E-Learning Course 1.10 PEACE & LOVE

Scientific References

2020-Dubois, B. & J.-F. Esculier. Soft-tissue injuries simply need PEACE and LOVE. British Journal of Sports Medicine 54 (2): 72-73. 4

2020-Gonzalez-Gil, A. M. & L. Elizondo-Montemayor. The Role of Exercise in the Interplay between Myokines, Hepatokines, Osteokines, Adipokines, and Modulation of Inflammation for Energy Substrate Redistribution and Fat Mass Loss: A Review. Nutrients 12 (6): 1899. 5

2020-Lin, I., L. Wiles, R. Waller R. Goucke, Y. Nagree, M. Gibberd, L. Straker, C. G. Maher & P. B. O'Sullivan. What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: Systematic review. British Journal of Sports Medicine 54 (2): 79-86. 6

2020-Pedisic, Z., N. Shrestha, S. Kovalchik, E. Stamatakis, N. Liangruenrom, J. Grgic, S. Titze, S. J. H. Biddle, A. E. Bauman & P. Oja. Is running associated with a lower risk of all-cause, cardiovascular and cancer mortality, and is the more the better? A systematic review and meta-analysis. British Journal of Sports Medicine 54 (15): 898-905. 7

2019-Ekelund, U., J. Tarp, J. Steene-Johannessen, B. H. Hansen, B. Jefferis, M. W. Fagerland, P. Whincup, K. M. Diaz, S. P. Hooker, A. Chernofsky, M. G. Larson, N. Spartano, R. S. Vasan, I.-M. Dohrn, M. Hagströmer, C. Edwardson, T. Yates, E. Shiroma, S. A. Anderssen & I.-M. Lee. Dose-response associations between accelerometry measured physical activity and sedentary time and all cause mortality: systematic review and harmonised meta-analysis. BMJ 366: l4570. 8

2019-Polaski, A. M., A. L. Phelps, M. C. Kostek, K. A. Szucs & B. J. Kolber. Exercise-induced hypoalgesia: A meta-analysis of exercise dosing for the treatment of chronic pain. PLoS ONE 14 (1): e0210418. 10

2018-Colpani, V., C. P. Baena, L. Jaspers, G. M. van Dijk, Z. Farajzadegan, K. Dhana, M. J. Tielemans, T. Voortman, R. Freak-Poli, G. G. V. Veloso, R. Chowdhury, M. Kavousi, T. Muka & O. H. Franco. Lifestyle factors, cardiovascular disease and all-cause mortality in middle-aged and elderly women: a systematic review and meta-analysis. European Journal of Epidemiology 33: 831-845. 11

2017-Geneen, L. J., R. A. Moore, C. Clarke, D. Martin, L. A. Colvin & B. H. Smith. Physical activity and exercise for chronic pain in adults: an overview of Cochrane Reviews. Cochrane Database of Systematic Reviews (4): CD011279. 12

2017-Ostman, C., N. A. Smart, D. Morcos, A. Duller, W. Ridley & D. Jewiss. The effect of exercise training on clinical outcomes in patients with the metabolic syndrome: a systematic review and meta-analysis. Cardiovascular Diabetology 16: 110. 14

2012-Naugle, K. M., R. B. Fillingim, J. L. Riley III. A Meta-Analytic Review of the Hypoalgesic Effects of Exercise. The Journal of Pain 13 (12): 1139-1150. 15

2010-Bleakley, C. M., S. R. O'Connor, M. A. Tully, L. G. Rocke, D. C. MacAuley, I. Bradbury, S. Keegan & S. M. McDonough. Effect of accelerated rehabilitation on function after ankle sprain: Randomised controlled trial. BMJ 340: c1964. 16

2001-Sculco, A. D., D. C. Paup, B. Fernhall & M. J. Sculco. Effects of aerobic exercise on low back pain patients in treatment. The Spine Journal 1 (2): 95-101. 17

2020-Dubois, B. & J.-F. Esculier. Soft-tissue injuries simply need PEACE and LOVE. *British Journal of Sports Medicine* 54 (2): 72-73.

Rehabilitation of soft-tissue injuries can be complex. Over the years, acronyms guiding their management have evolved from ICE to RICE, then on to PRICE and POLICE. Although widely known, these previous acronyms focus on acute management, unfortunately ignoring subacute and chronic stages of tissue healing. Our contemporary acronyms encompass the rehabilitation continuum from immediate care (PEACE) to subsequent management (LOVE). PEACE and LOVE outline the importance of educating patients and addressing psychosocial factors to enhance recovery. While anti-inflammatories show benefits on pain and function, our acronyms flag their potential harmful effects on optimal tissue repair. We suggest that they may not be included in the standard management of soft-tissue injuries.

2020-Gonzalez-Gil, A. M. & L. Elizondo-Montemayor. The Role of Exercise in the Interplay between Myokines, Hepatokines, Osteokines, Adipokines, and Modulation of Inflammation for Energy Substrate Redistribution and Fat Mass Loss: A Review. *Nutrients* 12 (6): 1899.

Exercise is an effective strategy for preventing and treating obesity and its related cardiometabolic disorders, resulting in significant loss of body fat mass, white adipose tissue browning, redistribution of energy substrates, optimization of global energy expenditure, enhancement of hypothalamic circuits that control appetite-satiety and energy expenditure, and decreased systemic inflammation and insulin resistance. Novel exercise-inducible soluble factors, including myokines, hepatokines, and osteokines, and immune cytokines and adipokines are hypothesized to play an important role in the body's response to exercise. To our knowledge, no review has provided a comprehensive integrative overview of these novel molecular players and the mechanisms involved in the redistribution of metabolic fuel during and after exercise, the loss of weight and fat mass, and reduced inflammation. In this review, we explain the potential role of these exercise-inducible factors, namely myokines, such as irisin, IL-6, IL-15, METRNL, BAIBA, and myostatin, and hepatokines, in particular selenoprotein P, fetuin A, FGF21, ANGPTL4, and follistatin. We also describe the function of osteokines, specifically osteocalcin, and of adipokines such as leptin, adiponectin, and resistin. We also emphasize an integrative overview of the pleiotropic mechanisms, the metabolic pathways, and the inter-organ crosstalk involved in energy expenditure, fat mass loss, reduced inflammation, and healthy weight induced by exercise.

2020-Lin, I., L. Wiles, R. Waller R. Goucke, Y. Nagree, M. Gibberd, L. Straker, C. G. Maher & P. B. O'Sullivan. What does best practice care for musculoskeletal pain look like? Eleven consistent recommendations from high-quality clinical practice guidelines: Systematic review. *British Journal of Sports Medicine* 54 (2): 79-86.

Objectives: To identify common recommendations for high-quality care for the most common musculoskeletal (MSK) pain sites encountered by clinicians in emergency and primary care (spinal (lumbar, thoracic and cervical), hip/knee (including osteoarthritis [OA] and shoulder) from contemporary, high-quality clinical practice guidelines (CPGs).

Design: Systematic review, critical appraisal and narrative synthesis of MSK pain CPG recommendations.

Eligibility criteria: Included MSK pain CPGs were written in English, rated as high quality, published from 2011, focused on adults and described development processes. Excluded CPGs were for: traumatic MSK pain, single modalities (eg, surgery), traditional healing/ medicine, specific disease processes (eg, inflammatory arthropathies) or those that required payment.

Data sources: Four scientific databases (MEDLINE, Embase, CINAHL and Physiotherapy Evidence Database) and four guideline repositories.

Results: 6232 records were identified, 44 CPGs were appraised and 11 were rated as high quality (low back pain: 4, OA: 4, neck: 2 and shoulder: 1). We identified 11 recommendations for MSK pain care: ensure care is patient centred, screen for red flag conditions, assess psychosocial factors, use imaging selectively, undertake a physical examination, monitor patient progress, provide education/information, address physical activity/exercise, use manual therapy only as an adjunct to other treatments, offer high-quality non-surgical care prior to surgery and try to keep patients at work.

Conclusion: These 11 recommendations guide healthcare consumers, clinicians, researchers and policy makers to manage MSK pain. This should improve the quality of care of MSK pain.

2020-Pedisic, Z., N. Shrestha, S. Kovalchik, E. Stamatakis, N. Liangruenrom, J. Grgic, S. Titze, S. J. H. Biddle, A. E. Bauman & P. Oja. Is running associated with a lower risk of all-cause, cardiovascular and cancer mortality, and is the more the better? A systematic review and meta-analysis. *British Journal of Sports Medicine* 54 (15): 898-905.

Objective: To investigate the association of running participation and the dose of running with the risk of all-cause, cardiovascular and cancer mortality.

Design: Systematic review and meta-analysis.

Data sources: Journal articles, conference papers and doctoral theses indexed in Academic Search Ultimate, CINAHL, Health Source: Nursing/Academic Edition, MasterFILE Complete, Networked Digital Library of Theses and Dissertations, Open Access Theses and Dissertations, PsycINFO, PubMed/MEDLINE, Scopus, SPORTDiscus and Web of Science.

Eligibility criteria for selecting studies: Prospective cohort studies on the association between running or jogging participation and the risk of all-cause, cardiovascular and/or cancer mortality in a non-clinical population of adults were included.

Results: Fourteen studies from six prospective cohorts with a pooled sample of 232 149 participants were included. In total, 25 951 deaths were recorded during 5.5–35 year follow-ups. Our meta-analysis showed that running participation is associated with 27%, 30% and 23% lower risk of all-cause (pooled adjusted hazard ratio (HR)=0.73; 95% confidence interval (CI) 0.68 to 0.79), cardiovascular (HR=0.70; 95% CI 0.49 to 0.98) and cancer (HR=0.77; 95% CI 0.68 to 0.87) mortality, respectively, compared with no running. A meta-regression analysis showed no significant dose–response trends for weekly frequency, weekly duration, pace and the total volume of running.

Conclusion: Increased rates of participation in running, regardless of its dose, would probably lead to substantial improvements in population health and longevity. Any amount of running, even just once a week, is better than no running, but higher doses of running may not necessarily be associated with greater mortality benefits.

2019-Ekelund, U., J. Tarp, J. Steene-Johannessen, B. H. Hansen, B. Jefferis, M. W. Fagerland, P. Whincup, K. M. Diaz, S. P. Hooker, A. Chernofsky, M. G. Larson, N. Spartano, R. S. Vasan, I.-M. Dohrn, M. Hagströmer, C. Edwardson, T. Yates, E. Shiroma, S. A. Anderssen & I.-M. Lee. Dose-response associations between accelerometry measured physical activity and sedentary time and all cause mortality: systematic review and harmonised meta-analysis. *BMJ* 366: l4570.

Objective: To examine the dose-response associations between accelerometer assessed total physical activity, different intensities of physical activity, and sedentary time and all cause mortality.

Design: Systematic review and harmonised meta-analysis.

Data sources: PubMed, PsycINFO, Embase, Web of Science, Sport Discus from inception to 31 July 2018.

Eligibility criteria: Prospective cohort studies assessing physical activity and sedentary time by accelerometry and associations with all cause mortality and reported effect estimates as hazard ratios, odds ratios, or relative risks with 95% confidence intervals.

Data extraction and analysis: Guidelines for meta-analyses and systematic reviews for observational studies and PRISMA guidelines were followed. Two authors independently screened the titles and abstracts. One author performed a full text review and another extracted the data. Two authors independently assessed the risk of bias. Individual level participant data were harmonised and analysed at study level. Data on physical activity were categorised by quarters at study level, and study specific associations with all cause mortality were analysed using Cox proportional hazards regression analyses. Study specific results were summarised using random effects meta-analysis.

Main outcome measure: All cause mortality.

Results: 39 studies were retrieved for full text review; 10 were eligible for inclusion, three were excluded owing to harmonisation challenges (eg, wrist placement of the accelerometer), and one study did not participate. Two additional studies with unpublished mortality data were also included. Thus, individual level data from eight studies (n=36 383; mean age 62.6 years; 72.8% women), with median follow-up of 5.8 years (range 3.0-14.5 years) and 2149 (5.9%) deaths were analysed. Any physical activity, regardless of intensity, was associated with lower risk of mortality, with a non-linear dose-response. Hazards ratios for mortality were 1.00 (referent) in the first quarter (least active), 0.48 (95% confidence interval 0.43 to 0.54) in the second quarter, 0.34 (0.26 to 0.45) in the third quarter, and 0.27 (0.23 to 0.32) in the fourth quarter (most active). Corresponding hazards ratios for light physical

activity were 1.00, 0.60 (0.54 to 0.68), 0.44 (0.38 to 0.51), and 0.38 (0.28 to 0.51), and for moderate-to-vigorous physical activity were 1.00, 0.64 (0.55 to 0.74), 0.55 (0.40 to 0.74), and 0.52 (0.43 to 0.61). For sedentary time, hazards ratios were 1.00 (referent; least sedentary), 1.28 (1.09 to 1.51), 1.71 (1.36 to 2.15), and 2.63 (1.94 to 3.56).

Conclusion: Higher levels of total physical activity, at any intensity, and less time spent sedentary, are associated with substantially reduced risk for premature mortality, with evidence of a non-linear dose-response pattern in middle aged and older adults.

2019-Polaski, A. M., A. L. Phelps, M. C. Kostek, K. A. Szucs & B. J. Kolber. Exercise-induced hypoalgesia: A meta-analysis of exercise dosing for the treatment of chronic pain. *PLoS ONE* 14 (1): e0210418.

Objective: Increasing evidence purports exercise as a first-line therapeutic for the treatment of nearly all forms of chronic pain. However, knowledge of efficacious dosing respective to treatment modality and pain condition is virtually absent in the literature. The purpose of this analysis was to calculate the extent to which exercise treatment shows dose-dependent effects similar to what is seen with pharmacological treatments.

Methods: A recently published comprehensive review of exercise and physical activity for chronic pain in adults was identified in May 2017. This report reviewed different physical activity and exercise interventions and their effectiveness in reducing pain severity and found overall modest effects of exercise in the treatment of pain. We analyzed this existing data set, focusing specifically on the dose of exercise intervention in these studies. We re-analyzed data from 75 studies looking at benefits of time of exercising per week, frequency of exercise per week, duration of intervention (in weeks), and estimated intensity of exercise.

Results: Analysis revealed a significant positive correlation with exercise duration and analgesic effect on neck pain. Multiple linear regression modeling of these data predicted that increasing the frequency of exercise sessions per week is most likely to have a positive effect on chronic pain patients.

Discussion: Modest effects were observed with one significant correlation between duration and pain effect for neck pain. Overall, these results provide insufficient evidence to conclude the presence of a strong dose effect of exercise in pain, but our modeling data provide tes predictions that can be used to design future studies to explicitly test the question of dose in specific patient populations.

2018-Colpani, V., C. P. Baena, L. Jaspers, G. M. van Dijk, Z. Farajzadegan, K. Dhana, M. J. Tielemans, T. Voortman, R. Freak-Poli, G. G. V. Veloso, R. Chowdhury, M. Kavousi, T. Muka & O. H. Franco. Lifestyle factors, cardiovascular disease and all-cause mortality in middle-aged and elderly women: a systematic review and meta-analysis. *European Journal of Epidemiology* 33: 831-845.

Cardiovascular disease (CVD) risk factors, incidence and death increases from around the time of menopause comparing to women in reproductive age. A healthy lifestyle can prevent CVD, but it is unclear which lifestyle factors may help maintain and improve cardiovascular health for women after menopausal transition. We conducted a systematic review and meta-analysis of prospective cohort studies to evaluate the association between modifiable lifestyle factors (specifically smoking, physical activity, alcohol intake, and obesity), with CVD and mortality in middle-aged and elderly women. Pubmed, Embase, among other databases and reference lists were searched until February 29th, 2016. Study specific relative risks (RR) were meta-analyzed using random effect models. We included 59 studies involving 5,358,902 women. Comparing current versus never smokers, pooled RR were 3.12 (95% CI 2.15–4.52) for CHD incidence, 2.09 (95% CI 1.51–2.89) for stroke incidence, 2.76 (95% CI 1.62–4.71) for CVD mortality and 2.22 (95% CI 1.92–2.57) for all-cause mortality. Physical activity was associated with a decreased risk of 0.74 (95% CI 0.67–0.80) for overall CVD, 0.71 (95% CI 0.67–0.75) for CHD, 0.77 (95% CI 0.70–0.85) for stroke, 0.70 (95% CI 0.58–0.84) for CVD mortality and 0.71 (95% CI 0.65–0.78) for all-cause mortality. Comparing moderate drinkers versus non-drinkers, the RR was 0.72 (95% CI 0.56–0.91) for CHD, 0.63 (95% CI 0.57–0.71) for CVD mortality and 0.80 (95% CI 0.76–0.84) for all-cause mortality. For women with BMI 30–35 kg/m^2 the risk was 1.67 (95% CI 1.24–2.25) for CHD and 2.3 (95% CI 1.56–3.40) for CVD mortality, compared to normal weight. Each 5 kg/m^2 increase in BMI was associated with 24% (95% CI 16–33%) higher risk for all-cause mortality. This meta-analysis suggests that physical activity and moderate alcohol intake were associated with a reduced risk for CVD and mortality. Smoking and higher BMI were associated with an increased risk of these endpoints. Adherence to a healthy lifestyle may substantially lower the burden of CVD and reduce the risk of mortality among middle-aged and elderly women. However, this review highlights important gaps, as lack of standardized methods in assessing lifestyle factors and lack of accurate information on menopause status, which should be addressed by future studies in order to understand the role of menopause on the association between lifestyle factors and cardiovascular events.

2017-Geneen, L. J., R. A. Moore, C. Clarke, D. Martin, L. A. Colvin & B. H. Smith. Physical activity and exercise for chronic pain in adults: an overview of Cochrane Reviews. *Cochrane Database of Systematic Reviews* (4): CD011279.

Background: Chronic (long−term) pain is pain that has lasted beyond the body's usual healing time. It is often described as pain that has lasted for at least three months. Chronic pain causes many problems, beyond the pain itself, including fatigue, anxiety, depression, and a poor quality of life.

In the past, people with chronic pain were told to rest. However, general advice now is to keep active − whether to affect the pain directly or to combat the other problems associated with it. Therefore, research studies have attempted to examine the effect of physical activity in people with chronic pain.

This overview aimed to bring together and analyse any reviews published by Cochrane that looked at physical activity and exercise studies in any chronic pain condition, including arthritis, back and neck pain, and menstrual (period) pain.

Key results and quality of the evidence: In January 2016, we identified 21 Cochrane Reviews which covered 10 different diagnoses (osteoarthritis (a joint disease), rheumatoid arthritis (joint pain and swelling), fibromyalgia (widespread pain condition), low back pain, intermittent claudication (cramping pain in the legs), dysmenorrhoea (period pain), mechanical neck disorders (neck pain), spinal cord injury, postpolio syndrome (a condition occurring in people who have had polio), patellofemoral pain (pain at the front of the knee)). The physical activity or exercise programme used in the trials ranged in frequency, intensity, and type, including land− and water−based activities, those focusing on building strength, endurance, flexibility and range of motion, and muscle activation exercises.

The quality of the evidence was low. This was mostly due to the small numbers of people with chronic pain who participated in each reviewed study. Ideally, a study should have hundreds of people assigned to each group, whereas most of the studies included in the review process here had fewer than 50 people in total.

There was evidence that physical activity reduced the severity of pain, improved physical function, and had a variable effect on both psychological function and quality of life. However, these results were not found in all studies. The inconsistency could be due to the quality of the studies or because of the mix of different types of physical activity tested in the studies. Additionally, participants had predominantly mild−to−moderate pain, not moderate−to−severe pain.

Conclusions: According to the available evidence (only 25% of included studies reported on possible harm or injury from the intervention), physical activity did not cause harm. Muscle soreness that sometimes occurs with starting a new exercise subsided as the participants adapted to the new activities. This is important as it shows physical activity in general is acceptable and unlikely to cause harm in people with chronic pain, many of whom may have previously feared it would increase their pain further.

Future studies should focus on increasing participant numbers, including a wider range of severity of pain (more people with more severe pain), and lengthening both the intervention (exercise programme) itself, and the follow–up period. This pain is chronic in nature, and so a long–term intervention, with longer periods of recovery or follow–up, may be more effective.

2017-Ostman, C., N. A. Smart, D. Morcos, A. Duller, W. Ridley & D. Jewiss. The effect of exercise training on clinical outcomes in patients with the metabolic syndrome: a systematic review and meta-analysis. *Cardiovascular Diabetology* 16: 110.

Background: *Purpose*: to establish if exercise training improves clinical outcomes in people with metabolic syndrome (MetS). Registered with PROSPERO international prospective register of systematic reviews (https://www.crd.york.ac.uk/PROSPERO/Identifier:CRD42017055491). *Data sources*: studies were identified through a MEDLINE search strategy (1985 to Jan 12, 2017), Cochrane controlled trials registry, CINAHL and SPORTDiscus. *Study selection*: prospective randomized or controlled trials of exercise training in humans with metabolic syndrome, lasting 12 weeks or more.

Results: We included 16 studies with 23 intervention groups; 77,000 patient-hours of exercise training. In analyses of aerobic exercise studies versus control: body mass index was significantly reduced, mean difference (MD) −0.29 (kg m^{-2}) (95% CI −0.44, −0.15, $p < 0.0001$); body mass was significantly reduced, MD −1.16 kg (95% CI −1.83, −0.48, $p = 0.0008$); waist circumference was significantly reduced MD −1.37 cm (95% CI −2.02, −0.71, $p < 0.0001$), peak VO_2 was significantly improved MD 3.00 mL kg^{-1} min^{-1} (95% CI 1.92, 4.08, $p < 0.000001$); systolic blood pressure and diastolic blood pressure were significantly reduced, MD −2.54 mmHg (95% CI −4.34, −0.75, $p = 0.006$), and, MD −2.27 mmHg (95% CI −3.47, −1.06, $p = 0.0002$) respectively; fasting blood glucose was significantly reduced MD −0.16 mmol L^{-1} (95% CI −0.32, −0.01, $p = 0.04$); triglycerides were significantly reduced MD −0.21 mmol L^{-1} (95% CI −0.29, −0.13, $p < 0.00001$); and low density lipoprotein was significantly reduced MD −0.03 mmol L^{-1} (95% CI −0.05, −0.00, $p = 0.02$). In analyses of combined exercise versus control: waist circumference, MD −3.80 cm (95% CI −5.65, −1.95, $p < 0.0001$); peak VO_2 MD 4.64 mL kg^{-1} min^{-1} (95% CI 2.42, 6.87, $p < 0.0001$); systolic blood pressure MD −3.79 mmHg (95% CI −6.18, −1.40, $p = 0.002$); and high density lipoprotein (HDL) MD 0.14 (95% CI 0.04, 0.25, $p = 0.009$) were all significantly improved. We found no significant differences between outcome measures between the two exercise interventions.

Conclusions: Exercise training improves body composition, cardiovascular, and, metabolic outcomes in people with metabolic syndrome. For some outcome measures, isolated aerobic exercise appears optimal.

2012-Naugle, K. M., R. B. Fillingim, J. L. Riley III. A Meta-Analytic Review of the Hypoalgesic Effects of Exercise. *The Journal of Pain* 13 (12): 1139-1150.

The purpose of this article was to examine the effects of acute exercise on pain perception in healthy adults and adults with chronic pain using meta-analytic techniques. Specifically, studies using a repeated measures design to examine the effect of acute isometric, aerobic, or dynamic resistance exercise on pain threshold and pain intensity measures were included in this meta-analysis. The results suggest that all 3 types of exercise reduce perception of experimentally induced pain in healthy participants, with effects ranging from small to large depending on pain induction method and exercise protocol. In healthy participants, the mean effect size for aerobic exercise was moderate (d_{thr} = .41, d_{int} = .59), while the mean effect sizes for isometric exercise (d_{thr} = 1.02, d_{int} = .72) and dynamic resistance exercise (d_{thr} = .83, d_{int} = .75) were large. In chronic pain populations, the magnitude and direction of the effect sizes were highly variable for aerobic and isometric exercise and appeared to depend on the chronic pain condition being studied as well as the intensity of the exercise. While trends could be identified, the optimal dose of exercise that is needed to produce hypoalgesia could not be systematically determined with the amount of data available.

Perspective: This article presents a quantitative review of the exercise-induced hypoalgesia literature. This review raises several important questions that need to be addressed while also demonstrating that acute exercise has a hypoalgesic effect on experimentally induced pain in healthy adults, and both a hypoalgesic and hyperalgesic effect in adults with chronic pain.

2010-Bleakley, C. M., S. R. O'Connor, M. A. Tully, L. G. Rocke, D. C. MacAuley, I. Bradbury, S. Keegan & S. M. McDonough. Effect of accelerated rehabilitation on function after ankle sprain: Randomised controlled trial. *BMJ* 340: c1964.

Objective: To compare an accelerated intervention incorporating early therapeutic exercise after acute ankle sprains with a standard protection, rest, ice, compression, and elevation intervention.

Design: Randomised controlled trial with blinded outcome assessor.

Setting: Accident and emergency department and university based sports injury clinic.

Participants: 101 patients with an acute grade 1 or 2 ankle sprain.

Interventions: Participants were randomised to an accelerated intervention with early therapeutic exercise (exercise group) or a standard protection, rest, ice, compression, and elevation intervention (standard group).

Main outcome measures: The primary outcome was subjective ankle function (lower extremity functional scale). Secondary outcomes were pain at rest and on activity, swelling, and physical activity at baseline and at one, two, three, and four weeks after injury. Ankle function and rate of reinjury were assessed at 16 weeks.

Results: An overall treatment effect was in favour of the exercise group (P=0.0077); this was significant at both week 1 (baseline adjusted difference in treatment 5.28, 98.75% confidence interval 0.31 to 10.26; P=0.008) and week 2 (4.92, 0.27 to 9.57; P=0.0083). Activity level was significantly higher in the exercise group as measured by time spent walking (1.2 hours, 95% confidence interval 0.9 to 1.4 v 1.6, 1.3 to 1.9), step count (5621 steps, 95% confidence interval 4399 to 6843 v 7886, 6357 to 9416), and time spent in light intensity activity (53 minutes, 95% confidence interval 44 to 60 v 76, 58 to 95). The groups did not differ at any other time point for pain at rest, pain on activity, or swelling. The reinjury rate was 4% (two in each group).

Conclusion: An accelerated exercise protocol during the first week after ankle sprain improved ankle function; the group receiving this intervention was more active during that week than the group receiving standard care.

2001-Sculco, A. D., D. C. Paup, B. Fernhall & M. J. Sculco. Effects of aerobic exercise on low back pain patients in treatment. *The Spine Journal* 1 (2): 95-101.

Background context: Aerobic exercise (AE) has been prescribed to improve fitness and well-being in apparently healthy individuals and cardiac, orthopedic, and other patient populations. AE has not previously been studied as a sole treatment for low back pain patients (LBPP).

Purpose: This study evaluated the effects of low to moderate aerobic exercise as an adjunct treatment for LBPP, 30 to 60 years of age, in a neurosurgical practice during a 2.5-year follow-up to an initial 10-week exercise program. The purpose of this study was to determine the effects of short- and long-term AE on LBPP. The initial 10-week phase compared AE and nonexercising controls on mood states and pain/symptoms.

Study design/setting: A matched stratified design was used to input LBPP with similar previous clinical treatments as well as age and sex into AE or control groups.

Patient sample: After screening 68 LBPP from a New England private neurosurgical practice, 40 patients met qualification criteria, and 35 volunteered for this AE research study. The LBPP in this study were 30 to 60 years old and had the following medical diagnoses: herniated nucleus pulposus at one or more lumbar levels, degenerative discopathy, lumbosacral strain, and spinal canal and/or foraminal stenosis.

Outcome measures: The measure of mood states was the Profile of Mood States, and the measure of pain was the Brief Pain Inventory. The 2.5-year follow-up phase compared AE and nonexercise patients on the following treatment variables: medical office visits for pain/symptoms, physical therapy referrals, epidural steroid injections for pain/symptoms, prescription of pain medications, and work status.

Methods: Thirty-five LBPP were matched stratified into an AE or nonexercise control group for a 10-week exercise program. After the 10-week exercise program, all subjects were given the opportunity to cross over to the opposite group. Those patients choosing to exercise were advised to follow a low to moderate aerobic exercise prescription (walking or cycling, 60% age-predicted maximal heart rate, 4 days per week for 45 minutes per day). None of the original AE group crossed over to the nonexercise group because of symptoms relating to their previous exercise participation. All participants were contacted at 6-month intervals, and the number of medical office visits for pain/symptoms, physical therapy referrals, number of epidural steroid injections, and number of prescriptions for pain was charted for 2.5 years. Work status was evaluated by comparing the change in number of patients not working, working part time, working full time, or number changing from full time to part time or not

working from randomization to the end of follow-up. Patients following the exercise prescription at least 50% of the time were compared with those exercising less than 50% of the time during the 2.5-year follow-up. Significance was determined at the .05 level using Fisher's exact test or the Kruskal-Wallis test.

Results: The initial 10-week AE phase of the study indicated that low to moderate AE significantly improved mood profile (AE X=−9.58; control X=19.11; p<.01) but did not alter pain levels. AE patients in the 2.5-year follow-up phase received significantly fewer pain medication prescriptions (AE X=2.76; control X=13.35; p<.02) and were given fewer physical therapy referrals (AE X=0.17; control X=1.64; p<.002). There was no significant difference in the number of medical office visits for pain or epidural blocks administered to either group. Work status was improved only in exercising patients (AE X=+0.24; control X=−0.35; p<.04).

Conclusions: Low to moderate aerobic exercise appears to improve mood states and work status and reduce the need for physical therapy referrals and pain medication prescriptions for LBPP in the care of a neurosurgeon.