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PERFORMANCE ENHANCING MICROBE

The microbiomes of athletes have been found to contain distinct intestinal microbial compositions, often defined by an elevated abundance of several bacteria. This animal study assessed the effect of one of these bacteria, *Veillonella atypica* (*V. atypica*), on run time performance.

In an AB/BA crossover mouse experiment spanning two weeks, the animals were randomized to a control group (*Lactobacillus bulgaricus*; n=16) or a treatment group (*V. atypia*; n=16). The mice were administered either *V. atypica* or *L. bulgaricus* and were run to exhaustion five hours later. The change in run times between baseline and follow-up were compared between groups. In a second experiment, stool samples were assessed from ultramarathoners and Olympic trial rowers (n=87), both before and after exercise. To test whether the exercise-enhancing effects of *V. atypia* may be attributable, at least in part, to propionate, a separate group of animals were randomized to receive intrarectal propionate instillation (n=8) or saline vehicle (n=8), and were compared by run time performance.

Mice treated with *V. atypica* ran, on average, 13% longer than did the control group (p=0.020). Levels of inflammatory cytokines were significantly reduced in *V. atypia*-treated animals, compared with those of *L. bulgaricus* or phosphate buffered saline (PBS) treated subjects. In the ultramarathon and rower cohorts, the analysis identified a group of gene families with differential relative abundance, pre- and post-exercise, which represented every step of the enriched methylmalonyl-CoA pathway (p=0.00147). The proprionate instilled mice had significantly longer run times than the placebo group (p=0.03).

Conclusion: This study identified a model wherein systemic lactate produced during exercise crosses to the gut lumen and is metabolized by *V atypia* into propionate in the colon, which, in turn, serves to promote performance on an endurance task.

Scheiman, J., et al. Meta-Omics Analysis of Elite Athletes Identifies a Performance-Enhancing Microbe that Functions via Lactate Metabolism. **Nat Med**. 2020, July; 25: 1104-1109.

NEUROLOGIC MANIFESTATION OF THE CORONAVIRUS

In December of 2019, a novel coronavirus was named COVID-19 by the World Health Organization (WHO). This study reports on characteristic neurologic manifestations in patients hospitalized with COVID-19.

This retrospective study was completed at three acute care sites in Wuhan, China. Subjects were diagnosed between January 16, 2020 and February 19, 2020. Radiologic assessments included chest and head CT, with all laboratory testing performed according to the clinical care needs of the patient. Neurologic manifestations were reviewed and characterized into three categories, central nervous system, peripheral nervous system and skeletal-muscular injury.

Data were available for 214 hospitalized patients with a mean age of 52.7 years with at least one of the following disorders, hypertension (23%), cardiac or cerebrovascular disease (14%) and malignancy (6.1%). Thirty-six percent had nervous system manifestations, including central nervous system (24.8%), peripheral nervous system (8.9%) and skeletal muscle injury (10.7%). Of those with central nervous manifestations, the most common were dizziness and headache. Of those with peripheral nervous system symptoms, the most common were taste impairment (5.6%) and smell impairment (5.1%). Neurologic manifestations occurred more often among those with severe infection and included cerebrovascular diseases, impaired consciousness and skeletal muscle injury.

Conclusion: This study of hospitalized patients in Wuhan, China, found that 36% had nervous system manifestations.

Mao, L., et al. Neurologic Manifestations of Hospitalized Patients with Coronavirus Disease-2019 in Wuhan, China. **JAMA Neurol**. 2020. doi:10.1001/jamaneurol. 2020.1127.

NON-PHARMACOLOGICAL INTERVENTIONS FOR FATIGUE

Both pharmacologic and nonpharmacologic interventions have been used to alleviate fatigue in older adults, with these including oral L carnitine and acetyl l-carnitine, yoga, physical exercise, cognitive behavioral therapy, intermuscular magnesium, oral melatonin, a vegetarian diet and medications such as corticosteroids. This literature search was designed to better understand the efficacy of nonpharmacologic treatments for fatigue in elderly individuals.

A literature search was completed for studies of community dwelling adults 60 years of age or older. Included studies used nonpharmacologic intervention for fatigue and compared this effect with a control. The initial search yielded 1,842 articles, among which seven were randomized, controlled trials, including a total of 1,093 participants. Treatments found in at least one of the studies included mindfulness meditation, a behavioral lifestyle program, muscle relaxation, art therapy and yoga. Two studies investigated tai chi, and two investigated cognitive behavioral therapy.

Significant improvement in fatigue was found in those treated with mindfulness meditation, muscle relaxation, yoga, tai chi and cognitive behavioral therapy. No effect on fatigue was found from treatment with

behavioral lifestyle programs or pet-insect assisted therapy. The effect on fatigue of cognitive behavioral therapy, and tai chi, persisted at three and 12 months, while yoga had no long-term effects. A subgroup analysis revealed that cognitive/ mental interventions were superior to physical interventions for reducing fatigue.

Conclusion: This literature review and meta-analysis found that nonpharmacologic interventions, especially cognitive interventions, were effective in reducing the subjective complaint of fatigue.

Ho, L., et al. Non-Pharmacological Interventions for Fatigue in Older Adults: A Systematic Review and Meta-Analysis. **Age Aging**. 2020, March; 49(3): 341-351.

STEROID INJECTIONS AND RISK OF KNEE ARTHROPLASTY

Studies dealing with the long-term complications of intra-articular injections have reported contradictory findings. This study was designed to better understand whether corticosteroid injections (CI) of the knee increase the risk of undergoing arthroplasty.

Data were obtained from the Osteoarthritis Initiative (OAI) database, a longitudinal, cohort study involving patients with, or at risk of developing, OA of the knee. Data for this study were collected from February of 2014 to May of 2016, including subjects 49 to 79 years of age, and included demographic, medical and OA specific treatment data. Those who received at least one CI were compared to those who had not (Control group). The patients were followed for up to nine years.

Of the 3,022 patients included, 31.3% received CIs. During follow-up, arthroplasties were performed in 31% of the CI group, and in five percent of the control group. Compared to the control group, the hazard ratio for arthroplasty for the CI group was 1.57. Each injection increased the risk of arthroplasty by 9.5% over the nine years of the study.

Conclusion: This study found that intra-articular corticosteroid injections are associated with an increased risk of arthroplasty among patients with, or at risk of developing, symptomatic osteoarthritis.

Wijn, S., et al. Intra-Articular Corticosteroid Injections Increase the Risk of Requiring Knee Arthroplasty. **Bone Joint J**. 2020, May; 102-B (5): 586-592.

PHYSICAL THERAPY VERSUS STEROIDS FOR KNEE OSTEOARTHRITIS

Osteoarthritis (OA) of the knee is one of the leading causes of disability. While intra-articular glucocorticoid injections are commonly used as a primary treatment for OA of the knee, evidence suggests that this medication may lead to deterioration of the cartilage within the knee. This study compared the efficacy of glucocorticoid injections with that of physical therapy (PT) in patients with OA of the knee.

Eligible patients were 38 years of age or older, presenting to one of two large military hospitals from October of 2012 through May of 2017. All had OA of the knee. The subjects were randomly assigned to undergo clinical PT or glucocorticoid injections. The intra-articular injections included one mL of 40 mg per mL of triamcinolone and seven mL of one percent lidocaine. During PT sessions, the physical therapist would implement hands-on, manual techniques immediately before the patient performed reinforcing exercises. The participants were assessed at baseline and at follow-up with the Western Ontario and McMaster University Osteoarthritis (WOMAC) index and Global Rating of Change Scale questionnaires. The primary outcome was the total WOMAC score follow-up.

At one year, WOMAC scores were 55.8 in the glucocorticoid group and 37.0 in the PT group, with significantly greater improvement in the PT group (p=0.0008). In a prespecified analysis, 10.3% of the PT group and 25.6% of the glucocorticoid group did not have improvement from baseline of at least 12% in WOMAC scores, deemed the clinically important difference.

Conclusion: This study of patients with osteoarthritis of the knee found that, at one-year post-intervention, physical therapy was superior to glucocorticoids for improving function.

Deyle, G., et al. Physical Therapy Versus Glucocorticoid Injection for Osteoarthritis of the Knee**. N Engl J Med.** 2020, April 9; 382(15): 1420-1429.

PLATELET RICH PLASMA VERSUS HYALURONIC ACID FOR KNEE OSTEOARTHRITIS

Osteoarthritis (OA) is a leading cause of chronic disability worldwide. Debate persists regarding whether Platelet-Rich Plasma (PRP) or Hyaluronic Acid (HA) is the superior nonoperative treatment for knee OA. This literature review and meta-analysis evaluated the short-term clinical outcomes of patients with knee OA who received intramuscular injections of either PRP or HA.

After a systemic literature review, the authors chose 18, randomized, controlled trials involving patients with knee OA, with combined data for 811 patients treated with PRP and 797 treated with HA knee injections. The mean time to follow-up was 11.1 months. The subjects were assessed using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), a visual analog scale (VAS) for pain, and the Subjective International Knee Documentation Committee (IKDC) scale.

The WOMAC scores improved by means of 44.7% in the PRP group and 12.6% in the HA group. In six of 11 studies utilizing a VAS, patients receiving PRP reported less pain at follow-up than did those receiving HA ($p<0.05$). Three of six studies reported that the PRP cohort had better IKDC scores at follow-up than did the HA cohort ($p<0.05$).

Conclusion: The conclusions drawn by this systemic review suggest that patients undergoing PRP injections can be expected to have better clinical outcomes in the short term when compared to patients receiving hyaluronic acid injections.

Belk, J., et al. Platelet-Rich Plasma versus Hyaluronic Acid for Knee Osteoarthritis: A Systematic Review and Meta-analysis of Randomized, Controlled Trials. **Am J Sports Med**. 2020 Apr 17. doi: 10.1177/ 0363546520909397.

DUAL TASK GAIT RECOVERY AFTER CONCUSSION

Recent studies have suggested that gait assessments objectively identify post-concussion deficits, particularly under dual task conditions. This study examined independent associations between gender and post-concussive gait recovery among collegiate athletes.

This prospective, longitudinal study included collegiate athletes evaluated at multiple points after a sport-related concussion. All were diagnosed with a concussion and were initially evaluated within seven days of injury and reevaluated at 1.5 and 4.5 months. All subjects completed a single task and a dual task gait assessment.

During single-task trials, participants only completed the walking task, whereas during dual-task trials, they walked and concurrently completed one of three cognitive tasks (five letter word backwards, serial subtraction from a two-digit number by 6 or 7's, or reverse math recitation). Gait during each task was quantified using three inertial sensors attached to the subject. The primary outcome measure was gait velocity.

Subjects were 94 athletes of whom 50% were female. In the controlled analysis, in the single task gait recovery, gender was not independently associated with height-adjusted, single task gait velocity recovery. In the dual task gait recovery trial, as compared to females, males demonstrated longer recovery time after controlling for potential confounders (hazard ratio 2.43)

Conclusion: This study of collegiate athletes found that male athletes required more time after a concussion to achieve dual task gait recovery than do female athletes.

Howell, D., et al. Dual-Task Gait Recovery after Concussion among Female and Male Collegiate Athletes. **Med Sci Sports Exerc**. 2020. doi: 10.1249/MSS.0000000000002225.

BLOOD PRESSURE AND LATER LIFE COGNITION AMONG BLACK AND WHITE INDIVIDUALS

Older black individuals are twice as likely as older white individuals to have cognitive impairment and dementia (CID), including Alzheimer's disease and related dementias. This study assessed the contribution of different levels of blood pressure to this difference in dementia between racial groups.

Data were obtained from five, prospective, cohort studies which included repeated measures of blood pressure and cognition. These included the Atherosclerosis Risk in Community Study, The Coronary Artery Risk Development in Young Adults Study, The Cardiovascular Health Study, The Framingham Offspring Study and the Northern Manhattan Study. Trained staff measured cognition using validated cognitive tests. Systolic blood pressure measurements were summarized as the time dependent mean of cumulative blood pressures before each cognitive measurement.

The sample included 19,378 participants, of whom 80.1% were white. During a median follow-up of 12.4 years, compared with the white cohort, those in the black cohort had significantly faster declines in global cognition ($p<0.004$) and faster declines in memory ($p<0.001$). After adjusting for cumulative mean systolic blood pressure, the differences between black and white individuals were no longer statistically significant. Interestingly, the decline in executive function was faster in the white cohort than that in the black cohort ($p<0.001$).

Conclusion: This study found that the faster later life cognitive decline in black, as compared to white, adults can, to a great extent, be attributed to differences in cumulative systolic blood pressure.

Levine, D., et al. Association Between Blood Pressure and Later Life Cognition Among Black and White Individuals. **JAMA Neurol**. 2020. doi:10.1001/jamaneurol.2020.0568.

HIGH FREQUENCY EXTERNAL MUSCLE STIMULATION AND DEPRESSION

Late life depression increases with age and is the leading cause of geriatric psychiatric morbidity. As epidemiologic studies have shown that low muscle strength is associated with more depressive symptoms, this study assessed the efficacy of high-frequency electrical muscle stimulation (EMS) for the treatment of depressive symptoms.

This Chinese study included military veterans, 60 years of age or older, all without neurologic disease or major psychological conditions. Those veterans were randomized to receive high-frequency EMS treatment or a control treatment, three times a week for 12 weeks. For the active treatment, EMS electrodes were placed on the femoral muscles, with impulses at 32,768 Hz, <350mA and <70V, adjusted for comfort. In the sham condition, the participants underwent the same procedure, with electrodes not connected to the electrical source. The subjects were evaluated with the Geriatric Depression Scale (GDS), the

Hamilton Depression Rating Scale (HAMD), the Hamilton Anxiety Rating Scale (HAMA) and the University of California Los Angeles Loneliness Scale. Muscle strength was assessed at baseline and every two weeks thereafter.

After 12 weeks, the treatment group demonstrated improvements from baseline by 58% on the GDS, 55% on the HAMD and 54% on the HAMA. The control group showed no significant changes in depression, anxiety or loneliness. Group comparisons revealed significantly greater improvements on the GDS (p=0.009), HAMD (p=0.007) and the HAMA (p=0.008) for the treatment group. Significant improvements in muscle strength were noted in the treatment group, but not in the control group, for the ankle dorsiflexors, quadriceps femoris and gluteus maximus.

Conclusion: This prospective, clinical, pilot trial found that high frequency EMS can reduce symptoms of depression and anxiety in older, male veterans.

Liu, M., et al. High-frequency, External Muscle Stimulation Reduces Depressive Symptoms in Older, Male Veterans: A Pilot Study. **J Geriatr Psychiatry Neurol.** 2020: 1-9.

EXERCISE WITH ELECTROPHYSICAL MODALITIES FOR KNEE OSTEOARTHRITIS

Supported by high-quality evidence, exercise therapy is currently indicated as the main intervention for knee osteoarthritis (OA). This study assessed the efficacy of several modalities as adjuncts for the management of knee OA.

This prospective, double-blind, randomized controlled trial included 100 participants between 40 and 80 years of age with knee OA. The participants were divided into five groups: exercise, exercise plus placebo, exercise plus interferential current therapy (ICT), exercise plus shortwave diathermy therapy (SDT), and exercise plus photobiomodulation (PHOTO). Exercises were performed in 90-minutes sessions, three times a week for eight weeks, at 70% of the maximum painless repetition.

Those in the ICT group received ICT at 4 kHz, 1/1 s sweep mode, 75-Hz frequency modulation amplitude (FMA), 25-Hz delta FMA, for 40 min. Those in the SWD group received thermopulse at 27.12-MHz frequency and 150-W input for 20 minutes. Those in the PHOTO group were treated at a dose of 6 J/cm2 applied on eight points, with a total dose of 48 J/cm^2 at each session. The primary outcome measure was performance on the Physical Function subscale of the WOMAC.

All groups demonstrated significant improvement ($p<0.05$) in all outcome variables over time, except for the pressure pain threshold. Better WOMAC scores were achieved by the exercise group, as compared to all other groups. Compared to the exercise plus placebo group, only results for the exercise plus ICT group reached statistical significance ($p<0.05$).

Conclusion: This study of patients with osteoarthritis of the knee who were engaged in therapeutic strength training did not find additional benefits by supplementing exercise with electrophysiologic modalities.

de Paula Gomes, C., et al. Exercise Program Combined with Electrophysical Modalities in Subjects with Knee Osteoarthritis: A Randomized, Placebo-Controlled, Clinical Trial. **BMC Musculoskelet Disord.** 2020, April 20; 21(1):258. doi: 10/1186/s12891-020-03293-3.

PERIODIZED TRAINING AND INTRAMUSCULAR FAT

Circuit training (CT) is a combined exercise strategy incorporating both multi-joint resistance training and calisthenics to maintain an elevated heart rate during the training session. This study assessed the effect of periodized circuit training (PCT) on muscle strength and intramuscular fat in patients with osteoarthritis (OA) of the knee.

The subjects were 40 to 65 years of age, all diagnosed with knee OA. At baseline, the participants were evaluated for strength and, by CT, for muscle quality and fat content. The subjects were randomized to; receive PCT, to participate in strength training (ST) at three sessions per week for 14 weeks or to an educational protocol (EP). For the PCT group, exercises were arranged in a circuit model: upper body, lower body, and trunk and global exercises, and were stratified according to the stress intensity levels. The ST protocol included exercises at 50% of the one repetition maximum (1 Rep Max) for the quadriceps and hamstrings and 25% of the 1 Rep Max for the hip abductors and adductors. The education protocol occurred twice per month in 60-minute sessions for 14 weeks.

Compared with baseline, changes in knee extension strength were +21% ($p=0.024$) in the PCT condition +28% in the ST ($p<0.001$) and -4% in the education group. The VAS pain scores improved by 74.89% ($p<0.001$) in the PCT group, 72.4% in the ST group ($p<0.001$) and 3.27 % in the EP group. Reductions in intramuscular fat were 16% in the PCT group and six percent in the EP group ($p=0.032$).

Conclusion: This study of patients with knee osteoarthritis, found that both strength training and periodized (circuit) training were effective in increasing strength and reducing pain, periodized training was superior for reducing intramuscular fat.

de Almeida, A., et al. A Periodized Training Attenuates Thigh Intramuscular Fat and Improves Muscle Quality in Patients with Knee Osteoarthritis: Results from a Randomized, Controlled Trial. **Clin Rheumatol**. 2020; 39: 1265-1275.

TESTOSTERONE AND PERFORMANCE IN YOUNG WOMEN

Androgens are considered beneficial for athletic performance due to potent anabolic effects on muscle mass and bone tissue. This study investigated the effects of moderately increased testosterone on the physical performance and body composition of young, healthy, physically active women.

This prospective, double-blind, placebo-controlled trial recruited healthy women, 18 to 35 years of age, all with moderate to high, self-reported recreational physical activity. The subjects were randomly assigned to a placebo group or to a testosterone group, the latter receiving 10 mg testosterone cream, applied topically once per day for ten weeks. Baseline data included fasting blood samples, body composition, body hair growth and physical performance. The primary outcome measure was aerobic performance, as measured by running time to exhaustion (TTE).

At ten weeks, the active treatment group had a mean testosterone level 4.8 times higher than the baseline level. Body fat percentage decreased significantly in the testosterone group but did not differ over time in the placebo group. Running time to exhaustion increased by 8.5% in the

active group and was significantly more improved as compared to the placebo group (p=0.045). In the testosterone group, 58% of the women reported increased acne compared with 25% in the placebo group.

Conclusion: This prospective trial involving young, athletic females demonstrates that a short-term moderately increased testosterone level can improve aerobic performance and result in a leaner body composition and an increase in muscle mass, without an increase in body weight.

Hirschberg, A., et al. Effects of Moderately Increased Testosterone Concentration on Physical Performance in Young Women: A Double-Blind, Randomized, Placebo Controlled Study. **Br J Sports Med**. 2020, May; 54(10): 599-604.

PELVIC FLOOR EXERCISES FOR FEMALE ATHLETES

Female athletes are predisposed to stress urinary incontinence and is related to the frequency to which the athlete is subjected to increased intra-abdominal pressure. This study evaluated the efficacy of pelvic floor muscle training on urine loss during athletic performance.

Subjects were 13 elite female volleyball athletes, 18 years of age or older, randomized to a control group or to an experimental group. Those in the experimental group underwent daily pelvic floor muscle training at home, as well as one-on-one exercise training and education sessions. At baseline and follow-up, all subjects were assessed for vaginal resting pressure and the maximum vaginal contraction (MVC) using a manometer. A pad test quantified urine loss during testing, and a King's Health Questionnaire was given to assess the impact of urinary incontinence on the athletes' quality of life.

The mean MVC increased significantly in the experimental group, with no significant change in the control group ($p<0.001$). For the pad test, compared to baseline, a significant reduction in mean urine loss was found in the exercise group, with no such change in the control group (p=0.039).

Conclusion: This randomized, controlled trial found that pelvic floor exercises reduced urine loss among female college athletes.

Pires, T., et al. Pelvic Floor Muscle Training in Female Athletes: A Randomized, Controlled, Pilot Study. **Intern J Sports Med**. 2020; 41(4): 264-270.

DOG ACQUISITION AND PHYSICAL ACTIVITY AND CARDIOMETABOLIC HEALTH

A recent study found that almost 28% of adults worldwide are insufficiently active. While numerous studies have suggested that dog owners perform more physical activity than do non-owners, data have been essentially cross-sectional. This prospective study investigated changes in physical activity patterns following the acquisition of a dog.

Subjects were self-selected to one of three groups, those who were to acquire a dog within one month of baseline measures (dog acquisition), those interested in dog ownership, but delaying acquisition for the duration of the study (delayed acquisition) and those expressing no interest or plans to acquire a companion dog (control). Data were collected at baseline, and again at three and eight months, including self-reported walking levels, blood pressure, resting heart rate and VO_2 max. Accelerometers were used to record physical activity patterns.

Significant increases in mean daily steps were noted in the dog acquisition group, with an additional 2,589 steps per day in the first three months after acquiring the dog (p=0.004). In addition, the dog acquisition group increased sit to stand transitions by mean of 8.2 per day (p=0.03). However, this increase was not maintained at eight months. The delayed acquisition group increased mean daily steps by 1,396 steps at eight months, although this finding did not reach statistical significance. Dog acquisition did not affect measures of blood pressure, resting heart rate or VO_2 max.

Conclusion: This study found that the acquisition of a dog may significantly increase the daily physical activity of the owner.

Powell, L., et al. Does Dog Acquisition Improve Physical Activity, Sedentary Behavior and Biological Markers of Cardio Metabolic Health? Results from a Three-Arm, Controlled Study. **BMJ Open Sport Exerc Med.** 2020; 6:e000703. doi:10.1136/bmjsem-2019-000703.

OLIVE OIL AND CARDIOVASCULAR RISK

Cardiovascular disease (CVD) is a leading cause of global death, thought to be largely preventable with a healthy lifestyle. Early studies have reported an inverse association between the average country level of olive oil consumption and the risk of CVD. This study was designed to better understand the associations between olive oil intake and the risk of CVD in the U.S. population.

Data were reviewed from two large, prospective studies, the Nurses Health Study (nurses 30 to 55 years of age in 1976 (NHSI) or 25 to 42 years of age in 1989 (NHSII)) and the Health Professionals Follow-Up Study (male health professionals 40 to 75 years of age in 1989). The baseline for this study took place in 1990, when olive oil consumption was first included as part of the food frequency questionnaires.

Olive oil intake was assigned to one of four categories: 1) never or less than once per month; 2) >0 to 1 teaspoon (>0 to 4.5 g/day); 3) >1 teaspoon to 0.5 tablespoon (>4.5 to 7 g/day); and 4) >0.5 tablespoon (>7 g/day).The primary outcome variable was major CVD, with other outcome variables including total coronary heart disease, total stroke and fatal cardiovascular disease.

Over 24 years of follow-up, 9,797 incident cases of CVD were identified. An adjusted analysis revealed that those in the highest category of olive oil intake (> 0.5 tablespoon per day) had a 14% lower risk of CVD, as compared to those in the lowest category. A pooled, fully adjusted analysis indicated that each five gram per day increase in olive oil consumption was associated with an eight percent lower risk of fatal cardiovascular disease and a four percent lower risk of nonfatal cardiovascular disease.

Conclusion: This large study of U.S. men and women found that a higher intake of olive oil is associated with a significantly lower risk of both cardiovascular disease and coronary heart disease.

Guasch-Ferre, M., et al. Olive Oil Consumption and Cardiovascular Risk in U.S. Adults. **J Am Coll Cardiol.** 2020; 75(15): 1729-1739.

MODERATE PHYSICAL ACTIVITY AND T-CELL RATIO

Age is often accompanied by impaired ability to mount a robust

immune response, termed immunesenescence. Among the hallmarks of immunesenescence are an inverted CD4/CD8 ratio, the accumulation of memory and senescent T cells and the accumulation of memory B cells. This study explored the beneficial effect of moderate physical activity on T and B cell immune parameters in healthy, older adults.

Physical activities were assessed in 211, healthy, older participants using accelerometers for seven days. Twenty-five of the most physically active men and women, who took 10,500 to 15,000 steps per day, were matched for age and gender to 25 of the least physically active individuals (1,500 to 4,580 steps per day). Venous blood was drawn, with serum frozen for later cytokine analysis.

No significant difference was observed in the CD4/CD8 ratio between the two groups (p=0.71). However, the physically active group had a significantly higher frequency of circulating naïve CD4 T cells (p=0.01) and a lower frequency of total memory CD4 T cells (p=0.01). These findings resulted in a significantly greater ratio of naïve/memory CD4 T cells in the physically active group (p=0.01). Interleukin-15 and interleukin-7, which act as lymphocyte survival factors, were significant higher in physically active older adults (p=0.003, p=0.02 respectively). A positive association was observed between circulating naïve CD4 T-cell frequency and interleukin-15 levels. In the CD8 T-cell subsets, a significantly higher naïve/memory CD8 T-cell ratio was noted in the physically active group (p=0.03).

Conclusion: This study found that moderate levels of physical activity can improve parameters of immune ageing.

Bartlett, D., et al. Moderate Physical Activity Associated with a Higher Naïve/Memory T-Cell Ratio in Healthy Older Individuals: Potential Role of Interleukin-15. **Age Aging.** 2020, May; 49(3): 368-373.

OPIOID AGONIST TREATMENT AND MORTALITY

Between 1990 and 2016 the total number of people dependent on opioids increased from 18.2 million to 26.8 million. Some data have suggested that opioid agonist treatment (OAT) may suppress illicit opioid use and reduce the risk of death. This study estimated the risk of mortality among those treated with OAT.

This retrospective cohort study linked five large databases in Canada to capture drug dispensation, hospitalizations, deaths and cause of death. In addition, all OAT recipients were identified. The risk of mortality within 1-12 weeks after each patient started and stopped OAT therapy were calculated.

Data were collected for 55,340 OAT recipients between January of 1996 and September of 2018. During that time, 12.7% of the recipients died. The risk of mortality was significantly lower during periods of OAT treatment than during periods off OAT treatment. The risk of mortality was highest in the week after stopping treatment for those prescribed both methadone and buprenorphine/naloxone. The risk ratios varied depending upon the opioid medication use.

Conclusion: This study found that, for patients with opioid use, opioid agonist treatment was associated with a substantially lower risk of mortality.

Pearce, L. Opioid Agonist Treatment and Risk of Mortality During Opoiod Overdose Public Health Emergency: Population Based Retrospective Cohort Study. **BMJ.** 2020; 368: m772.

EFFECT OF SLEEP ON CONSTRAINT-INDUCED MOVEMENT THERAPY

One of the most effective treatments of post-stroke upper extremity (UE) impairment is constraint-induced movement therapy (CIMT). As evidence suggests that sleep is important for motor skill acquisition and memory consolidation after injury to the brain, this study compared the efficacy of CIMT to circadian preferences and sleep quality.

Subjects were 154 patients who had sustained a recent stroke, each of whom had completed a 10-day post-stroke CIMT protocol. The CIMT training involved wearing a mitt on the unaffected limb during 90% of waking hours. Training of the affected UE comprised 150 min daily with 10 × 30 second repetitions for 10 consecutive weekdays, exclusively in the morning (7–10 a.m.). The effect of the intervention was assessed using a Motor Activity Log (MAL) and the Wolfe Motor Function test, completed before and after therapy. All subjects were administered the Morningness Eveningness Questionnaire (MEQ) to assess circadian preferences. From this test, patients were identified as morning, intermediate or evening types. Additional assessments included the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS) and the Berlin Questionnaire (BQ).

With therapy, all groups showed improvement in quality and quantity of the use of the affected UE, as well as in motor and functional ability, after CIMT ($p<0.01$). The morning and intermediate types perceived the quantity of their movement to be higher than did the evening group ($p<0.01$). In addition, those with PSQI scores of five or less (Good sleep quality) perceived the quality of their movement to be better than those with higher PSQI scores.

Conclusion: This study of stroke patients undergoing constraint-induced muscle therapy found that circadian preferences and sleep quality impact improvement in these patients' motor performance.

Pereira, D., et al. The Influence of Sleep Quality and Circadian Preferences on Upper Extremity Rehabilitation in Stroke Patients after Constraint-Induced Movement Therapy. **Int J Rehabil Res**. 2020, 43(1); 20-27.

GUT TO BRAIN AND BRAIN TO GUT IN PARKINSON'S

Studies have suggested that Parkinson's disease (PD) may begin in the gastrointestinal tract, and then spread to the brain via the vagus nerve. This theory is supported by experimental data showing that misfolded α-synuclein, the main component of Lewy bodies, can transfer from gut to brain after viral vector injection into the gastrointestinal (GI) tract. This study further investigated this pathological process.

Subjects were 14, healthy, adult Baboons, randomized to receive either intrastriatal or enteric (EN) injections of α-synuclein containing Lewy body extracts from patients with PD. Intrastriatal inoculations of Lewy body fractions were performed at two rostrocaudal levels of the motor striatum. Administration of GI Lewy bodies was performed by injection into the ventral walls of the stomach and duodenum. At 24 months post-injection all baboons were euthanized to assess for synucleinopathy using a monoclonal antibody. Inflammation was assessed in the striatum, entorhinal cortex and white matter of the non-Lewy body and Lewy body-injected animals.

At two years after administration, injections of Lewy body-enriched fractions in the EN led to striatal

dopaminergic loss, to the same extent as in striatum-injected animals. No change in α-synuclein immunoreactivity was observed in the vagus nerve in Lewy body-injected animals compared to age-matched controls

Conclusion: This animal study suggests that the general circulation, rather than the vagus nerve, serves as a route for the bidirectional transmission of endogenous α-synuclein between the enteric and the central nervous systems, further clarifying the gut-brain axis contribution to Parkinson's disease.

Arotcarena, M., et al. Bidirectional Gut to Brain and Brain to Gut Propagation of Synucleinopathy in Non-Human Primates. **Brain.** 2020, May; 143(5): 1462-1475.

KINESIOTAPE FOR ISOLATED RIB FRACTURE

Pain management of rib fractures can be a challenge for physicians. As kinesiotape (KT) has been used to treat various, painful, musculoskeletal conditions, this study evaluated the effect of KT for the acute treatment of rib fractures.

This prospective, quasi-randomized trial included patients presenting to the emergency department (ED) with three or fewer rib fractures. Consecutive patients were chosen, with alternating placement into a KT group or to a control group. Both groups received flurbiprofen 200mg/day, with the treatment group receiving KT applied in the ED. Pain intensity was assessed at baseline, within 15 minutes of KT application and then on the fourth day at a follow-up visit.

Of the 30 patients included in the study, 16 were assigned to the KT group and 14 to the control group. Compared with baseline, pain intensity at 15 minutes was significantly reduced in the KT group ($p<0.01$). In addition, compared with baseline, pain intensity on the fourth day was significantly reduced in both groups ($p<0.01$). The reduction in pain was significantly greater in the KT group than in the control group ($p<0.01$).

Conclusion: This study of patients seen in the emergency department for treatment of rib fracture pain found that Kinesiotape, when added to nonsteroidal anti-inflammatory medications, resulted in additional pain relief.

Akca, A., et al. Kinesiotaping for Isolated Rib Fractures in Emergency Department. **Am J Emerg Med.** 2020, March; 38 (3): 638-640.

SUBACROMIAL CORTICOSTEROID INJECTIONS

Although shoulder pain is the third most common musculoskeletal complaint, the sensitivity and specificity of clinical exam maneuvers present difficulties with diagnostic accuracy. This cadaveric study compared the localization and diagnostic accuracy of anterior and posterior approaches of subacromial corticosteroid injections.

Cadaveric shoulders without deformity were placed in the supine position. Using anatomical landmarks, subacromial injections were completed with 7 mL of a lidocaine-dye mixture. For the posterior approach, the needle was inserted one cm medial and two cm inferior to the posterior corner of acromion directed towards the subacromial space in an approximately 45° cephalad direction. For the anterior approach, the point of entry was one cm below the anterolateral corner of acromion directed towards the subacromial space. After ten minutes the shoulders were dissected to assess dye placement.

After injection, dye was found in the subacromial space of all 10 shoulders. All five of the shoulders injected from the anterior approach demonstrated extravasation of dye into the bicipital groove, while all five performed from the posterior approach demonstrated dye exclusively in the subacromial space, without extravasation.

Conclusion: This small cadaveric study found that posterior subacromial injections remain isolated in the subacromial space, while anterior injections spread into the bicipital groove.

Duraiswamy, G., et al. Posterior Subacromial Injections are Superior in Differentiating a Rotator Cuff from Bicep Pathology: A Cadaveric Study. **J Orthop.** 2020, April; (19): 89-92.

THE IMPACT OF BMI ON LUMBAR FUSION OUTCOMES

Lumbar fusion is a common treatment option in the management of lumbar spine degenerative disorders. Research has revealed that a higher preoperative body mass index (BMI) is associated with a higher risk of adverse events after fusion surgery. However, the data remain unclear concerning the role of BMI in postoperative, patient-reported outcome measures (PROMs). This study sought to determine the effect of BMI on outcome following lumbar fusion.

A retrospective analysis was performed on patients who underwent lumbar fusion between one to three levels. The Short Form-12 Physical Component Score, Mental Component Score, Oswestry Disability Index (ODI) and Visual Analog Scale Back and Leg pain scores were obtained to determine postoperative outcomes. Patients were stratified based upon BMI: class 1, BMI under 25.0; class 2, BMI 25.0 to 29.9; class 3, BMI 30.0 to 34.9; and class 4, BMI 35.0 or more. The outcomes were compared by weight class.

A total of 366 patients were included, with all demonstrating postoperative improvement in all categories ($p<0.001$), except for BMI class 4 on the Short Form-12 mental component. Class 4 patients also had worse scores on the ODI, as compared to groups 1 and 2. Both 30 - and 90-day readmission rates were similar between classes. Those in BMI class 4 had the highest revision rates, secondary to a higher incidence of surgical site infection ($p=0.014$)

Conclusion: This study of patients undergoing spinal fusion found that the majority of patients report improvement in PROMs after lumbar fusion surgery, irrespective of preoperative BMI. Patients with a BMI of above 35 had the highest rates of infection and the highest revision rate.

Divi, S., et al. How Does Body Mass Index Influence Outcomes in Patients after Lumbar Fusion? **Spine.** 2020 April. 45(8): 555-561.

LATE LIFE ALCOHOL CONSUMPTION AND LONGEVITY

Previous studies have suggested a J shaped curve relating alcohol to longevity, suggesting the lowest risk for light–moderate drinker. This study investigated relationship between alcohol intake in later life and the probability of reaching 90 years of age.

Data for this study were taken from the Netherlands Cohort Study a large population based prospective study. From these data, participants born in 1916–1917 were selected to form the longevity cohort. In 1986 this cohort was 68–70 years of age. Consumption of alcohol beverages was addressed by questions discussing the type of beverage, and

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the frequency and volume regularly consumed.

Among the original cohort, 16.7% of the men and 34.4% of the women survive until 90 years of age. The proportion of alcohol higher among non-survivors than among survivors in both men and women. In an analyses of men and women combined, those drinking 5–<10 g alcohol/day had a RR of surviving to 90 years of age of 1.41 compared with abstainers. In men, but not women, the probability of reaching 90 years of age remained elevated at higher alcohol consumption levels with relative risk of 1.64 for those with a daily intake of 30+ grams per day, as compared with abstinence (p=0.014). The relative risk for reaching 90 was elevated more among wine drinkers than for dringers of other alcohol beverages.

Conclusion: This prospective study of men and women age is 68-70 years at baseline found the highest probability of reaching 90 years of age for those drinking 5-15 g of alcohol per day.

Van Den Brandt, P Et Al. Alcohol Consumption in Later Life in Reaching Longevity: The Netherlands Cohort Study. **Age Ageing.** 2020; 49:395–402.

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