J Sports Med.** 2017, April; 45(4): 961-964.

LONG-TERM EFFECTS OF HABITUAL BAREFOOT RUNNING AND WALKING: A SYSTEMATIC REVIEW

Barefoot running (BR) is a growing practice in the running community. While the short-term effects of BR have been studied, the long-term effects are not as well understood. This study was designed

to better understand the long-term effects of BR and walking on anthropometrics, biomechanics and performance.

This meta-analysis included randomly controlled trials, case controls, cohorts and cross sectional studies from peer reviewed journals. Fifteen studies were included in the final analysis. Three studies revealed evidence of reduced ankle dorsiflexion at foot strike in BR ($p < 0.0001$). There was limited evidence showing reduced contact time, stride length, stride time and increased cadence in BR. Five studies assessed morphology, showing BR to have wider, but not shorter, feet compared to nonbarefoot running. Two studies showed reduced hallux angle. Limited evidence showed reduced incidence of flat feet in BR children, but conflicting evidence in adults. Very limited evidence suggests that injury patterns are different, with plantar surface injuries more common in BR.

Conclusions: This large literature review and meta-analysis found insufficient evidence in the literature to draw significant conclusions concerning the effects of barefoot running as compared with shod running.

Hollander, K., et al. Long-Term Effects of Habitual Barefoot Running and Walking: A Systematic Review. **Med Sci Sports Exer.** 2017;49(4) 752-762.

OUTCOME TWO YEARS AFTER ENDOVASCULAR TREATMENT FOR ISCHEMIC STROKE

In the MR CLEAN study, standard treatment was compared with endovascular treatment of acute ischemic stroke, demonstrating better functional outcome at 90 days with endovascular treatment. This study reports on that study's two-year, clinical follow-up.

This randomized, multicenter study included patients presenting with acute ischemic stroke, with a confirmed intracranial arterial occlusion. The participants were randomized to receive either endovascular treatment, or conventional care, consisting of care representing the most appropriate medical management according to national and international guidelines that could include intravenous

administration of alteplase. The primary outcome measure was the modified Rankin scale (mRS) score at two years, with secondary outcomes including all-cause mortality and quality of life at two years.

Subjects were 233 patients, randomized to the intervention group, and 267 to the control group. Among 391 patients with available mRS scores at two years, the odds ratio was 1.68 ($p=0.007$) for better outcome among the endovascular group as compared to the conventionally treated group. The cumulative, two-year, all-cause mortality rates were 26% in the endovascular group and 31% the control group ($p=0.46$).

Conclusion: This study of patients presenting with acute ischemic stroke found that endovascular treatment results in better functional outcome at two years than does conventional care.

Van den Berg, L., et al. Two-Year Outcome after Endovascular Treatment for Acute Ischemic Stroke. *N Eng J Med.* 2017, April 6; 376: 1341-1349.

EFFECT OF HYPNOSIS ON MEMORY IN BRAIN INJURY

Working memory is essential to executive function and attention, and is impaired across all etiologies of brain injuries (BIs). As hypnosis has shown promise in treating working memory, this study further evaluated the effect of hypnosis directed towards working memory in patients with BI.

This double-blind, randomized, controlled trial included 49 patients with BI, of varying severity and lesion location. The participants were randomized to one of two groups, that both received hypnotic induction, followed by one group receiving direct suggestion (D) on improved working memory, while the other received non-targeted suggestions (N). A third group was recruited to serve as a passive control (C). These sessions occurred weekly for four weeks, with participants tested with the Working Memory Index (WMI) of the WAIS III and the Trail Making Test (TMT), parts A and B.

The D group demonstrated greater, positive improvements in the WMI than did the N group ($p<0.000$). This improvement was unchanged

after a six- to seven-week break. The TMT improvement was significant in the D group ($p=0.0007$), but not in the N group ($p=0.5$).

Conclusions: This study suggests that hypnosis, if directed appropriately, can improve working memory and act as a useful modality for the treatment of patients with brain injury.

Lindelov, J., et al. Improving Working Memory Performance in Brain-Injured Patients Using Hypnotic Suggestion. *Brain.* 2017, April; 140 (4): 1100-1106.

MENTALLY STIMULATING ACTIVITIES IN LATE LIFE AND INCIDENT MILD COGNITIVE IMPAIRMENT

As dementia is becoming a global epidemic, it is critical to examine potential protective lifestyle factors against cognitive decline and dementia. This study was designed to determine whether engaging in mentally stimulating activities in later life can reduce the risk of incident mild cognitive impairment (MCI) in persons 70 years of age or older.

This prospective, cohort study used data from the population-based cohort study of participants in the Mayo Clinic Study of Aging, an ongoing study of normal cognitive aging and MCI involving persons 70 years of age or older. Information concerning mentally stimulating activities was obtained, with type and frequency identified. Cognition was assessed using the Clinical Dementia Rating Scale and neuropsychological testing. A determination of MCI status was made by an expert panel after reviewing the test results. In addition, blood was drawn to determine APOE- ϵ -4 status.

The cohort of 1,929 cognitively normal persons was followed for four years. At four years, 456 developed new onset MCI at a median age of 77 years. In total, 512 participants were APOE- ϵ -4 carriers. After adjusting for gender, age and educational status, the risk of developing MCI was found to be reduced among those who reported playing games (HR 0.78) or engaging in craft activities (HR 0.72), computer use (HR 0.70) and social activities (HR 0.77). A reduced incidence of MCI was found for both APOE- ϵ -4 carriers and noncarriers.

Conclusion: This study of persons 70 years of age or older found that ongoing mentally stimulating activity can reduce the risk of developing mild cognitive impairment.

Krell-Roesch, J., et al. Association between Mentally Stimulating Activities in Late Life and the Outcome of Incident Mild Cognitive Impairment, with an Analysis of the APOE-Epsilon 4 Genotype. *JAMA Neurol.* 2017, March; 74(3): 332-338.

SOMATOSENSORY CORTEX AND ACUPUNCTURE

Prior to surgery, several conservative therapies are recommended for patients with carpal tunnel syndrome (CTS). As previous neuroimaging studies of patients with CTS have demonstrated changes in the primary somatosensory cortex of the brain, this study was designed to further understand the effects of acupuncture on the symptoms, the peripheral conduction and the somatosensory cortex of patients with CTS.

Subjects were patients with CTS, 20 to 65 years of age. All underwent baseline clinical and MRI assessments and were randomized to one of three study arms. These included verum acupuncture localized to the more affected hand (L), verum acupuncture at distal body sites contralesionally (D) and sham acupuncture using nonpenetrating needles. All acupuncture treatments included 16 sessions over eight weeks, using a tapering schedule. Brain MRI and nerve conduction studies were obtained at baseline and after therapy. Symptoms were assessed using the Boston Carpal Tunnel Syndrome Questionnaire (BCTQ) at baseline, post-therapy and at three-month follow-up.

A total of 79 patients were enrolled. All three groups demonstrated improvement in BCTQ symptom severity scores immediately after therapy, with improvement retained at three months in the active groups ($p<0.001$), and no difference between the L and D active groups. Both were significantly better than the sham group ($p<0.04$). A significant improvement in median sensory nerve latency was found in the

acupuncture groups ($p=0.01$), but not in the sham group.

A significant relationship was found between latency following acupuncture and BCTQ at three-month follow-up. Data from somatosensory cortical mapping with functional MRI found that D2/D3 separation distance was greater for the acupuncture groups than for the sham group ($p=0.04$).

Conclusion: This study found that acupuncture reduces symptoms of carpal tunnel syndrome and improves peripheral and brain-related neurophysiological outcomes.

Maeda, Y., et al. Rewiring the Primary Somatosensory Cortex in Carpal Tunnel Syndrome with Acupuncture. *Brain*. 2017, April; 140 (4): 914-927.

NEUROPROTECTIVE EFFECT OF FAGOPYRUM DIBOTRYS AGAINST ALZHEIMER'S DISEASE

Alzheimer's disease (AD) is progressive disorder, characterized by a loss of memory and other cognitive abilities. The pathological accumulation of A β appears to be a key factor that drives neuroinflammatory responses in AD, as A β aggregates bind to cell-surface receptors on microglia, inducing an inflammatory activation that results in the secretion of proinflammatory cytokines, including TNF- α , interleukin 1 β (IL-1 β) and IFN- γ . This study assessed the effect of Fagopyrum Dibotrys extract (FDE), a traditional herbal medicine with high quantities of phenol, on the A β -related pathology of AD, including A β deposits in the brain and the A β burden in the plasma.

Using the APP/PS1 transgenic model mouse model of AD, mice were randomly divided into groups of 12. The FDE group were treated for nine months with 0.65% FDE mixed with food (0.103 mg/kg/d), while the control group received standard commercial food. After completion, the mice were anesthetized, with blood collected to assess TNF- α , IL-1 β and IFN- γ . Histological assessment was completed to determine total A β plaques, microgliosis and A β peptide levels. In vitro studies explored the inhibitory effects of FDE on A β 1-42 fibril formation and protective effects against cytotoxicity within cells induced by A β 1.

The FDE group had decreased A β deposits in the brain (49%-57%) and plasma (55%) as compared to the controls ($p<0.05$ for both comparisons). The FDE group further demonstrated inhibited A β 1-42 fibril formation ($p<0.001$), with FDE significantly lowering the neurotoxicity on the cultured SH-SY5Y cells ($p<0.05$), suggesting a potential effect of FDE on A β clearance. In addition, the levels of activated microglia and plasma levels of proinflammatory cytokine TNF- α were lower in the FDE group than in the control group.

Conclusion: This animal study found that Fagopyrum Dibotrys extract cleared A β deposits and reduced reactive microglia in the brain and decreased A β and TNF- α levels in the serum.

Liang, C., et al. Neuroprotective Effects of Fagopyrum Dibotrys Extract against Alzheimer's Disease. *Evid Based Complement Alternat Med*. 2017: 4567217. doi.org/10.1155/2017/3294586.

SHOCKWAVE TREATMENT WITH ECCENTRIC TRAINING FOR PATELLAR TENDINOPATHY

Patellar tendinopathy is caused by an overload of the knee extensor mechanism, and is often chronic and difficult to treat. Eccentric training is a standard treatment method for patellar tendinopathy. As extra corporeal shockwave therapy (ESWT) has shown some promise for the treatment of tendinopathy, this study assessed the effect of combining ESWT and eccentric training for the treatment of patellar tendinopathy.

This randomized, placebo controlled trial included patients 18 to 40 years of age with patellar tendinopathy, with symptoms persisting for at least eight weeks. All subjects were instructed to perform eccentric exercises twice daily, with three sets of 15 repetitions per session for 12 weeks. Those randomized to the treatment group received ESWT applied in three sessions at one-week intervals, while the control group received sham shockwave treatment. The primary outcome measure was the Victorian Institute of Sport Assessment-Patella (VISA-P). Secondary outcome measures were pain scores during

functional knee loading tests, as rated with a numeric rating scale (0-10).

The mean improvements in VISA-P scores from baseline over time were 70.9 in the placebo group and 78.2 in the treatment group ($p=0.15$). No significant differences were found between groups in pain, except during three maximal vertical jumps at six weeks, which favored the sham group.

Conclusion: This study of patients with chronic patella tendinopathy found no additional benefit when adding shockwave treatment to traditional eccentric exercise.

Thijs, K., et al. Effectiveness of Shockwave Treatment Combined with Eccentric Training for Patellar Tendinopathy: A Double-Blinded, Randomized Study. *Clin J Sport Med*. 2017, March; 27(2): 89-96.

MYOFASCIAL RELEASE FOR CHRONIC LOW BACK PAIN

Low back pain (LBP) is a common condition with negative economic and social consequences. As some have suggested that lumbar fascia might be involved in chronic low back pain (CLBP), this study assessed the effect myofascial release (MFR).

This double-blind, parallel controlled trial involved adults 18- 60 years of age diagnosed with nonspecific, chronic (>3months) LBP. Those who were randomized to an MFR group received four sessions of myofascial treatment, 40 minutes per session, twice per week. The MFR techniques included longitudinal sliding of lumbar paravertebral muscles, MFR of the thoracolumbar fascia, MFR of quadratus lumborum and MFR of the psoas muscle. A control group received sham MFR. The primary outcome measure was pain, assessed with the Spanish version of the Short Form McGill Pain Questionnaire (SF-MPQ) and a visual analog scale (VAS) of pain.

Both groups demonstrated significant improvement at two weeks in SF-MPQ scores, with significantly better scores at 12 weeks in the MFR group in the pain ($p=0.023$) and sensory subscales ($p=0.011$) than in the control group. A significant improvement on the VAS was found for both groups with no significant difference between the two groups. In addition, disability, as measured with the Roland Morris Questionnaire

and Fear Avoidance Beliefs Questionnaire scores were significantly better in the MFR group than in the sham group ($p < 0.05$).

Conclusion: This study of patients with nonspecific low back pain found that myofascial release techniques help improve pain and disability.

Arguisuelas, M., et al. Effects of Myofascial Release and Nonspecific Chronic Low Back Pain: A Randomized, Clinical Trial. *Spine*. 2017, May 1; 42(9): 627-634.

RETURN TO SPORT MATTERS AFTER ANTERIOR CRUCIATE LIGAMENT REPAIR

Prior studies have demonstrated that individuals undergoing anterior cruciate ligament (ACL) repair can expect normal or near normal knee function within one year. Despite these expectations, one of three report knee difficulties six years following the repair. This study assessed quality of life (QOL) and psychological health outcomes of patients 20 years after ACL repair.

All individuals undergoing a hamstring or patella tendon autograft ACL repair five to 20 years previously were identified from the surgical records of four orthopedic surgeons. The participants were asked to complete a battery of patient reported outcome measures, including the Knee Injury and Osteoarthritis Outcomes Score (KOOS), the ACL-QOL and the Assessment of QOL (AQoL-8D), the Workplace Activity Limitation Scale (WALS) and the Hospital Anxiety and Depression Scale (HADS). Knee difficulties were recorded, and were defined as knee pain, symptoms and functional limitations.

Participants were 162 individuals who were an average of nine years post-surgery and sought medical attention for knee difficulties. The patients reported a mean KOOS-QOL score of 57, suggesting impaired, knee-related QOL. A multivariable analysis revealed that non-return to sport, higher BMI and subsequent surgery were independently associated with worse KOOS-QOL scores. Return to sport explained the greatest proportion of variance of KOOS-QOL ($p = 0.0001$), and resulted in an estimated 21-point higher ACL-QOL score compared to that of those who did not return ($p < 0.001$).

Conclusion: Returning to sport after an anterior cruciate ligament tear is associated with better knee-related and general health-related quality of life among people with knee difficulties five to 20 years after ACL repair.

Fibay, S., et al. Return to Sport Matters-Longer Term Quality of Life after ACL Reconstruction in People with Knee Difficulties. *Scand J Med Sci Sports*. 2017, May; 27(5): 514-524.

ORAL CONTRACEPTIVES AND SPRINT INTERVAL PERFORMANCE

Studies have shown that near maximal to maximal interval training (80% to 100% peak heart rate) or sprint interval training (SIT) can rapidly improve peak aerobic capacity and endurance performance in as little as two weeks. As previous studies have found that oral contraceptive (OC) use may influence athletic performance, this study assessed the influence of these medications on performance adaptations to SIT.

Healthy, recreationally active women who were either OC users or experienced regular natural menstrual cycles were studied. At baseline, the subjects were assessed for serum hormone levels and VO_{2peak} , peak power output (PPO), peak cardiac output (Q_{peak}), peak stroke volume (SV_{peak}), peak HR (HR_{peak}), peak rating of perceived exertion (RPE_{peak}), peak respiratory quotient (RQ) and minute ventilation ($V_{E \cdot V \cdot CO_{2slope}}$). Each participant then completed three supervised SIT sessions (at 100 to 120% PPO) per week for four weeks, with a minimum of 36 hours between sessions. Assessments were again made immediately after completing and four weeks after completion of the program. Those taking oral contraceptives were compared to those who were not.

The MC group showed greater improvement than did the OC group in $V \cdot O_{2peak}$ ($p = 0.010$), and Q_{peak} ($p = 0.002$). The SV_{peak} increased in the MC group ($p = 0.002$), and remained elevated from pre-training at follow-up ($P = 0.023$), but did not change in the OC group. The MC group had a higher RQ compared with the OC group at all time points including baseline ($p = 0.038$), post-training ($p = 0.015$) and follow-up ($p = 0.025$).

Conclusion: This study of recreationally active women involved in sprint interval training found that oral contraceptives can reduce gains in VO_{2peak} and Q_{peak} .

Schaumburg, M., et al. Oral Contraceptive Use Dampens Physiological Adaptations to Sprint Interval Training. *Med Sci Sports Exer*. 2017, April; 49 (4): 717-727.

BEDSIDE ULTRASOUND TO DIAGNOSE NEUROGENIC HETEROTOPIC OSSIFICATION

Neurogenic heterotopic ossification (NHO) is associated with stroke, traumatic brain injury, spinal cord injury, encephalitis and burns. This study investigated the role of ultrasound (US) for the evaluation of patients with suspected NHO.

Subjects were 310 consecutive patients treated in the ICU for acquired brain injury. Each day, the major joints were evaluated by a physical therapist for a decrease in range of motion. Those with decreased ROM were assessed daily thereafter, by US. An x-ray was used to confirm any US identified NHO.

Of the 310 patients identified with a decreased range of motion, US evidence of NHO was identified in 21, all of whom demonstrated the latter stage zone phenomenon, 42.8% that demonstrated distorted muscle architecture and 81% that demonstrated hyperemia. Comparing the x-ray findings and the US findings, x-ray evidence of NHO was found to be delayed by 2 weeks as compared with the US findings. The hip was the most common joint identified, in 66.6%, followed by the knee and the elbow. Of those surviving for 12 months, 12 of the 21 had a resolution by x-ray, US and clinical examination.

Conclusion: This pilot study demonstrates that ultrasound may be used to detect heterotopic ossification two weeks earlier than can conventional x-ray.

Stefanidis, K., et al. Bedside Ultrasound to Facilitate Early Diagnosis and Ease of Follow-Up in Neurogenic Heterotopic Ossification: A Pilot Study from the Intensive Care Unit. *J Head Trauma Rehabil*. 2017. DOI:10.1097/HTR.000000000000293.

LOW-LEVEL LASER THERAPY FOR LIMB FRACTURE

Delayed union of fractures occurs when there are no signs of bone healing within the expected timeframe. While operative intervention is an option after delayed union, many look for more conservative means of accelerating healing. The use of low-level laser treatment (LLLT) to promote healing has been reported in human fractures, although none have previously reported its use in a clinical setting. This case series reported on consecutive patients with delayed union of fracture who were clinically treated with LLLT.

Subjects included consecutive patients with a mean age of 26 years presenting with delayed union of upper or lower extremity limb fracture, who had been offered, but had refused surgical intervention. All received LLLT every other day, eight weeks for UE and 12 weeks for LE fractures. The patients were followed for clinical and radiologic findings of fracture healing, as well as satisfaction with the procedure.

At presentation, the age of the fractures ranged from six to eight weeks. Of the patients who completed the study, 15 of 16 achieved union. The time to clinical and radiologic fracture union was seven weeks for UE and 10 weeks for LE fractures. The mean satisfaction of those with UE fractures was 9/10, while that for those with LE fractures was 8/10.

Conclusion: This case series of patients with delayed union of fractures found that, after initiating low level laser therapy, solid union was achieved in seven to 10 weeks.

Ip, D., Use of Low-Level Laser Therapy in Conservative Treatment of Delayed Union of Human Upper and Lower Limb Fractures. *Internet J Ortho Surg.* 2017; 25(1): 1-7.

RIVAROXABAN OR ASPIRIN FOR EXTENDED TREATMENT OF THROMBOEMBOLISM

Venous thromboembolism is the third most common cause of vascular death after myocardial infarction and stroke. This study compared the efficacy and safety of rivaroxaban with that of aspirin for patients in need of long-term anticoagulation.

This double-blind study included adult patients with symptomatic

proximal deep vein thrombosis or pulmonary embolism who had been treated for six to 12 months with an anticoagulant agent. The patients were randomized to receive 20 mg of rivaroxaban, 10 mg of rivaroxaban or 100 mg of aspirin once daily. The primary efficacy outcome was a composite of symptomatic, recurrent fatal or nonfatal venous thromboembolism and unexplained death for which pulmonary embolism could not be ruled out.

Subjects were 3396 patients from 31 countries. Both rivaroxaban doses were superior to aspirin with respect to the primary efficacy outcome, with a hazard ratio (HR) of 0.34 for 20 mg of rivaroxaban vs. aspirin, and a HR of 0.26 for 10 mg of rivaroxaban vs. aspirin ($p < 0.001$ for both comparisons). The HR for recurrent venous thromboembolism compared to aspirin was 0.34 for the 20mg and 0.26 for the 10 mg rivaroxaban groups. Compared to aspirin the HR for death from any cause for the 20mg and the 10 mg rivaroxaban were 0.42 and 0.27 respectively.

Conclusion: This study of adult patients found rivaroxaban to be more effective than aspirin for the prevention of recurrent venous thromboembolism among patients in need of long-term anticoagulation.

Weitz, J., et al. Rivaroxaban or Aspirin for Extended Treatment of Venous Thromboembolism. *New Eng J Med.* 2017, March 30; 376(13): 1211-1222.

CERVICAL SPINE SURGERY COMPLICATIONS IN THE ELDERLY

The frequency of surgical spinal procedures in the United States continues to grow, particularly for the elderly. This study was designed to better understand the incidence of complications and associated risk factors of cervical spine surgery in an elderly cohort.

Using a five percent random sample of Medicare physician/carrier claims data from 2010 to 2012, patients undergoing cervical decompression and posterior cervical fusion were identified. The 90-day, postoperative rate of newly diagnosed adverse events was assessed. A multivariate Cox regression was used to evaluate risk factors for complications, adjusted for age, socioeconomic status, Charleston comorbidity index, race,

census region, gender and year of surgery.

A total of 1,519 patients underwent cervical decompression (CD) and 1,273 underwent cervical fusion (CF). Respiratory complications occurred in 12.1% of CD, and 14.6% of CF patients. Other complications of CD and CF were urinary retention in 8.2% and 9.1%, respectively, acute delirium in 5.3% and 6.0%, respectively and postoperative nausea and vomiting occurred in 2.8% and 3.1%, respectively. Older patients and those with a history of smoking had higher risks of respiratory complications. Patients with dementia were at a higher risk of acute delirium after both CD and CF ($p < 0.001$ for both comparisons).

Conclusion: This study, using a nationally representative cohort of elderly patients undergoing cervical decompression and posterior cervical fusion, demonstrated that respiratory complications, urinary retention, postoperative nausea and vomiting, as well as acute delirium, were the most common postoperative complications.

Radcliff, K., et al. Cervical Spine Surgery Complications and Risks in the Elderly. *Spine.* 2017, March 15; 42(6): E347-E354.

STOCKING USE AND PLANTAR SENSATION AFTER ANKLE SPRAIN

The most common injury in organized sports in United States is the lateral ankle sprain. Though often perceived as a minor injury, long-term symptoms are reported in nearly 40% of these individuals. Patients with chronic ankle instability (CAI) may present with insufficiencies including both mechanical and sensorimotor. As compression stockings have been shown to improve joint position sense, this study was designed to determine whether stocking use can influence tactile perception among patients with CAI.

Subjects were 45 young adults, including 15 without injury, 15 with CAI and 15 with a history of sprain without chronic symptoms (a control group). For all individuals, after footwear removal, light touch was evaluated at three sites on the plantar surface using 20 calibrated Semmes-Weinstein monofilaments (SWM). The light touch threshold was evaluated at the head of the first

(Continued from page 2)

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***Regional Managing Editors have attested that they have no financial conflict of interest when choosing articles that appear in Rehab in Review.**

metatarsal (1MT), the base of the fifth metatarsal (5MT) and the calcaneus (CAL). Testing conditions were compared with and without stocking use.

Thresholds were increased at all three sites with stocking use ($p < 0.05$). In the CAL group, significantly higher thresholds were identified during stocking use at the CAL, but not the 1MT or the 5 MT. In the control groups, SWM thresholds were higher at the 5MT, but not the 1MT or CAL, with stocking use. In addition, thresholds were higher when participants in the coper group wore stockings at the 5MT and the CAL, but not the 1MT.

Conclusion: This study of patients with ankle sprains found that, even though ankle compression and taping have been shown to improve joint position sense and postural control, a light stocking on the foot results in deterioration of light touch thresholds.

Burcal, C., et al. Effects of a Stocking on Plantar Sensation in Individuals with and without Ankle Instability. **Muscle Nerve.** 2017, April; 55(4): 513-519.

Rehab in Review (RIR) is produced monthly by physicians in the field of Physical Medicine and Rehabilitation (PM&R), with the cooperation and assistance of Emory University School of Medicine, Department of Rehabilitation Medicine. The summaries appearing in this publication are intended as an aid in reviewing the broad base of literature relevant to this field. These summaries are not intended for use as the sole basis for clinical treatment, or as a substitute for the reading of the original research.

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ISSN # 1081-1303
www.rehabinreview.com



REHAB IN REVIEW

Produced by the Department of
Rehabilitation Medicine, Emory
University School of Medicine



Department of
Rehabilitation
Medicine

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