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VERY LOW CARBOHYDRATE DIET AND HIGH INTENSITY INTERVAL TRAINING

As carbohydrate availability and muscle glycogen content are primary components of metabolism and exercise performance, restriction of endogenous carbohydrate availability would seem to adversely affect strenuous exercise performance. This study examined the effects of a very low carbohydrate high fat (VLCHF) diet on cardiorespiratory and metabolic responses during high intensity interval training (HIIT).

Eighteen, moderately trained males were recruited. The subjects were randomized to either remain on a western based mixed diet or to begin a VLCHF diet (eight percent carbohydrates, 29% protein and 63% fat) for four weeks. HIIT sessions occurred three times per week for four weeks and involved a 10-minute warm-up at 60% $VO2_{max}$, followed by five, high-intensity repetitions, consisting of three minutes at 100% $VO2_{max}$, separated by 1.5 minutes of passive recovery (work to rest ratio, 2:1), for a total of 34 min. A maximal incremental treadmill test was performed at baseline and after two and four weeks of training. Heart rate, oxygen uptake, respiratory exchange ratio, total time to exhaustion and maximal $VO2_{max}$ were measured.

Changes in body mass averaged 4.7 kg in the VLCHF group and 0.8 in the control group, while body fat percentages were reduced by 3.2% and 1.1%, respectively. The $V02_{max}$ increases were 3.1ml/kg/min in the VLCHF group and 1.5ml/kg/min in the control group.

Conclusion: This study found no adverse effects on any aspect of performance in subjects consuming a high-fat diet for four weeks.

Cipryan, I., et al. Effects of a Four-Week, Very Low Carbohydrate Diet on High Intensity Interval Training Responses. **J Sports Sci Med**. 2018; 17:259-268.

FRACTURES AND INCREASED RISK OF SUICIDE

Previous studies have demonstrated a high rate of death by suicide among patients with fractures. This study evaluated the associations between fracture and the risk of suicide.

The Taiwan National Health Insurance Research Database contains information covering more than 99% of Taiwan's residents. From this database were identified all individuals 40 years of age or over with a suicide recorded as the cause of death between the years 2000 and 2011. All records identifying diagnoses of fractures and osteoporosis treated medically were reviewed. Covariates included gender, age, marital status, education, morbidity, osteoporosis, fractures, psychological comorbidity and income.

From the database were identified 34,794 patients who had died by suicide, who were then matched with 139,176 controls. Those with fractures exhibited a higher risk of suicide (adjusted odds ratio 1.48), including all fracture sites except the wrist. Fractures of the pelvis (adjusted odds ratio 2.04), spine (adjusted odds ratio 1.53), and femoral shaft (adjusted odds ratio 1.47) had a relatively higher risk than other sites. A diagnosis of osteoporosis was not associated with an increased risk of suicide.

Conclusion: This Taiwanese population study found that fractures are associated with an increased risk of suicide, especially hip and spine fractures.

Chang, C., et al. Fractures and the Increased Risk of Suicide: A Population Based, Case Control Study. **Bone Joint J.** 2018; 100B: 780-786.

RISK OF STROKE AFTER TRANSIENT ISCHEMIC ATTACK

Previous studies of patients treated for a transient ischemic attack (TIA) or a minor stroke have demonstrated an increased risk of stroke within the first year. Data extending beyond one year are quite limited. This study reports on the five -year follow-up of patients treated by stroke specialists for a TIA or minor stroke.

This study involved specialized care centers in 21 countries. All subjects presented with a TIA or a minor stroke, with a modified Rankin scale (mRS) score of 0 or 1 at the initial evaluation. The acute care decisions were made by the stroke specialists, individualized to each patient. All patients were followed with interviews beginning at baseline, and at one, three and 12 months, and then yearly for five years. The primary outcome variable was a composite of death from cardiovascular diseases, nonfatal stroke or nonfatal acute coronary syndrome.

Five-year follow-up data were available for 3,356 patients. At year five, a primary outcome event had occurred in 469 patients, corresponding to an estimated cumulative event rate of 12.9%. Of these, 50% occurred during the years two through five. At five years, a stroke had occurred in 9.5%. Death from any cause had occurred in 10.6%, and death from cardiovascular causes in 2.7%.

Conclusion: This multicenter study of patients with minor stroke or TIA found that the rates of cardiovascular events, including stroke, were 6.4% in the first year and 6.4% in years two through five.

Amarenco, P., et al. Five-Year Risk of Stroke after TIA or Minor Ischemic Stroke. **N Engl J Med**. 2018, June 14; 378: 2182-2190.

ASSOCIATION BETWEEN BMI AND LOW BACK PAIN

Low back pain (LBP) and obesity are two of the most prevalent medical conditions in the United States. Each are major drivers of increased health care expenditures. This study explored the prevalence, severity and

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frequency of LBP and its association with body mass index (BMI).

This study included 4,796 patients from the Osteoarthritis Initiative, a prospective study initially designed to review osteoarthritis of the knee. BMI was classified according to the World Health Organization's definition, with prevalence, severity and frequency of low back pain also assessed.

Compared with patients in the normal and underweight categories, those who were overweight and obese had an increased prevalence of LBP ($p<0.05$ for both), as did those who were severely and morbidly obese ($p<0.01$ for both). An adjusted analysis indicated that variables significantly related to an increased prevalence of LBP were a BMI of greater than 25 kg/m^2 ($p=0.021$), depression ($p=0.048$), smoking ($p=0.002$), OA of the hip ($p=0.025$) and OA of the spine ($p<0.001$).

Conclusion: This study suggests that a BMI of over 25kg/m^2 is associated with an increased prevalence of low back pain.

Su, C., et al. The Association between Body Mass Index and the Prevalence, Severity and Frequency of Low Back Pain. **Spine.** 2018, June. 43(12): 848-852.

OBESITY AND SURGICAL SITE INFECTION

Obesity is recognized as a burden on healthcare systems. Obese individuals are more likely to develop osteoarthritis (OA) requiring a total knee arthroplasty (TKA). TKA is an invasive surgery with many associated complications, including surgical site infection (SSI). This study explored the association between body mass index (BMI) and surgical site infection.

This study retrospectively evaluated 839 patients who underwent a primary TKA. The charts were reviewed for BMI at the time of surgery and SSI during the year after surgery. Superficial SSI (SSSI) was classified as any infection that did not require re-hospitalization and which occurred during the first 30 days post-operatively. Deep SSI (DSSI) was classified as any infection that required a re-admission within one year post-operatively.

Compared with all other weight groups, the obese class III group (>40kg/m^2) had a 4.20 times greater odds of SSSI ($p=0.009$) and a 6.97 times greater odds of DSSI ($p=0.003$).

Conclusion: This study of patients undergoing total knee arthroplasty revealed that compared with those with a lesser BMI, those in obese class III had a higher incidence of surgical site infections.

Wilson, J., et al. Surgical Site Infection in Overweight and Obese Total Knee Arthroplasty Patients. **J Ortho.** 2018, June; 15(2): 328-332.

DRIVING AFTER HIP ARTHROSCOPY

Numerous studies have examined return to driving after common lower extremity orthopedic surgeries, but none have addressed return to driving after a hip arthroscopy. This study was designed to evaluate patients braking performance after undergoing a right hip arthroscopy.

Subjects were 14 patients scheduled for right hip arthroscopy and 17 healthy volunteers. All were assessed with a driving simulator system completed preoperatively (baseline) and at two, four, six and eight weeks postoperatively. The control group underwent five simulator sessions two weeks apart. Multiple parameters of braking performance were assessed, including initial reaction time (IRT), throttle release time (TRT), foot movement time (FMT) and brake travel time (BTT).

The control group had significantly faster reaction times at baseline than did the experimental group. The surgery group did not show any decline in any of the braking performance variables between baseline and two weeks post-surgery. The surgery group demonstrated significant improvements in IRT ($p=0.002$), TRT ($p<0.0001$), FMT ($p<0.0001$) and BRT ($p=0.0002$) between baseline and the two-week postoperative driving session, with no significant changes thereafter.

Conclusion: This study suggests that patients could safely return to driving two weeks after a right-sided hip arthroscopy.

Momaya, A., et al. Return to Driving After Hip Arthroscopy. **Clin J Sport Med.** 2018, May; 28(3): 299-303.

OBESITY TRENDS IN THE UNITED STATES

The prevalence of overweight and obesity has increased since the 1980s and plateaued among youth between 2005 and 2014. This study analyzed the prevalence of obesity among youth and adults in the United States between 2007 and 2016.

Data were obtained from the National Health and Nutrition Examination Survey (NHANES), a cross-sectional survey of non-institutionalized individuals in the United States. Obesity was defined as a body mass index of 30 kg/m^2, and severe obesity as 40 kg/m^2 or more. Data were compared between the surveys obtained in 2007 through 2008 and those obtained in 2015 through 2016.

Data from 16,875 youth and 27,449 adults were analyzed. The prevalence of obesity in youth was 16.8% in 2007 through 2008, and 18.5% in 2015 through 2016. The age standardized prevalence of obesity among adults was 33.7% in 2007 through 2008 and 39.6% in 2015 through 2016. This increase was significant among women and in adults 40 years of age or older. Severe obesity in adults increased from 5.7% in 2007 through 2008 to 7.7% in 2015 through 2016 (p=0.001).

Conclusion: This study, using data from the National Health and Nutrition Examination Survey, found that, over the most recent decade, increases in obesity and severe obesity prevalence have continued among both youth and adults.

Hales, C., et al. Trends in Obesity and Severe Obesity Prevalence in U.S. Youth and Adults by Sex and Age, 2007–2008 to 2015–2016. **JAMA**. Published online March 23, 2018. doi:10.1001/jama.2018.3060

SYSTEMIC EFFECTS OF EPIDURAL STEROID INJECTIONS FOR SPINAL STENOSIS

Epidural steroid injections (ESIs) are used frequently for a variety of back conditions and are considered to be safe procedures. However, several case reports have shown that even a single dose of ESI can cause adrenal suppression. This study was designed to determine whether a single epidural injection with corticosteroids plus lidocaine causes greater cortisol suppression than does an epidural injection with lidocaine alone.

Subjects were 400 patients with low back pain who were scheduled for an ESI. The participants were randomized to receive an epidural with corticosteroid plus lidocaine (CL) or lidocaine alone (L). A morning fasting serum cortisol level was measured at baseline and again three weeks after the epidural.

Overall, patients in the CL group averaged a 14.4% reduction in cortisol at week three as compared to baseline, while the L group had an average increase of 8.2%. Of the four different corticosteroids used, those injected with methylprednisolone or triamcinolone had reductions in cortisol at three weeks of 41% and 41.6%, respectively (p=0.005 and p<0.001, respectively). Those treated with betamethasone or dexamethasone had an average cortisol reduction of 1.8% and 23.3%, respectively.

Conclusion: This study confirms that a single epidural steroid injection can suppress cortisol levels for up to three weeks after the injection.

Friedly, J., et al. Systemic Effects of Epidural Steroid Injections for Spinal Stenosis. **Pain**. 2018, May; 159: 876-883.

INTRAMUSCULAR STEROID INJECTIONS FOR HIP OSTEOARTHRITIS

A systemic effect of glucocorticoid on joint pain has been demonstrated in patients with subacromial impingement of the shoulder. This study was designed to determine whether intra-muscular rather than intra-articular glucocorticoid injections can affect hip pain among patients with osteoarthritis (OA) of the hip.

Subjects were patients over 40 years of age with symptomatic OA of the hip for at least six months, with hip pain severity of at least three on a 10-point scale. The patients were randomized to receive either 40 mg of triamcinolone acetate or a similar volume (1 mL) of normal saline, injected at the lateral upper quadrant of the gluteal musculature. Primary outcome variables were the severity of hip pain at two weeks, as measured by an 11-point numerical rating scale, at rest and during walking, as well as scores on the Western Ontario and McMaster University Osteoarthritis Index (WOMAC) Pain Subscale.

At two weeks, compared with the placebo group, the glucocorticoid group had a significant reduction in hip pain at rest, but not during walking. At four-, six- and 12-week follow-ups, the glucocorticoid group had significant hip pain reductions at rest and during walking. Other differences favoring the glucocorticoid group including WOMAC Pain, Function, Stiffness subscales and Total scale. Adverse events were reported by 13 patients in the placebo group and 19 in the glucocorticoid group.

Conclusion: This randomized, controlled trial found that an intramuscular glucocorticoid injection can reduce pain and improve function for up to 12 weeks.

Dorleijn, D., et al. Intramuscular Glucocorticoid Injection versus Placebo Injection in Hip Osteoarthritis: A 12-Week, Blinded, Randomized, Controlled Trial. **Ann Rheum Dis**. 2018, June; 77(6): 875-882.

SURGERY AND PT FOR FEMORAL ACETABULAR IMPINGEMENT TREATMENT

Arthroscopic hip surgery is often considered the standard treatment for patients with femoral acetabular impingement syndrome (FAIS). This study compared surgery to physical therapy (PT) for the treatment of FAIS.

At a single military hospital, 80 patients with FAIS were randomized to undergo surgery (acetabuloplasty, labral repair/debridement or femoroplasty, per the surgeon's clinical judgement) or a supervised physical therapy (PT) program, performed twice weekly for a total of 12 sessions. At baseline, all participants were evaluated using the Hip Outcome Score (HOS) ADL and Sport subscales and the International Hip Outcome Tool (iHOT-33), with these repeated at six, 12 and 24 months. The primary outcome measure was the HOS, administered at two years.

No significant difference was found between the groups at any time point of the study on the HOS -ADL subscale, the HOS-Sport subscale or the iHOT-33 scale. Further, no significant differences were found between the groups in perceived current level of function, with 58.1% of the entire cohort failing to perceive a clinically meaningful change at two years, and with no significant difference between groups. Despite this, 28 patients in the PT group had chosen to undergo surgery within the two years.

Conclusion: This study of patients with femoral acetabular impingement found no statistically significant difference in outcomes between surgical and non-surgical treatment of FAIS.

Mansell, N., et al. Arthroscopic Surgery or Physical Therapy for Patients with Femoroacetabular Impingement Syndrome. **Am J Sports Med.** 2018, May; 46(6): 1306-1314.

EXERCISE VERSES BRACING IN SCOLIOSIS

Adolescent idiopathic scoliosis (AIS) is the most common type of scoliosis in China, accounting for 70-80% of cases. This study compared the effect of orthotic management versus exercise management for patients with AIS on quality of life (QoL), spinal curvature and body symmetry.

Subjects were diagnosed with moderate AIS (Cobb angle 20-40°), with ages ranging from 10 to 17 years. Those randomized to a bracing group wore a rigid thoracolumbosacral orthosis (TLSO) 23 hours per day. Those in the exercise group performed 10 to 15 minutes of home exercises, based on the Scientific Exercise Approach to Scoliosis (SEAS), with one additional weekly office session. The patients were followed for one year, with measures including QoL, assessed with the SRS Outcomes Questionnaire (SRS-22), and body image, assessed with the Trunk Appearance Perception Scale (TAPS). Spinal curvature was evaluated with imaging to assess the Cobb angle.

Data were available at one year for 24 patients in the bracing group and 29 in the exercise group. The bracing group achieved smaller Cobb angles at both six- and 12-month evaluations. However, the exercise group obtained better QoL scores both at six and 12 months, with better subscale scores in Self-Image and Satisfaction at six months.

Conclusion: This randomized, controlled trial suggests that thoracolumbosacral bracing and exercise are both effective for the treatment of moderate AIS, with bracing better for improving spinal curvature, and exercise better for improving quality of life.

Zheng, Y., et al. Whether Orthotic Management and Exercise are Equally Effective to the Patients with Adolescent Idiopathic Scoliosis in Mainland China? **Spine.** 2018; May 15, 43(9): E494-E503.

PATIENT PREFERENCE FOR PHYSICIAN ATTIRE

While many medical groups have dress codes for their medical staff, no studies have examined the opinions of patients about physician attire and its association with patient satisfaction. This study was designed to better understand patients' preferences of physican attire.

The authors delivered 6280 surveys to ten academic Medical Centers across the United States with a response rate of 65%. The surveys included 22 questions and photographs of a male and female physician in various forms of attire, administered to adult patients receiving care in both inpatient and outpatient settings. For each photo, the patients were asked to rate how knowledgeable, trustworthy, caring and approachable each physician appeared, as well as how comfortable the physician made the respondent feel. A Likert scale was used to determine the magnitude of the response. The primary outcome of interest was calculated as the cumulative average of the five rating domains.

The most preferred dress for both male and female physicians was formal attire with a white coat. ($p<0.001$). This attire was associated with the best ratings of knowledgeable, trustworthy, caring and approachable. Scrubs with a white coat was ranked second overall, followed by formal attire without a white coat. These findings differed by care setting. Formal attire with a white count was preferred by respondents for their primary care and hospital physicians while scrubs were rated highest for emergency room physicians and surgeons.

Conclusion: This study of over 4000 patients across the United States found that the majority believe that a physicians' attire is important to them, and that the preferred attire is formal dress with a white coat.

Petrilli, C et al. Understanding Patient Preference for Physician Attire: A Cross–Sectional Observational Study Of 10 Academic Medical Centers in the USA. **BMJ Open.** 2018. doi:10.1136/bmjopen-2017-021239

ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION OVER AGE FIFTY

Anterior cruciate ligament (ACL) reconstruction is one of the most common orthopedic surgeries. Given an aging population, this study was designed to compare the outcomes of ACL reconstruction in patients over 50 with those of younger patients.

This prospective study compared the outcomes of 28 consecutive patients, 50 years of age or older, with 36 patients under 40 years of age, all presenting for reconstruction of an ACL tear. Data collected at baseline and at five years' follow-up included subjective functional status, assessed using the Lysholm score, activity level, assessed with the Tegner Activity Scale, development of osteoarthritis (OA), assessed by radiological evaluation and joint laxity measurement using the KT-1000 arthrometer.

The mean time to return to activity was 102 days in the older subjects and 93 days in the younger group ($p>0.05$). At the final evaluation, no difference was found between the younger and older groups in Lysholm scores ($p=0.20$), Tegner Activity Scale scores ($p=0.22$) or the development of degenerative OA. The mean side-to-side differences in the KT-1000 arthrometric evaluation of laxity were 1.6mm in the in the older group and 2.7mm in younger group ($p=0.009$).

Conclusion: This study of patients undergoing anterior cruciate ligament reconstruction repair found that those over age 50 can achieve comparable results to younger patients.

Iorio, R., et al. Anterior Cruciate Ligament Reconstruction in Patients Older than Fifty Years: A Comparison with a Younger Age Group. **Intern Ortho.** 2018, May, 42(5): 1043-1049.

BALANCE AFTER MILD TRAUMATIC BRAIN INJURY

Traumatic brain injury (TBI) is considered to be the signature wound of the Middle East conflicts following 9/11. It has been estimated that 19% of those deployed soldiers have sustained a TBI, 80% of which are mild. Additionally, 20% of those who sustain a mild TBI may develop post-concussion syndrome, which may include postural instability or imbalance. This study explored the relationship between postural instability and mild TBI.

Data were obtained from the Chronic Effects of Neurotrauma Consortium (CECN), an observational study of the late effects of deployment in Afghanistan or Iraq. Subjects with a history of mild TBI were recruited from three sites. Records were reviewed for the frequency of TBI, as well as for the presence of post-traumatic amnesia and blast exposure. All participants were assessed with computerized dynamic posturography (CDP) testing and the Sensory Organization Test (SOT). Comparisons were made between 273 with mild TBI and 49 with no TBI.

Compared to those without a history of TBI, those with mild TBI obtained no worse CDP scores.

Those with three or more mTBIs earned worse scores than those with two or fewer lifetime mTBIs. Compared to those without a TBI history, those with a positive history had increased pain interference measures, with this finding more pronounced among those with three or more mTBIs.

Conclusion: This study of veterans of the Middle Eastern conflicts suggests that those with a history of three or more mild traumatic brain injuries have reduced balance performance.

Walker, W., et al. Is Balance Performance Reduced after Mild Traumatic Brain Injury? Interim Analysis from Chronic Effects of Neurotrauma Consortium (CENC) Multi-Centre Study. **Brain Inj.** 2018, June: doi.org/10.1080/02699052.2018.1483529

FAMPRIDINE FOR COGNITION, FATIGUE AND DEPRESSION IN MULTIPLE SCLEROSIS

Cognitive impairment and fatigue are important symptoms among patients with multiple sclerosis (MS). While disease modifying treatments have been shown to significantly reduce the relapse rates of MS, data are much less clear regarding the effects of these medications on cognitive function. Fampridine is a potassium channel blocker which enhances signal conduction in demyelinated axons. This study was designed to understand the effects of this medication on symptoms of fatigue, as well as cognitive function.

This randomized, controlled trial included patients diagnosed with MS. The patients were randomized to receive either placebo or PR-fampridine 10 mg twice per day, with cognitive functioning assessed twice within the first year and three times within the second year.

Of the 32 patients who completed the first year, 20 completed the second year. Treatment with PR-fampridine resulted in significant improvement in physical fatigue (p=0.014), cognitive fatigue (p=0.003), total fatigue (p=0.0005), depressive symptoms (p=0.0049), tonic alertness (p=0.024) phasic alertness (p=0.042), psychomotor speed (p=0.014), and verbal fluency (p=0.0002).

Conclusion: This study of patients with multiple sclerosis found that treatment with PR-fampridine can improve emotional and cognitive symptoms and total fatigue.

Broicher, S., et al. Positive Effects of Fampridine on Cognition, Fatigue and Depression in Patients with Multiple Sclerosis over 2 Years. **J Neurol**. 2018, May; 265(5):1016-1025.

CORTICOSPINAL EXCITABILITY AND HAND MOTOR RECOVERY AFTER STROKE

Approximately half of stroke victims retain permanent motor deficits, despite rehabilitation. This study compared the changes in cortical excitability to motor recovery of a hand affected by a stroke.

Subjects were patients with ischemic lesions in the middle cerebral artery territory, with no contraindication for transcranial magnetic stimulation (TMS). Hand motor function was evaluated with the Wolf Motor Function Test (WMFT) and the Action Research Arm Test (ARAT). Corticospinal excitability was evaluated with resting motor threshold (rMT) and motor evoked potentials (MEP).

Improvements on the WMFT over the first three weeks directly correlated with baseline hand function as assessed by ARAT (p=0.005) and WMFT (p=0.003). At the end of seven weeks, increases in ipsilesional MEP at APB were associated with increases in ARAT scores (p=0.019). No significant relationship was found between contralesional corticospinal excitability and hand motor recovery.

Conclusion: This study suggests that a favorable motor recovery of the hand after stroke is associated with increased ipsilateral corticospinal excitability.

Veldema, J., et al. Cortico-Spinal Excitability and Hand Motor Recovery in Stroke: A Longitudinal Study. **J Neurol**. 2018, May; 265(5): 1071-1078.

POTENTIATING PAIRED CORTICOSPINAL-MOTONEURONAL PLASTICITY AFTER SPINAL CORD INJURY

It is known that pairing noninvasive stimulation of the primary motor cortex and a peripheral nerve, known as paired corticospinal transmission-motoneuronal stimulation (PCMS), enhances corticospinal transmission in patients with chronic spinal cord injury (SCI). This study examined whether voluntary activity can also increase the excitability of spinal motoneurons, subsequently potentiating PCMS effects on corticospinal transmission in chronic SCI patients.

Subjects were 17 patients with SCI, and 14 age-matched controls. Corticospinal volleys evoked by TMS over the hand representation of the primary motor cortex were timed with peripheral electrical stimulation of the ulnar nerve. The PCMS was applied at rest ($PCMS_{active}$), and during a small level of isometric index finger abduction ($PCMS_{active}$). Motor evoked potentials (MEPs) elicited by TMS and electrical stimulation were measured in the first dorsal interosseous muscle in both case and control groups.

In patients with SCI, MEPs elicited by the combined TMS and peripheral electrical stimulation were increased when compared to controls. Those SCI patients who did not respond to $PCMS_{rest}$ did respond with $PCMS_{active}$. Those who responded to both, demonstrated larger increments with active PCMS.

Conclusion: Muscle contraction during paired corticospinal transmission-motor neuronal stimulation potentiates corticospinal transmission, suggesting a technique that may be used to increase spinal plasticity after spinal cord injury.

Bunday, K., et al. Potentiating Paired Corticospinal-Motoneuronal Plasticity after Spinal Cord Injury. **Brain Stim.** Article in Press. 2018: https://doi.org/10.1016/j.brs.2018.05.006.

POST-CONCUSSIVE LIGHTHEADEDNESS, VERTIGO, AND SYMPTOM DURATION

Dizziness is a frequent complaint after concussion but is nonspecific and is often reported as either lightheadedness or vertigo. This study was designed to determine the prevalence of post-concussive lightheadedness, and to determine its relationship to overall symptom duration.

This prospective, cohort study included patients, ages nine to 19 years, with a history of concussion during the prior 30 days. Subjects completed two symptom questionnaires, one at the time of the concussion and then another on the day of evaluation. Subjects rated the severity of 23 post-concussion symptoms, including lightheadedness and vertigo.

The 510 subjects had a mean age of 13.9 years and a mean interval from concussion to evaluation of 9.7 days. From the day of injury, more subjects recalled a sensation of lightheadedness (70.8%) than of

vertigo (48.6%) (p<0.001). At clinic evaluation, more subjects also reported lightheadedness (47.1%) than vertigo (24.1%) (p<0.001). Mean symptom ratings for both lightheadedness and vertigo improved from injury to evaluation. Post-concussive symptom duration was influenced by reports of dizziness/fogginess, including lightheadedness (p=0.028). The duration of post-concussive symptoms was greater among females (p=0.04) and among those with emotional symptoms recalled from the date of concussion (p=0.028), dizziness/fogginess, symptoms which include lightheadedness (p=0.007) and cephalalgic symptoms reported on the day of the evaluation (p<0.001).

Conclusion: Lightheadedness is more frequently reported than vertigo after concussion. Lightheadedness, along with vertigo and balance difficulties, are associated with a longer duration of overall post-concussive symptoms.

Heyer, G., et al. Lightheadedness after Concussion: Not All Dizziness is Vertigo. **Clin J Sport Med.** 2018, May; 28(3): 272-277.

MEDICATION OVERUSE HEADACHE DISABILITY

Medication overuse headache (MOH) is defined as a headache 15 or more days per month, associated with the overuse of acute headache medications. This study evaluated headache related disability in MOH and identified predictors for successful self-detoxification.

This large, cross-sectional population-based study included 30,000 patients, ages 30 to 44 years, drawn from the general population in Norway. Potential subjects included 935 persons with self-reported chronic headache, of whom 633 were interviewed by a physician experienced in the treatment of headaches.

During the interviews, information was given about the role of medication overuse in chronic headaches, informing the patient that in some cases reducing the medication could improve their symptoms. Successful self-detoxification was defined as medication withdrawal and reversion to episodic headache. After the interview, patients completed questionnaires including information on socio-demographics, height, weight, smoking status, medication overuse, headache frequency and psychological symptoms. All were given the migraine disability assessment (MIDAS) to measure headache related disability. Interviews were conducted an average of 1.5 years later to reassess for medication overuse headaches

Of the initial group, 108 were available for follow-up. Of those, 44 were free of MOHs, 38 were described as detoxified, but still had chronic headaches and 25 still had MOHs. Only those cured of MOH had a significant reduction in headache intensity. In a multivariate, linear regression, variables positively associated with a high headache frequency included being without a migraine at baseline (p=0.009), a high baseline headache frequency (p=0.023), and high baseline psychological distress (measured by the Hopkins Symptom Checklist 25).

Conclusion: This study of patients with medication overuse headaches found that these headaches cause substantial disability and that self-detoxification could lead to a reduction in headache frequency and disability.

Christopherson, E., et al. Medication-Overuse Headache, Detoxification Reduces Headache Disability: The Akershus Study of Chronic Headache. **Euro J Neurol**. 2018, May; 25(5):756-794.

PROGRESSIVE AEROBIC INTERVAL TRAINING IN CARDIAC REHABILITATION

Studies of adults with stable coronary artery disease (CAD) have found that aerobic interval training (AIT) is more effective than moderate intensity continuous exercise (MICE) for increasing aerobic capacity. This study assessed the effects of AIT on health outcome measures in patients with CAD.

This retrospective study included consecutive patients with documented CAD who entered a six-month cardiovascular rehabilitation (CR) program. All underwent a complete physical examination, including labs, a cardiopulmonary exercise assessment and a test of depression, administered at baseline and then at three and six months after completion. Of the 7,726 patients enrolled, 6,554 were prescribed MICE at both the initial and final exercise prescriptions. The remaining 1,172 were prescribed MICE at their initial prescription but ended with a prescription AIT. Patients in the MICE group were initially prescribed walking for approximately 1.6 km at 60% intensity based on $\dot{V}O_{2peak}$ and progressed biweekly to longer distances and higher intensities. Subjects in the AIT group were initially prescribed walking for 1.6 km at 60% intensity but progressed to walking/jogging intervals.

Compared with the MICE group, the AIT group demonstrated significantly greater improvement in resting heart rate, with elevated peak heart rate, distance, time peak workload achieved, and the primary outcome measure of the $\dot{V}O_{2peak}$ (p< 0.001 for all). In addition, the AIT group realized greater improvements in body mass index (p<0.001), hip girth (p<0.001), abdominal girth (p<0.001), triglycerides(p=0.01), and depression scores (p<0.001).

Conclusion: This study of patients in a cardiac rehabilitation program found aerobic interval training to be superior to traditional cardiac rehabilitation for improving aerobic exercise capacity.

Lee, L., et al. The Effectiveness of Progressive Aerobic Interval Training and Cardiac Rehabilitation. **Med Sci Sport Exercise.** 2018, May; 50(5): 881- 888.

EFFECT OF EXERCISE ON PAIN SENSITIVITY

Aerobic or weight lifting exercise has been noted to reduce pain sensitivity, an effect termed exercise induced hypoalgesia. This study evaluated whether short bouts of maximal anaerobic exercise would result in analgesic effects on induced pain and whether noxious stimulus at one location could lead to reduced perceptions of pain in another location.

Fifty health individuals were randomized to either a control group or the Wingate Anaerobic test (WAT) group. The WAT involved 30 seconds of maximum effort pedaling on stationary bikes. Immediately after performing the WAT, participants were asked to verbally rate their leg muscle pain using the 0–100 NPS, and then tested for heat, cold and pressure induced pain. The effect of stimuli at two sites on perceived pain was measured by applying noxious stimuli at a remote body part while perceived pain to a separate noxious stimulus was measured. The aerobic group was compared to the control group.

Compared to the controls those in the WAT had decreased ratings of their perceived pain to heat and cold stimuli (p<0.001), had higher pain

pressure thresholds (p<0.001), and had decreased pain at measured sites when distal noxious stimuli were applied (p=0.029).

Conclusion: This study suggests that engagement in 30 seconds of maximal anaerobic effort will lead to acute analgesic effects.

Samuelly-Leichtag, G., et al. A Fast Track to Hypoalgesia – The Anaerobic Exercise Effect on Pain Sensitivity. **Int J Sports Med.** 2018; 39:473-481.

PREDICTING FUNCTIONAL OUTCOME IN LOWER LIMB AMPUTEES

It is well known that lower limb amputations have a substantial impact on a patient's physical capabilities and quality of life. This study was designed to develop a preoperative scoring tool to predict the probability of ambulation among patients receiving a lower limb amputation.

The authors identified variables suggested in the literature as being important to the functional outcomes of patients with amputations. Eight, preoperative variables were identified as potentially affecting the success of rehabilitation. These included, younger age (progressively scored as less likely to walk in age categories of 50 to 64, 65 to 74, 75 to 80 and over 80), male gender, lower body mass index (with scores worsening at 25 to 30 kg/m^2, 18.5 kg/m^2 or less and 40 kg/m^2 or greater), more distal amputation, trauma patients (with worse scores for amputations related to cancer, orthopedic and vascular), fewer medical comorbidities, (myocardial infarct, stroke, renal failure and severe respiratory disease), higher mobility pre-amputation and lack of cognitive impairment. A scoring system was created to reflect these variables.

Using the scoring system proposed in this tool, named the BLART tool, those with a score of 13 or above did not achieve a good functional outcome, and those with a score of 17 or more did not achieve any walking function.

Conclusion: This tool suggests that the BLART tool may be effective in providing an estimate of prognosis for pre-surgical lower limb amputation.

Bowrey, S., et al. Development of a Scoring Tool (BLART Score) to Predict Functional Outcome in Lower Limb Amputees. **Disabil Rehab**.2018 DOI:10.1080/09638288.2018.1466201.

CARDIORESPIRATORY FITNESS THROUGH E-BIKE AND CONVENTIONAL BICYCLE COMMUTING

Electrically assisted bicycles (e-bikes) have becoming increasingly popular in the past decade, particularly along the elderly who would normally have difficulties with regular bicycles. This study investigated the cardiovascular benefits of e-bikes.

Subjects were recruited from governmental offices who were 18 to 50 years of age, with a body mass index of 25 to 35 kg/m^2, and who conveyed a willingness to commute to work by bicycle. The participants were randomized to either a conventional bicycle group or an e-bike group, and were asked to commute to work at a self-chosen speed at least three days per week for four weeks. All subjects were assessed at baseline for height, body mass, blood pressure, electrocardiogram results and $VO2_{peak}$. The primary outcome variable was the change in $VO2_{max}$. Secondary measures included resting heart rate, systolic and diastolic blood pressure and body mass index (BMI).

The $VO2_{max}$ improved by a mean of 3.6 mL/kg-min in the e-bike group, and 2.2 mL/kg-min in the conventional bike group (p=0.327). Improvements were seen in both groups in systolic blood pressure, diastolic blood pressure and body mass index, with no significant difference between the two groups.

Conclusion: This study demonstrates that the use of electric assisted bicycles for daily commuting to work can produce cardiovascular gains similar to those achieved by commuting with a conventional bicycle.

Hochsmann, C., et al. Effect of E-Bike versus Bike Commuting on Cardiorespiratory Fitness in Overweight Adults: A Four-Week, Randomized Pilot Study. **Clin J Sport Med.** 2018; 28(3): 255-261.

SEVERITY OF GASTROINTESTINAL BLEEDING IN PATIENTS TREATED WITH DIRECT-ACTING ORAL ANTICOAGULANTS

Direct-acting oral anticoagulants (DOACs) have recently been approved for stroke prevention in nonvalvular atrial fibrillation as well as venous thromboembolism cases. DOACs are increasingly preferred over warfarin due to predictable pharmacodynamics, lack of required monitoring and superior outcomes. DOACs are associated with an increased incidence of gastrointestinal (GI) bleeding compared with warfarin, but few data exist concerning the source and severity of the GI bleeding in patients treated with DOACs.

This retrospective study included the medical records of patients at the authors' institution with GI bleeding (n=8496) from 2010 through 2016. Of these, 61 patients had GI bleeding while being treated with DOACs and 123 while taking warfarin. These cases were compared to a control group of 296 patients with GI bleeding who were not receiving anticoagulation treatment.

Among the 480 patients studied, no significant difference was seen in the source of bleeding between the three groups (patients taking DOACs, warfarin or no anticoagulation). The DOAC group had fewer hospitalizations (p=0.003) fewer days hospitalized (p=0.007) and required fewer transfusions (p=0.008) than did the warfarin group. The DOAC and control groups were not statistically different for all outcomes. No significant differences in mortality were found among the three groups.

Conclusion: Despite evidence showing a greater incidence of gastrointestinal bleeding in patients taking direct-acting oral anticoagulants (DOACs), as compared to those taking warfarin, this study suggests that such bleeding in patients taking DOACs may be less severe.

Brodie, M., et al., Severity of Gastrointestinal Bleeding in Patients Treated with Direct-Acting Oral Anticoagulants. **Am J Med**. 2018, May; 131(5): 573.e9-573.e15.

CORTICOSPINAL EXCITABILITY AND HAND MOTOR RECOVERY AFTER STROKE

Approximately half of stroke victims retain permanent motor deficits despite rehabilitation. This study evaluated the changes in cortical excitability in relation to motor recovery of an affected hand after stroke.

Subjects were patients with ischemic lesions in the middle cerebral artery territory, with mild to severe sensory-motor deficit of an upper limb, and no contraindication

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*Kenton Hagan, M.D.
Alyssa Marulli, M.D.
Tulsi Singh, M.D.
Univ. of Pennsylvania, Philadelphia, PA

*Anna Coles, M.D.
University of Washington, Seattle, WA

*Puneet Ralhan, M.D.
Caroline Lee, M.D.
Steven Mann, M.D.
Suny Downstate Med. Ctr., Brooklyn, NY

Executive Editor Emeritus
Donald F. Langenbeck, Jr., M.D.

Subscription Manager
Michael P. Burke, M.S.

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for transcranial magnetic stimulation (TMS). Hand motor function was evaluated with the Wolf Motor Function Test (WMFT) and the Action Research Arm Test (ARAT). Corticospinal excitability was evaluated with resting motor threshold (rMT) and motor evoked potentials (MEP).

Improvements in the WMFT over the first three weeks directly correlated with baseline hand function as assessed by the ARAT (p=0.005) and the WMFT (p=0.003). At the end of seven weeks, increases in ipsilesional MEP at the abductor pollicis brevis were associated with an increase in ARAT scores (p=0.019). No significant relationship was found between contralesional corticospinal excitability and hand motor recovery.

Conclusion: This study suggests that favorable motor recovery of the hand after stroke is associated with an increase in ipsilateral corticospinal excitability during the recovery period after stroke.

Veldema, J., et al. Cortico-Spinal Excitability and Hand Motor Recovery in Stroke: A Longitudinal Study. **J Neurol**. 2018, May; 265(5): 1071-1078.

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