Contents

The Complex Role Of Regular Exercise On Aging Brain Function

Zsolt Radak
Research Center of Sport Science, University of Physical Education, Budapest, Hungary.
Email : radak@tf.hu

Regular exercise has systemic beneficial effects, including the promotion of brain function. The adaptive response to regular exercise involves the up-regulation of the enzymatic antioxidant system and modulation of oxidative damage. Reactive oxygen species (ROS) are important regulators of cell signaling. Exercise, via intensity- dependent modulation of metabolism and/or directly activated ROS generating enzymes, modulates the cellular redox state of the brain. ROS mediated alteration of lipids, protein, and DNA could directly affect brain function, while exercise modulates the accumulation of oxidative damage. Oxidative alteration of macro molecules can activate signaling processes, membrane remodeling, and gene transcription. ROS are also involved in the self-renewal and differentiation of neuronal stem cells and the exercise-mediated neurogenesis could be partly associated with ROS production. Exercise directly activates brain derived neurotrophic factor, neuron growth factor and vascular epithelial growth factor which play an important role in synaptic plasticity, memory and neurogenesis. Moreover, has been reported that exercise-induced changes in microbiome has an impact on endurance capacity and neurogenesis. It is also known that regular physical exercise and nutritional intervention decreases both the incidence and symptoms intensity in Alzheimer Disease (AD) along with changes in microbiome including those in the gut, while direct link has not been established. We have examined if exercise induced changes in gut microbiome have beneficial effect on cognitive functions using APP/PS1 mice. Results showed that when APP/PS1 mice subjected to exercise and probiotic treatments significantly over-performed controls in maze tests, while exercise, prebiotic alone and together decreases of beta-amyloid plaques, and increased microglia numbers around plaques. At molecular level improvement in cognitive functions was associated with increased expression 8-oxoguanine DNA glycosylase-1 (OOG1) in APP/PS1 mice. Microbiome data revealed that AD development is associated with leaky gut, which can be prevented by exercise training. Data also show that exercise training increases the levels of anti inflammatory microorganism, such as bacteria that are involved in butyrogenesis. These data together show beneficial effects exercise and probiotic on cognitive functions in mouse model, which can be applied in benefit of human.

Exercise And The Heart: Can You Exercise Safely With An Arrhythmia?

Domenico Cianflone
Director of Cardiovascular Prevention & Rehabilitation, San Raffaele Hospital, Milan, Italy.
Email : cianflone.domenico@hsr.it

Exercising is a key element for a healthy lifestyle, and most people who have heart rhythm disorders – also known as arrhythmias – should not avoid exercise because of their condition. There are only a few, specific types of arrhythmias for which exercise is discouraged, and those are rare. For the vast majority of people with arrhythmias – including atrial fibrillation, the most common arrhythmia – exercise is not only acceptable, it's encouraged. Ectopic beats are a common finding in either in symptomatic or asymptomatic subjects. Their occurrence triggers a number of clinical actions along with a certain degree of wariness on patients. These arrhythmias are casually detected during a screening visit, possibly for a preliminary assessment before to subscribing to a gym or a physical activity event or non-professional competition. Their occurrence usually bears no clinical significance. Nevertheless, since in some cases the presence of ventricular ectopic beats indicates susceptibility towards life-threatening arrhythmias or an underlying cardiac disease a thorough clinical assessment is required. Premature ventricular contractions have been described in 1% of clinically normal people as detected by a standard ECG and 40–75% of apparently healthy persons as detected by 24–48 hour ambulatory (Holter) ECG recordings. Kennedy et al demonstrated that frequent (>60/h or 1/min) and complex PVCs could occur in apparently healthy subjects, with an estimated prevalence of 1–4% of the general population.(1) Further to demonstrating that frequent and complex ventricular ectopy could occur in healthy subjects, they also showed it could be associated with a benign prognosis. Moreover, in competitive athletes ectopics may be occasionally recorded during pre-event ECGs. The clinical importance of these findings is still debatable with studies implying a benign consequence of athlete's heart, while other suggest a structural heart disease (or cellular/molecular) with a risk for sudden death. The frequency significance, prognosis and treatment of ventricular extrasystoles are nicely discussed in an article from the e-Journal of the ESC Council for Cardiology Practice Vol. 9, N° 17 - 28 Jan 2011. Ventricular extrasystoles are a relatively common occurrence for clinicians when seeing. Frequent and apparently idiopathic PVCs are usually considered a benign condition that can be managed with conservative measures. Ventricular ectopic beats not provoked by exercise or reduced during exercise can be regarded as without clinical significance. However, this notion is not thoroughly supported by scientific examination. Exercise testing is the most commonly used

procedure to diagnose myocardial ischemia and to stratify patients with ischemic heart disease. Early papers did not establish an association between exercise induced ventricular ectopic beats and prognosis over a relatively short follow up period. Exercise has undoubted benefits and results in many structural and functional changes of the myocardium that enhance performance and may prevent heart failure. Nevertheless, intense exercise also presents a significant challenge to right hearth secondary to an excessive increase in afterload and wall stress up to an actual damage that can be now measured with circulating cardiac troponin levels. Fortunately, the approach of classifying ventricular arrhythmias by their origin as provided an important and simple tool to stratify patients. A relatively benign prognosis is the case of right ventricular outflow tract tachycardia. It is a form of idiopathic ventricular tachycardias, in the absence of structural heart disease. Unifocal PVCs arising from the right ventricular outflow tract are common and may increase with exercise and cause non-sustained or sustained ventricular tachycardia. Catheter ablation is effective and safe treatment for these patients. B-blockers may be used for symptom control in patients where PVCs arise from multiple sites. It should also be considered in patients with impaired ventricular systolic function and/or heart failure. All these concepts are tied to a simplified cardiac diagnostic approach with which stress-ECG and echocardiogram are the key and (most commonly) the only diagnostic testing considered. In conclusion it is very important for individuals with ventricular ectopics who want to engage in sports is to exclude underlying structural or familial arrhythmogenic conditions, since sports activity may trigger sustained VT. Possibly the occurrence of >_2 PVCs on a baseline ECG should be followed by a more complete evaluation. The clinical assessment should include family history, ECg and >=24hr ECG-Holter monitoring of the number, morphology, and complexity of ventricular ectopics, inducibility by exertion (via exercise test or long-term ECG recording during sports activities), and indvidualized imaging. Further diagnostic evaluation with molecular genetic testing may be indicated in selected cases if the suspicion for familial disease is high (Long QT syndrome Brugada Syndrome, Hypertrophic cardiomyopathies, Arrhythmogenic right ventricular cardiomyopathy, Non-Compaction myocardium. Finally, repeat evaluation may be needed after 6 months to 2 years. Currently in selected patients the addition of cardiac MRI allows to asses and diagnose patients in whom a significant cardiac disorder is of tantamount value: let’s just consider how many cases of mild and self-limiting/healing myocarditis can nowadays be identified Last but not least in all patients in which the presence of arrhythmias are secondary to a coronary or valvular heat disease exercise is a very useful tool in providing prognostic advantage, once an appropriate clinical evaluation is performed In summary: The appropriate indication to an adequate diagnostic assessment is

the cornerstone for subjects with ectopic beats. Precautions when starting an exercise program When starting an exercise program, keep the following precautions in mind: Pace yourself by alternating exercises. Rotate light workouts, such as short walks, with more strenuous exercises, such as low-impact aerobics or swimming. Avoid exercising outdoors in extreme temperatures or high humidity. When the weather is bad, try exercising indoors at a gym or walking at a mall. Avoid exercises that require or encourage holding your breath, such as push-ups, sit-ups, and heavy lifting. Do not take hot or cold showers or sauna baths after exercising. Moderate temperatures are best, because very hot or very cold temperatures can be dangerous. Ask your doctor about continuing your exercise program if your medicines change. New medicines can affect how you feel when you exercise. Do not take naps after exercise, because that reduces exercise tolerance. Take your pulse frequently or wear a heart rate monitor, and keep your pulse within the parameters your doctor sets. Watch your pulse when walking up hills or stairs. Make sure you adjust your exercise program if it is interrupted for more than just a couple of days. Gradually increase to your regular activity level as tolerated.

Suggested readings

1. 2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease And its supplement ESC Guidelines for the management of patients with Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death Int J Cardiol. 2014 Dec 15;177(2):467-76.

2. Physical activity and incidence of atrial fibrillation: a systematic review and meta-analysis. Kwok CS, Anderson SG, Myint PK, Mamas MA, Loke YK. Heart Lung Circ. 2018 Sep;27(9):1116-1120.

3. What May the Future Hold for Sports Cardiology? La Gerche A, Baggish A, Heidbuchel H, Levine BD, Rakhit D. Heart Lung Circ. 2018 Sep;27(9):1072-1077.

4. Sudden Cardiac Death in Athletes. Sweeting J, Semsarian C. Neth Heart J. 2018 Mar;26(3):146-153.

5. Athletes with channelopathy may be eligible to play. Panhuyzen-Goedkoop NM, Wilde AAM.

Exercise Prescription For Heart Failure Patient

Hashbullah Ismail
Cardiac Rehabilitation Specialist/ Clinical Exercise Physiologist at UiTM Private Specialist Centre And Senior Consultant at Rehab Specialist Centre, Shah Alam.
Email : hashbullah@salam.uitm.edu.my

The uncertainty over optimal exercise programming is the natural product of progressive research over time. Before we can justifiably move towards prescribing exercise, we need a better evidence base otherwise exercise adherence is often below desired targets and this may lead to much smaller improvement than expected. The aims of the presentation will provide an objective framework for designing an exercise prescription to be more efficacious and safe based in heart failure patients.

Keywords: Heart Failure, exercise prescription

References

1. Ismail, H., J. McFarlane, G. Dieberg and N.A. Smart. Exercise Training Program Characteristics and Magnitude of Change in Functional Capacity of Heart Failure Patients. International Journal of Cardiology, 2014, 171(1): pp 62-65

2. Smart, N.A. and H. Ismail. Is It Safer and More Beneficial to Work Heart Failure Patients Harder? An Editorial Commentary. Clinical Cardiology, 2013, 36(10): pp 638-639

3. Dieberg, G., H. Ismail, F. Giallauria, N.A. Smart Clinical Outcomes and Cardiovascular Responses to Exercise Training in Heart Failure Patients with Preserved Ejection Fraction: A Systematic Review and Meta-Analysis. Journal of Applied Physiology. 6 March 2015 Vol. no., DOI: 10.1152/japplphysiol.00904.2014

Screening For Premature Coronary Heart Disease And Sudden Cardiac Death In Young People

Oteh Maskon
Department of Medicine, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Malaysia.
Email : omaskon@gmail.com

Background and aims: SCD happens mostly at rest, during sleep and less commonly during exercise and emotional stress. It is associated with a number of risk factors that are present in the population. Coronary artery disease (CAD) is the most common cause of SCD in Malaysia and worldwide. This study examined the prevalence of risk factors for premature CAD and SCD and predicted the 30-year cardiovascular disease (CVD) risk among students of Universiti Kebangsaan Malaysia.

Materials and methods: Respondents were selected through convenient sampling and an online questionnaire on demographics and CVD risk factors was taken. Health screening was conducted whereby body mass index (BMI), blood pressure, fasting blood glucose and total cholesterol levels were measured. Physical examination and electrocardiography were also done. The 30-year risk for CVD was calculated using Framingham BMI-based risk score.

Results: 231 respondents completed the questionnaire. 65 were excluded due to failure to attend screening or ineligibility. A total of 166 respondents were available for analysis. Their mean age of 22.2 years and 22.3% were males. Of the CVD risk factors, 39.1% were either overweight or obese, 36.1% had positive family history for premature CAD, 9% positive family history of SCD, 23.5% had dyslipidaemia, 18.1% had elevated fasting blood glucose and 9.6% had hypertension. Lifestyle evaluation revealed that 62.7% did not consume a healthy diet, 53.6% were physically inactive and 1.2% were active smokers. Symptoms associated with CAD or SCD either palpitations, exertional dyspnoea, syncope and chest pain were reported at 62% frequencies. The median 30-year hard and full CVD risk was 1% and 2% respectively. Electrocardiogram abnormalities were found in 19.3% of the respondents, the commonest being frontal plane axis deviation and ST segment depression. Univariate analysis revealed a significant association between obesity ($p<0.001$) and hypertension ($p<0.001$) with 30-year CVD risk. No significant association was found between electrocardiogram abnormalities ($p=0.159$) and the 30-year CVD risk.

Conclusion: Risk factors for premature CAD and SCD that are highly prevalent among these young people are positive family history, High BMI, Dyslipidemia, High blood sugar, physical

inactivities and ECG abnormalities. In addition common symptoms of CVD which also represent the riks of SCD were commonly reported. Hypertension and obesity are significant risk factors which correlate with the 30-year CVD risk among young individuals. Therefore early screening for risk of premature CAD and SCD may allow early intervention aimed at reducing future events.

Keywords: *Cardiovascular diseases, electrocardiography, obesity, hypertension, Sudden Cardiac Death, Exercise*

Exercise-Based Cardiac Rehabilitation: The Neglected Role Of Exercise

Francesco Maranta
Cardiovascular Rehabilitation Unit, IRCCS San Raffaele Hospital and Vita-Salute San Raffaele Univeristy , Milan, Italy
Email : maranta.francesco@hsr.it

The Cardiovascular Rehabilitation (CR) is an important but underused tool for the effective management of cardiac patients.[1] Exercise-based CR is a multi-factorial intervention recommended by international guidelines to patients with coronary artery disease (CAD)[2] and heart failure (HF)[3]: it is a fundamental aspect of secondary prevention, able to limit the pathophysiological and psychological effects of cardiovascular disease, manage symptoms and reduce the risk of future cardiovascular events. Several studies and meta-analyses support the beneficial effect of CR in reducing mortality, hospital readmissions, costs and in improving exercise capacity, quality of life and psychological well-being.[4,5] The occurrence of an acute cardiac event has a great prognostic impact on the short-, medium- and long-term morbidity and mortality of the patients.[6] Moreover, after that patients (and in many times also doctors) are scared of physical activity and return to everyday life. It has been shown that participation to an exercise-based CR program after acute coronary syndrome (ACS) and coronary artery bypass grafting (CABG) is associated with reduced mortality even in the modern era of CAD treatment with statins and acute revascularization.[7] CR is traditionally divided into three phases. An initial phase, typically an inpatient service, consisting of early mobilization, brief counselling about the illness, the treatment, the risk factors management and the follow-up planning. A second phase is mainly represented by a supervised ambulatory outpatient program (inpatient in case of most compromised or post-cardiac surgery patients) with aerobic physical activity at increasing work-load. The third phase is the lifetime maintenance phase where the aim is to continue the risk factor- and lifestyle change and exercise training: aerobic exercise in particular has a great prognostic impact also in the long-term. At present, the benefit of CR appears to be through direct physiological effects of exercise training and through effects on risk factors, behavior and mood. Aerobic exercise is the key component of post-acute patient management. It should be offered to patients with known CAD or stable HF, usually as part of a structured CR program, with the need for an evaluation of both exercise capacity and exercise-associated risk: patients should undergo aerobic exercise training ≥3 times a week and for 30 min per session. Sedentary patients should be strongly encouraged to start light-intensity exercise programs after adequate exercise-related risk stratification.[3] Certainly, there is a wide heterogeneity in CR programs with

the need for defining internationally accepted standards in CR delivery and scientific evaluation. In our unit we have derived and validated a scoring system with an operative algorithm to better stratify patients and define their probability of functional recovery.[8] Even if CR benefits are well known, CR referral and uptake is often suboptimal.[2] The successful implementation of CVD prevention guidelines relies heavily on acute-care physicians, that are the first point of contact for the patient and the critical point for referral to CR, and on general practitioners, who manage the patients after hospital discharge. To overcame some limitation to CR implementation alternative modes of CR delivery have been proposed, including home-based programs and e-health programs using e.g. the Internet and mobile phones.[9] It should be noted that the available resources at present are not enough to offer CR to all the patient that should have an adequate program after an acute event. The role of governments, healthcare system administrators, health insurance industry and professional and scientific organizations is central to improve care delivery.[2]

References

1) Piepoli MF, et al. Challenges in secondary prevention after acute myocardial infarction: A call for action. Eur J Prev Cardiol 2016; 23: 1994-2006.
2) 2013 ESC guidelines on the management of stable coronary artery disease. Eur Heart J. 2013 Oct;34(38):2949-3003.
3) 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur Heart J. 2016 Jul 14;37(27):2129-2200.
4) Anderson L, et al. Exercise-based cardiac rehabilitation for coronary heart disease. The Cochrane database of systematic reviews 2016, 1:CD001800.
5) Wong WP, et al. A systematic review of economic evaluations of cardiac rehabilitation. BMC Health Serv Res 2012; 8: 243.
6) 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. Eur Heart J. 2018 Jan 7;39(2):119-177.
7) Rauch B, et al. The prognostic effect of cardiac rehabilitation in the era of acute revascularisation and statin therapy: A systematic review and meta-analysis of randomized and non-randomized studies - The Cardiac Rehabilitation Outcome Study (CROS). Eur J Prev Cardiol 2016; 23: 1914-1939.
8) Maranta F, et al. A new scoring system to stratify post-surgical valvular patients during cardiovascular rehabilitation: derivation and validation study. Accepted abstract at ESC 2019; manuscript in preparation.

9) Clark RA, et al. Alternative models of cardiac rehabilitation: a systematic review. Eur J Prev Cardiol 2015; 22: 35-74.

Appropriate Exercise To Induce Cardioprotective Effects In Patients With CVD Risk: How To Do It?

Dominique Hansen
Rehabilitation and Exercise Physiology in Internal Diseases and Vice Dean of the Faculty of Rehabilitation Sciences at Hasselt University, Hasselt, Belgium.
Email : dominique.hansen@uhasselt.be

Cardiovascular rehabilitation matters significantly to patients with cardiovascular disease. As a result of multidisciplinary cardiovascular rehabilitation, significant and clinically relevant reductions in mortality, hospitalization rates and incidence of major adverse cardiovascular events have been noticed. However, which exercises should be prescribed, remains a major issue in this field, and should be dealt with in order to maximize the benefits of cardiovascular rehabilitation. The current major controversies in cardiovascular rehabilitation are therefore discussed in this lecture, including (but not limited to): how to determine the exercise intensity, how to tailor exercise prescription to patients with very different phenotypes, should we go for high-intense interval training after all, how to prescribe strength training and is high-intense strength training too dangerous, and how good are we really at prescribing exercise to these patients after all? By answering these questions, practical tips and tricks will be delivered to the audience that can be used in clinical practice.

Exercise As A Therapeutic Approach To Reduce Cancer-Related Fatigue

Ian Lahart
University of Wolverhampton
Email : I.Lahart@wlv.ac.uk

Cancer-related fatigue (CRF) has been defined as "a distressing, persistent, subjective sense of physical, emotional, or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning" (Bower, 2014). It is one of the most common symptoms reported by people diagnosed with cancer, with as many as 40% of patients reporting CRF at diagnosis (Hofman et al., 2007). Almost all patients undergoing radiation therapy (~90%) and chemotherapy (80%) experience CRF, and a third of patients' report prolonged symptoms months and in some years after treatment has been completed (Hofman et al., 2007). CRF can result in chemotherapy interruptions or dose reductions which can limit the effectiveness of treatment. CRF can also lead to increased sleep problems, depressive symptoms, pain, nutritional deficiencies, and physical inactivity. All of these fatigue-associated co-morbidities can profoundly impact patients' physical function and ability to perform activities of daily living, and ultimately their quality of life (Mustian et al., 2012). Due to its prevalence, CRF is one of the most common endpoints in exercise randomised controlled trials (Fuller et al., 2018; Stout et al., 2017). Of 42 meta-analyses included in an umbrella review, 32 (76%) reported a statistically significant beneficial effect. Most of these meta-analyses (52%), however, reported a small effect size and provided moderate (45%) or low (31%) quality of evidence. More encouragingly, in a meta-analysis that included six studies that were considered as having a low risk of bias, exercise interventions resulted in a large reduction in CRF (Kessels et al., 2018). Similarly, an individual patient meta analysis found that exercise statistically reduced fatigue, with stronger effects reported for supervised exercise and patients reporting worse fatigue at baseline (Buffart et al., 2018). The recent American College of Sports Medicine roundtable paper, which aimed to provide evidence-based exercise prescriptions for a host of cancer-related health outcomes, concluded that there was 'strong' evidence supporting the beneficial effects of exercise on fatigue (Campbell et al., 2019). The roundtable authors (2019) offered a precise exercise prescription for patients with cancer wishing to reduce fatigue that recommended moderate- to vigorous-intensity aerobic exercise programmes of at least 12 weeks duration. In my presentation, I will critically review the quality of the evidence that the conclusions reached in the paragraph above and investigate the level of uncertainty in studies investigating the effects of exercise on CRF. In addition, I will discuss the use of a precision-based approach to exercise prescription and explore how exercise

professionals can provide evidence-based exercise programmes for patients with cancer experiencing CRF.

References:

Bower, J.E., 2014. Cancer-related fatigue: Mechanisms, risk factors, and treatments. Nat. Rev. Clin. Oncol. 11, 597–609. https://doi.org/10.1038/nrclinonc.2014.127

Buffart, L.M., Sweegers, M.G., May, A.M., Chinapaw, M.J., van Vulpen, J.K., Newton, R.U., Galvão, D.A., Aaronson, N.K., Stuiver, M.M., Jacobsen, P.B., Verdonck-de Leeuw, I.M., Steindorf, K., Irwin, M.L., Hayes, S., Griffith, K.A., Lucia, A., Herrero-Roman, F., Mesters, I., van Weert, E., Knoop, H., Goedendorp, M.M., Mutrie, N., Daley, A.J., McConnachie, A., Bohus, M., Thorsen, L., Schulz, K.-H., Short, C.E., James, E.L., Plotnikoff, R.C., Arbane, G., Schmidt, M.E., Potthoff, K., van Beurden, M., Oldenburg, H.S., Sonke, G.S., van Harten, W.H., Garrod, R., Schmitz, K.H., Winters-Stone, K.M., Velthuis, M.J., Taaffe, D.R., van Mechelen, W., José Kersten, M., Nollet, F., Wenzel, J., Wiskemann, J., Brug, J., Courneya, K.S., 2018. Targeting Exercise Interventions to Patients With Cancer in Need: An Individual Patient Data Meta-Analysis. J. Natl. Cancer Inst. 110, 1190–1200. https://doi.org/10.1093/jnci/djy161

Campbell, K.L., Winters-Stone, K.M., Wiskemann, J., May, A.M., Schwartz, A.L., Courneya, K.S., Zucker, D.S., Matthews, C.E., Ligibel, J.A., Gerber, L.H., Morris, G.S., Patel, A.V., Hue, T.F., Perna, F.M., Schmitz, K.H., 2019. Exercise Guidelines for Cancer Survivors: Consensus Statement from International Multidisciplinary Roundtable. Med. Sci. Sports Exerc. 51, 2375. https://doi.org/10.1249/MSS.0000000000002116

Fuller, J.T., Hartland, M.C., Maloney, L.T., Davison, K., 2018. Therapeutic effects of aerobic and resistance exercises for cancer survivors: a systematic review of meta-analyses of clinical trials. Br. J. Sports Med. 52, 1311. https://doi.org/10.1136/bjsports-2017-098285

Hofman, M., Ryan, J.L., Figueroa-Moseley, C.D., Jean-Pierre, P., Morrow, G.R., 2007. Cancer-related fatigue: the scale of the problem. The Oncologist 12 Suppl 1, 4–10. https://doi.org/10.1634/theoncologist.12-S1-4

Kessels, E., Husson, O., van der Feltz-Cornelis, C.M., 2018. The effect of exercise on cancer-related fatigue in cancer survivors: a systematic review and meta-analysis. Neuropsychiatr. Dis. Treat. 14, 479–494. https://doi.org/10.2147/NDT.S150464

Mustian, K.M., Sprod, L.K., Janelsins, M., Peppone, L.J., Mohile, S., 2012. Exercise Recommendations for Cancer-Related Fatigue, Cognitive Impairment, Sleep problems, Depression, Pain, Anxiety, and Physical Dysfunction: A Review. Oncol. Hematol. Rev. 8, 81–88.

Stout, N.L., Baima, J., Swisher, A.K., Winters-Stone, K.M., Welsh, J., 2017. A Systematic Review of Exercise Systematic Reviews in the Cancer Literature (2005-2017). PM R 9, S347–S384. https://doi.org/10.1016/j.pmrj.2017.07.074

Reporting Of Resistance Training Dose Compliance And Tolerance In Exercise Oncology

Ciaran Fairman
Exercise Medicine Research Institute, Edith Cowan University, Perth, Western Australia, Australia.
Email : c.fairman@ecu.edu.my

Purpose: The field of exercise oncology is rapidly expanding, with specific areas of research highlighted as central to the continued progress of the field. There is a plethora of evidence that highlights the role of resistance training (RT) in combatting many cancer- and cancer treatment-related toxicities. However, an important aspect of designing and reporting findings from studies is the inclusion and reporting of key exercise training principles (progression, specificity, overload, individuality, and reversibility) and characteristics (volume, frequency, intensity, type, and duration). These training variables are then typically sequenced in such a manner that RT principles are taken into account to optimize specific outcomes of interest (i.e. periodization of RT). Unfortunately, several systematic reviews in this area demonstrate the consistent underreporting of exercise training principles and characteristics, thus in fact compromising the applicability of the findings. The purpose of this study was to apply a novel method to report resistance exercise dose, compliance and tolerance in patients with cancer.

Methods: A total of 47 prostate cancer patients (70.15 ± 8.9 yrs, body mass index, 28.61 ± 4.03)with bone metastatic disease completed a progressive modular multimodal exercise program for 12 weeks. We assessed traditional metrics of adherence (attendance and loss to follow-up), in addition to novel proposed metrics (relative dose intensity (RDI), dose modification, and exercise interruption). We used the resistance training prescription component of the intervention to calculate as the total training volume in kilograms (repetitions x sets x training load (weight)) prescribed to each. The actual dose of resistance training was the total training volume actually performed by each participant.

Results: Traditional metrics showed an attendance of 79.5±17%, and four patients (9%) patients were lost to follow-up. The prescribed and actual cumulative total dose of resistance training was 139,886 ± 69,150 kg and 112,835 ± 83,499 kg respectively, with a mean RDI of 77.4% ± 16.6% (range: 19.4% - 99.4%). Resistance training was missed (1-2 consecutive sessions) or interrupted (missed ≥3 consecutive sessions) in 41 (87%) and 24 (51%) participants respectively, due to a variety of health and non-health related reasons. Training dose was modified (reduction in sets, repetitions, or weight) in 40 (85%) of patients. Importantly, all attended sessions with dose modifications would have been classified as 100% attendance using conventional metrics.

Conclusions: Traditional reporting metrics of resistance training in exercise oncology may overestimate exercise compliance and attendance and provides inaccurate dose of resistance exercise completion. Our proposed additional metrics to capture resistance training dose, compliance and tolerance in patients with cancer may have important applications for future studies and clinical practice.

Exercise Oncology In Prostate Cancer: A Urologist's Point Of View

Goh Eng Hong
Consultant Urologist
Email : goh.enghong@gmail.com

In an age whereby the life expectancy has increased it is expected that the society would see a landscape of ageing population. Therefore, aged-associated diseases such as prostate cancer unsurprisingly are gradually becoming more common encounter. Unfortunately, crippling consequences are prevalent, whether directly resulting from the disease or due to the treatment received. It is a substantial burden to the society and hence clearly a responsibility for the healthcare sector to seek solutions to improve the outcome, not only to increase survival, but also to address the issues of adverse effect due to treatment and the quality of life. Pelvis is an area with specialised vital functions such as micturition, sexual function and defecation. Any treatment therefore potentially could lead to debilitating dysfunctional state, causing much agony to the patient. Additionally, the affected elderly population largely have various existing medical morbidities plaguing their health hence poorer functional reserve. These patients also commonly face the social issues of isolation, loneliness, poor support, financial constraint and therefore impaired coping strategy. The treatment modalities for prostate cancer are numerous and rapidly evolving, ranging from mere monitoring to invasive types such as surgery. Although this seems to provide more alternatives for the patients, they may develop anxiety instead as the patients find it hard to make mutual agreement with their care givers and keep questioning the validities of their choices. One of the recognised reasons for patient to opt out of active surveillance and proceed for treatment despite having low risk and absence of disease progression is in fact anxiety during the monitoring period. In tandem with improved management, the patients apparently enjoy longer longevity but at the same time, have to endure more debilitating side effects. It is a question hence whether there is quality of life in a setting of prolonged survival. In all likelihood, these thorny issues aforementioned could be addressed by exercise medicine, as evidenced by the abundant results from the literatures. Exercise and physical activities generally are regarded as tools in managing metabolic diseases. Evidences are gaining attention that exercise is also beneficial in the disease progression of cancer, ranging from prevention to palliation, whether physiologically or mentally. Hart et al mentioned this nicely, "exercise is a provocative medicine, known for its preventive, complimentary and rehabilitative role in the management of cancer." (1) There have been guidelines suggesting the necessary amount of exercise required to achieve the desirable end results. (2, 3) In the context of exercise advantage on malignant diseases, why is prostate cancer

an excellent example? This malignancy represents more than a classical case of cancer. Not only there are the conventional treatment options such as surgery, radiotherapy, and chemotherapy, it also is a disease of the elderly, affecting the critical pelvic functions, as well as necessitating metabolic consideration due to the hormonal treatment. In order to fully utilise the benefit of exercise, the exercise physicians need to be constantly updated with the rapidly changing perspective of prostate cancer management. In addition, providing exercise medicine in the form of multidisciplinary approach is also crucial as it allow a better formulated regime for the particular patients. As a matter of fact, the participation of patient in the decision making process in an era of patient-centred care should be encouraged to improve compliance. Despite the gainful greatness of physical activities, the adherence rates somehow are known to be disappointingly low. (4, 5, 6, 7, 8, 9) Clearly there is a need for further venture to better understand this undesirable situation. What may have allowed this to happen? Healthcare sector first and foremost partly is to be blamed. Exercise medicine is an uncharted territory for many clinicians as it is not yet a widely known mainstream practice and certainly there is lacking in confidence and expertise to provide the treatment. (10) In addition, evidence of the exercise benefits maybe perceived to be deficient. (3, 10) Clinicians likewise, may have different outlook towards exercise compared to the patients. An example being the reluctance of the primary clinicians to discuss exercise during the point of diagnosis as it was felt that additional information may not be well received by the patients. Contrary to that belief, patients actually are more appreciative of the advices, probably because this is the time in which the patients are absolutely wiling to make changes in their life. (10) In terms of infrastructure, inadequate facilities requiring patients to travel a distance definitely is a hindrance towards participation. (8) Certainly we cannot forget also that the treatment for prostate cancer could result in protracted adverse effect, resulting in exhaustion to the patients, making even a trivial activity a daunting task. Being overwhelmingly consumed with the sequelae of treatment whether financially, physically or mentally, there maybe little room left for the patient to be moti- vated to progress further into other treatment such as exercise despite knowing its perk and essential. On the other hand, exercise maybe poorly informed or understood among the patients causing under utilisation as a result. (10) In this regard, the patients may not have the confidence to perform the physical duties and be wearily occupied with the worry and fear of getting injury. (11) Implementation of appropriate strategies unquestionably could ascertain exercise medicine to be properly exploited. Most importantly in this aspect is educating and creating awareness among the physicians and the public about the advantages of physical activities not just towards metabolic diseases but also cancers. Of course, exercise facilities that are provided sufficiently

and conveniently should expect better patient adherence rate. Additionally, the regimes preferably to be tailor-made for each patient. (3) It appeared that spousal involvement is a key facilitating factor in enhancing the acceptability of exercise among the patients. (11) At the same time, much consideration fundamentally is needed to ensure safety features to be thoroughly applied. (2,3) Even if exercise is difficult to be attained the patients are encouraged to avoid no activities at all. (3) As a matter of fact, the patients could realise even some simple daily activities at home is equivalently regarded as exercise. (2, 6) Alternatively, there are also other comparable effective physical exercise such as Qigong or Tai chi. (12) It is hoped that via this conference, physicians of various disciplines are able to understand each specialty better. Undeniably there would be a better opportunity to expose the public clearer the benefit of exercise and also to develop improved exercise regimens that are more meaningful to the patients.

References

1. Hart NH et al. Exercise medicine for advanced prostate cancer. Curr Opin Support Palliat Care, 2017; DOI: 10.1097/SPC.0000000000000276.

2. Doyle C et al. Nutrition and physical activity during and after cancer treatment: An American Cancer Society Guide for Informed Choices. CA Cancer J Clin, 2006; 56:323-53.

3. Schmitz KH et al. American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. Med & Sc in Sports & Exercise, 2010; DOI: 10.1249/mss. 0b013e3181e0c112.

4. Focht BC et al. The individualized diet and exercise adherence pilot trial (IDEA-P) in prostate cancer patients undergoing androgen deprivation therapy: study protocol for a randomized controlled trial. Trials, 2014; 15:354.

5. Galvao DA et al. Compliance to exercise-oncology guidelines in prostate cancer survivors and associations with psychological distress, unmet supportive care needs, and quality of life. Psycho-oncology, 2015; DOI: 10.1002/pon.3882.

6. Champ CE et al. Fortifying the treatment of prostate cancer with physical activities. Prostate Canc, 2016; article ID 9462975.

7. Pinto BM et al. Home-based exercise among cancer survivors: adherence and its predictors. Psychooncology, 2009;18(4):369-76.

8. Singh F et al. Feasibility of presurgical exercise in men with prostate cancer undergoing prostatectomy. Integrative Cancer Therapies, 2016; DOI: 10.1177/1534735416666373.

9. Craike M et al. Predictors of adherence to a 12-week exercise program among men treated for prostate cancer: ENGAGE study. Cancer Med, 2016; 5(5):787-94.

10. Sutton E et al. The provision of dietary and physical activity advice for men diagnosed with prostate cancer: a qualitative study of he experiences and views of health care professionals, patients and partners. Cancer Causes Control, 2017; 28:319-29.

11. Keogh JW et al. Perceived barriers and facilitators to physical activity in men with prostate cancer: possible influence of androgen deprivation therapy. Eur J Cancer Care, 2014; 23(2): 263-73.

12. McQuade JL et al. Qigong/taichi for sleep and fatigue in prostate cancer patients undergoing radiotherapy: a randomized controlled trial. Psychooncology, 2016; DOI: 10.1002/pon.4256.

Exercise And Immune System

Dusan Hamar
Faculty of Physical Education and Sport, Comenius University Slovakia.
Email: dusan.hamar@fsport.uniba.sk

Though the effects of exercise on immune system had been studied by exercise scientists for decades, current COVID 19 pandemic has intensified the focus on this topic. From practical point of view, during current pandemic situation one has to consider two exercise-related fields of interest. One covers exercise limitations caused by adhering to strict rules of social contacts, another the effects of exercise on immune functions with potential protection against infection. Strict restriction of social contacts usually requires substantial modification of physical activity habits. Exercise, particularly moderate to vigorous intensity aerobic activities performed by large muscle groups for up to 60 minutes, instantaneously mobilize immune system. Positively affected are namely types of immune cells capable of the recognition and killing of virus-infected cells. The immune cells are firstly mobilised from marginated vascular pools, then also from spleen and the bone marrow. They are trafficked to secondary lymphoid organs and tissues, particular to the mucous epithelial tissues of lungs and the gut to be at disposal for immune defense. The immune cells are not only moblised, but also primed for their functions. Increased cardiac output and perfusion of virus endangered tissues fosters host immune surveillance, which makes body better equipped to deal with any infectious agent and in theory increases resistance to infection. Its well known that exercise also leads to a release of various proteins that may affect immune function. Among them worth of mentioning are namely muscle-derived cytokines from the group of interleukins such as IL-6 (trafficing of immune cell toward areas of infection), IL-7 (the promoton of new T-cells production from the thymus and IL-15 (maintain of the peripheral T-cell and NK-cell compartments). Similar patterns of immune response have also been observed during moderate-intensity resistance exercise training. Maintaining physical activity with resulting fostering of protective function of immune system is also important precaution for counteracting negative effects of long period of isolation and confinment in limited spaces of apartments and houses. Concomitant stress reactions mediated by increased level of glucocorticoids, namely cortisol inhibits many critical functions of immune system. Stress in particular negatively affects the ability of T-lymphocytes to multiply in response to infectious agents, as well as function of certain types of lymphocytes (e.g., NK-cells and CD8+ T-cells) to identify and kill abnormal cells with cancerous potentials or damaged by virus infection. Such negatively affected immune cells loose their ability to carry out effective surveillance within vulnerable tissues (e.g., the upper respiratory tract and the

lungs), hence failing to prevent viruses from entering the cells. This process is of utmost importance to minimize the impact of the virus spreading in the case of infection. Although currently no scientific data exists regarding the effects of exercise on coronavirus, there is evidence that exercise can protect the host from many other viral infections including influenza, rhinovirus (another cause of the common cold) and herpesviruses such as Epstein-Barr (EBV), varicella-zoster (VZV) and herpes-simplex-virus-1 (HSV-1). These theoretical assumptions are corroborated by animal studies showing protective effects of exercise on survival of influence infected mice. In the same line are also results of the space travel studies, showing that exercise distinctly mitigate negative effects of stress on immune functions during prolonged periods of isolation and confinement. In addition, research studies also indicate that exercise, due to aforementioned direct effects on cells and molecules of the immune system, may be an effective countermeasure to help maintain immune function and lower infection risk. In this regard, it is vitally important to maintain activity levels within recommended guidelines. During period of strict confinement, sedentary behavior should be avoided as much as possible. Long term sitting while watching TV or using computer should be interrupted by at least 2–3 minutes activity (walking, cleaning, gardening, etc.) every 20 minutes. It has been shown that performing at least some activity have positive health benefits compared to no activity at all. Ideally, general public is advised to adhere to the standard WHO recommendations of at least 150 minutes per week of moderate-intensity aerobic physical activity or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week and 2 sessions per week of muscle strength training. Performance oriented athletes should consider to respect results of of the studies showing compromised immune function for period up to 24 hours after vigorous exercise lasting more than 60 minutes avoiding extreme exercise regimens during critical pandemic period. Last but not least is also worth mentioning that exercise may especially beneficial for older adults who are more susceptible to infection in general and have also been identified as a particularly vulnerable population during this COVID-19 outbreak.

Cardiorespiratory Fitness And Immune System

Kalaivane Subramaniam
Bachelor of Medicine, Bachelor of Surgery (MBBS), International Medical University, Malaysia
Email : kalaivane@yahoo.com

Biological defence system which identifies and defends the body from pathogens. The system is further divided into two major types of immune response which is the Innate and Adaptive (Acquired) response.

Response	Line of defence	Time line	Cells	Examples
Innate (non-specific)	1st	Immediate Response (0-96hrs)	NK cells, Macrophages, Neutrophils, Dendritic cells , Mast cells, Basophils, Eosinophils	Skin, Hair, Cough, Mucous membrane of throat and gut, Phagocyte, Granulocyte
If Pathogen manages to escape the **Innate system**, **Adaptive** response kicks in				
Adaptive (specific)	2nd	Long term (>96 hours)	T and B lymphocyte	Pus, Swelling, Pain, T and B lymphocyte response

How Aerobic Exercise boost host Immune System?

Only small number of immune cells circulate around the body as they are usually confined to lymphoid tissues (lymph nodes, thymus and bone marrow) and spleen. The contracting muscles during exercise will increase the mobilization and availability of immune cells (especially the NK cells and T cells). An expert review in 2019 revealed the presence of circulating immune cells around the circulation for up to 3 hours after brisk walk. However this immediate response will gradually fade unless this work out is consistent. A study published in 2011 (British Journal of Sports Medicine) found that those who did aerobic exercise five or more days of the week had lower number of Upper Respiratory Tract Infection (URTI) over 12 week by 40%. This suggest that immune-protective effect that comes with moderate intensity exercise training are cumulative effect of daily acute changes that occur during each bout of exercise. Therefore constant regular exercise is important to build an ill-ness clearing immune system.

Association of Cardiorespiratory Fitness and Immune System

Moderate intensity exercise with 60 to 75% of maximum heart rate, frequency being 3-5 days per week and sessions ranging 20 to 60 mins for 10 to 12 weeks had shown significant improvement in cardiorespiratory fitness of the participants.

There are multiple scientific evidence which has demonstrated positive association between moderate intensity exercise intervention and the host immune system.

- A few randomized controlled trial found that participants in aerobic exercise group (moderate intensity exercise intervention 3- 5 days/week with 30 to 45 mins per session for 8, 12 and 15 weeks and others up to 1 year) reported lesser episodes of acute respiratory illness compared to participants with sedentary lifestyles. Moreover the severity and days of illness showed lower trend for exercise group. (Nieman et al 1990, 1993, Chubak et al 2006, Barret 2 et al 2012)
- A 16 week of 30 minutes moderate intense walking program corresponding to 75% of individual Maximum Heart Rate can increase the secretion of salivary Immunoglobulin A, the main immune defence mechanism in saliva. (Sloan et al 2012)
- A study in 2009 (moderate intensity exercise intervention 3 days/week with each session lasting 45 to 60 mins for 10 months) reported that the aerobic exercise improved antibody responses to influenza vaccination where the exercise group experienced influenza seroprotection throughout the influenza season. (Wood et al 2009)
- Recent studies on astronauts demonstrated that those with increased level of cardiorespiratory fitness and skeletal muscle endurance are 40% less likely to reactivate a latent herpesvirus (Varicella-Zoster, Epstein Barr and herpes Simplex Virus) during a 6-month mission into International Space Station. (Agha et al 2020)

The Bottom Line

Cardiorespiratory Fitness which is increased with moderate intensity exercise intervention contributes to the augmentation of host immune system and at the same time enhances responses to vaccination and protects against reactivation of latent virus. Moreover, exercise group who had respiratory tract viral infection had less severe symptoms and shorter recovery times therefore less likely to infect others. Sufficient stimulus is necessary to mobilise the immune cells to the circulation and this could be achieved with proper dosage of exercise by stressing the cardiorespiratory system, with intensity of exercise at 60 to 75% of maximum heart rate, 3 to 5 days per week ranging from 20 to 60 minutes. In view of our current pandemic

state, moderate intensity exercise training is the best route and should be used as adjunct to other preventative measures against respiratory tract viral infection and the key point is to maintain the activity in some form of regular systematic pattern.

References:

1. Nieman DC, Henson DA, Gusewitch G, Warren BJ, Dotson RC, Butterworth DE N-CS. Physical activity and immune function in elderly women.
2. Nieman DC, Nehlsen-Cannarel SL, Markoff PA, Balk-Lamberton AJ, Yang H, Chritton DBW, et al. The Effects of Moderate Exercise Training on Natural Killer cells and Acute Respiratory Tract Infections.
3. Chubak J, Mc Tieman A, Sorensen B, Wener MH, Yasui Y, Velasquez M, et al. Moderate Intensity exercise reduces the incidence of cold among the post menopausal womes. AM J Med 2006; 119(11).
4. Woods JA, Keylock KT, Lowder T, VieiraVJ, Zelkowich W, Dumich S, et al. Cardiovascular Exercise Trainingextends influenza vaccine seroprptection in sedentary old adults: the immune function intervention trial. J AM Geriatri Soc 2009;57(12)2183-91
5. Barrett B, Hayney MS, MullerD, rakel D, Ward A, Obasi CN, et al. Meditation or exercise for preventing acute respiratory infection: a randomized control trial. Ann Fam Med 2012;10(4):337-46
6. Sloan CA, Engels HJ, Fahlman MM, Yarandi HE, Davis JE. Effects of exercise on S-IgA and URS in postmenopausal women. Int J Sports Med 2013;34 (1): 81-6
7. Snehil. 2020 Oct; 143. Can moderate intensity aerobic exercise be an effective and valuable therapy in preventing and controlling the pandemic of COVID-19?. Med Hypotheses. 10.1016/j.mehy.2020.109854
8. Richard JS, Emmanuel K. 2020 Jul; 87: 6-7. The Immunological case for staying active during the Covid-19 pandemic. Brain Behav immun. 10.1016/j.bbi.2020.04.041
9. Mallory C. 2020 April. Does Exercise Boost Immunity? Health.com. https://www.health.com/fitness/does-exercise-boost-immunity

Does Exercise Help Or Harm Our Immune System?

Mandy Zhang
Associate Consultant, Sport and Exercise Medicine, Singapore.
Email : mandy.zhang.j@singhealth.com.sg

Exercise immunology is a relatively new area of scientific endeavor in sport and exercise medicine. The immune system is very responsive to exercise, correlating to the physiological stress imposed by the workload. Studies reported that high intensity heavy exercise was associated with transient immune dysfunction, increased inflammatory biomarkers and increased risk of upper respiratory tract infections (URTI).[1] Acute bouts of intense and prolonged exercise were reported by several early exercise immunology pioneer researchers to suppress immunoglobulin IgA, decrease natural killer cell lytic activity, reduce T and B-cell function and lead to 2 to 6-fold increase in URTI risk during the 1-2-week postrace period.[2,3] The immune changes occur in several compartments of the immune system and body including the skin, upper respiratory tract mucosal tissue, lung, blood, muscle and peritoneal cavity. For example, in a large group of 2311 endurance runners who participated in the Los Angeles Marathon race, 13.0% reported illness compared to 2.2% of control runners (OR 5.9, 95% CI 1.9-18.8).[4] Another study on 852 German athletes showed that URTI risk was highest in endurance athletes who concurrently reported significant stress and sleep deprivation.[5] Illness risk may be increased when the athletes participates in competitive events, undergoes repeated cycles of heavy exertion or experiences other stressors to the immune system including stress, anxiety and lack of sleep. However, the direct connection between exercise-induced immune changes and infection risk has not yet been established.

An illness prevention program on training and competition load management guideline may be as such:[6]

1. A detailed and individualized training and competition plan to provide for sufficient recovery, focusing on sleep, nutrition, hydration and psychological strategies
2. Small increments when changing the training load (typically less than 10% weekly)
3. Develop a competition event calendar that is based on the health of the athlete
4. Monitor for early signs and symptoms of over-reaching, overtraining and illness
5. Avoid intensive training when ill or experiencing the early signs and symptoms of illness
6. Participate in ongoing illness surveillance systems by sport agencies

It is also important to consider psychological load management and develop coping strategies to minimize internalized impact of negative life events and emotions as well as optimizing hygiene, lifestyle, nutrition and behavioral strategies. The protective effect of moderate activity on illness incidence contrasts with the increased illness risk linked with prolonged and intensive exercise, as depicted in the J-curve model.[7] In the J-curve model, a 40-50% reduction in URTI symptoms are observed with moderate intensity exercise. Thus, recreational athletes are generally advised to limit training sessions to <60 minutes and <80% of maximal ability. The IOC consensus provided support for the J-curve model but cautioned for the elite athletes accustomed to high intensity training, evidence suggests that this J-curve hypothesis may not apply to them, where high training loads are not consistently associated with an increased risk of illness.[6]

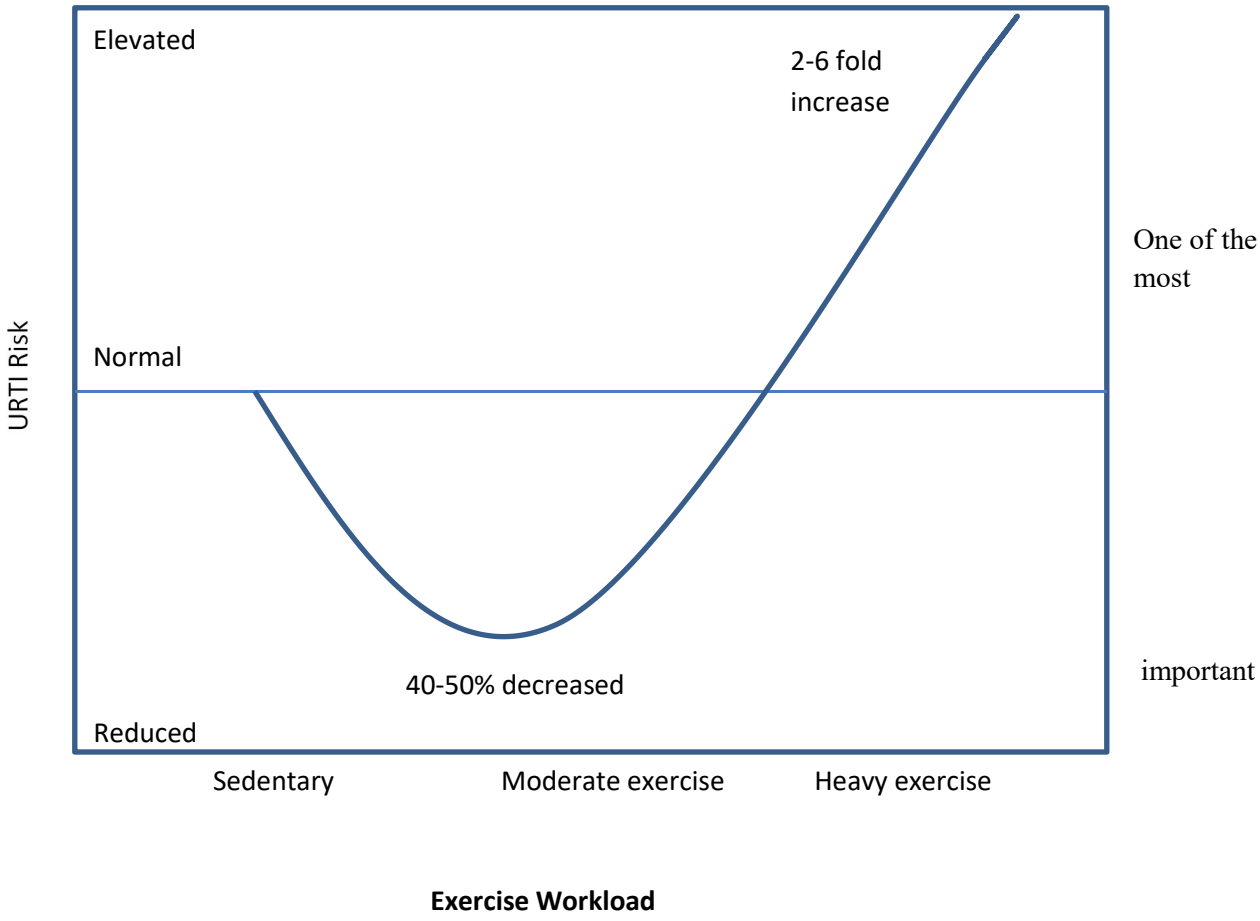


Figure. J curve model relationship between exercise workload continuum and risk of upper respiratory tract infection (URTI).

In this webinar, we will discuss if exercise is helpful or harmful in the era of the COVID-19 pandemic, the acute and chronic effects of exercise on the immune system, clinical benefits of this exercise-immune relationship and the nutritional influences on the immune response to exercise.

References:

1. Mackinnon LT. Changes in some cellular immune parameters following exercise training. Med Sci Sports Exerc 1986;18:596–7.

2. Mackinnon LT, Chick TW, van As A, Tomasi TB. The effect of exercise on secretory and natural immunity. Adv Exp Med Biol 1987; 216A:869–76.

3. Hoffman-Goetz L, Keir R, Thorne R, Houston ME, Young C. Chronic exercise stress in mice depresses splenic T lymphocyte mitogenesis in vitro. Clin Exp Immunol 1986;66:551–7.

4. Nieman DC, Johanssen LM, Lee JW, Arabatzis K. Infectious episodes in runners before and after the Los Angeles Marathon. J Sports Med Phys Fitness 1990;30:316–28.

5. Konig D, Grathwohl D, Weinstock C, Northoff H, Berg A. Upper respiratory tract infection in athletes: influence of lifestyle, type ofsport, training effort, and immunostimulant intake. Exerc Immunol Rev 2000;6:102–20.

6. Schwellnus M, Soligard T, Alonso JM, Bahr R, Clarsen B, Dijkstra HP, et al. How much is too much? (Part 2) International Olympic Committee consensus statement on load in sport and risk of illness. Br J Sports Med 2016;50:1043–52

7. Nieman DC. Is infection risk linked to exercise workload? Med Sci Sports Exerc 2000;32(Suppl. 7):S406–11.

Sportsmen Infected With SARS2-CoV Recover By Secretory And Cellular Immune Responses And Do Not Develop Long-Term Immunity Through Neutralizing IgG Antibodies

Zsombor Laczsa
University of Physical Education, Budapest, Hungary
Email : lacza.zsombor@tf.hu

Serological, cytokine, and virus neutralization capacities were analyzed in professional athletes who volunteered for reconvalescent plasma donation after they recovered from a possible COVID-19 infection. The Hungarian national kayaking, swimming, fencing, wrestling and mountain biking teams participated in international sports events during the early phases of the COVID-19 epidemic in February-March 2020. From those 97 of them who were tested with PCR 11 were found positive. Testing was not widespread at this early phase of the pandemic, several more of them were possibly infected and altogether 29 professional athletes volunteered to donate plasma. Their serological status was evaluated by IgA, IgM and IgG ELISAs and the highest virus neutralization titer in an in vitro live tissue assay. Plasma cytokine patterns were analyzed with a Bioplex multiplex ELISA system. Surprisingly, only 1 athlete had a strong anti-SARS2-CoV IgG titer while the secretory IgA was more common (31% positive). Neither one plasma showed direct virus neutralization in a titer over 1:10, hence they were not suitable for reconvalescent plasma donations. The 'cytokine storm' markers IL-6, IL-8, GM-CSF, IP-10, MIP1alpha were all at baseline levels. In contrast, the anti-viral cytokine RANTES was elevated in 48,27 % of athletes, who also showed elevated IL1 beta, IL1-ra, IL-13, MCP-1 and TNF-alpha concentrations. We conclude that the professional athlete population is highly susceptible for the SARS2-CoV infection without developing long-term immunity through neutralizing immunoglobulins. Elevated secretory and cellular immunity markers indicate that these systems are probably responsible for virus elimination in this sub population.

Keywords: SARS2-CoV, COVID-19, sports, athletes, cytokines, immunoglobulins, neutralizing antibodies, coronavirus

Cultivating Happiness With Appropriate Exercise Parameters

Lim Boon Hooi
University of Malaya, Kuala Lumpur, Malaysia
Email : lboonhooi62@gmail.com

Happy people are lively, witty and have the ability to spread joy and laughter around them. Above all, happy people lead a more successful life and possess a greater capacity for handling challenging situations (Kaczmarek, 2017). Most authors use happiness as a valid psychological term within the well-being literature (Diener, 2000). There are three main components of happiness that have been identified by researchers are frequent positive affection or joy, high level of life satisfaction over a period of time, and the absence of negative feelings such as depression and anxiety (Argyle & Crossland, 1987). One of the key strategies for improving happiness and reducing negative feeling is exercise, which contributes to healthy ageing by preventing disability, morbidity and mortality in older adults (Fararouei, Brown, Toori, Haghighi, & Jafari, 2013; khazaee-pool, 2015).The benefits of exercise on mental health have been well documented (Saxena, Clark, Oliver, & Ilbery, 2007). For instance, there is a large body of literature demonstrating that exercise effectively reduces depression and anxiety (Ströhle et al., 2007). However, previous studies have predominantly focused on the effects of exercise on the negative aspects of mental health and concerned the use of exercise as a preventive or curative approach for mental disorders (Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014). The investigation of the relationship between exercise and mental disorders is of importance because mental disorders are linked to increased morbidity, premature mortality, and greater medical cost (Alexopoulos, 2005). The relationship between exercise and positive mental constructs has remained largely unexplored. The World Health Organization has stressed the positive dimension of mental health and defined that “health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO 2014). At the beginning of 21st century, researchers pointed out the psychology’s empirical focus should shift from “only pre-exercise ring the worst things in life to also building positive qualities” (Seligman & Csikszentmihalyi, 2000). Therefore, attention should not only be given to the negative aspects when examining the relationship between exercise and mental health. A recent cross-sectional studies based on large general population have shown that exercise is associated with happiness (Lathia, Sandstrom, Mascolo, & Rentfrow, 2017). Some reviews indicate that the exercise might be an important correlate of happiness and the investigation of the effects of exercise on happiness would be a very promising research area (Diener, Ronald, & Tay, 2012). Such investigation is also thought to

enable new channels to apply health promotion models to exercise interventions (Huppert, 2009). At such, to cultivate happiness, the following section elaborate the appropriate exercise parameters enable to obtain the optimal levels of happiness.

Type of Exercise Associated with Levels of Happiness

The types of exercise programs implemented in the intervention studies included aerobic exercises (Courneya, 2017), mixed school exercise classes (Johnson et al., 2008), and stretching and balance exercises. All these studies clearly specified the time, frequency, and duration of the exercise programs, with the time ranging from 30 to 75 min, frequency from once per week to five times per week, and duration from 7 weeks to 12 months (Khazaeepool, Sadeghi, Majlessi, & Foroushani, 2015). These studies reported the type of exercise chosen able to cultivate happiness among participants. Hence, regardless what type of exercise, as long you enjoyed doing it without stressed. Another study was carried out to compare effects of moderate intensity aerobic exercise with stretching exercise 6 months among sedentary older adults, with 40 min each time and three times per week, results reported that happiness level significantly improved in both aerobic exercise group and stretching exercise group after 6-month intervention and there was no difference in the change of happiness between the two groups (McAuley et al., 2005). Similar study was conducted 30-min stretching and balance exercise with 3 times per week for 8 weeks among older adults aged 65–89 years (khazaee-pool, 2015). This study found that intervention group significantly increased happiness level after 8-week while non-intervention group did not. Another study reported that 8-week stretching and balancing exercises intervention, with 60 min each time and one time per week, significantly improved happiness level in intervention group but not in usual care group among older adults living in nursing homes (Tse, Tsoi, Wong, Kan, & Kwok, 2014) .

Frequency and Duration of Exercise Associated with Levels of Happiness

Exercise frequency and exercise volume are essential factors in the relationship between exercise and happiness (Zhang & Chen, 2018), and more importantly, even a small change of exercise makes a difference in happiness. Studies showed the significant difference in happiness levels between doing exercise 1 day per week and none per week.

As little as 10 min exercise per week might greatly increase the odds of being happy. Such pattern that small amounts of exercise yield benefits was similar in the relationship between exercise and other aspects of mental health, such as depression and anxiety (Teychenne, Ball, &

Salmon, 2008). In addition, there seems to be a threshold effect for the relationship between exercise and happiness.

Intensity and other parameters of Exercise Associated with Levels of Happiness

There might not be an optimal type or intensity of exercise in the relationship between exercise and happiness. Previous studies have demonstrated aerobic exercise and stretching/balancing exercise were equally effective in improving happiness. The positive associations between exercise and various intensities of exercise (light, moderate, vigorous) were reported across observational studies. In addition, the relationship between exercise and happiness might be domain-specific, in which leisure time exercise showing the most consistent positive association with happiness (Zhang & Chen, 2018). The intensity of exercise programs was reported in four studies by indicating the percentage of maximum heart rate (Vallerand, Rhodes, Walker, & Courneya, 2017). or the percentage of maximum rate of oxygen consumption (McAuley & Blissmer, 2000). Gender difference was found in two studies, with males showing the positive association between exercise and happiness while females not. One possible explanation may be that the men are more likely to participate in exercise for the reason of enjoyment than women (Azevedo et al., 2007). Previous studies have shown that there were some differences across cultures in terms of the causes of happiness, such as the relationship between self-esteem and happiness was moderated by individualism (Neve, Diener, Tay, & Xuereb, 2013). Our results indicate that exercise is consistently correlated with happiness in countries across various areas, indicating no cultural difference in the relationship between exercise and happiness (Zhang & Chen, 2018).

References

Alexopoulos, G. (2005). Depression in the Elderly. *Lancet, 365*, 1961-1970. doi:10.1016/S0140-6736(05)66665-2

Argyle, M., & Crossland, J. (1987). The dimensions of positive emotions. *British Journal of Social Psychology, 26*(2), 127-137. doi:10.1111/j.2044-8309.1987.tb00773.x

Azevedo, M., Araújo, C., Reichert, F., Siqueira, F., Silva, M., & Hallal, P. (2007). Gender differences in leisure-time physical activity. *International journal of public health, 52*, 8-15. doi:10.1007/s00038-006-5062-1

Cornelisse-Vermaat, J. R., Antonides, G., Van Ophem, J., & Maassenvandenbrink, H. (2006). Body Mass Index, Perceived Health, and Happiness: Their Determinants and Structural Relationships. *Social Indicators Research, 79*, 143-158. doi:10.1007/s11205-005-4097-7

Courneya, K. S. (2017). Exercise guidelines for cancer survivors: Are fitness and quality-of-life benefits enough to change practice? *Current Oncology, 24*, 8. doi:10.3747/co.24.3545

Diener, E. (2000). Subjective Well-Being: The Science of Happiness and a Proposal for a National Index. *The American psychologist, 55*, 34-43. doi:10.1037/0003-066X.55.1.34

Diener, E., Ronald, I., & Tay, L. (2012). Theory and Validity of Life Satisfaction Scales. *Social Indicators Research, 112*. doi:10.1007/s11205-012-0076-y

Fararouei, M., Brown, I., Toori, M., Haghighi, R., & Jafari, J. (2013). Happiness and health behaviour in Iranian adolescent girls. *Journal of adolescence, 36*, 1187-1192. doi:10.1016/j.adolescence.2013.09.006

Huppert, F. (2009). Psychological Well-Being: Evidence Regarding Its Causes and Consequences. *Applied Psychology: Health and Well-Being, 1*, 137-164. doi:10.1111/j.1758-0854.2009.01008.x

Johnson, C., Murray, D., Elder, J., Jobe, J., Dunn, A., Kubik, M., . . . Schachter, K. (2008). Depressive Symptoms and Physical Activity in Adolescent Girls. *Medicine and science in sports and exercise, 40*, 818-826. doi:10.1249/MSS.0b013e3181632d49

Kaczmarek, L. (2017). Happiness. In (pp. 1-5).

khazaee-pool, M. (2015). *Effects of physical exercise programme on happiness among older people*.

Khazaeepool, M., Sadeghi, R., Majlessi, F., & Foroushani, A. (2015). Effects of physical exercise programme on happiness among older people. *Journal of Psychiatric and Mental Health Nursing, 22*. doi:10.1111/jpm.12168

Lathia, N., Sandstrom, G., Mascolo, C., & Rentfrow, P. (2017). Happier People Live More Active Lives: Using Smartphones to Link Happiness and Physical Activity. *PLOS ONE, 12*, e0160589. doi:10.1371/journal.pone.0160589

McAuley, E., & Blissmer, B. (2000). Self-Efficacy Determinants and Consequences of Physical Activity. *Exercise and sport sciences reviews, 28*, 85-88.

Neve, J.-E., Diener, E., Tay, L., & Xuereb, C. (2013). The Objective Benefits of Subjective Well-Being. In.

Rosenbaum, S., Tiedemann, A., Sherrington, C., Curtis, J., & Ward, P. (2014). Physical activity interventions for people with mental illness: A systematic review and meta-analysis. *Journal of Science and Medicine in Sport, 18*, e150. doi:10.1016/j.jsams.2014.11.161

Saxena, G., Clark, G., Oliver, T., & Ilbery, B. (2007). Conceptualizing Integrated Rural Tourism. *Tourism Geographies - TOUR GEOGR, 9*, 347-370. doi:10.1080/14616680701647527

Seligman, M., & Csikszentmihalyi, M. (2000). Positive Psychology: An Introduction. *The American psychologist, 55*, 5-14. doi:10.1037/0003-066X.55.1.5

Ströhle, A., Höfler, M., Pfister, H., Müller, A.-G., Hoyer, J., Wittchen, H.-U., & Lieb, R. (2007). Physical activity and prevalence and incidence of mental disorders in adolescents and young adults. *Psychological medicine, 37*, 1657-1666. doi:10.1017/S003329170700089X

Teychenne, M., Ball, K., & Salmon, J. (2008). Physical activity and likelihood of depression in adults: A review. *Preventive medicine, 46*, 397-411. doi:10.1016/j.ypmed.2008.01.009

Vallerand, J., Rhodes, R., Walker, G., & Courneya, K. (2017). Correlates of meeting the combined and independent aerobic and strength exercise guidelines in hematologic cancer survivors. *International Journal of Behavioral Nutrition and Physical Activity, 14*. doi:10.1186/s12966-017-0498-7

Zhang, Z., & Chen, W. (2018). A Systematic Review of the Relationship Between Physical Activity and Happiness. *Journal of Happiness Studies*. doi:10.1007/s10902-018-9976-0

Impact Of Brain-Breaks Videos On Improving Coping Strategies For Malaysian: The New Norms

Garry Kuan Pei Ern
Exercise and Sports Science Programme, School of Health Sciences, Universiti Sains Malaysia, Kelantan, Malaysia, Department of Life Sciences, Brunel University London, Uxbridge, United Kingdom.
Email : garry@usm.my

The COVID-19 is the first global pandemic of our generation spreading worldwide, disrupting the everyday lives of people living in the affected areas, affecting almost every industry, including healthcare, education, jobs, transport, finance and cultural activities. The outbreak of COVID-19 has forced governments to impose "lock-down", "movement control order" and "work from home" policies for a prolonged period. All of a sudden, most of the world population has been in lock-down as their new normal form of living. Although these steps are crucial to slow the spread of COVID-19, they can have a detrimental effect on psychological distress and other mental health symptoms, including anxiety about the uncertainty of virus exposure and stress from social isolation. The lock-down orders, coupled with the ever-increasing number of reported cases and deaths, economic instability, frustration and boredom, insufficient resources and access to regular medical care, changes in their daily routine, and widespread media coverage, may all contribute to unintended health consequences that may persist long after the outbreak. Under such conditions, maintaining physical and mental health is more critical than ever, because not only can a healthy body and mind allow us to cope with the challenges in life, but they can also avoid infection and other illnesses. Physical activity is considered essential to maintaining mental health and has been recognised as an important method for dealing with stress. Studies have shown that physical activity releases endorphins chemicals in the brain that act as natural painkillers and also enhance sleeping capacity (Hajar et al., 2019), which in turn reduces stress. Evidence shows that daily involvement in physical activity helps to decrease overall stress levels and makes one feel energised and healthy. With the implementation of the MCO, public parks, playgrounds and jogging tracks have been closed. This has contributed to an even higher decline in physical activity levels among the population of Malaysia. Fortunately, Brain-breaks was introduced free of charge to the Malaysian population on 21st of March 2020 and more than 2000+ new registrations were registered due to the MCO, with more people staying healthy during the MCO. Brain Breaks® Physical Activity Solutions or known as brain-breaks, an exercise video which aims to stimulate people' interest in learning and promote better health and wellness. The programme is supported by the United

Nations as part of the 17 Sustainable Developmental Goals under the #3 Health and well-being and #4 Quality education, with a focus on CDC's Whole School, Whole Community, Whole Child (WSCC) model. Brain-breaks have shown success in enhancing students' learning, improving motor and health-related fitness, self-esteem, and cultural awareness are embedded in every video. There are over 400+ physical activity videos to choose from on the website (Kuan et al., 2019; Rizal et al., 2019). The goal of the this study was therefore to investigate the impact of using brain-breaks videos on improving coping strategies for Malaysian during the MCO. Since brain-breaks are a promising intervention strategy, they can be introduced among Malaysian populations to improve coping mechanisms and improve their levels of physical activity during MCO. In this regard, more research on the implementation of brain-breaks interventions is needed. More convincing evidence based on longitudinal data and experimental research is therefore still needed, especially during the MCO period. Thus, in this presentation, I will attempt to incorporate brain-breaks for Malaysian population in three levels: adolescents (< 18 years of age), adults (between 19 – 65 years of age) and older adults (> 65 years of age). Participants received 12 Brain-breaks videos sessions, each of which ranged from 8 to 10 minutes, at low-to- moderate intensity, while the control group did not engage in brain-breaks. There are some limitations in this study. Firstly, brain-breaks is intended for the classroom settings; but, as a result of the MCO, not all participants have enough spare in their home to conduct the intervention. In addition, the online session could have hindered the ability to ensure that all the participants did the correct movements during the intervention sessions. However, this limitation did not have a substantial effect on the findings of the study. The study was conducted in the real-world situations, which is the strength of the study. To conclude, brain-breaks have shown promising tools on improving the coping strategies of the participants. It is seen as a holistic approach to be introduced in the every family to improve commitment to exercise adherence and to cope with stress during the time of movement control order.

Acknowledgement: I would like to also acknowledge Ming-Kai Chin for his guidance and for providing the Brain-Breaks platform, under the GCH and HOPSports® Inc.

Reference:

Kuan, G., Rizal, H., Hajar, M.S., Chin, M.-K., & Mok, M. (2019). Bright sports, physical activity investments that work: Implementing brain breaks in Malaysian primary schools. *Br. J. Sports Med*. 1, 1–2.

Hajar, M.S., Rizal, H., Kueh, Y.C., Muhamad, A.S., & Kuan, G. (2019). The effects of brain breaks on motives of participation in physical activity among primary school children in Malaysia. *Int. J. Environ. Res. Public Health*. 16, 2331.

Rizal, H., Hajar, M.S., Muhamad, A.S., Kueh, Y.C., & Kuan, G. (2019). The effect of brain breaks on physical activity behaviour among primary school children: A transtheoretical perspective. *Int. J. Environ. Res. Public Health*.16, 4283.

Stages Of Exercise Behavior Change And Exercise Participation During Covid 19 Pandemic Among Adult Filipinos

Henry Daut
Deputy National Director, National Grassroots Sports Development Program, Philippines
Email : henry_daut@yahoo.com

The main purpose of this study was to determine the stage of exercise behavior change among adult Filipinos and their participation in exercise during the pandemic. A total of 512 subjects from different regions in the country responded to the on-line survey questionnaire. Collected data was analyzed using descriptive statistics and Pearson r and chi-square for the relationships of the variables. Results showed that majority of the respondents are female (55.5%) and employed (77.5%), and single (53.1%). Data on the stage of exercise behavior change revealed that majority (55.4%) of the respondents are in the Maintenance stage of exercise behavior while 40.1% are in the Pre-Contemplation to Preparation Stages. Participation in exercise showed that majority (57.4%) are not regular. Results indicate that 61.1% of the respondents exercised below the suggested minimum frequency of 3 times a week. Likewise, 75.8% did not meet the required number of hours of exercise per week. Significant relationships were found between age (r-.089*) and sex (p-.035*) and Stage of exercise behavior change. Likewise, significant relationship was found between sex and exercise participation (p-.002*). frequency (r-.328*) and length of time (x-43.942*) of exercise are also significantly related to stages of exercise behavior change. Findings indicate factors of frequency and length of time of exercise engagement as determinants of exercise behavior change. There is a need to promote regular engagement in physical exercise to promote resilience and strengthen health and fitness among Filipinos against illnesses or pandemic such as Corona virus 19. The present pandemic highlighted the importance of regular exercise to promote health and fitness and help strengthen the immune system of the body. Furthermore, the need to understand and promote exercise behavior change from pre-contemplation to action and maintenance is vital to promoting healthy, fit and active citizens.

Exercise behavior change, exercise participation

Exercise And Depression

Nurashikin Binti Ibrahim
Public Health Medicine Specialist, Ministry Of Malaysia
Email : putriumy@gmail.com

According to the World Health Organization, it is estimated that over 264 million people of all ages suffer from depression. It has been reported that depression is the main cause of disability worldwide[1]. Due to this, there have been various efforts from governments and non-governmental agencies to combat depression in overall society. The question now is, how can individuals help themselves establish healthy coping mechanisms to combat depression on a day-to-day basis? There is evidence to suggest that exercise can improve treatment outcomes for patients who suffer from depression. In a study conducted by McNeil JK, 30 community-dwelling moderately depressed men and women were asked to perform an exercise consisting of walking 20 to 30 minutes 3 times per week for 6 weeks. The outcome of the research found that the exercise program alleviated overall symptoms of depression[2]. There are few reasons as to why exercise helps to alleviate symptoms of depression. Firstly, it has been established that exercise releases endorphins. Endhorphins are hormones that are often related with creating a positive mood for an individual. This has a positive effect in alleviating symptoms of depression as it allows a person to feel a sense of accomplishment post-exercise[3]. Next, exercise also serves the purpose of distracting an individual from engaging in their worries and depressive thoughts. When an person is heavily engaged with physical activity, they do not have the time to self-introspect and think about their worries and form negative associations[4]. Furthermore, exercise builds self-worth and enhances the generalized feelings of efficacy of individuals. When a person is depressed, they feel that they cannot do positive activities that they desire an reach their goals. People who experience depression often have low efficacy to cope with the symptoms of their depression. However, when a person exercises, the physical activity that they do is likely to allow the enhancement of generalized feelings of efficacy. It has been reported that individuals who exercise tend to have better feelings of self worth and are less likely to engage in negative feelings such as negative self - evaluation and negative ruminations[5]. In conclusion, it can be established that exercise is an important tool in decreasing symptoms of depression in individuals. It is imperative fro individuals who experience depression to incorporate exercise in their daily routine in order to further improve their mental health and quality of life.

References

[1] World Heath Organisation. Available at <https://www.who.int/news-room/fact-sheets/detail/depression> (Accessed, September 7,2020)

[2] McNeil JK, LeBlanc EM, Joyner M. The effect of exercise on depressive symptoms in the moderately depressed elderly. Psychol Aging. 1991;6:487-488. [Pubmed] [Google Scholar]

[3] Lynette L. Craft, Ph.D. and Frank M. Perna, Ed.D., Ph.D. The Benefits of Exercise for the Clinically Depressed. Available at <https://www.ncbi.nlm.nih.gov./pmc/articles/PMC474733/>

[4] Leith LM. Foundations of Exercise and Mental Health. Morgantown, W Va: Fitness Informational Technology. 1994 [Google Scholar] [Ref list]

[5] Craft LL. Exercise and clinical depression: examining two psychological mechanisms. Psychol Sport Exerc. In press [Google Scholar] [Ref List]

The Directive Function Of Autobiographical Memory: Recalling Positive Memories Increases Exercise Activity

Lee Kean Mun
University of Nottingham Malaysia
Email : Leekeanmun@hotmail.com

Adoption of sedentary lifestyles increases individuals' risk of dying from ischemic heart disease. Despite such consequences, only 37% of Malaysian adolescents are considered physically active. Building off the work of Biondolillo and Pillemer (2014), the current study aimed to examine how personality traits may influence the effects of motivational memory recall with regard to exercise behaviour. Participants completed questionnaires which assessed exercise-related attitudes, motivation, and behaviour. They were then randomly assigned a positive, a negative, or no memory prompt, and, if requested to recall a memory, they would answer a questionnaire examining the memory characteristics. Finally, all participants rated their intentions to exercise. This procedure (excluding the memory prompt and questionnaire) was then repeated one week and one month after the respective prior session. Analyses suggest that, when not accounting for covariates, participants who recalled positive memories experienced larger increases in exercise activity after one week when compared to those who recalled negative or no memories. This effect persisted after one month. No effects with regard to personality were, however, found. Participants with strong Extraversion, Neuroticism, or Conscientiousness traits did not benefit more or less from positive or negative memory prompts.

The Global Obesity Epidemic: Potential Causes And Solutions

Robert Girandola
University of Southern California, Los Angeles, USA.
Email : girandol@usc.edu

Obesity, as defined by the BMI standard (weight in kg/height in Meters squared), has nearly tripled since the mid 1970's. Despite all the recommendations, all the conferences, all the medical intervention, this problem continues to get worse, There is no evidence that the numbers have plateaued. The BMI standards, which are gender independent are as follows: 25 = Overweight, and 30 and above = Obesity. Based upon statistics from WHO in 2016 more than 1.9 billion adults were overweight (25>) and of those 650 million were obese. The statistics get worse. In 2019 38 million children UNDER the age of 5 were overweight or obese. As of 2016 there were 340 million children and adolescents between ages of 5-19 that were classified as either overweight of obese. IF we look at childhood obesity alone in the United States the data are frightening. Since the 1970's childhood obesity has increased by 400%. While the actual numbers are still lower than adults these data indicate the problem for children is becoming much worse. Obesity is classified as a preventable disease yet regardless of the country and the medical intervention we have not been able to arrest it. The Covid 19 epidemic has also brought in obesity as a co morbidity factor. Where some are suggesting that if people are obese the potential outcome of the virus may end up in death. There is no doubt that obesity is a major risk factor in cardiovascular disease, Type 2 Diabetes and certain forms of cancer. In the United States where the CDC continues to do epidemiological data on obesity shoes that perhaps as many as 70% of the adult population are overweight and about 35% are obese. These data vary markedly by states with the greatest problems occurring in the southern part of the US. When we look at the main causes of obesity the conclusion is quite simple people eat more food than the amount of energy they expend. This is referred to as Positive Caloric Balance. While the ultimate cause appears to be simple the root cause of this imbalance is quite complex. Of course when we examine the time frame when obesity and overweight began to increase dramatically we try to determine what factors might have brought on this change. If we examine data from the USA, it is clear that a dramatic rise in obesity began in the 1970's and has continued into the 21st Century with no evidence of a plateau. What were the environmental variables that caused people to gain weight? Can it be the expenditure side of the caloric balance equation? Jobs were more automated fewer and fewer required physical effort. Cars began to proliferate so people walked much less. Television sets were less costly and also proliferated dramatically in the latter part of the 20th century Computers, video games and the internet were the final pieces

of the puzzle to MAKE people sit home and not move. Childhood obesity seemed to parallel adult obesity during the same time frame. IF children were not involved in a school sports program the likelihood was that they would be mostly sedentary at school and then at home. Having grown up. In the 1950s, 60s and 70s I can attest to the greater activity level of children during that time frame. In the present environment computers ipads, phones and ,of course, the internet occupy a great deal of children's lives with the sacrifice of being outdoors and being active. Fitness clubs do a world of business after the Christmas and New Years holidays as people who have eaten too much want to somehow lose weight Sadly, statistics show that as many as 50% of new members will stop attending clubs within 3-4 months of joining. It is very difficult to motivate anyone to exercise and maintain it. However it is not just the expenditure side of the equation that is the problem. There has always been the question: Do we eat more now than we did at the turn of the 20th Century. This question is still unanswered. However, according to the US Department of Agriculture Americans ate approximately 500 Calories more food from 1970 to 2016, from 2055 to 2515. Refined grains, sugars and fats, were supplying these extra calories. An increase of 500 Calories per day could certainly lead to an enormous weight gain over time, if not balanced out by activity. Mathematically that amounts to 15,000 Calories/month and 180,000 Calories/year. IF we use the algorithm of 3500 Cal/pound that would amount to a weight gain of 100 lbs or 45 kg. Of course it is never that linear but one can see how easy it is to gain weight in the present environment. The first McDonalds restaurant opened in 1950's and now we have them everywhere. The fast food establishments proliferate every country and they are in competition to gain more customers. They do this by offering larger and larger portions for the same cost. When McDonalds first opened the typical serving of Hamburger, French fries and Coke amounted to about 500 Calories. That would not even amount to a child's plate. People are now used to eating larger and larger portions of food. Evidence has clearly shown that when humans eat foods with salt and sugar the brains react positively. In addition fat, both the texture and taste make people consume more and more of it. Also many individuals are overstressed and it does appear that foods, especially certain kinds of foods may act as stress relievers. The medical consequences of being obese are severe. Having a BMI over 40 is considered morbid obesity with an attenuated life span. According to statistics from the USA, the rise in obesity into 2023 will result in the following increases of these conditions and diseases. Stroke increase 5%; Angina increase 12%; Heart Attack increase 18%; Hypertension increase 28% and the REAL problem, Type 2 Diabetes, already at epidemic levels is supposed to increase by 54%! The solution is prevention, to not become obese. Once a person is obese the medical solutions are limited and possibly extreme. Drugs are essentially a

non-factor. Those that have any efficacy have rather severe side effects. Surgery is one possibility but it results in the removal of part of the GI Tract and is extremely expensive. My recommendation is to Somehow get people to become active again, but that boat may have been long gone . The solution to this problem is grim.

Endocrine Disorders And Physical Activity

Irena Aldhoon-Hainerova
Birmingham Children's Hospital, Department of Endocrinology and Diabetes, Birmingham, UK
and Charles University, Prague, Czech Republic
E-mail: ihainer@gmail.com

This review will discuss the impact of hormonal impairment on musculoskeletal system and physical performance as well as the response to physical activity in patients with endocrine diseases involving thyroid, adrenal, pituitary or gonadal glands. The heart is an organ sensitive to the action of thyroid hormone. Even only small changes in thyroid hormone serum concentrations can lead to changes in cardiovascular performance. Thyroid hormones may significantly decrease the strength of skeletal muscles. Thyrotoxicosis is a common disease caused by an excess of thyroid hormones, most frequently caused by Graves' disease. In hyperthyroid patients there is observed increased metabolic rate, heartbeats and cardiac output. Hyperthyroidism is thus associated with low efficiency of cardiopulmonary function, impaired chronotropic, contractile, and vasodilatory reserves. Mitochondria oxidative dysfunction during exercise causes intracellular acidosis. Congenital hypothyroidism is an endocrine condition with a significant impairment of growth and neuromotor development. Deficiency of thyroid hormones affects the function of several systems, including the musculoskeletal system. It has been shown that children early treated with thyroid hormones do not exhibit impairment in muscle strength, however patients with congenital hypothyroidism still present with poor postural control ability and asymmetric plantar loading distribution. Improvement of body posture can be achieved by increasing the physical activity. A reduced physical performance in hypothyroidism is due to impaired muscle metabolism and exercise capacity and an inadequate cardiovascular support. Administration of levothyroxine in patients with subclinical hypothyroidism is still somewhat controversial, however some studies demonstrated that such treatment has led to improvement of submaximal cardiopulmonary exercise performance. In both thyroid conditions (excess and deficiency), cardiac structures and function may remain normal at rest, however an impaired cardiovascular and respiratory adaptation to effort becomes apparent during exercise. Overweight and physical inactivity are positively related to risk of several cancers. A meta-analysis did not find any association between physical activity and thyroid cancer, however a study in normal weight and underweight women showed a reduction of papillary thyroid cancer risk in those with long-term physical activity. Disorders of adrenal glands, such as classic congenital adrenal hyperplasia or Addison's disease are associated with

impaired function of the adrenal cortex leading to decreased production of cortisol. A blunted exercise-induced rise in blood glucose may be found in these patients. Increasing dose of hydrocortisone, so called stress dose, before exercise has been widely discussed. Some studies showed that stress dose of hydrocortisone is not beneficial in patients with classic congenital adrenal hyperplasia undergoing short-term, high intensity exercise and in patients with Addison's disease undergoing short-term strenuous physical activity. It is still unclear whether stress doses are needed in other types of exercise. Endogenous increased cortisol levels such as in Cushing's syndrome is associated with visceral obesity and increased risks for cardiovascular diseases. Muscle function in Cushing´s syndrome is affected by both proteocatabolic effects of cortisol and frequently present hypokalemia. Corticosteroids-induced myopathy was first described in 1932 by Harvey Cushing and is a feature leading to fatigue and exercise intolerance. Cardiac dysfunction that limits blood supply to muscles in patients with Cushing syndrome was found to persist during remission of the disease. Corticosteroid-induced myopathy is also found in patients with prolonged oral or intravenous glucocorticoid use. Physical therapy in the form of resistance and aerobic exercise has shown in some studies to prevent and treat steroid-induced myopathy. There have been several theories related to the cause of the Overtraining Syndrome in athletes. One theory proposes hypercortisolemic states similar to Cushing's syndrome. This may be induced by intensive exercise training as well as by the stress of sporting competitions. A study published in 2005 found that cortisol responses to exercise (e.g. endurance athletes) can be as high as those seen in Cushing´s syndrome patients, however in contrast to patients with Cushing's syndrome high levels of cortisol last for only a short period of time. A normal testosterone secretion is crucial in males to guarantee both a physiological exercise adaptation and safe sport participation. Exercise and sport participation may positively or negatively influence andrological health status depending on the type, intensity and duration of performed physical activity and on individual health status. Congenital hypogonadotropic hypogonadism is characterized by impaired testosterone secretion. Hypogonadism in men is associated with decreased physical performance due to increased body fat content and reduced muscle mass. Additionally, physical abilities are further hampered by lower oxygen supply due to decreased hemoglobin concentrations and by poor glucose utilization as well as by dysthymia and lack of necessary aggressiveness. Several studies demonstrated that regular testosterone replacement therapy is efficient in providing health physical fitness in these men. Testosterone substitution improves lipid and insulin metabolism, decreases fat depots, supports the growth of muscle fibers and increases bone density. All this leads to increased physical fitness, strength and endurance. On the other hand, the use of

doping substances is known to disrupt the male hypothalamic pituitary-gonadal axis, resulting in hypogonadism and infertility. Similarly, it can have an impact on the ovarian function in women. Interestingly, several studies demonstrated that regular physical activity can alleviate menopausal symptoms, including, psychological, vasomotor, somatic and sexual symptoms. Disorders of growth hormone (deficiency as well as its excess) are associated with impaired physical performance. Growth hormone has a strong lipolytic action and its secretion is increased during exercise. Further, growth hormone and insulin growth factor I are involved in the regulation of cardiovascular function. In patients with childhood and adulthood-onset GH deficiency, the impairment of cardiac performance is manifest primarily as a reduction in the left ventricular mass, inadequacy of left ventricle ejection fraction both at rest and at peak exercise, and abnormalities of left ventricle diastolic filling. Additionally, these patients present with decreased muscle strength. A recent study concluded that even a short period of resistance exercise was sufficient to improve parameters of muscle strength in young male adults with childhood-onset growth hormone deficiency. Patients with acromegaly (growth hormone excess) may have balance abnormalities due to changes in body composition. A recent paper recommended implementation of therapist-oriented home rehabilitation in the care of patients with acromegaly as it results in improvements in muscle function, functional capacity, general fatigue, body balance and overall quality of life. Physical activity in endocrine disorders should be prescribed after an appropriate treatment of the disease. Individually tailored exercise may significantly improve physical performance, cardiorespiratory fitness and overall quality of life in patients with most endocrine disorders.

References:

Int J Environ Res Public Health;17(13):4830; J Endocrinol Invest 2009;32(5):470-3; Thyroid 2002;12(6):473-81; Eur J Epidemiol 2013;28(12):945-58; J Clin Endocrinol Metab 2004;89(8):3679-84; Eur J Endocrinol 2016;174(1):97-105; J Clin Endocrinol Metab 2020;105(4):e1408-e1418; Biol Sport 2005;22(3):209-214; Qual Life Res 2020;29(8):2089-2100; Endocrine. 2012;42(2):278-84; J Endocrinol Invest 2003;26(9):886-92; Reprod Biol Endocrinol 2018;16(1):114; Maturitas 2014;77(4):318-23; Br J Gen Pract 2007;57(535):130-5; J Pediatr Endocrinol Metab 2018;31(8):887-894; Pituitary 2019;22(5):497-506; Growth Horm IGF Res 2016;29:39-44.

Exercise And Pandemic: New In Sight In Type 1 Diabetes

Luis Paulo Gomes Mascarenhas
Universidade Estadual do Centro-Oeste, Brazil.
Email : luismsk@gmail.com

Diabetes Mellitus is one of the fastest-growing chronic diseases worldwide. Type 1 Diabetes Mellitus (T1DM) concentrates 5 and 10% of all people with the disease, usually developed during childhood or early adulthood. The management of T1DM is based on three cares: insulin therapy, nutrition, and regular practice of physical activity. Physical exercises are associated with metabolic demands that depend on the individual's energy stores, level of physical conditioning, and modify according to environmental conditions and intensity, duration, and type of exercise (Mascarenhas *et al.*, 2016). Patients with T1DM for a safe practice of physical activity should have pre-exercise glucose levels below 14 mmol/L (250 mg/dL) and or ketonemia (<0.5 mmol/L). Regular physical activity and improved cardiorespiratory fitness can play an important role in the prevention of complications, as risk factors of cardiovascular diseases, maintenance of body weight, reduction in blood pressure and the incidence of chronic complications, such as diabetic nephropathy, retinopathy and neuropathy (Tonoli *et al.*, 2012). The Guidelines of American Diabetes Association (2019), recommended at least 60 minutes a day of moderate to vigorous-intensity exercises for children and adolescents and at least 150 minutes a week for adults, with additional carbohydrate intake and insulin adequations to maintain glycemic balance during and after physical activity (Colberg et al., 2016).

Table 1. Nutritional recommendations for T1DM patients involved in physical activities.

During the activity
Ingestion of 0.5–0.6g of carbohydrates per kg of body weight for every hour of activity. In activities lasting more than 2 hours, ingestion of a larger amount of carbohydrates (0.8 g/kg) may be necessary.
During prolonged and high-intensity (>70% VO_2max) training or competitions, ingestion of 15g of carbohydrates at each 30–45-minute interval.
Food rich in solid or liquid carbohydrate may be ingested. Liquid foods help with hydration, while solid foods may prevent hunger.
After the activity
Ingestion of 1.5g of carbohydrate per kg of body weight after the end of prolonged exercises (>90 minutes).
An additional amount of 1.5g of carbohydrate per kg of body weight may be required 1 to 2 hours after the exercise to reduce the risk of post-exercise hypoglycemia.
Blood glucose monitoring is required immediately after the exercise and 1 to 2 hours later to adjust the caloric intake and insulin dose.

Note: Adapted from Mascarenhas et al., 2016.

Review studies demonstrates that with the practice of 20 to 60 minutes of exercises continuous or intermittent (ranging from 4 to 30 sprints, duration time 4 to 15 seconds), with periods of passive recovery or active recovery of moderate intensity, can be expected a reduction in blood glucose. Through the analysis of the studies it can be concluded that the practice intermittent exercises may help in reducing the risk of hypoglycemia induced by exercise. However, the schedule of insulin application may be associated with exercise-induced hypoglycemia. Currently, 2020, due to the SARS-COV-2 pandemic, the practice of physical activity should be encouraged taking into account the isolation restrictions (Harmann-Boyce *et al*., 2020). Remembering that diabetes is a risk factor of the virus disease and according to a report from the U.K., the COVID-19 mortality rate as significantly higher in older patients with type 1 diabetes compared with those with type 2 diabetes (Barron *et al*., 2020). Therefore, the treatment and management of exercise and nutrition for patients with T1DM presents new challenges arising from the pandemic and this will be reflected in new studies on this topic.

References

American Diabetes Association. (2019). 5. Lifestyle management: standards of medical care in diabetes—2019. Diabetes care, 42(Supplement 1), S46-S60.

Barron, E., Bakhai, C., Kar, P., Weaver, A., Bradley, D., Ismail, H., & Wareham, N. J, Young, B., Valabhji, J. (2020). Type 1 and type 2 diabetes and COVID-19 related mortality in England: a whole population study. [preprint – 17/05/2020]

Colberg, S. R., Sigal, R. J., Yardley, J. E., Riddell, M. C., Dunstan, D. W., Dempsey, P. C., & Tate, D. F. (2016). Physical activity/exercise and diabetes: a position statement of the American Diabetes Association. Diabetes care, 39(11), 2065-2079.

Hartmann-Boyce, J., Morris, E., Goyder, C., Kinton, J., Perring, J., Nunan, D., ... & Roussel, R. (2020). Diabetes and COVID-19: risks, management, and learnings from other national disasters. Diabetes care, 43(8), 1695-1703.

Mascarenhas, L.P.G., Decimo, J.P, Lima V.A., Nesi-França, S. (2016) Physical exercise in type 1 diabetes: recommendations and care. *Motriz, 22* (4), 223-230.

Robertson, K., Riddell, M.C., Guinhouya, B.C., Adolfsson, P., & Hanas, R. (2014). Exercise in children and adolescents with diabetes. *Pediatric Diabetes, 15* (20): 203–223.

Tonoli, C., Heyman, E., Roelands, B., Buyse, L., Cheng, S.S., Berthoin, S., & Meeusen, R. (2012). Effects of different types of acute and chronic (training) exercise on glycaemic control in type 1 diabetes mellitus: a meta-analysis. *Sports Med, 42* (12): 1059-1080.

Is Breaking Up Sitting A Waste Of Time For Physically Active People?

Arto J. Pesola
Research manager, Active Life Lab, South-Eastern Finland University of Applied Sciences, Mikkeli, Finland.
Email : arto.pesola@gmail.com

The updated physical activity guidelines now emphasize that all adults should sit less and move more throughout the day (1). The guidelines highlight that although the benefits of reducing sitting are greatest in those who are physically inactive, those who are active may also gain further benefits from reducing sitting time. In a large harmonized meta-analysis using self-reported data, active individuals (50% of the sample) were found to achieve an additional 10-12% reduction in all-cause mortality risk if reducing their total daily sitting time from more than eight hours to less than four hours per day, but the effects were attenuated at the higher limit of the recommendation (more than 300 min of MVPA per week) (2, 3). More recent epidemiological findings with device-measured data suggest even larger health benefits from reducing sitting, even for those who are highly active (4). However, these data focus on total sitting time and it is unclear if physically active people can benefit from breaking up their sitting time. Moderate-to-vigorous activity (even at high volumes) typically takes up only a small fraction of the day, even in those categorized as physically active. Across a whole day, a range of other short-lasting moderate activities and light-intensity activities occur that can also have significant potential biological impact (5, 6). Large lower limb muscle groups activate and inactivate on average 12000 times during a course of one day, at an intensity below that of normal walking (7). In particular, accumulating sitting time or sedentary time in a prolonged unbroken manner consistent with long periods of muscle inactivity is associated with markers of cardiometabolic health (8, 9) and amplifies the deleterious associations between total sitting time and cardiometabolic risk biomarkers and all-cause mortality, statistically independent of moderate-to-vigorous physical activity (5, 10, 11). In essence, these patterns consistent with periods of muscle inactivity are similar in inactive and active adults, remain unchanged following participation in well-structured exercise for fitness sessions, but can show wide inter-individual variability attributable to normal daily activities (12–15). The aim of this lecture is to summarize and discuss evidence of how breaking up prolonged periods of muscle inactivity time can benefit health also in those who are physically active.

References

1. Piercy KL, Troiano RP, Ballard RM, et al. The physical activity guidelines for Americans. *JAMA - J Am Med Assoc*. 2018;320(19):2020–8.

2. Stamatakis E, Gale J, Bauman A, Ekelund U, Hamer M, Ding D. Sitting Time, Physical Activity, and Risk of Mortality in Adults. *J Am Coll Cardiol*. 2019;73(16):2062–72.

3. Ekelund U, Steene-Johannessen J, Brown WJ, et al. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *Lancet*. 2016;388(10051):1302–10.

4. Ekelund U, Tarp J, Steene-Johannessen J, et al. Dose-response associations between accelerometry measured physical activity and sedentary time and all cause mortality: systematic review and harmonised meta-analysis. *Bmj*. 2019;l4570.

5. Bellettiere J, Winkler EAH, Chastin SFM, et al. Associations of sitting accumulation patterns with cardio-metabolic risk biomarkers in Australian adults [Internet]. *PLoS One*. 2017;12(6) doi:10.1371/journal.pone.0180119.

6. Healy GN, Winkler EAH, Owen N, Anuradha S, Dunstan DW. Replacing sitting time with standing or stepping: Associations with cardio-metabolic risk biomarkers. *Eur Heart J*. 2015;36(39):2643–9.

7. Tikkanen O, Haakana P, Pesola AJ, et al. Muscle Activity and Inactivity Periods during Normal Daily Life. *PLoS One*. 2013;8(1):20–1.

8. Brocklebank LA, Falconer CL, Page AS, Perry R, Cooper AR. Accelerometer-measured sedentary time and cardiometabolic biomarkers: A systematic review. *Prev Med (Baltim)*. 2015;76:92–102.

9. Chastin SFM, Egerton T, Leask C, Stamatakis E. Meta-analysis of the relationship between breaks in sedentary behavior and cardiometabolic health. *Obesity*. 2015;23(9):1800–10.

10. Diaz KM, Howard VJ, Hutto B, et al. Patterns of sedentary behavior and mortality in U.S. middle-aged and older adults a national cohort study. *Ann Intern Med*. 2017;167(7):465–75.

11. Diaz KM, Goldsmith J, Greenlee H, et al. Prolonged, Uninterrupted Sedentary Behavior and Glycemic Biomarkers among US Hispanic/Latino Adults. *Circulation*. 2017;136(15):1362–73.

12. Finni T, Haakana P, Pesola AJ, Pullinen T. Exercise for fitness does not decrease the muscular inactivity time during normal daily life. *Scand J Med Sci Sport*. 2014;24(1):211–9.

13. Finni T, Uusi-vähälä M, Pesola AJ, Taipale RS. Do Running and Strength Exercises Reduce Daily Muscle Inactivity Time ? 2016;3(September):702–21.

14. Pesola AJ, Laukkanen A, Tikkanen O, Finni T. Heterogeneity of muscle activity during sedentary behavior. *Appl Physiol Nutr Metab*. 2016;41(11):1155–62.

15. Rantalainen T, Pesola AJ, Quittner M, Ridgers ND, Belavy DL. Are habitual runners physically inactive? *J Sports Sci*. 2017;00(00):1–8.

Socio-Economic Aspects Of Sport

Hanna Vehmas
University of Jyvaskyla, Finland
Email : hanna.m.vehmas@jyu.f

Influence of parental background and involvement in children's sport participation. Inactivity is a global trend that causes high costs for societies. Even children are engaged in a sedentary lifestyle from the early age even though physical activity has many positive effects on individual's health. To increase children's physical activity level, it is important to understand factors that affect physical activity behavior. Physical culture is facing a problem where e.g. money is becoming one of the main barriers for participating in organized sports. Very often the most expensive sports happen to be the sports that children desperately want to join. Recent evidence suggests for example in Finland that membership fees in youth sports are roughly two to three times as expensive as they were ten years ago. This presentation illustrates the socio-economic factors of the parents that are associated with physical activity of children and adolescents in Finland. First, the aim is to find out how parental socio-demographic factors, parental role modeling, and parental support are associated with the sport participation of the child. And second, to highlight the socio-economic background of the parent and barriers of participation particularly in figure-skating, which is one of the most popular children's sport hobbies in Finland. Data for these studies were gathered in 2019 (n= 1763) and 2020 (n=239) through web-based online surveys from the parents of Finnish children who are involved in their children's hobbies. Results show that parents' socio-economic background and involvement are positively associated with the sport participation of the child. Results indicate how important it is to prevent socio-economic barriers in society and support family involvement in order to enhance physically active life style of the citizens from the early ages on.

Key words: Socio-economics, sport participation, physical activity, children, parental correlates, Finland

Understanding Physical Activity In A Social Context : Beyond Behavioral Science To Public Health

Miranda Thurston
Inland Norway University of Applied Sciences
Email : miranda.thurston@inn.no

The health benefits of regular physical activity are well-documented, having been described as the 'best buy' in public health (Morris, 1996). Yet many populations are becoming less active including those in low- and middle-income countries. Within and between population comparisons show that physical activity and inactivity – both independent risk factors for a variety of health problems – are socially patterned and thus contribute to social inequalities in health. A public health perspective shifts attention away from a single focus on individual behavioural scientific explanations and gives priority to the social and cultural determinants of physical activity and inactivity. Taking a global perspective, and using specific examples from the UK and Scandinavia, the presentation introduces and explores the complex social, cultural and physical environment within which physical activity and inactivity are shaped. This provides an evidence-base that can inform policy and practice in this field.

Building Health Promoting Sports Clubs: Strategies And Key Leverage

Aurélie Van Hoye
Associate Professor, Faculty Of Sports, University Of Lorraine, Germany
Email : aurelie.van-hoye@univ-lorraine.fr

The potential of sports clubs to become a health promoting setting, while doing their core sporting activity has been underlined by numerous authors. While the settings based approach has emerged with the Ottawa Charter [1], the first research in HP in sports was conducted in Australia in the mid-1990s. In Europe, the application of the settings based approach in sports clubs starts around 2000, when Kokko and colleagues [2] developed the standards for Health Promoting Sports Club. With 20 years of research on health promotion (HP) in sports clubs, my presentation will focus on (1) the theoretical tenets of the health promoting sports club, (2) evidence based strategies to support sports clubs to promote health, (3) sports clubs needs and expectations in regard to health promotion and (4) limitations and future challenges to develop comprehensive and acceptable interventions to support health promotion in sports clubs.

Theoretical tenets

Within sports clubs, the settings based approach has been designed using two types of categories (determinants and level). Three levels within the sports clubs have been identified by Kokko [3] :

- the macro level, related to the sports club's policies and operation regulations regarding HP
- the meso level, encompassing the guidance and support given to coaches and staff by sport officials and management
- the micro-level, described as the HP activities and support given to participants by coaches.

Recent research work [4] has completed the number of level by adding other actors surrounding the sports clubs, like governmental actors, public health professionals, sports federations, which are also needed to support the HP capacity (time, money, people, policies) and readiness of sports clubs. Based on statement from the Vancouver Conference, at each level, four main type of determinants have been identified: social, cultural, environmental and economic [3]. I will present the last theorical model and its definition, as well as a measurement scale to evalate health promotion in sports clubs [4].

Key leverage for health promoting sports clubs

To better operationalize health promoting sports clubs, 14 evidence-driven strategies, identified through a mapping littérature review, have to be implemented [5]. We are aware that sports clubs may not fulfill the guidelines in total, but strive for them in a way that make sense to their

particular organization. Especially, the challenge is to develop beyond implementing separate sporadic HP initiatives to evolve into a HP setting. With my research teams, based on these 14 strategies, we have framed a intervention theory for the health promoting sports clubs, as well as questionned promising health promotion project among 8 french sports clubs. The applicability of the intervention theory, as well as illustration on how to implement each of the strategy will be presented.

Sport clubs needs and expectations

Using a concept mapping approach, we have questionned what sports clubs needed to become health promoting and found out nine clusters of ideas : awarness and mobilisation, advocacy, communication and dissemination, sharing and networking, policies and methods, communication tools, tools for health promotion, stakeholders training courses, diagnostic and financing and 35 ideas, which were rated both as important and feasible by sports clubs stakeholders.

Some limitations

While the theoretical approach has been developed, empirical data on its applications are lacking, due to five factors: (1) measuring outcomes of HPSC approach is challenging, (2) self-reported measurement tool of HPSC framework does not exist, (3) no longitudinal study about the evolution of HP in sports clubs have been undertaken, leading to lack of understanding of causal effects or evolution of the concept, (4) most of the studies were developed in a single country, and not internationally and (5) key interventions components rooted in the theoretical model are only emerging and not tested.

References

1. WHO, *Ottawa Charter for Health promotion*. 1986.
2. Kokko, S., L. Kannas, and J. Villberg, *The health promoting sports club in Finland—a challenge for the settings-based approach.* Health Promotion International, 2006. **21**(3): p. 219-229.
3. Kokko, S., *Sports clubs as settings for health promotion: Fundamentals and an overview to research.* Scandinavian journal of public health, 2014. **42**(15 suppl): p. 60-65.
4. Johnson, S., et al., *Measuring Health Promotion in Sports Club Settings: A Modified Delphi Study.* Health Education & Behavior, 2019: p. 1090198119889098.
5. Geidne, S., et al., *Health Promotion Interventions in Sports Clubs: Can We Talk About a Setting-Based Approach? A Systematic Mapping Review.* Health Education & Behavior, 2019: p. 1090198119831749.

Wellness Hub : Empowering Community To Take Ownership For Health Outcomes

Vanitha Subramaniam
Education Division, Ministry of Health, Malaysia.
Email : Svanitha@moh.gov.my

The Ministry of Health Malaysia has developed Wellness Hubs in community setting with the concepts of community ownership, empowerment and participation in prevention of unhealthy lifestyles. The development of Wellness Hub involves investment in visible infrastructure and planning initiatives with the aim of producing long-lasting health benefits to its surrounding community. At the moment there are 28 Wellness Hubs providing services in rural and urban areas throughout Malaysia. The surrounding communities mainly approach the hubs for weight loss intervention, self-risk assessment; quit smoking service, exercise prescription, structured physical activity and healthy lifestyle consultation. It is vital to enable communities to increase control over their lives with identify the determinant that underpin health and seeks to build partnership with health team, NGOs, private agencies and local leaders in finding solutions.

A Doctor's Referral : Exercise Clinic Intervention In Non Communicable Disease Prevention (Smart Partnership Programme)

Hazwanim Md Hashim
Family Medicine Specialist, Ministry Of Health, Malaysia
Email : hazwanimhashim@gmail.com

Non Communicable Diseases (NCDs) have been a growing threat for not only Malaysia, but also an increasing burden for many other countries throughout the world. Among the major risk factors for NCDS are high cholesterol, high blood pressure, high blood sugar, tobacco smoking, overweight and obesity. The Malaysia's National Health and Morbidity Survey 2019 stated that 3.4 million people in Malaysia living with two (2) major risk factors while 1.7 million people currently living with three (3) major risk factors. Various strategies have been implemented and planned in order to reduce the preventable and avoidable burden of morbidity, mortality and disability due to NCDs. The Smart Partnership Programme between Ministry of Health Malaysia (MOH), MS New Symphony (MSNS), and University Islam Antarabangsa Sultan Abdul Halim Muadzam Shah (UniSHAMS) has created a platform for the selected consented clients (Pre-Diabetes, Pre-Hypertension and obesity) to be referred to undergo a customized, suitable exercise intervention with the help and monitoring by specially trained exercise therapists (ETs) with the ultimate goal of NCDs prevention. The partnership, which has started in August 2019 until now had shown excellent collaboration between all parties with the total of 104 registered clients. The clients are mainly referred by medical officers in health clinics and walk-in clients. A well customized standard operating procedures (SOPs) and work process has made the process of referring, back referral and client's monitoring a success. Many challenges and obstacles also faced by all parties especially during the Covid-19's world pandemic such as when the movement control order (MCO) being enforced. To date, majority of clients are still undergoing the exercise programme. Three (3) clients has been discharged (successful), five (5) clients from walk in-appointments have been referred back to the health side as been detected to have undiagnosed and untreated NCDs.

Reference

1. National Health and Morbidity Survey (NHMS) 2019 (NMRR-18-3085-44207) Non-communicable diseases, healthcare demand, and health literacy: Key Findings:

Exercise And Overuse Injuries

Berkes Istvan
University of Physical Education, Budapest, Hungary,
Email: berkesdr@gmail.com

Introduction: Overuse injuries, also known as cumulative trauma disorders, are described as tissue damage that results from repetitive demand over the course of time. Overuse injuries can occur when somebody try to undertake too much physical activity too quickly. About 50% of all sports injuries are secondary to overuse [1]. Reports for sports injuries caused by overuse vary between various studies, ranging from 30 % up to 78 % [2]. The European Union has been actively supporting the development of regular physical activity for several health reasons [3]. Overuse injuries result from repetitive micro trauma that leads to local tissue damage in the form of cellular and extra cellular degeneration, and are most likely to occur due to any change in the mode, intensity, or duration of training, a phenomenon described as the principle of transition [4,5]. Signs of overuse injuries include swelling, warmth, redness, stiffness, soreness, and impaired function of the affected area. People starting a new physical activity without enough training can be at risk of an overuse injury, which could ultimately scare them from being active. The purpose of this lecture is to present what can cause an overuse injury and how to safely prevent and rehabilitate them.

Common Causes: Overuse injuries to the muscles or joints, such as tendinopathy or stress fracture, are usually caused by repetitive micro-traumas to the related structures. Evident predictors of overuse musculoskeletal injuries include previous history of injury as well as walking or running more than 20 miles per week [6]. In sports medicine, the major cause of overuse injuries to the athletes can be training errors or technique errors. The former can occur when the athlete takes on exaggerated physical activity too quickly which ultimately causes muscle strain and lea to the injury. The later depicts the errors in training techniques. Improper technique can overload certain muscles and results in overuse injuries.

Risk factors: Old aged people with secondary medical conditions, or any type of anatomical abnormalities are at more risk of overuse injuries. Therefore, it is very important to recognize the impacts of aging on health, and modify the daily routine accordingly. Exercise and physical activities in such cases should be supervised with special focus on pre-activity examination before starting a new activity or ramping up the current routine.

Prevention: Most overuse injuries are avoidable. To prevent an overuse injury, the most important measure is to perform proper warm-up (including stretching) and cool-down

(including stretching) before and after all exercise, including athletic training. Other preventive measures include use of proper equipment (for example proper jogging shoes for jogging), to increase training parameters at a rate no faster than 10% increase per week (including distance, speed, and weight), special focus on correct exercise techniques, conditioning the body for 2-3 weeks before starting strength and flexibility drills, early identification and management of the causes of pain and discomfort, and ensuring full injury rehabilitation. If the athletes are made aware of these strategies at early stage, and advised to take maximum responsibility for the injury prevention, they will be more likely to reach their own ideal compromise of safety and speed of progress in training and athletic activities [7].

Rehabilitation: Rehabilitation from overuse injury and prevention of overuse injury are terms that describe differing aspects of the same challenge. The trainer must be continually aware of the principles of rehabilitation and their order of priority (prevent further damage, restore motion, restore strength and coordination) while supervising patients' progress toward their specific goals [7]. Physical therapists dealing with the rehabilitation of overuse injuries need to develop expertise in manual techniques, along with clinical competency in the application of physical agents and electrotherapy modalities. Reduction of predisposing factors is of utmost importance in the successful rehabilitation of overuse injuries, and often requires greater skill and attention than does the treatment of the primary lesion [8]. Rehabilitation includes relief of inflammation, restoration of normal joint arthrokinematics, and neuromuscular strengthening [9]. Rehabilitation comprises of three phases, defined by muscular action (isometric, concentric and eccentric); kinetic chain (closed or open); range of movement (internal, medial, external and total); and exercise orientation (general, directed and specific). Return to play after an injury rehabilitation must be agreed upon on the basis of objective information on the recovery stage of the injury, the state of fitness, and the sportsman's own perception [10]. The first phase of rehabilitation aims to achieve active early mobilization, which provides a mechanical and circulatory benefits. This is characterised by recommending exercises in closed kinetic chain (CKC) and by muscular, isometric or dynamic action in internal or medial ranges. The second phase is aimed at improving functionality, intensity and load. This includes the progression of content in CKC to open kinetic chain and extent of work, which enables concentric muscular work patterns, with an orientation directed at the particular movements and needs of the specific sport. Third phase of rehabilitation for overuse injuries aims to reach competition-level intensity and exercise loading, proposed under training conditions. The content focuses on the intensity and maximum loading of the specific type of sports with gradual admittance of the athlete into different phases of training

sessions. For most sports these exercises are performed in open kinetic chain and the development of strength and endurance is based on exercises which are mainly eccentric in nature.

Reference

1. Herring SA, Nilson KL. Introduction to overuse injuries. Clin Sports Med 1987;6(2):225 – 39
2. Fischer F., Menetrey J., Herbort M., Gföller P., Hepperger C., Fink C. (2016) Causes of Overuse in Sports. In: Mayr H., Zaffagnini S. (eds) Prevention of Injuries and Overuse in Sports. Springer, Berlin, Heidelberg.
3. Toussaint J.-F. (coord.) (2008) Plan national de prévention par l'activité physique ou sportive (PNAPS)
4. O'Connor F, Buetler A, Wilder R. Overuse injuries: current strategies for diagnosis and management. Phys Sportsmed, in press.
5. Leadbetter WB. Cell-matrix response in tendon injury. Clin Sports Med 1992;11(3):533 – 78
6. Hootman JM, Macera CA, Ainsworth BE, et al. Predictors of lower extremity injury among recreationally active adults. Clin J Sport Med 2002;12(2):99 – 106
7. Thomas DR, Plancher KD, Hawkins RJ. Prevention and rehabilitation of overuse injuries of the elbow. Clinics in Sports Medicine. 1995 Apr;14(2):459-477.
8. Marshall P. The rehabilitation of overuse foot injuries in athletes and dancers. Clin Podiatr Med Surg. 1989;6(3):639-655.
9. Ellenbecker TS, Derscheid GL. Rehabilitation of overuse injuries of the shoulder. Clin Sports Med. 1989;8(3):583-604.
10. Periodization and physical therapy: bridging the gap between training and rehabilitation. Phys Therapy Sport. 2015.

The Ultimate Healthy Lifestyle Checklist

Edgar Michael T. Eufemio
Founding Head - Philippine General Hospital Sports Medicine Clinic
Email : gareufemio@gmail.com

One of my favorite authors, Dr. Atul Gawande, writes about challenges doctors face in the modern world. In his bestselling book, The Checklist Manifesto, he tells us that no matter how intelligent or diligent an individual is, when confronted by a multitude of tasks, certain stages are easily missed. The solution is simple; a written guide that walks us through key steps in any complex procedure. Really, is there any mission more complicated than staying hale and hearty? Here then, ladies and gentlemen, is my version of the The Components of a Healthy Lifestyle. My worksheet has a dozen entries. To keep it simple and easy to remember, I divided it into the four E's, the four S's and the four D's.

The Four E's

1. Exercise

When you engage in physical activity, you burn calories and prevent excessive weight gain. Resistance exercises then tone your muscles. The result is a body that ROCKS! ("I figure you think you have all you need to know but please read on…"). Although it is best to have a sport or go to the gym, there are activities you can do even while at work – walk more and at a faster pace and take the stairs. If you can fit it in, three days a week of cardio and strength training is plenty. Staying active aids in boosting your HDL (or good cholesterol) and decreasing the unhealthy triglycerides. It helps lessen the incidence of hypertension, heart disease, stroke, type 2 diabetes, arthritis and osteoporosis. Seemingly every fitness center has some members that just have to work out every day. They feel sluggish and sickly whenever they miss a session. These individuals are addicted to endorphins. These are natural chemicals released by your body during workouts that interact with certain receptors in the brain and reduce your perception of pain. It also triggers a "feel good" sensation similar to that of morphine. Regular training makes one sleep better too.

2. Proper Eating Habits

People tend to think that, to lose weight, all you have to do is eat less and exercise more. Easier said than done. Not only that, what actually happens is your body's metabolism slows down to make up for the diminished calorie intake.

Better to go by the following tips:

- Stay away from saturated fats
- Steer clear of the bad carbohydrates – refined sugar, white rice, white bread, pasta, potatoes (WHY WE GET FAT: AND WHAT TO DO ABOUT IT by Gary Taubes is a must read)
- Have light dinners
- Avoid binge eating; better to have small, frequent feedings
- Be guided by the glycemic index

  The glycemic index is a numerical score that ranks carbohydrates based on their rate of conversion to glucose in the human body. Higher values cause a bigger rise in blood sugar (not good).

Having problems with blood sugar, my nutritionist mentioned locally available fruits that I should avoid (watermelon, chico, atis and lychee) while my cardiologist revealed foodstuffs that I can rotate I get hungry (apples, pears, seeds, walnuts, almonds, cashew, saba, singkamas and kamote).

3. The Ideal Environment

The perfect living situation has no pollution and traffic, no excessive heat and humidity, is quiet and provides just enough sunlight. All of us city dwellers are doomed!

4. Enjoyment

You have to love what you do. Do you wake up exhilarated on Mondays because it is the start of another workweek? I do… Always a chance to do something good, something great. Surround yourself with friends who make you happy and who you enjoy hanging around with. Spend quality time with your family – travel, watch movies, shop, eat out, get drunk.

The Four S's

1. Sleep

Forty winks play an important role in your health. It is involved in healing and repair of your heart, blood vessels and muscles. Ongoing sleep-deficiency is linked to an increased risk of heart and kidney disease, hypertension, diabetes, and stroke. Furthermore, when you are in deep slumber, you cannot overeat, smoke or drink alcohol. An added bonus, you also circumvent stress. ("We will discuss this later."). Everyone emphasizes getting at least eight hours, but have you realized that the older you get, the less you are able to sleep continuously? So, just get as much rest as you can, whether at home, in the car or maybe even at work ("during break time only of course")

2. Stress Reduction

Let us say you are walking along the street and, out of nowhere, a lion runs towards you ready to eat you. Two hormones are released into your bloodstream – adrenaline and cortisol. Adrenaline or amino-hydroxy-phenyl-proprionic acid ("Say that again.") increases your heart rate and blood pressure and raises glucose and lipid levels. Cortisol enhances your brain's use of glucose while altering functions that are NOT essential during a stressful situation, like the digestive and reproductive systems. Once the threat has passed, your adrenaline and cortisol levels drop and your body goes back to normal. If you are constantly under pressure, the over-exposure to cortisol can lead to heart disease, digestive problems, sleep disorders, weight gain, memory impairment and depression. So relax, dude.

3. Supplements

Please limit it to vitamins and minerals, maybe stem cell enhancers. Enough of the tiger bone, bear gallbladder, rhino horn, shark fin and snake blood crap. Animals are being hunted to extinction because of the idiots behind the trade and the bozos who still believe in their medicinal properties.

4. Spirituality

Deep down inside, you have to believe that there IS a God. Pray often and learn to appreciate nature. Knowing He is there should have a natural calming effect on you and we all know what that does to good ole cortisol. I do regular talks to coaches and trainers. Everyone wants to know "How can we achieve fitness?" Other than the four E's and the four S's, you need…

The Four D's

1. Desire
2. Discipline

You are now armed with the knowledge of why things happen and what should be done. The challenges are: 1) "Are you going to go for it?" and 2) "Can you maintain it?" It is one thing to be cognizant of what has to be accomplished; quite another to actually make it happen and keep at it. Challenge accepted?

3. DNA

Patient: "Doc, I am 5'4" and my wife is 4'11". Our son is twelve and really loves playing basketball. What can we do so he can be taller? What exercises does he have to do and what does he have to eat? We will be more than happy if he reaches 6'0""

Dr. Gar (together with, hopefully, all of you out there): "Absolutely NOTHING!!!"
Excerpts from a previous lecture: "I am a believer that athletes CAN be made; proper training could make a sub-par individual average; a so-so performer, decent; or a respectable player, very good. But the truly elite ones, the crème de la crème, they are born that way. Genes, baby. Accept it, they have it, we do not." If you are a shorty and really want to have tall kids, look for a towering spouse. At least now you have a chance.

4. 'Ducation (short for Education)

The specialty of Sports Medicine is continually evolving; new studies are constantly churned out. It is my responsibility to always keep abreast on what is new and to know what is bogus. Do your share. Read books and magazines, consult experts, try different routines, attend symposia and talk to your friends.

In summary, The Ultimate Healthy Lifestyle Checklist:

1) Exercise _____
2) Eating Habits _____
3) Environment _____
4) Enjoyment _____

5) Sleep _____
6) Stress-Reduction _____
7) Supplements _____
8) Spirituality _____

9) Desire _____
10) Discipline _____
11) DNA _____
12) ‘Ducation _____

How many checks do you have?

Battle Of The Bulge – Obesity, Its Toll On The Pelvic Floor

Su Fen Yew
Consultant Physiotherapist, Silver Jubilee Home for the Aged, Penang, Malaysia.
Email: suyew58@yahoo.com

In a 2016 world obesity index (WHO), it is reported that 1.9 billion adults aged from 18 years and older were overweight. Of these over 650 million adults were obese. Overall about 13% of the world populations (11% were men and 15% of women) were obese. The worldwide prevalence nearly tripled between 1975 and 2016. Obesity is a complex disease involving an excessive amount of fat. One of the health consequences of obesity is muscular skeletal disorders or injuries. Among the medical conditions affected by obesity are pelvic floor disorders (PFDs), including: urinary incontinence (UI), fecal incontinence (FI) and pelvic organ prolapse (POP). It is known to affect between 2% and 42% of adult females. Epidemiological reviews have shown an association between obesity and UI with odds ratios for the presence of UI as high as 1.6 per 5 unit increase in BMI (Kapoor et al). So how can being overweight directly impact the pelvic floor? It has debated and theorized that there are various mechanisms, namely excess body weight increases abdominal pressure, which in turn increases bladder pressure and urethral mobility, leading to stress UI and also exacerbating detrusor instability and overactive bladder. According to Noblett KL, there is a strong association between BMI, and intra-abdominal and intravesical pressure. This can have a long lasting damaging effect on the pelvic floor in an obese person and as long as remain obese. The pelvic floor is like a hammock containing and supporting all the intra-abdominal organs and viscera. The constant chronic increase in intra-abdominal pressure over a period of time will strain, weaken and damage to the pelvic floor muscles and cause nerve damage. Additionally, it may affect the neuromuscular function of the genital tract and thereby contribute to pelvic floor and urethral dysfunction This increase in intra-abdominal pressure is akin to chronic straining in chronic constipation; prolong chronic cough, incorrect weight lifting technique, and multiple pregnancies of which have been some of the cause of UI. Rarely life threatening, urinary problems such as incontinence and pelvic organ prolapse cause distress to the individual and significantly impair quality of life and sexual function. Pelvic floor symptoms are significantly associated with reduced sexual arousal, infrequent orgasm, and dyspareunia. Weight loss studies indicate that surgical and nonsurgical weight loss lead to significant improvements in UI symptoms. Subak *et al*. reported a 50% reduction in incontinence frequency after only a 5% decrease in weight. Also, moderate weight reduction is associated with extensive health

improvements. Physical therapy is widely recommended as first-line conservative management for pelvic floor muscle re-education, reconditioning and strengthening for these obese women with stress, urge or mixed urinary incontinence. Women who did pelvic floor muscle training were more likely to report that they were cured or improved, had a better continence-specific quality of life and experienced fewer incontinence episodes per day. Physiotherapy includes core training, specific pelvic floor muscles exercises and advice. . Adjunct physiotherapy therapies, such as electrical stimulation and biofeedback have been used aid motivation and adherence.

Key word: Obesity, pelvic floor dysfunction, weight loss, physiotherapy

Reference

1. Jain P, Parsons M. A review. The effects of obesity on the pelvic floor. *Royal College of Obstetricians and Gynecologists.* 2011;13:133-142
2. Melville JH, Katon W, Delaney K, et al. Urinary incontinence in US women: a population-based study. Arch Intern Med. 2005 Mar 14;165(5):537–42
3. Burgio KL, Matthews KL, Engel BT. Prevalence, incidence and correlates of urinary incontinence in healthy, middle-aged women. J Urol. 1991 Nov;146(5):1255–9
4. Bump R, Sugerman H, Fantl J, et al. Obesity and lower urinary tract function in women: effect of surgically induced weight loss. Am J Obstet Gynecol. 1992;166:392.
5. Subak LL, Whitcomb E, Shen H, et al. Weight loss: a novel and effective treatment for urinary incontinence. J Urol. 2005;174:190
6. Leslee L. Subak, Holly E. Richter, and Steinar Hunskaar, Obesity and Urinary Incontinence: Epidemiology and Clinical Research Update J Urol. 2009 Dec; 182(6 Suppl): S2–S7.
7. Noblett KL, Jensen JK, Ostergard DR. The relationship of body mass index to intra-abdominal pressure as measured by multichannel cystometry. Int Urogynecol J Pelvic Floor Dysfunct. 1997;8:323
8. Kapoor DS, Davila GW, Rosenthal RJ, Ghoniem GM. Pelvic floor dysfunction in morbidly obese women: Pilot Study. *Obesity* 2004;**12**:1104–7.
9. Subak LL, Johnson C, Whitcomb E, Boban D, Saxton J, Brown JS. Does weight loss improve incontinence in morbidly obese women? *Int Urogynecol J Pelvic Floor Dysfunc* 2002;**13**:40–3.

10. Slack A, Hill A, Jackson S. Is there a role for a specialist physiotherapist in the multi-disciplinary management of women with stress incontinence referred from primary care to a specialist continence clinic? J Obstet Gynaecol 2008;28(4):410–2

Impact Of Simplified Exercise Program On Weight Reduction And Quality Of Life (QOL) Of Overweight And Obese Inactive Diabetes Mellitus II Patients With And Without Non-Specific Chronic Low Back Pain

Dr. Mahmoud Othman
Damascus University, Syria
Email : dr.mahmoud1971@gmail.com

Introduction : Many researches have pointed out (Warburton et al. 2006), that regular practice of physical activity (PA) and involvement in regular exercise are an important factor in the prevention- and/or treatment progress of non-communicable diseases (NCDs), and provides physical and psychological benefits to individuals in various age groups (Cassidy et al. 2004, Chyum et al. 2006, Olson et al. 2005). On the other hand, regular PA and participation in exercise programs also associated with several aspects of quality of life (Silva et al. 2010), and this relationship has been consistently reported in the literature (Bize et al 2007).

Methods and materials : A total of 102 Diabetes Mellitus II (DM II) patients with 35.5 years mean age have been surveyed. Of those 56 (54.90%) had non-specific lower back pain. The non-specific lower back pain reveal that there is no anatomical-pathological origin for their pain, and this was evaluated according to their medical records. QOL was evaluated using the abbreviated version of the World Health Organization (WHOQOL-BREF). The Arabic abbreviated version of the WHOQOL has adequate psychometric characteristics (α= 0.83 and 0.85), and has the advantage of requiring less time for the completion as compared to the full version (Ahmed 2007). Exercise program was consisted of strength, endurance and stretching exercises constructed in progressive intensity for six weeks, three sessions per week and for a session lasting70-90 minutes. Every session was started with endurance followed by strength and ended by stretching loads. Exercises were adapted to be performable and executable by patients without injuries or harmful effects. Yet, the exercises were selected by specialized researcher to meet the purposes of the study which were in consistence with –primarily- improvement of QOL and –subordinately- weight reduction.

Results and discussion : As it presented in table (1), there were no significance differences between the two groups in body height, but body weights were significantly different between groups and in pre- post-intervention comparison alike. Additionally, same tendency can be detected in BMI results. This may be explained by the pain caused by LBP when patients participate in PA, and by the fact that our sample is consisted predominantly of non-active patients.

Table (1): Pre- and Post- intervention Anthropometric Measures

Variable	Exercise program	Diabetic (n=46)		Diabetic with LBP (n=56)		t value	p
		M	SD	M	SD		
BH(cm)	Pre	167.23	4.71	166.89	5.65	0.326	0.7454
	post	167.19	4.69	167.01	5.55	0.175	0.8617
t value (p)		**0.0409 (0.9675)**		**0.113 (0.9099)**		**---**	**---**
BW(kg)	Pre	73.77	12.34	81.34	8.98	3.581	0.0005*
	post	68.13	7.15	75.81	7.47	5.267	0.0001*
t value (p)		**2.207 (0.0299*)**		**3.543 (0.0006*)**		**---**	**---**
BMI (kg/m^2)	Pre	27.11	3.42	29.69	3.27	3.884	0.0002*
	post	24.42	3.13	26.18	2.99	2.896	0.0046*
t value (p)		**3.935 (0.0002*)**		**5.928 (0.0001*)**		**---**	**---**

In table (2), in one hand, there were significance differences between the two groups in every QOL domain in pre-intervention, on the other hand, none of QOL domains (physical, psychological, social relations, environment) differences were significant in post-intervention data. Same result is noted in the whole scale (general) results correspondingly. The only exception was the social relations domain where no significant differences were noted in pre- and in post-intervention measures. Taking into consideration the improvement of QOL within group, the differences between pre- and post- intervention were significant in every domain for both diabetic and diabetic with LBP group alike

Table (2): Pre-, And Post-Intervention QOL Of Studied Two Groups

QOL domains	**Exercise program**	**Diabetic (M±SD)**	**Diabetic with LBP (M±SD)**	**t value**	**p**
Physical	Pre	55.4± 8.3	51.1± 6.9	2.858	0.0052*
	Post	61.9± 5.4	62.1± 4.8	0.198	0.08437
t value (p)		**4.452 0.0001*)**	**9.793 (0.0001*)**	**---**	**---**
Psychological	Pre	59.7± 9.1	53.8± 7.7	3.547	0.0006*
	Post	68.8± 4.1	67.7± 3.9	1.385	0.1698
t value (p)		**6.184 (0.0001*)**	**11.800 (0.0001*)**	**---**	**---**
Social relations	Pre	64.6± 11.3	64.2± 12.7	0.166	0.8687
	Post	73.6± 6.6	73.2± 6.3	0.312	0.7559
t value (p)		**4.665 (0.0001*)**	**4.751 (0.0001*)**	**---**	**---**
Environment	Pre	66.8± 12.4	61.5± 7.3	2.684	0.0083*
	Post	71.5± 7.4	69.8± 7.4	1.154	0.2521
t value (p)		**2.208 (0.0298*)**	**5.957 (0.0001*)**	**---**	**---**
General	Pre	60.9± 10.3	55.6± 8.8	**2.**802	0.0061*
	Post	68.97± 5.9	68.22± 5.6	0.657	0.5134
t value (p)		**4.611 (0.0001*)**	**9.054 (0.0001*)**	**---**	**---**

*-Differences are significant at 5% level.

Reference

Ahmed Abdel-khalek (2007). The Arabic version the World Health Organization Quality of Life Brief Scale: Psychometric results. **Psychological Studies**, 18 (2), pp. 247-257. (In Arabic).

Bize, R., Johnson, J., & Plotnikoff, R. (2007). Physical activity level and health-related quality of life in the general adult population: A systematic review. **Preventive Medicine**, 45 (6), pp. 401–415.

Cassidy, K., et al. (2004). Association between lifestyle factors and mental health measures among community-dwelling older women. **Australian and New Zealand Journal of Psychiatry**, 38 (11–12), pp. 940–947.

Chyun, D. A., et al. (2006). The association of psychological factors, physical activity, neuropathy, and quality of life in type 2 diabetes. **Biological Research for Nursing**, 7 (4), pp. 279–288.

Olson, S. H., et al. (2005). Cancer history and other personal factors affect quality of life in patients with hepatitis C. **Health and Quality of Life Outcomes**, 3, pp. 39.

Silva, R. S., et al. (2010). Physical activity and quality of life. **Ciencia de Saude Coletiva**, 15 (1), pp. 115–120.

Warburton, D., Nicol, C., & Bredin, S. (2006). Health benefits of physical activity: The evidence. **Canadian Medical Association Journal**, 174 (6), pp. 801–809.

Diabetic Adhesive Capsulitis And Exercises

Srikanth Babu Venga
Chief physiotherapist Menara Medical Centre
Email : jespalcoolsmile@gmail.com

Shoulder pain is one of the most common complaints of patients with diabetes that causes motion limitation, functional disability and decreased quality of life. There is higher prevalence of shoulder disorders in patients with diabetes. Adhesive capsulitis (AC) and rotator cuff (RC) tendinopathy being the most common disabling shoulder disorders1 . Adhesive capsulitis is a term used to describe an insidious onset of pain and movement restriction in the glenohumeral joint2 . Adhesive Capsulitis also called as frozen shoulder, pericapsulitis and humeroscapular fibrositis3 . Most authorities agree that Adhesive Capsulitis is caused by inflammation of the joint Capsule and synovium that eventually results in the formation of capsular contractures4 . The pathophysiology that predisposes patients with diabetes for the development of Adhesive capsulitis is not well-understood but Studies have shown that adhesive capsulitis is caused by glycosylation of the collagen within the shoulder joint capsule triggered by the presence of high blood sugars. Clinically there is global loss of both passive and active range of motion of the glenohumeral joint with external rotation being the most restricted physiological movement, thus leading to functional limitation4 . Primary Adhesive Capsulitis affects from 2% to 3% of the general population, but is reported to occur in 10 to 29% of those with diabetes. It affects female slightly more than males and is seen in ages 40-70 years. Bilateral involvement occurs in 10% to 40% cases5 . Bridgman reviewed the medical records of 800 diabetic subjects and found evidence of Adhesive capsulitis in 10.8 % compared with 2.3% in a control group of 600 non diabetic subjects. Diabetic patients much more likely to have problem with their shoulder than others, some studies showing that they are six times more likely to have this problem than the rest of the population6 The progression of Adhesive capsulitis goes through four stages if not treated early. Initial stage is about 3 months during which patients complains of pain and reduced range of motion, second stage is the freezing stage which may last from 3-9 months presents itself with chronic pain and further reduction in range of motion. In this stage inflammatory process slowly changes to fibrotic process. Treatment at stage 1 and 2 includes pain management by various means and exercises to improve the range of motion such as pendular exercises, wand exercises, wall exercises, towel stretches, passive stretching and active stretching exercises at home. Stage three is the frozen stage which goes for 9-14 months where the pain is minimal but the range of motion is significantly reduced. At this stage person shows

a marked stiffening of the shoulder and substantial loss of ROM. In general, an extremely painful phase may resolve itself spontaneously, but with continued stiffness and loss of ROM. Treatment may be possible with surgical intervention, manipulation, aggressive stretching exercise program. Fourth stage is the Thawing Stage is from 15 to 24 months and shows minimal pain and progressive improvement in ROM. At this stage, the pain and active fibroplasia in the shoulder has completely subsided. An individual has to recover ROM by strength and conditioning exercises7 . Currently no standard medical, surgical or therapy regimen is universally accepted as the most efficacious treatment for restoring motion in patients with shoulder adhesive Capsulitis8 . Non-surgical interventions may include physiotherapeutic interventions, exercise therapy, paincontrol medications, and steroid injection. Surgical approaches include shoulder arthroscopy and shoulder arthroplasty. Exercises are proven beneficial especially active and passive range of motion exercises have shown to improve shoulder range of motion in all planes thus increasing the functional activity of the person9 . Active ROM exercises, self-stretching and joint mobilization techniques have been reported by several systematic reviews to reduce pain and restore shoulder ROM and function in patients with Adhesive capsulitis10 .

References

1. Sana A. Alsubheen, Joy c et al., The Diabetic Shoulder – A Literature Review, J Diabetes Clini Res, 1(2) (2019)

2. Nevaiser R.J. and Nevaiser T.J., The frozen shoulder diagnosis and management, Clinical Orthopedic Rehabilitation, 59-64 (1987)

3. Donatelli – Physical therapy of the shoulder; 3rd edition, 257-273 (1996)

4. Fitz Patrick MT, Powell SE. The anatomy, pathology and definitive treatment of rotator interval lesions, current concepts. Arthoscopy, 19, 70-79 (2003)

5. Mao Cy, Jaw WC, Cheng: Frozen shoulder – Correlation between the response to physical therapy and follow-up shoulder arthrography. Archives Physical medicine and rehabilitation., 857-859 (1997)

6. J.F. Bridgemann; Periarthritis of the shoulder and diabetes mellitus: Ann rheum Dis., 31, 69 (1972)

7. https://www.diabetesnet.com/about-diabetes/diabetes-complications/frozen-shoulder-in-diabetes/

8. Ekelund A.L., Rydell N. Combination treatment for adhesive capsulitis. Clinical orthoped, relat, res, 105 109 (1992)

9. Hannafin JA, Chaiaia, Adhesive capsulitis – A Treatment approach, Clinical Orthopedic, Relat. Res., 95-109 (2000)

10. Favejee, M. M., Huisstede, B. M. A., & Koes, B. W. Frozen shoulder: the effectiveness of conservative and surgical interventions—systematic review. British Journal of Sports Medicine, 45(1), 49– 56. (2011)

Research Trends Of Sports Injuries Among College Students From 2000 To 2019: A Bibliometric Analysis

Yuling Wang
Department of Rehabilitation Medicine, The Sixth Affiliated Hospital of Sun Yat-sen University, Guangzhou, China.
Email : wangyul@mail.sysu.edu.cn

Background: Sports injuries among the younger population especially college students have been an appealing topic over the past decades due to the increased prevalence of injuries during sports or exercise. However, limited research was done to systematically review the current literature and analyze the research trends using the bibliometric method.

Purpose: This study employed a widely used technique, the bibliometric analysis, to comprehensively evaluate the publication patterns and research trends of sports injury among college students during the period 2000-2019.

Study Design: A bibliometric analysis

Methods: Totally 469 documents were selected under the theme of "College Students" and "Sports Injury" in the Web of Science Core Collection database from 2000 to 2019. CiteSpace V was used to analyze the knowledge map of publications, journals, countries, institutions, authors, keywords co-occurrence, strongest citation bursts, among others.

Results: From 2000 to 2019, the number of papers concerning sports injuries among college students was increasing, but the average number of articles was only 23 annually. The prevailing types of sports injuries included brain trauma and concussion. Relevant interventional measures and risk factors of the sports injuries were discussed. In terms of the research design, the majority of articles were epidemiological studies. The *Journal of Athletic Training* was the most commonly published (46 articles) in this topic, and *The American Journal of Sports Medicine* (5-year IF 6.804) had the highest impact factor. The contributing organizations in these publications are mainly universities.

Conclusions: The output of sports injuries among college students was increasing in the past decades, however, this area was still in its infancy. The research hotspots focused on traumatic brain injury, and prevention and risk factor of the injuries. Sports injuries associated with football players and high school students may become a new trend. Future research of the above target trends with a multi-faceted and multi-disciplinary design is warranted.

Key points: The analysis offers a cross-cutting perspective of the up-to-date research work on the subjective area of interest in terms of identifying trends related to sports injuries among the young population, disclosing productive researchers and contributing institutions, and

discerning the quality of previous work. It provides insights into further research that would play a role in producing evidence-based visualizations of research outputs in this specialty.

Clinical Relevance: The findings provide a picture of the state-of-the-art scientific research in the specialty of sports injuries amongst the younger population of college students. The knowledge map unraveled in this work offers clinicians a better understanding of the common injury types, risk factors, as well as prevention and management strategies in an evidenced-based perspective and may bridge connections between researchers and practitioners of interest.

Key Terms: sports injury, college student, brain trauma, concussion, bibliometric analysis

Figure legends:

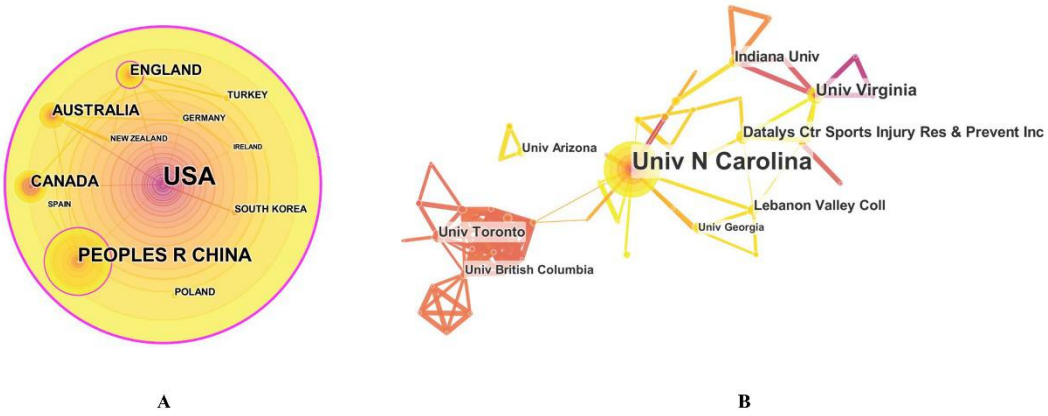


Figure 1. Analysis of countries and institutions. (A) Network map of countries; (B) Network map of institutions.

Abbreviations:

Univ N Carolina, University of North Carolina; Univ Virginia, University of Virginia; Univ Georgia, University of Georgia; Univ Otago, University of Otago; Univ Toronto, University of Toronto; Datalys Ctr Sports Injury Res & Prevent Inc, Datalys Center for Sports Injury Research and Prevention Inc.; Indiana Univ, Indiana University; Univ Arizona, University of Arizona.

Note: Each node represents a country or institution, and the size of the node is proportional to the number of posts. The connection lines between the nodes symbolize the connections between the circles. The thicker the line, the closer the connection.

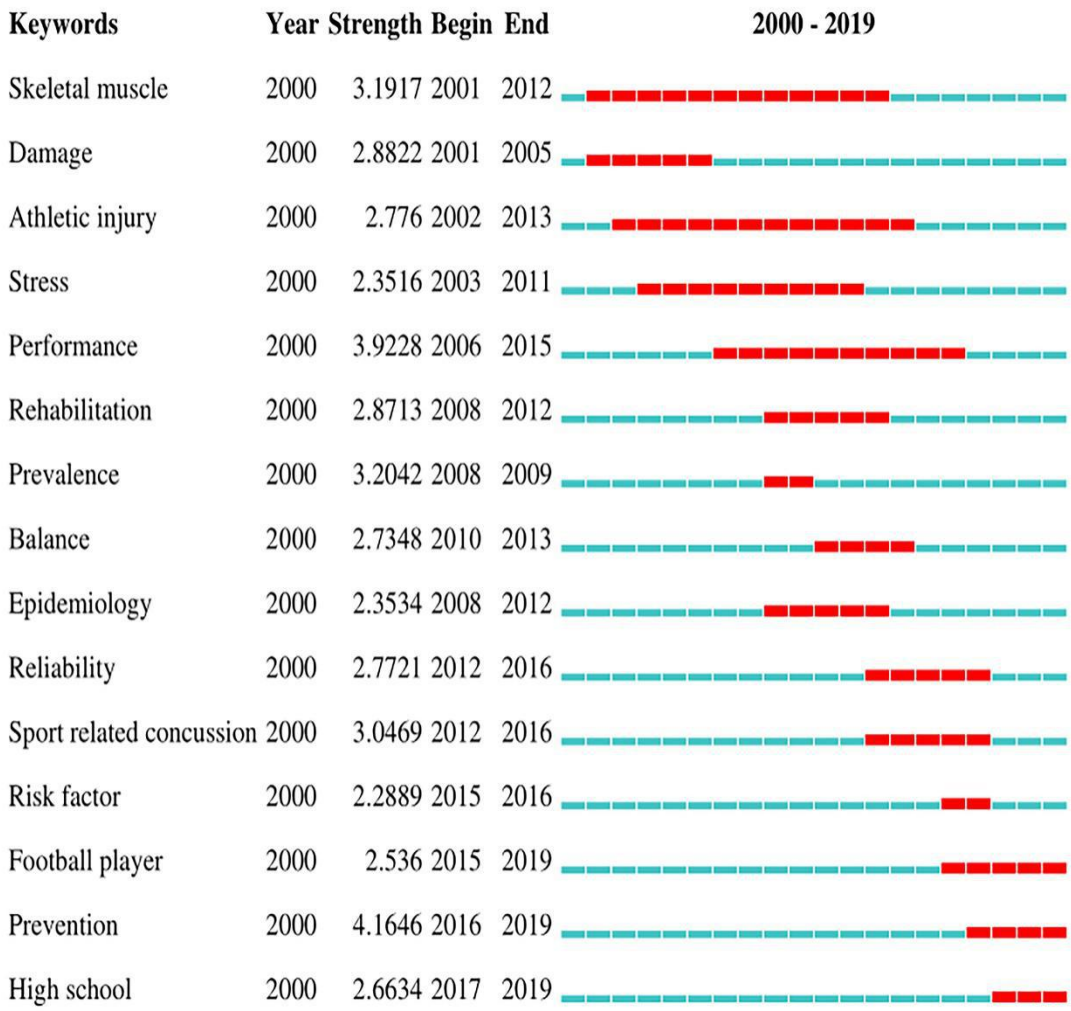


Figure 2. Top 15 keywords with the strongest citation bursts

Case Study On The Effect Of Training Using The Keep It Simple (KIS) Principle On Osteoarthritis , Frailty, And Sarcopenia

Kentaro Esaki
CEO of Esaki Medical Instrument, Japan
Email: kesaki@esakimedical.co.jp

Background : There is a dogma in the medical community that muscles are strengthened by active exercise in our daily living. This includes both “aerobic exercise” and “anaerobic exercise”. Ironically, if muscles are strengthened in the activities of daily living, why are we seeing the locomotive syndrome, sarcopenia, frailty, and OA, which are major problems in Japan, continues to increase despite these diseases that have a strong correlation with muscle strength? Why is it so ? In addition, the term "Intensity" in training is ambiguous and unclear depending on the doctor who uses the terms such as METs, 1RM, maximum heart rate, calorie consumption, etc. In other words, the definition of high-intensity exercise differs from doctor’s perception and it is unclear on the measurement. EBM (Evidence Based Medicine) is being recommended loudly. However there is a tendency to blindly see the word scientific as it seeks statistical and scientific grounds. For example, statistics show that IQ test is low in Africa, where literacy rate is low. The statistic hence concludes that a person with curly hair has a low IQ, but we all know that this is not an absolute truth. It has been pointed out that in most papers (which missed the prerequisite condition of low literacy rate) have not been able to eliminate the effects of the size of sampling and Conflict of Interests※1. Scientific philosopher Karl Popper defines Science as "what science always leaves behind falsification," and warns that scientific is always left with the possibility of being wrong. In Japan, Dr. Kojima advocates The KIS (Keep it Simple) principle. Dr Kojima urges that we should observe human being in a holistic form to understand the living human activities. Many scientists tend to observe human in a mechanical form or reductionism and dissect human body to understand the structure/ elements / cells and etc. Thinking In a Simple Way is the solution. In his training method = KIS training, the training are defined into three elements , these are "intensity", "volume", and "frequency" on active exercise. These are further divided into three categories namely ; "daily activities", "aerobic exercise", and "anoxic exercise". Currently, the most supported definition of aerobic exercise; relating to, involving, or requiring free oxygen" and refers to the use of oxygen to adequately meet energy demands during exercise via aerobic metabolism. In KIS principle, aerobic exercise is defined as "exercise until you can no long continue due to short of breath " and anaerobic exercise is "exercise until you are unable to continue due to muscle

fatigue" The activities of daily living are defined as "exercises that you can continue without shortness of breath or muscle fatigue.

Active exercise	Intensity	Volume	Frequency
Daily living activities	Low	Mid	High
Aerobic exercise	Mid	high	Mid
Anerobic exercise	High	low	Low

In KIS training, muscle can be strengthened by anaerobic exercise and it is defined that muscles could adapt to a higher load while maintaining a higher power state as much as possible. "Strength" in KIS training is the Power of Physics.
The Work in training is
Work (J) = Power (weight) * Distance (REPs)
Since the Power is W = Work/hour
Power(W)= Weight * Distance (number of REPs) / Time (The faster the speed of movement in concentric contraction, more the power increases)

* It is no good if there are too many REPs, but always remember that it is important to use the range of motion as much as possible and increase the speed accordingly.

Centripetal force is used as fast as possible using the range of motion, and centrifugal force is slowly moved without losing power, and continue this exercise until the muscle cannot move on any further. That is a very simple method. In addition, the risk of injury can be reduced to a level that can be almost ignored by suppressing the frequency (frequency) and the volume (volume). This time, while introducing a video of the actual KIS training, I would like to also demonstrate the improvement on OA and locomotive syndrome; diseases which associated with muscle weakness.

※ 1 Why Most Published Research Findings Are False

Therapeutic Plasma Exchange In the Treatment Of Ageing-Associated Frailty

Bradley Elliot

Lecturer in Physiology, Translational Physiology Group Leader - School of Life Sciences, London, United Kingdom

Email : B.Elliott@westminster.ac.uk

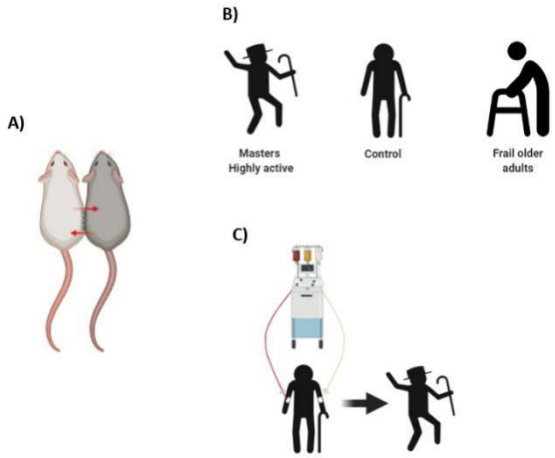
The human population is older today than at any point in history, and is continuing to age. Successes in treatment of communicable diseases has led to a rapidly increasing shift of the population's distribution towards and older average. From approximately 35 years of age, a sustained and continuous decrease in physiological function of all organ systems occurs. This human ageing processes is complex, multifactorial and involves significant environmental (diet, exercise) and intrinsic processes. Decrements in physiological function with age are associated with increased rates of cancers, cardiovascular disease, metabolic disorders, reduced independence and and decreased quality of life. Thus, we rapidly need to understand what causes the physiological process of ageing, why individuals appear to physiology age at different rates and what interventions can maintain and maximise health into older age (healthspan), thus promoting a healthy population. The endocrine model of ageing posits that changes in circulating growth factors and inflammatory cytokines (so called 'inflamm-aging') induces many of the ageing related declines in physiological function. Indeed, heterochronic parabiosis leads to improvements in multiple ageing markers in older mice, including frailty measures such as grip strength. Heterochronic blood exchange without parabiotic connection between younger and older mice leads to improvements in the older mice, and detriments in the younger mice, suggested that these effects are endocrine in nature [1]. To examine if these effects are maintained in the human, our work has compared differences in circulating pro-inflammatory cytokines in highly trained older masters athletes vs inactive control older men [2], and in a large cohort of healthy adults 18 – 80 years of age, we were able to show a signature change in specific growth factors that was both linked to age and ageing-associated loss of grip strength [3]. We were further able to confirm that these changes were biologically relevant by taking plasma from younger and older participants and co-incubating plasma ex vivo with C2C12 myocytes, demonstrating myotubes in an older environment differentiated into smaller diameter myotubes and myoblasts recovered from injury slower [4]. Combined, this raises a key question, is the ageing associated effects due to an increase in 'ageing' factors (e.g. pro-inflammatory cytokines) or a decrease in 'younger' factors (e.g. anabolic growth factors) in circulation. Recently a mouse model of therapeutic plasma exchange (TPE) by plasmapheresis

demonstrated exciting results. Following a one- time replacement of ~50% of mouse plasma volume and albumin buffered saline improved markers of ageing dysfunction were witnessed in multiple organs, including hippocampal neurogenesis and liver adiposity and fibrosis [5]. In light of these findings [1,5]. the sum of evidence appears to lean towards the accumulation of ageing factors, not the loss of youth growth factors, underlies endocrine-inflected decrements in peripheral tissue functions. This has positive implications for the use of plasma-based provision models for the treatment of ageing-associated frailty. Current efforts are focused on 'farming' and provision of young plasma to older individuals, on the assumption that 'younger' factors would underlie any potential successes in such an approach [6]. However, it instead appears to be that the accumulation of ageing factors is instead one causative factor for ageing-associated reductions in physical function. Thus TPE clinical trials are indicated in ageing humans to establish what effect (if any) is seen on peripheral frailty and muscle function. Indeed, therapeutic plasma exchange via plasmapheresis is already indicated in autoimmune disorders for the removal of plasma circulating autoimmune factors has been suggested for Alzheimer's disease and multiple sclerosis , with a high degree of safety [7].

To reasonably confirm this hypothesis, we propose to;

Examine the effect of ex vivo plasma from aged matched frail, control and masters athletes. In a manner similar to our previous work [2,3], we will collect plasma from three aged matched groups (frail, control and masters). Full comparison of plasma constituents should be performed (NMR, inflammatory and growth factor cytokines panels, targeted ELISAs). The ex vivo effect of co-incubation of plasma with key cell lines (hepatic, muscle, astrocyte) will then be performed. Effect of plasma co-incubation on phenotypic and metabolic function of cells measured, reported and regressed back to constituents of plasma samples. Targeted pharmacological intervention can then be preformed on specific pathways identified by regressive analysis to demonstrate causative roles.

Effect of Therapeutic Plasma Exchange (TPE) in a human model – In a similar manner to [1], a cohort of clinically stable older individuals (>65 years of age), will have plasma / saline switching performed once (acute), and repeated (1 session per week for 4 weeks). Following acute model, plasma samples for circulating pro-inflammatory cytokines will be collected to establish time to return to baseline, and body composition and function measures collected. Pre and post repeated model, body composition and functional measures will be collected, and circulating growth factors and pro-inflammatory cytokines measured 3 days post final TPE session.



This work will demonstrate which human plasma changes underlie ageing associated reductions in cellular and organ function, provide insight into molecular mechanisms, and reasonably confirm a plausible treatment model which is more efficacious and practical than heterochronic blood exchange in humans, overcoming the ethical barriers for 'farming' plasma required for heterochronic blood exchange.

Figure 1; A) heterochronic parabiosis improves ageing markers in older mice. B) Humans ageing is highly heterogenous, with wide range of functional ability seen in age-matched groups. We propose to establish a biosignature of ageing in human plasma, by examining cohorts of highly active masters athletes, control inactive individuals and frail older athletes. C) as animal studies suggests accumulation of ageing factors associates with the ageing phenotype in mice, we propose to use therapeutic plasma exchange (TPE) to replace circulating plasma (and thus endocrine factors and cytokines) in an inactive and frail older population, examining changes in body composition and physical function.

Exercise To Prevent Falls In Older Adults: The Risk-Benefit Paradox

D Matt Hill
Assistant Professor in Exercise Physiology, Coventry University, United Kingdom,
Email: matt.hill@coventry.ac.uk

Falls among older people represents a substantial health and social priority. Falling often leads to progressive functional decline, the development of comorbidities and the start of dependency (Okubo et al. 2016). Approximately 35% of adults aged 65 years and over will fall at least once annually (Stalenhoef et al. 2002) and as the proportion of older people is rising globally, the costs associated with falls will increase. Although the aetiology of falling is complex (Rubeinstein, 2006), several modifiable risk factors have been documented including diminished balance and mobility (Delbaere et al. 2010), a progressive reduction in muscle strength and/or power (Orr et al. 2006) and poor cognitive function (Mirelman et al. 2012). Consequently, detection of changes in balance abilities is crucial to ensure that fall prevention strategies may be considered for implementation to target specific impairments to decrease the risk of falling. Crucially, there is robust meta-analytical evidence of randomised controlled trials (108 RCTs with 23,407 participants) that exercise as a single intervention can protect against falls in older people (Sherrington et al. 2019). Whilst a range of exercise interventions have been demonstrated to reverse age-related reductions in physical function (Chou et al. 2012), limited cardiorespiratory capacity, locomotor ability, and fear of falling in older people can reduce exercise capacity and tolerance. These issues can subsequently limit the ability to exercise at a sufficient intensity to prevent further losses in physical function, accelerating decline and contributing to the development of frailty (Cesari et al. 2014), increased levels of disability (Freedman et al. 2002), and poor quality of life (Chou et al. 2012). Accordingly, uptake, adherence and efficacy of exercise therapies can often be disappointing. Therefore, developing exercise strategies with sufficient stimulus to effectively and simultaneously counteract multiple impairments, whilst minimising the challenges older adults face with traditional forms of exercise, remains a high priority in ageing research. For example, several novel therapeutic exercise strategies show promise in reducing falls, including eccentric exercise (Kay et al. 2020), dual-task training (Falbo et al. 2016), exergames (Schoene et al. 2014) and reactive/volitional step training (Okubo, Schoene and Lord, 2015). These exercises appear to be well-accepted and tolerated by older adults which should encourage long term engagement and participation.

While regular exercise is among the main pillars of standard care for preventing falls, most falls occur during walking and so promoting physical activity might paradoxically increase fall rates (i.e. iatrogenic falls). For example, an inevitable consequence of being physically active is the short-term manifestation of muscle fatigue (Vuillerme, Forestier and Nougier, 2002). Fatigue can transiently increase the short-term risk for an adverse (i.e. a fall) by negatively influencing postural, muscular, and physical functions (Halbostad et al. 2010). Importantly, fatigue (or tiredness) is a common complaint among older adults with more than 50% of people over 70 years reporting fatigue during daily activities (Avlund, 2010). Unfortunately, muscle fatigue is often overlooked as an important contributor to fall risk. Findings from these studies will be discussed in the context of their implications in the examination and management of fall risk. When considering the effects of exercise on health, a risk-benefit paradox applies. Despite the risk-benefit paradox, it is clear that the wider health benefits of being physically active far outweigh the acute risks. The aims of this session will be threefold. The presentation will begin by discussing the physiological risk factors for falls and will attempt to identify neuromuscular abilities which we can potentially target to prevent falls. The second part of the talk will aim to synthesise how novel exercise therapies have potential for effective fall prevention. The talk will conclude by emphasising the detrimental effects of skeletal muscle fatigue (a natural consequence of being physically active) on postural control in an effort to raise awareness of iatrogenic falls. Practitioners, therapists and exercise scientists will benefit from this presentation by learning how to adequately implement exercise interventions in primary fall prevention.

Exercise and Aging Biomarkers Of Cell: The Effect Of Exercise On Leukocyte Telomere Length

Hanson Sen-Fang Huang
Associate Professor, Center for Physical Education Teaching, Tzu Chi University, Hualien, Taiwan
Email : hanson@gms.tcu.edu.tw

Background : Telomere dynamics are an active biological process. Positive lifestyle factors such as exercise, healthy diet and others are proposed to potentiate their length. Telomeres are regions of repetitive DNA at the end of human chromosomes, which protect the end of the chromosome from damage. As a cell divides the telomere length (TL) will have some attrition and until certain level of the telomere length attrition, the cell stops division and dies. Therefore, telomere length is regraded as the biological marker of cell aging (Li, 2018). There is increasing evidence to show that telomere shortening has negative effects on health conditions and has been linked to many health issues including cardiovascular diseases, cancer, metabolic diseases, osteoporosis, Alzheimer's disease, stress, infertility etc. (Lai et al., 2018). Promisingly, mounting scientific evidence shown physical activity or exercise may protect telomere length from attrition, and delay cell aging, prevent various degenerative diseases and further increase life expectancy compared with physical inactivity. This presentation will review and focus those reports on the effect of exercise type, time on the leukocyte telomere length (LTL) even though relative TL in peripheral leukocytes is not strongly correlated with the relative TL in different human organ (Dlouha, Maluskova, Kralova Lesna, Lanska, & Hubacek, 2014), LTL is consistently decreased with age (Müezzinler, Zaineddin, & Brenner, 2013).

Effect of physical activity on LTL

Cross-sectional study results shown LTL was shorter in the older vs. young sedentary adults, and in inactive older vs. active elder adults. Moreover, human LTL is positively associated with maximum oxygen uptake VO_2max (LaRocca et al., 2010). Two big scale studies explored 2401 and 5823 middle-aged subjects respectively. researchers compared LTL in most active with least active subjects. Results indicated that human LTL decreased with age and the most active subjects had LTL 9-10 years younger than sedentary individuals' on average (Cherkas et al., 2008; Tucker, 2017). And study investigated the association of different types of sports across different stages of life on relative LTL in 815 subjects (397 men) aged between 61-82 years. Compared to the inactive group Individuals, subjects in currently active, intensive exercise and physical activity for at least 10 years groups showed significantly have longer LTL, and

resistance exercise have no impact on relative LTL (Saßenroth, et al., 2015). A meta-analysis study included eleven eligible studies involving 19,292 participants. Study results revealed longer telomere length was associated with physically active individuals and significantly associated with robust exercise as was moderate exercise. Subgroup analysis indicated that longer telomere length was positively associated with exercise, regardless of sex and intensity of exercise, not statistically significant in elderly populations (Lin et al., 2019). However, in an interventional study, 124 healthy previously inactive middle-aged individuals completed 6-month exercise training. Participants were randomized to three different interventions or the control condition (no change in lifestyle), aerobic endurance training (AET, continuous running), high-intensive interval training (4×4 method), or resistance training (RT, circle training on 8 devices), each intervention consisting of three 45 min training sessions per week. VO_2max was increased by all three training modalities. This 6-month exercise training increased LTL telomerase activity and telomere length in aerobic endurance training, or intensive interval training but not resistance training groups (Werner et al., 2019). However, in another interventional study with 23 sedentary middle-aged adults participants and performed two one-hour sessions of resistance training per week for 12 weeks. Study outcomes shown LTL remained unchanged with a borderline significant increase in telomerase reverse transcriptase (TERT) expression following the training intervention. Subjects who returned to a sedentary lifestyle displaced shorter telomeres compared to their pre values at 12-month follow-up. It demonstrates this two one-hour sessions of resistance training per week have no substantial effect on LTL, but may improve molecular parameters associated with telomere dynamics and implies that longer term of exercise training intervention(>12 months) is necessary to preserve LTL in previously inactive individuals (Nickels, Mastana, Hunter, Denniff, Codd, & Akam, 2020). Interestedly, another study with twenty pre-menopausal obese women (BMI 30–40 kg/m2, 20–40 years) in a combined strength and aerobic exercises program for 55 min/day and 3 times/week throughout 8 weeks (13 finished the protocol). The 8 weeks combined exercise program significantly promoted leukocyte telomere elongation in obese women (Brandao et al., 2020). A summarized mechanisms and subsequent effects on health benefits have been proposed as follows: Regular physical activity or exercise activates telomerase, then preserves telomere length and also enhances mitochondrial biogenesis and function, by which subsequently leads to the reduction of apoptosis, cellular senescence and oxidative stress, lowering the multi-system chronic inflammation (Semeraro etal., 2020).

Summary:

Physical activity or exercise definitely delays cell aging by preserving LTL in cell. Aerobic exercise, HIIT and combined aerobic exercise and resistance training exercise training effectively maintain LTL. Resistance training only and elder participants may need longer training time to elicit solid impact on LTL either than other exercise modes or younger participants. Regular lifelong active lifestyle instead of being active at a certain period of time preserves LTL. Regular exercise or physical activity is a

promising strategy to preserve genomic integrity, tissue function and reduce the onset of age-related chronic diseases.

References

1. Brandao, C.F.C., Nonino, C.B., de Carvalho, F.G. Nicoletti, C. F., Noronha, N. Y., Martin, R. S., … Marchini, J. S. (2020). The effects of short-term combined exercise training on telomere length in obese women: a prospective, interventional study. Sports Med - Open 6, (5). https://doi.org/10.1186/s40798-020-0235-7

2. Cherkas, L. F., Hunkin, J. L., Kato, B. S., Richards, J. B., Gardner, J. P., Surdulescu, G. L., ... Aviv, A. (2008). The association between physical activity in leisure time and leukocyte telomere length. Archives of Internal Medicine, 168(2), 154-158. https://doi.org/10.1001/archinternmed.2007.39

3. Dlouha, D., Maluskova, J., Kralova Lesna, I., Lanska, V., Hubacek, J. A. (2014). Comparison of the relative telomere length measured in leukocytes and eleven different human tissues. Physiol Res. 2014;63 Suppl 3:S343-S350.

4. Müezzinler, A., Zaineddin, A. K., & Brenner, H. (2013). A systematic review of leukocyte telomere length and age in adults. Ageing Research Reviews, 12(2), 509–519. doi:10.1016/j.arr.2013.01.003

5. LaRocca, T. J., Seals, D. R., & Pierce, G. L. (2010). Leukocyte telomere length is preserved with aging in endurance exercise-trained adults and related to maximal aerobic capacity. Mechanisms of Ageing and Development, 131(2), 165–167. doi:10.1016/j.mad.2009.12.009

6. Lai T-P, Wright, W. E., and Shay, J.W.. (2018). Comparison of telomere length measurement methods. Phil. Trans. R. Soc. B 373: 20160451. http://dx.doi.org/10.1098/rstb.2016.0451

7. Li, Y. (2018). Aging and Telomere Length Quantification by qPCR. January 9, 2018. https://sciencellonline.com/blog/590-2/. Accessed 20180604Lin, X., Zhou, J., & Dong, B.

(2019). Effect of different levels of exercise on telomere length: A systematic review and meta-analysis. Journal of Rehabilitation Medicine, 51: 473–478. doi:10.2340/16501977-2560

8. Nickels, M., Mastana, S., Hunter, D., Denniff, M., Codd, V., & Akam, E. (2020). The effect of a 12-week resistance training intervention on leukocyte telomere length. Heliyon, 6(6), e04151. doi:10.1016/j.heliyon.2020.e04151

9. Saßenroth D, Meyer A, Salewsky B, Kroh M, Norman K, Steinhagen-Thiessen E, Demuth I. (2015). Sports and Exercise at Different Ages and Leukocyte Telomere Length in Later Life – Data from the Berlin Aging Study II (BASE-II). PLoS ONE 10(12): e0142131. doi:10.1371/journal.pone.0142131

10. Semeraro, M. D., Smith, C., Kaiser, M., Levinger, I., Duque, G., Gruber, H-J., & Herrmann, M..(2020). Physical activity, a modulator of aging through effects on telomere biology. Aging (Albany NY), 12(13), 13803-13823. doi:10.18632/aging.103504

11. Tucker, L. A.. (2017). Physical activity and telomere length in U.S. men and women: An NHANES investigation. Preventive Medicine 100, 145–151. http://dx.doi.org/10.1016/j.ypmed.2017.04.027

12. Werner, C. M., Hecksteden, A., Morsch, A., Zundler, J., Wegmann, M., Kratzsch, J., … Laufs, U. (2019). Differential effects of endurance, interval, and resistance training on telomerase activity and telomere length in a randomized, controlled study. European Heart Journal. doi:10.1093/eurheartj/ehy585

Precise Exercise Prescription For Non-Communicable Diseases

Jin Jong Chen
Professor, Institute And Faculty Of Physical Therapy
Email : jinjong.chen518@gmail.com

In modern society, because of the advancement of medical care and public health, the invention and use of antibiotics and vaccines, which effectively control the infection and mortality of acute infectious diseases, the causes of disease and death have been transformed into noncommunicable diseases (NCDs). Non-communicable diseases kill 41 million people around the world every year, which is about 71% of the world's deaths. Cardiovascular diseases, cancer, diabetes and chronic respiratory diseases are the four major non-communicable diseases. The four major risk factors for non-communicable diseases are smoking, drinking, unhealthy diet and lack of exercise (WHO, 2018). Among them, "lack of exercise" has become the fourth leading risk factor for death. According to a World Health Organization study published in Lancet, more than 1.4 billion adults in the world lack exercise and have higher risk of cardiovascular disease, diabetes, Alzheimer's and cancer. In addition to the prevention of chronic diseases and the improvement of disease conditions control, exercise has significant benefits, and also has significant effects on the overall health of patients. Taking cancer, which is the top one cause of death in Taiwan, as an example, scientific research has confirmed that exercise training can improve the symptoms of cancer patients, including bone loss and related diseases, muscle and fat imbalance, symptoms of cachexia, peripheral neuropathy, lymphedema, pain, tiredness, sleep disorders, depression, anxiety, quality of life and self-esteem, etc. Therefore, in 2007, the American College of Sports Medicine and the American Medical Association jointly launched the "Exercise is medicine, (EIM)" action plan. There are three major goals:(1) The weekly exercise time should be recorded in the medical record as an important vital sign. (2) Exercise is a good remedy for most diseases in the 21st century and needs to be actively promoted. (3) Grant training and certification to medical professionals and sports science practitioners to facilitate the promotion of exercise prescriptions. Since exercise has been recognized as a good medicine and medical treatment, there should be an "exercise prescription" for the right medicine, and the concept of precision medicine should be integrated and the development of a "precision exercise prescription" can reduce exercise ineffectiveness, unsustainability, injury, and even sudden death The adverse reactions and side effects.

However, since the promotion of EIM in 2007, exercise prescription is still in the form of public health education and activity promotion, lacking a stable and continuous execution structure and platform. Therefore, in order to further strengthen the implementation effect of exercise as a good medicine, it should be compared with the structure of formal medical prescriptions: the doctor prescribes the medicine, the pharmacist gives the medicine and medication guidance, and divides the exercise prescription into two parts: the doctor's exercise referral prescription and exercise execution prescriptions for scientific professionals. In view of this, Associate Professor Huang and I actively have collated relevant literature and written "precision exercise prescriptions for non-communicable diseases" as a guidebook to promote the training and certification of clinical exercise physiology professionals. Help them to conduct planning healthy sports fields in hospitals and perform "exercise is medicine" tasks successfully. The book is divided into three parts: the first part is "exercise is medicine", the second part is "exercise prescription practice" and the third part is "the development of precision exercise". In the "exercise is medicine", we will provide evidence of the prevention and treatment effects of exercise intervention on non-communicable diseases from the latest and most empirical international sports science and sports medicine literature, as well as the American Sports Medicine Association and the United Nations World Health Organization. Organize international action plans and guidelines on "exercise is medicine". In the second part "exercise prescription practice", we will summarize the international and domestic official exercise prescription guidelines and recommendations, as well as the author's personal participation in domestic policy projects and researches. It is aimed at working adult groups, non-communicable chronic disease groups and the elderly groups. For different health conditions, detailed exercise referral prescriptions of specific physicians and exercise execution prescriptions of sports science professionals are presented. The contents of exercise execution prescriptions are mainly based on the information related to physical activity guidelines on the ACSM American Sports Medicine Association website. The exercise prescriptions with referral and execution are different from public health education and promotion forms. In the third part "the development of precision exercise", we try to integrate the essence and requirements of precision medicine based on the theoretical foundation of the first part and the practical needs of the second part. Then, we will discuss how to make good use of wearable devices and wireless physiological monitoring management technology to enhance the social connection and interaction between people. Innovation of healthy exercise environment and sports furniture which in line with human nature will be introduced. Taking into account the adaptation of individual fitness

characteristics and the quality of the exercise environment, coupled with the monitoring of physiological reactions during exercise, it achieves the best state of precision exercise prescriptions for good results.