

## SASMA 2017 CONGRESS: INDEX TO ABSTRACTS

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## OPEN COMMUNICATION

### O1: How Do Transplant Athletes Experience Competitive Sport: A Volleyball Perspective?

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**Introduction:** Following organ transplantation, near-normal levels of physical functioning and quality of life are possible with greater levels being achievable for those partaking in regular physical activity (Painter et al 1997). Current research, however, considers the physiological aspects of organ transplantation per se with little published research concerning transplant athletes' experiences within competitive sport.

**Aim:** To explore transplant athlete's experiences of competitive sport

**Methods:** An ethnographic study was undertaken with 11 athletes from both Great Britain (n=9) and United States (n=2) Transplant volleyball teams. Initial analysis of publicly available documents, in the form of; newspaper cuttings, magazine articles and case studies from the transplant sport website, informed the direction of the interview matrix. Subsequently, face to face semi-structured interviews lasting approximately one hour were held with the athletes during training camps. Analysis of artefacts and interviews was undertaken, coding all the data through the use of computer software (NVivo). Themes were developed through identifying, coding, classifying and labelling patterns in the data.

**Results:** The following emerging themes were observed: Shift in relationship with sport: Athletes pre-transplant sporting activities may not match those of transplant games events, therefore, to compete at the National and International Transplant Games athletes must adapt and develop alternative sports.

Factors contributing to decisions regarding sport played: the positioning of a kidney transplant, due to their vulnerable location, may be a factor in determining whether kidney transplantees are able to participate in contact sports, however, the mechanisms by which such decisions of medical staff are made, and the impact that they have are unknown. Analysis of published media focused mainly on the transplantee's life journey with information on sport being factual reporting of sporting events.

**Conclusion:** Pre-transplant sporting activities played by transplantees are not necessarily included in the Transplant Games. For kidney transplantees post-transplant sporting activities appear to be limited and restricted possibly due to the position of the donated organ. Future research: To understand factors preventing transplantees participating in sport, including fundamental questions and advice given by medical staff concerning participation within sport for a range of transplantees.

### O2: Home-Based Balance Training Can Reduce Freezing Of Gait, But Not Improve Turning Ability

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**Introduction:** Freezing of gait is a major mobility problem for individuals with Parkinson's disease (PD). Not only does it impact the effectiveness of movement but can also be accompanied by postural instability during walking and turning. Often this can result in subsequent falls which reduces independence and quality of life. The aim of this study was to assess the efficacy of a home-based compared to therapist-supervised balance training programme on freezing of gait and turning effectiveness.

**Methods:** Based on a sample of convenience, 40 participants with mild to moderate Parkinson's disease (Hoehn & Yahr stages I – III) were allocated to a therapist-supervised (n = 24, age 65.4 ± 8.3 years) or home-based group (n=16, age 64.9 ± 7.1 years). Within each group 50% of individuals reported experiencing freezing. Both groups followed eight weeks of balance training; the Therapist-supervised group attended classes with a qualified Biokineticists and the Home-based group followed a series of guided DVDs at home. Primary outcome variables were measure pre- and post-intervention and included turning ability assessed with the modified instrumented Timed-Up-and-Go, mobility parameters assessed with a functional gait analysis, and freezing of gait assessed by self-reported questionnaire.

**Results:** The main findings for this study are that both groups experienced a decrease in reported freezing of gait after intervention. Freezers scored worse in balance and gait measurement at pre-test than Non-freezers (p 0.05), but improved significantly after the intervention. Only the Freezers in the Therapist-supervised group improved their turning duration (p = 0.04), and turning velocity (p = 0.02), while Freezers and Non-freezers of the Therapist-supervised group improved turn-to-sit duration at post-tests (p 0.001).

**Conclusions:** This study has verified that individuals who experience freezing are likely to have less functional mobility, including gait and turning actions. An eight-week balance intervention with a therapist can improve the efficacy of a turn when the exercises are presented by an exercise scientist. Home-based training does not seem to be nearly as effective as Therapist-supervised training in improving turning ability, but it is however effective in reducing self-reported freezing of gait severity.

### O3: Concussions: A Conundrum Of Uncertainty And The Need To Standardize Care - The Online Concussion Awareness Training Tool – [www.cattonline.com](http://www.cattonline.com)

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**Context:** The Concussion Awareness Training Tool (CATT, [www.cattonline.com](http://www.cattonline.com)) is an online resource with three comprehensive toolkits providing training in the recognition and treatment of concussion. Based upon international consensus on concussion in sport and other evidence-based resources, each toolkit includes a self-paced learning module as well as tailored resources. CATT for Medical Professionals aims to standardize practice in a clinical setting with a focus on the paediatric patient. Resources include diagnostic tools, clinical resources, patient handouts, journal articles, websites, videos and case studies. Physicians demonstrated significant positive change in concussion practices, and significant change in knowledge by those treating >10 concussions per year. Nurses had significant positive change in practices and attitudes.

CATT for Parents, Players and Coaches speaks to concussion identification and management, with resources including the Smartphone accessible Concussion Response Tool and Questions to Ask Your Doctor. Parents demonstrated significant positive change in concussion knowledge.

CATT for School Professionals includes Return-to-Learn protocol and resources to support teachers, administrators, counsellors and others in the school setting. Teachers and school administrators demonstrated significant positive change in concussion knowledge.

**Objective:** To promote the implementation of an evidence informed concussion awareness training tool.

**Key Messages:** To date, over 100 relationships have been developed with organizations and key stakeholders in British Columbia and beyond, more than 10,000 print resources distributed, >25,000 coaches and parents and >2,000 school professionals have completed CATT, and >15 sporting organizations and schools have mandated CATT.

Continuing implementation will include enhancing CATT MP by adding modules to include dealing with persistent concussion symptoms (e.g., persistent headaches), supporting good sleep hygiene, and speaking to the need to support mental health (social/emotional wellbeing). Other additions may include language translation, a workplace concussion toolkit (employee/employer awareness), and developing a toolkit aimed at elite, university and professional athletes.

**Discussion and Conclusions:** Concussion is an under-recognized, -diagnosed and -treated medical condition, requiring physical and mental rest. CATT addresses this gap by increasing knowledge and awareness among appropriate audiences. Good concussion management can reduce health problems and the risk of long-term brain damage, potentially lowering total health care costs.

#### **O4: Reliability Of Rotational Knee Laxity Measurements In Healthy Participants Using The RKT Device**

*Samantha Beckley<sup>1</sup>, Dr Thomas Branch<sup>2</sup>, Dr Shaun Stinton<sup>3</sup>, Assoc Prof Alison September<sup>1</sup>*

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A number of clinical tests exist to assess knee laxity, which is defined as the displacement or rotation of the tibia in relation to the femur. These assessments, which are the predominant tools of diagnosis, are subjective and rely on the experience of the clinician. The dial test is typically used to assess rotational laxity. The Robotic Knee Testing (RKT) device has been developed in order to quantitatively and objectively measure rotational knee laxity.

The purpose of this study was to determine the intra-tester reliability of the RKT device.

Twenty healthy participants (10 males and 10 females) with no lower limb injuries were recruited and tested using the RKT device daily over five consecutive days to determine the ICC value. Measurements were carried out by external and internal rotation of the tibia of both legs using a servometer, until a maximal torque of -5.65 N m and 5.65 N m respectively was reached. These measurements were repeated and carried out for three cycles. Data from the third cycle were used to generate a load deformation curve. After completion of the study, a total of four participants' data were excluded due to initial setup errors. The RStudio statistical environment was used to calculate ICC for both legs combined and each individual leg. Preliminary results demonstrated ICC values between 0.7 and 0.85. The externally rotated measurements of the left lower limb had lowest ICC value of approximately 0.6.

The RKT device showed good to excellent reliability in measurements of external and internal rotational laxity. The lower ICC values during the external rotation of the left lower limb in comparison to the right lower limb suggests these values could be improved. We hypothesise these reliability scores could be improved by a more stringent setup process of the equipment and participant. Therefore, we recommend (i) further training in the use of the RKT device, (ii) implementation of software assisting in correct initial setup and a (iii) further testing of a larger sample size.

#### **O5: The Psycho-Hormonal Influence Of Anaerobic Fatigue On Semi-Professional Female Soccer Players**

*Adele Broodryk<sup>1</sup>, Cindy Pienaar<sup>1</sup>, David Edwards<sup>2</sup>, Martinique Sparks<sup>1</sup>*

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Globally it is assumed that high-intensity activities are the general cause of fatigue experienced during a soccer match. However, little is known about the hormonal and psychological effects of fatigue due to these activities on semi-professional female soccer players. Forty-seven female players (22.0 ± 2.7 y) from a tertiary education institution volunteered for the study. Their cortisol values (saliva sample), anxiety [Spielberger State-trait anxiety inventory questionnaire (STAI)] and mood scores [Incredible Short Profile of Mood states questionnaire (ISP)] were taken an hour and immediately prior to, and 15 minutes after an anaerobic fatiguing test (AFT). During the AFT, subjects completed a 5-m multiple shuttle run test and their HRmax, blood lactate (BLA-) and rate of perceived exertion (RPE) taken afterwards. Anxiety scores were divided into three categories and mood scores into the Total Mood Disturbances (TMD) and six subscales. The results indicated an increase in cortisol, psychological fatigue and TMD from baseline and/or pre- to post-AFT (p 0.05). Vigour and confusion decreased from baseline and/or pre- to post-AFT (p 0.05). A relationship was seen between state-anxiety and TMD (r ≥ 0.63, p 0.05) at all three time points, as well as between state-anxiety and HRmax (r = 0.37, p = 0.03). Cortisol and RPE (r = -0.34, p = 0.03) demonstrated a correlation post-AFT. This is the first study to evaluate the effects of anaerobic fatigue on the hormonal and psychological states of female soccer players. The results suggest that an AFT can be perceived as a physiological and psychological stressor by female players, hence has the ability to influence performance. Altering a player's awareness and anaerobic fitness level might therefore influence both the hormonal and psychological consequences of the stressor, subsequently reducing the experience of fatigue and thereby enhancing performance.

#### **O6: Assessing The Validity A Novel Collision Sport Simulator Developed To Study Tackling And Prevent Tackle-Related Injuries**

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**Introduction/background:** It is necessary to study the rugby tackle in detail as it occurs most frequently in comparison to other contact phases and has the highest propensity to cause injuries, including severe and sometimes catastrophic head and neck injuries. As a result of these risks, the tackle has recently been subject to significant scrutiny and an official call was made to ban contact rugby at schoolboy level. With only a limited pool of data available detailing the discrete biomechanical properties of the tackle, a novel collision sport simulator was developed to study and train the tackle in a controlled laboratory environment.

**Methods:** The collision sport simulator consists of five primary components; (1) an A-frame gantry, (2) pneumatic system, (3) twin trolley system, (4) shock absorbing units, and (5) a custom-built tackle dummy. Testing comprised two phases involving two unique conditions; (1) tackling using the collision sport simulator i.e. tackling the dummy, and (2) tackling during a standardised 'live' one-on-one tackle drill i.e. tackling a human ball-carrier. Tackling performance and proficiency were compared between conditions using a list of technical criteria. Mean criteria scores, standard deviations, and Cohen's d effect sizes were calculated for the comparative analysis.

**Results:** Mean overall score for dynamic simulator tackles was 7.78 (95%CI 7.58-7.99) (out of 9) or 87% (SD±8.94), and mean overall score for dynamic 'live' tackles was 7.85 (95%CI 7.57-8.13) (out of 9) or 87% (SD±9.60) (effect size=0.08; trivial; p>0.05). Mean overall score for static simulator tackles was 7.45 (95%CI 7.20-7.69) (out of 9) or 83% (SD±10.71), and mean overall score for static 'live' tackles was 8.05 (95%CI 7.83-8.27) (out of 9) or 89% (SD±7.53) (effect size=0.72; moderate; p0.001).

**Conclusion:** The simulator replicates dynamic tackle performance and technique comparable to real-life tackle drills and may be used for research analysing various aspects of the tackle in rugby and other contact sports. These aspects include, but are not limited to, head and neck kinematics and shoulder impact forces. Data from this research may help guide clinicians, conditioning coaches, and various other key stakeholders working in rugby to formulate novel injury prevention strategies.

## **O7: The Effect Of Three Different Exercise Training Modalities On Cognitive And Physical Function In A Healthy Older Population**

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**Background:** Older adults are encouraged to participate in regular physical activity to counter the age-related declines in physical and cognitive health. Literature on the effect of different exercise training modalities (aerobic vs resistance) on these health-related outcomes is not only sparse, but results are inconsistent. In general, it is believed that exercise has a positive effect on executive cognitive function, possibly because of the physiological adaptations through increases in fitness. Indications are that high-intensity interval training is a potent stimulus to improve cardiovascular fitness, even in older adults; however, its effect on cognitive function has not been studied before. The purpose of the study was to compare the effects of resistance training, high-intensity aerobic interval training and moderate continuous aerobic training on the cognitive and physical functioning of healthy older adults.

**Methods:** Sixty-seven inactive individuals (55 to 75 years) were randomly assigned to a resistance training (RT) group (n=22), high-intensity aerobic interval training (HIIT) group (n=13), moderate continuous aerobic training (MCT) group (n=13) and a control (CON) group (n=19) for a period of 16 weeks. Cognitive function was assessed with a Stroop task and physical function with the Timed-Up-and-Go (TUG) and submaximal Bruce treadmill tests.

**Results:** No significant GROUP x TIME interaction was found for Stroop reaction time (P > 0.05). The HIIT group showed the greatest practical significant improvement in reaction time on the information processing task, i.e. Stroop Neutral (ES = 1.11). MCT group participants had very large practical significant improvements in reaction time on the executive cognitive tasks, i.e. Stroop Incongruent and Interference (ES = 1.28 and 1.31, respectively). The HIIT group showed the largest practically significant increase in measures of physical function, i.e. walking endurance (ES = 0.91) and functional mobility (ES = 0.36).

**Conclusion:** MCT and RT proved to be superior to HIIT for the enhancement of older individuals' executive cognitive function; whereas HIIT were most beneficial for improvement in information processing speed. HIIT also induced the largest gains in physical function.

## **O8: Prevalence, Clinical Presentation, Treatment And Severity Of Exercise Associated Muscle Cramping (EAMC) Differ Between 56km And 21.1km Runners: Cross-Sectional Study In 76 654 Race Entrants**

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**Background:** EAMC is a common complication during distance running. Differences in the epidemiology and clinical presentation of EAMC in 21.1km vs. 56km runners have not been investigated. The purpose of this study was to determine if the lifetime prevalence (%), clinical presentation, severity and self-reported treatment for EAMC differs between 21.1km and 56km runners.

**Methods:** Data from 76 654 consenting race entrants over 4 years (21.1km= 47 069) (56km= 29 585) who completed a pre-race medical screening tool, that included data on history, clinical presentation and treatment of EAMC, were analysed. 10 614 runners indicated a history of EAMC, and were included in this study. The lifetime prevalence, clinical presentation, severity and self-reported treatment for EAMC was compared (crude %; 95%CI) between the 56km and 21.1km runners.

**Results:** The lifetime prevalence (%) of EAMC in all runners was 13.9% (13.6-14.1), and this was significantly higher in the 56km (21.1%; 20.6-21.5) vs. the 21.1km (9.3%; 9.1-9.6) runners (p0.05). 62.2% (61.3-63.2) of runners with EAMC reported EAMC in the past 12 months. Although most runners experienced cramping either in the fourth quarter (48.1%; 47.2-49.1) or after the race (22.1%; 21.3-22.9), 21.1km runners reported EAMC more frequently in the first quarter (21.1km=4.9%, 4.2-5.5; 56km=1.3%; 1.1-1.6), second quarter (21.1km=3.6%; 3.1-4.2; 56km=2.4%; 2.0-2.7), and after the race (21.1km=29.0%; 27.7-30.4; 56km=17.3%; 16.3-18.2) compared to the 56km runners. The most frequent muscle groups affected by EAMC was calves (53.8 %), and this was significantly higher in the 21.1km runners (62.1%, 60.7-63.6) compared to 56km runners (48.0%, 46.7-49.2). Serious forms of EAMC were significantly more frequent in the 56km group compared to 21.1km runners, specifically for whole body cramping (56km=5.5; 4.9-6.1; 21.1km=2.8%; 2.3-3.3) and EAMC with dark urine (56km=3.8%; 3.3-4.3; 21.1km=2.0%; 1.6-2.4). In both groups, the most successful self-reported treatment to relieve an acute cramp was stretching, followed by rest, and massage.

**Conclusion:** 56km runners experience EAMC more frequently and report more severe forms of EAMC, compared with 21.1km runners. 21.1km runners experience EAMC earlier in races. These data indicate that the risk factors and causes of EAMC may differ between these two groups of runners.

### **O9: The Contact Skill Characteristics Of An Academy Rugby Union Team**

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Rugby Union is a field based collision sport, requiring strength, speed, deception and skill (Williams & Bunce 2012). Typically, coaches use standardised physical assessment protocols to evaluate the physical characteristics of their players. The results of the assessments are subsequently used as a tool to screen whether a player can meet the physical demands of the sport. However, to authors' knowledge, no standardised skill assessment protocols exist to evaluate whether players meet the skills demands of Rugby Union.

For this purpose a skill assessment protocol for Rugby Union was developed. The protocol incorporates a number of drills and tasks which assess rugby specific technical, tactical and perceptual skills. The technical skill assessments involve the participants taking part in contact and non-contact drills which are filmed. This allows the researcher to retrospectively analyse the participant's technique using standardized technical criteria. These criteria were developed based on the guidelines of a national rugby union (Posthumus & Viljoen 2008). The criteria have also been used in video analysis research, and high skill proficiency scores have been associated with reduced risks of injury (Hendricks et al. 2015; Burger et al. 2016) and improved performance (Hendricks et al. 2014; Tierney et al. 2017) in contact.

This study used the skill assessment protocol to describe the skill characteristics of an academy Rugby Union team.

Thirty rugby players from a local academy took part in the field based contact drill. The drill, a 3 on 2 contact drill, assessed the players' tackle, ball-carrier, and ruck clearing technique. 74% of ball-carriers had a 'straight back' going into contact and 45% were 'explosive' in contact. 95% of tacklers had their 'heads up' pre-contact, 63% of tacklers made contact with the ball-carrier's centre of gravity. Only 17% performed a 'leg drive' post contact. 98% of players went from an 'upright to low' body position prior to going into a ruck, however only 38% 'dipped and stepped into contact'. The execution of the above mentioned techniques have been associated with reduced injury risks and improved performance. This information can therefore be used by coaches to improve performance and decrease injury risk.

### **O10: About 1/20 Road Cyclists Report Non-Traumatic Injuries, With 38% Of The Injuries Being Severe Enough To Affect Cycling – A Cross-Sectional Study Amongst 22 560 Cyclists**

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**Introduction:** Road cycling increases in popularity, but there is an increased risk of injury amongst both amateur and professional cyclists. There are sparse data on the epidemiology and risk markers for non-traumatic (chronic, "overuse") injuries (NTI) in recreational cyclists participating in mass community based cycling events. The aim of this study is to determine the lifetime prevalence of NTI, anatomical areas affected by NTI, and severity of NTI in a large cohort of road cyclist participating in the Cape Town Cycle Tour.

**Methods:** This is a cross-sectional study on recreational cyclists that participated in the 2016 Cape Town Cycle Tour (109km). 37 425 race entrants were required to complete an online pre-race medical screening questionnaire and 22 560 consenting cyclists (60.3%) were included in this study. We report the crude (un-adjusted) lifetime prevalence (%; 95%CI) and common anatomical areas of NTI, and specific cycling NTI's (% cyclists with NTI; 95%CI).

**Results:** The lifetime prevalence of NTI is 4.4% (4.1-4.7) and 34.4% of cyclists with NTI reported becoming aware of the injury between 1–6 months ago. NTIs were reported equally on the left (32.1%; 28.2-36.1) and right (32.0%; 28.0-35.9) sides of the body. The most common anatomical areas for NTIs were the knee (27.8%; 24.0-31.6), followed by the lower back (11.10%; 8.4-13.8), and the shoulder (9.8%; 7.3-12.3). NTIs occurred most commonly in muscle (19.0%; 15.7-22.3), and tendon (17.5%; 14.3-20.7) tissue. The most common specific NTIs in cyclists were patellofemoral pain (14.7%; 11.7-17.7), lower back pain (10.3%; 7.8-12.9) and iliotibial band friction syndrome (9.8%; 7.3-12.3). In 8.8% (6.4-11.3) and 29.3% (25.5-33.2) of cyclists with NTI, injuries were severe enough to prevent cycling, or interfere with training, respectively.

**Conclusion:** About 1 in 20 recreational cyclists report ever suffering from a non-traumatic injury. These injuries affect mostly the knee, lower back and shoulder (47% of injuries) and >38% injuries are severe enough to affect training and competition.

### **O11: Compression Socks And Post-Exercise Recovery: How Does It Work?**

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Two theories exist to explain the physiological mechanism whereby compression socks aid post-exercise recovery. The first is that the socks increase venous return from the periphery, thereby facilitating greater lactate removal in the muscle. The second theory suggests the retention of lactate within the muscle due to the external mechanical pressure provided by the socks, therefore oxidising lactate within the muscle itself. Both theories lack universal support, however, the use of compression socks are fairly common among athletes. The aim of this study was to determine if the measurement of post-exercise muscle oxygenation will shed more light on the physiological mechanism at work during recovery with compression socks.

Eleven male recreational long-distance runners (30 to 40 years) voluntarily took part in the study. The participants completed three 10 km sub-maximal runs on the treadmill (80% of peak treadmill velocity) under three conditions and in random order (compression socks, flight socks, no socks). During a 60 min passive recovery period, near-infrared spectroscopy (NIRS) was used to measure muscle oxygenation variables (oxy-haemoglobin (O<sub>2</sub>Hb), deoxy-haemoglobin (HHb), and total haemoglobin index (THI)), while maintaining the sock condition of the run.

Statistically significant (p 0.05) in oxygenation levels in the blood between the compression conditions (CS = -187.0%; FS = 198.0%; -108.0%), thus compression did not cause an increase in arterial flow to the muscle. However, THI was significantly higher with the compression socks compared with the other two conditions, suggesting a significant shift in blood flow from the superficial to the deep veins because of compression.

We therefore hypothesize that the external pressure provided by the compression socks to the calf muscle causes greater extraction of oxygen from the blood, which supports the theory that post-exercise recovery with compression socks is enhanced by the retention of metabolic by-products in the muscle for oxidation and regeneration of ATP.

### **O13: Statistical Methods To Explore The Relationship Between Illness And Injury In The Super Rugby Tournament**

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**Background:** The epidemiology of injuries and illness in Rugby Union players is well documented. We are not aware of any studies that addressed a possible relationship between injuries and medical illness.

**Objectives:** The aim of this study is to develop statistical methods that can be used to explore a possible relationship between illnesses and injuries among the players of the South African Super Rugby teams over a 4-year period.

**Methods:** Daily injury and illness data from 869 consenting South African Super Rugby players who participated in a 4 year (2013-2016) prospective study was used as the principle dataset for this exploratory study. The number (and %) of all the players that suffered from both an illness and an injury were included in the analysis. The observed agreement between illness and injury is reported and kappa is reported as a measure of agreement for each year, as well as combined over the 4 years. The main outcome is the risk of an injury when an illness was also observed in the same player during the tournament (Risk Ratio, 95%CI).

**Results:** The number (and %) of ill (IL) and injured (IJ) players in each year was as follows: 2013 [IL=58 (32.2%); IJ= 90 (50.0%)], 2014 [IL=75 (38.1%); IJ=103 (52.3%)], 2015 [IL=86 (39.5%); IJ=110 (50.5%)] and 2016 [IL=75 (27.4%); IJ=111 (40.5%)]. The measure of agreement (kappa) between illness and injury occurrence for each year was as follows: 2013=0.11, 2014=0.16, 2015=0.14 and 2016=0.28. The overall kappa for the 4-year period was 0.18. The risk ratio (with 95%CI) for injury when an illness was observed in the same year was as follows: 2013=1.3 (1.0-1.7), 2014=1.4 (1.1-1.8), 2015=1.3 (1.0-1.7) and 2016=2.0 (1.6-2.6). The overall risk ratio for injuries when an illness was observed for the 4-year period was 1.5 (1.3-1.7).

**Conclusions:** The overall agreement between injury and illness status in Super Rugby players over 4 years is 18%. In players with an illness during the tournament, the risk ratio of having an injury in the same tournament is 1.5.

### **O14: The Injury And Illness Profile Of 23055 Participants In A 94.7km Cycle Race Cross-Sectional Study**

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**Introduction:** The Momentum 94.7 Cycle Challenge is an annual recreational long distance cycling event in South Africa. Medical support at such an event is imperative, with little known regarding the risk of acute traumatic injuries and acute medical illness.

**Purpose:** To describe the incidence and patterns of acute injury and medical illness and difference between sexes during a mass community cycling race.

**Methods:** A descriptive study of the 2014 Momentum 94.7 Cycle Challenge, documenting the incidence of acute traumatic injuries and acute non-traumatic medical illness in 23055 race starters (males=17520, females=5236, not specified=299) during the 94.7km distance.

**Results:** An incidence (per 1000 starters) of 38.69 (females=38.39, males=36.52) for all medical illness; with an incidence of 11.88 (females=16.42, males=10.73) for adverse medical events and of 1.3 (females=2.67, males=0.86) for serious adverse events, were reported. The incidence of non-traumatic medical complaints was 32.48 (females=31.32, males=33.39) and of traumatic injuries was 3.99 (females=7.07, males=3.14). Females had a higher risk of sustaining traumatic injuries (p50yrs (p=0.0002), had a higher risk for traumatic injuries.

**Conclusions:** A reported ratio of 1:26 (females=1:26, males=1:28) of all starters developed medical complaints; with 1:84 cyclists (females=1:61, males=1:93) that developed adverse events and did not finish the race; and 1:769 participants (females=1:374, males=1:1163) developing serious adverse events that required hospitalisation. The majority of admissions for traumatic injuries were followed by cardiovascular complaints. A wide spectrum of medical complaints can be expected during mass recreational sport events, with a higher risk for females to sustain traumatic injuries, and encounter central nervous system and eye complaints. The majority of disorders involved the musculoskeletal system. Information regarding the pattern and type of medical encounters can prove useful during planning and management of similar future events.

### **O15: Infections Of The Respiratory Tract Account For >50% Of All Illness During The Super Rugby Union Tournament – A Prospective Study Involving 80 088 Player Days**

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**Background:** Illness accounts for a significant proportion of consultations with a team physician travelling with elite athletes. The purpose of this study is to determine the incidence, type, and severity (time loss >1 day) of illness in rugby union players participating in the annual 20-week Super Rugby tournaments.

**Methods:** A cohort of 869 elite rugby players from 5 South African teams participating in the Super Rugby tournaments each year, from 2013 to 2016, were recruited. All players were followed daily over the 20-week competition period for each year (80 088 player days over 4 years). The team physicians completed an illness log with 100% compliance on every day of the annual competition period. Information included the daily squad size and illness details including system affected, suspected cause (infection or not), and training/match days lost.

**Results:** The incidence of illness (illness per 1000 player days) in rugby players in the 4-year period were as follows: A total of 389 illnesses were reported, resulting in an overall crude incidence rate of illness of 4.9 / 1000 player days (95% CI, 4.4–5.4). The highest proportion of all illness (%)

of all illness) was in the respiratory system (69.7%) followed by illness in the gastro-intestinal system (20.1%). An infection was the suspected cause of illness in 75.3% of all illness, with infections in the respiratory system accounting for 55.0% of all illness. A time loss of >1 day was reported for 33.5% of all illness.

**Conclusion:** During the Super Rugby tournament, infective illness involving the respiratory tract, accounts for more than 50% of all illness. Future studies should therefore be directed at determining risk markers for infections in the respiratory tract, so that preventative measures can be designed and implemented to protect the health of these athletes.

### **O16: 13.3% Runners Use Prescription Medication, Mostly To Treat Hypertension, Raised Serum Lipids, Depression And Asthma: A Cross-Sectional Study In 76 654 Distance Runners**

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**Introduction:** The evidence that considerable health benefits are associated with regular exercise is irrefutable and participation in mass community-based distance running events should be encouraged. Entrants to these events are older and therefore more likely to have underlying medical conditions and use chronic prescription medication. However, data on the use of chronic prescription medication in distance runners is limited. Chronic prescription medication can be associated with increased risk of medical complications during exercise. The purpose of this study is to determine the prevalence of use of chronic prescription medication in 21.1km and 56km runners and to determine the most common types of medication used.

**Methods:** 76 654 consenting participants in the Two Oceans Marathon races (21.1km=47 069; 56km=29 585) were studied from 2012 - 2015. Chronic prescription medication use, and type of medication (12 categories) were self-reported as part of an online pre-race medical screening and intervention system administered during the race entry process. Crude (un-adjusted for age, sex) frequencies (% runners; 95% CI) of chronic prescription medication use and type are reported.

**Results:** Overall, 10 188 (13.3%; 13.1-13.5) runners reported using chronic prescription medication and this was significantly higher in 21.1km (14.1%; 13.8-14.4) vs. 56km (12.0%; 11.6-12.4) runners (p80% of runners, were anti-hypertensive medication (24.4%; 23.5-25.2), lipid lowering medication (23.4%; 22.5-24.2), anti-depressants (20.0%; 19.2-20.8), and asthma medication (13.0%; 12.4-13.7).

**Conclusion:** 1 in 8 runners use chronic prescription medication at the time of entry for an event, mostly to treat four conditions: hypertension, raised serum lipids, depression and asthma. All these categories of medication may influence exercise performance and/or alter the risk of medical complications during high-intensity, prolonged exercise.

### **O17: Novel Direct And Indirect Effects Of Risk Factors For Exercise Associated Muscle Cramping (EAMC) In A Cohort Of 47784 Distance Runners Over 4 Years**

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**Background:** We recently identified novel risk factors for EAMC in distance runners, including age, gender, a history of heart diseases, medication use for heart disease, training (number of years being a runner), racing distance (21km/56km), symptoms of running injuries and medication use for injuries. The relationships between these risk factors for EAMC are over-simplified, and complex path relationships between these risk factors and EAMC have not been investigated.

**Objective:** The objective of the analysis was to explore the complex relationships among the risk factors associated with EAMC by means of path analysis, in order to identify significant paths and to estimate direct as well as indirect path relationships between the risk factors and EAMC. In addition, we sought to explore total effects by aggregating the direct and indirect effects.

Type of study

Path analysis of prospective data.

Design and Setting

47784 runners (21km/56km) took part in one (62%), two (22%), three (11%) or four (5%) years of a 4-year prospective cohort study from 2012 to 2015. Data was collected via 76654 questionnaires.

**Main outcome measurements:** Indirect, direct and total path estimates of the predictors of EAMC in distance runners.

**Results:** Direct predictors of EAMC included a history of/medication use for CVD (p=0.0001), training/competition load (p=0.0001), and age (p=0.0001). Gender was an indirect predictor operating mainly through training/competition load (73%) and to a lesser extent through a history of/medication use for CVD (28%) (p=0.0001). Additionally, training/competition load is a predictor of a history of/medication use for CVD as well as symptoms/medication use for injuries (p=0.0001). However, for a history of/medication use for CVD the estimate is negative (estimate=-0.310, SE=0.022) and for symptoms of/medication use for injuries the effect is positive (estimate=0.698, SE=0.021)

**Conclusion:** Using a path analysis approach, novel risk factors for EAMC (indirect and direct relationships) were identified, indicating that the risk factors associated with EAMC are complex. Indirect risk factors do not impact directly on EAMC, but rather through their effects on direct risk factors. These data enable clinicians to better understand these complex relationships of risk factors and can apply this to knowledge in the prevention, diagnosis and management of EAMC in athletes.

### **O18: Prevalence And Modifiable Intrinsic Risk Factors For Anterior Knee Pain Among Runners In Peri-Urban Communities In Ekurhuleni, Gauteng Province**

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**Introduction:** Anterior knee pain (AKP) is the most common injury experienced by runners and is prevalent among females, young adults and adolescents. Several modifiable intrinsic risk factors have been suggested to contribute to AKP.

**Aim:** To determine the prevalence and modifiable intrinsic risk factors for AKP among runners in peri-urban communities in Ekurhuleni, Gauteng province.

**Methods:** A cross-sectional study design was used. Population comprised of 347 runners from six developing running clubs. Convenient sampling method and a Raosoft statistical tool were used to recruit and calculate a representative sample size of 183 participants, taking into consideration a 95% confidence level. Participants included runners aged between 13 and 55-year-old with no history of degenerative and traumatic injuries. Standardized anterior knee pain questionnaire was used to determine AKP prevalence and 12 physical tests were used to screen for modifiable intrinsic risk factors. Ethical clearance was granted and consent by participants was obtained. Data were collected over three months and SPSS was used to obtain descriptive (frequencies) and inferential statistics (logistic regression).

**Results:** Participants were dominated by males (57.9%), youth (18-35 years) and those with 3 - 5 years of running experience (31.1%). Anterior knee pain accounted for 40% among participants. Modifiable intrinsic risk factors for AKP were found present among many runners (over 50%). Older (36-55 years) and more experienced (>10 years) participants were less likely to contribute to AKP compared to younger (13-17 years) and less experienced (<1 year) (OR=0.341, p=0.037 and OR=0.207, p=0.028 consecutively). Gluteus muscle weakness, patellar tilt and patellar glide problems on the right side of the body were less likely to contribute to AKP (OR=0.378, p=0.027; OR=0.304, p=0.027 and OR=0.051, p=0.043 consecutively).

**Conclusion:** Study showed a high presence of AKP and modifiable intrinsic risk factors. A comprehensive multidisciplinary approach programme is highly recommended for the management of AKP and its associated risks among the population.

**Key words:** anterior knee pain, prevalence, modifiable intrinsic risk factors, runners

### **O19: Barriers To Concussion Management In Low-Income Countries. Uganda As A Case Study**

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**Background:** The management of concussed athletes is topical in the developed world and best practice guidelines representing several sports have been developed. Whether these guidelines have been adopted in the developing world is not known.

**Aim:** To identify the barriers to appropriate health care of a concussed athlete in a developing country, using Uganda as an example. The study objectives were to identify concussion injuries in a variety of sports in Uganda, and to monitor the circumstances of treatment until the athlete returned to full sports participation.

**Methodology:** A mixed study design using an injury management data extraction form, facility checklists, and knowledge and practice of sports service providers' questionnaire and an interview guide. Data were collected over eight months and analysed using the Stat version 64, and presented as frequencies and percentages. The qualitative data were analysed using a thematic and content analysis method.

**Results:** A total of 75 injuries were documented within a period of six months. Three cases of concussion (4%) were followed from the injury to return to full sports participation. None of the concussed athletes had undergone pre-participation evaluation before the competition. There were no diagnostic tests carried out at the time of injury and no return-to-play protocol advice was provided at the medical facilities. The study established that there was insufficient knowledge and appropriate practices during emergency care and intermediate care stages of concussion management. There was no national sports health care policy guideline regarding management of concussion injuries.

**Conclusion:** This study exposes the lack of care and management of concussed athletes in Uganda. The following steps could improve concussion management: (i) create a national awareness campaign about concussion; (ii) develop a national concussion policy guideline; (iii) train more medical specialists in concussion management and other sports-related injuries.

### **O20: The Effect Of Progressive Resistance Exercise Intervention On Hiv Infected Individuals Taking Antiretroviral Therapy (ART) In Zimbabwe**

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**Introduction:** HIV infected individuals initiating ART increase their life expectancy, however the ARTs result in an increased risk of chronic diseases. Resistance exercise (RE) interventions address modifiable risk factors brought about the adverse effects of ART in HIV infected. The study investigated effect of REs on body composition (BC), chronic disease risks and strength of this patient population.

**Methods:** Quasi-experimental pre-and-post-test design was followed. A sample of 128 male and female HIV infected, on ART, 18-45 years, black African ethnic groups, in Harare, were recruited and randomly assigned to experiment (PRE n=64) group performing REs 3days/week or control (CON n=64) group, for 12 weeks. Anthropometric (BC), chronic disease risk (BP, blood glucose, blood cholesterol) and strength (1RM) markers were pre-and-post measured in all participants observing standard protocols. Chi-square, Fisher's test, linear regression, Binomial test, Spearman's and Pearson's correlations were conducted, with statistical significance at p0.05.

**Results:** There were significant differences in post-test chronic disease risks between PRE and CON group after correcting for pre exercise scores, p.0005. Post-test blood cholesterol and glucose measures in CON group were significantly higher [4.672(±0.497) and 3.98(±0.818) mmol/L] than PRE group [4.240(±0.488) and 2.49(±1.846) mmol/L]. A 100% of CON group participants remained with pre-hypertension at post-test while 66% of PRE group with hypertension 2 had hypertension 1 at post-test. Post-test BC (W/Hip Ratio, BMI, %BF) remained high in CON group and improved significantly in PRE group p0.05. Strength levels in PRE group members significantly increased for bench press, squats, bicep curls and leg curls p0.05 than CON group.

**Conclusion:** The results showed that the resistance exercise programme improved their BC, chronic disease risk and strength in HIV infected individuals on ART. REs are safe and beneficial for HIV infected individuals in resource constrained settings. Therefore, policy makers in Zimbabwe can utilise this information to include RE programs for HIV infected as a healthy lifestyle intervention.

**Key words:** HIV, ART, Chronic disease risks, Resistance exercises, Body composition, Strength

## **O21: Selected Motor Fitness Test Scores For Rural Emergency Medical And Rescue Services (EMRS) Personnel In The North West Province**

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**Introduction:** The occupation of Emergency Care Personnel (ECP) places high mental and physical demands on the body. ECPs perform a range of vigorous tasks on demand in a pre-hospital environment as quickly and efficiently as possible. There is limited data on occupational demands of ECPs although recent studies indicate an association between low fitness levels and premature rescuer fatigue during CPR and increased incidence of musculoskeletal injuries. The objective of the study was to determine the physical characteristics of ECPs through the administration of a motor fitness test battery.

**Methods:** Ninety one ECPs volunteered to take part in the study (64 males, 27 females). Health questionnaires, morphological measurements and nine field tests were administered to subjects. The data collected was subjected to statistical analysis using a computer programme. Scores were compared to available norms.

**Results:** Descriptive statistics were used to analyse the data. Means recorded were age 36.7(±5.4), BMI 28.4(±5), BF% 25.7(±7.4), Waist circumference 90.7(±11.3), Waist/hip ratio 0.86(±0.06), RHR 96(±16), SBP 122(±15), DBP 91(±11), BG 5.1(± 2.4), TC 4.89(±0.71). Means for Field tests included trunk flexibility MSR (35.3±8), muscular strength (Grip 40±9), isometric torso lift 101(±28) and squat 106(±30) kg. Local muscular endurance including push ups to failure, flexed arm hang (seconds) and 60 seconds sit up produced means of 21(±4), 27(±19) and 26(±11) respectively. Means for anaerobic (250m shuttle runs) and aerobic capacity (12 minute walk/run) were 73(±15) seconds and 1844(±416) meters resulting in a predicted VO<sub>2</sub>max of 29.9(±9.3)ml/kg/min. High levels of overweight (36%), obesity (36%), low levels of aerobic capacity (76%), grip (75%), lower body strength (72%) and local muscular endurance (push ups 36%, sit ups 67%) were found among ECPs. Cardiovascular risk factors were hypertension (21%), abdominal obesity (25%), high BF% (55%), BG (IFG 30%, IGT 6%) and elevated TC levels (35%).

**Conclusion:** Most results obtained showed poor levels of fitness as compared to other occupations and was inadequate for practicing ECP's. Physical fitness and healthy lifestyle interventions need to be implemented for ECPs thereby improving occupational fitness, lowering musculoskeletal injury and cardiovascular risk. Normative data should be established to conduct regular workplace fitness assessments of ECPs.

## **O22: High Intensity Interval Training And Detraining Effects On Cardio-Metabolic Profiles Of Young Overweight And Obese Women**

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Almost 57% of South African adult women are overweight or obese. Regular exercise, has been shown to facilitate weight loss, however, people usually cite lack of time as a barrier to sustained participation. High intensity interval training (HIIT) is not only a time-efficient exercise to improve aerobic fitness and cardio-metabolic risk factors, but it is also safe for those with poor health and fitness levels. Since there is a paucity of research on women populations, the aim of this study was to investigate the training and detraining effects of a short-term HIIT programme on selected health-related measures in young overweight and obese women.

Twenty women volunteered to participate in the study. They performed six sessions of HIIT (10- 15 x 1 min running bouts at 90% HRmax), separated by 1 min recovery at 50-60% HRmax, followed by two weeks of detraining. Testing was done before and after the exercise intervention and after detraining. The outcome variables included resting glucose, total cholesterol, blood pressure, fat mass, lean mass and maximal aerobic capacity (VO<sub>2</sub>max). Although the dietary intake of the women was not monitored, they were asked to maintain the same diet throughout the experimental period.

There was a statistically significant decrease in body mass (1.6%, p 0.001), fat mass (3.7%, p 0.001) and waist circumference (4.8%, p 0.001), and an increase in lean mass of 1.9% (p 0.001) following the training intervention. There was a decrease in resting blood glucose (11%, p 0.001), total cholesterol (10.4 %, p 0.01), systolic (3.4%, p 0.001) and diastolic blood pressure (5.8%, p 0.001), as well as an increase in VO<sub>2</sub>max after the six training sessions. Following detraining, the metabolic adaptations after HIIT were either maintained, or at least not completely reversed.

HIIT resulted in significant weight loss and improved cardio-metabolic health of overweight and obese women. The fact that most of the weight loss was due to a reduction in fat mass was a surprising finding. The minimal exercise time per session and positive results within a short period should be highly encouraging for women wishing to lose fat mass.

## **O23: About 1/8 Runners Report A Non-Traumatic Injury Annually, And >50% Of These Significantly Affect Training: A Cross-Sectional Study In 29 585 56km Runners**

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**Introduction:** Participation in ultra-marathons has become increasingly popular, but there is an inherent risk of injury in these runners. There are little data on the epidemiology of non-traumatic (chronic, "overuse") injuries (NTI) in ultra-marathon runners. The purpose of the study is to determine the lifetime prevalence, annual incidence, anatomical areas and severity of NTI's in a large cohort of runners participating in a 56 km ultra-marathon.

**Methods:** A cross-sectional study was conducted in runners participating in the 56km Two Oceans Marathon races between 2012-2015. 29 585 runners gave consent that their online pre-race medical questionnaire data could be used for research. These data included information on non-traumatic (overuse) injuries they experienced in the 12months prior to registration. We report the crude (un-adjusted) (%; 95%CI) lifetime prevalence, annual incidence, common anatomical areas, specific NTI's, and severity of NTIs in runners.

**Results:** In total, 6608 (22.3%; 21.9-22.8) runners reported a NTI during their running careers. Of the runners reporting a lifetime injury, 58.9% (57.7-60.1) reported a NTI in the previous year (retrospective annual incidence). The most common anatomical regions affected by NTI in runners reporting a NTI in the previous 12 months were the following: knee (20.9%; 19.6-22.2), calf (12.0%; 11.0-13.1) and the Achilles tendon area (9.4%; 8.5-10.3). Most NTI's were muscle tissue injuries (42.1%; 40.6-43.7) followed by tendon (25.1%; 23.7-26.4), and ligament injuries (11.0%; 10.0-12.0). The most common specific NTIs were Iliotibial band (ITB) syndrome (16.2%; 15.0-17.3), calf muscle injury (10.8%; 9.8-11.7) and

Achilles tendinopathy (9.7%; 8.8-10.7). 54.3% (52.7-55.9) of NTI's were severe enough to interfere with training or competition, and the preferred choice of treatment modality was rest (67.0%; 65.5-68.4).

**Conclusion:** About 1 in 8 runners (56km) report a non-traumatic injury in the last year. These injuries affect mostly the knee, calf and Achilles tendon and 54% injuries are severe enough to affect training and competition.

#### **O24: The Effect Of Therapeutic Horseback Riding On Heart Rate Variability Of Children With Disabilities**

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**Introduction:** Heart rate variability (HRV) is the oscillation in the interval between consecutive heart beats, resulting from dynamic interplay between multiple physiologic mechanisms that regulate instantaneous heart rate. Short-term heart rate regulation is governed by sympathetic and parasympathetic neural activity and therefore HRV examination can be used as a non-invasive estimate of the functioning of the autonomic nervous system (ANS).

**Aim:** To determine the effects of therapeutic horseback riding (THR) intervention on the HRV of children with disabilities. The objective was to examine if THR intervention improves the HRV of children, hence improving the parasympathetic activity that is associated with a calm and relaxed state.

**Methods:** This is a quasi-experimental design. Heart rate variability components were measured over six intervention sessions of THR. Heart rate variability measures were recorded from 29 participants with various disabilities, and was assessed in both time and frequency domains.

**Results:** Over the six THR sessions, the time domain showed an increase in HRV for pre-THR indicating improved vagal activation, whereas frequency domain showed both increased sympathetic activity and increased parasympathetic activation during THR based on different components of frequency domain.

**Conclusion:** Therapeutic horseback riding intervention of six sessions demonstrated a change in HRV of children with disabilities. However, the changes obtained were not significant to make conclusive measures as to whether sympathetic or parasympathetic activity is predominantly increased after the six sessions. Further research involving more than six sessions of THR is required to yield more significant changes.

#### **O25: The Biomechanical Evolution Of A Portable Muscle Testing Device (PAB®), Using Air Pressure As A Biofeedback And Strength Testing Tool - A New Innovation.**

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The pressure air biofeedback device (PAB®) was developed, researched and validated through a clinical PhD study; however its application was limited to the strength assessment of the lumbar spine only. For this purpose, the PAB® device was further developed by adding new air-filled devices (Togu, Germany) to the device, allowing it to measure a wider range of muscle groups of the body. Previously, the PAB® device only made use of an air-filled elastic ball to assess isometric strength of the lower back. However, the new Togu air-filled devices have been used in an innovative way to measure muscle performance of the shoulder, chest, arm, hand, hip, thigh and posture. Eleven (11) new muscle performance tests have been added to the PAB® muscle testing protocol. The Togu air-filled devices consist of the Air Grip Roll, Pull Ring, Touch Ball and Air Sit Cushion. The validity of these Togu air-filled devices was assessed by comparing a selected measure, air pressure force in millibar (mb), to a standard criterion; calibrated weights in kilograms (kg) during day to day tests. A highly significant relationship was found between air pressure output (mb) of all the Togu air-filled devices and calibrated weights (kg). Apart from validating these air-filled devices, a conversion factor for three of the Togu air-filled devices, used for measuring muscle strength, has also been calculated. Inter-Pull Ring calibration testing indicated a highly significant correlation between Togu Pull Rings. This study shows the usefulness and great promise of the new PAB® device and may be used in rehabilitation interventions to provide air pressure biofeedback results to patients. However, specific clinical validation and reliability studies are left as future work.

**Keywords:** PAB®, air pressure, calibration, validity, Togu air-filled devices

#### **O26: Oral Supplementation Of Specific Collagen Peptides Accelerates Improvement In Achilles Tendon Symptoms And Function In Combination With Eccentric Exercise.**

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**Introduction:** Recent studies indicate that nutritional factors can modulate local tendon healing following mechanical overloading. At a histological level tendinopathy is characterised by an imbalance in tendon collagen synthesis and structural fibril degradation. The current pilot study aimed to investigate whether oral supplementation of specific collagen peptides (sCPs) improves Achilles tendon symptoms and function in patients with chronic Achilles tendinopathy.

**Methods:** The current pilot study was a prospective double-blinded placebo-controlled clinical trial with a cross-over design. Eligible participants were randomized to 3 months of bi-daily doses of 2.5g sCPs (TENDOFORTE®, GELITA AG, Germany) or a placebo before exercise. Group AB received CPs for the first 3 months before crossing over to placebo. Group BA received placebo first before crossing over to sCPs. In addition to the nutritional intervention, all participants followed a well-structured eccentric calf strengthening program and milestone-based return-to-running program for 6 months. At baseline (T1), 3 (T2) and 6 (T3) months, VISA-A questionnaires were obtained in 20 patients (13 men/7 women, age:44±8 yrs, BMI:24.4±3.3kg.m<sup>-2</sup>) with clinical symptoms (duration 54±90 months) of uni- or bilateral Achilles tendinopathy.

**Results:** After 3 months, 6 out of 10 participants in group AB and 3 out of 10 participants in group BA successfully returned to running activities. After 6 months these numbers further increased to respectively 7 (group AB) and 5 (group BA) participants. VISA-A score for the AB group at T1 was on average 60.8 (95%CI:[52.0;69.6]), similar to the BA group at T1 (62.8, 95%CI: [54.0;71.6]). At T2 the VISA-A score increased significantly for the AB group (73.4, 95%CI:[64.6;82.2]), while in the BA group there was only a small increase (68.1, 95%CI:[59.3;76.9]). At T3, the AB group showed a further non-significant increase in VISA-A (79.3, 95%CI:[70.5;88.1]), while the BA group showed a significant increase in VISA-A (85.8, 95%CI: [77.0;94.6]). Both groups achieved the same improvement between T1 and T3.

## Discussion & Conclusion:

Although this pilot study has limited statistical power and requires duplication in a larger clinical trial, oral supplementation of sCPs may accelerate the clinical benefits of a well-structured calf strengthening and return-to-running program in patients with chronic Achilles tendinopathy symptoms.

## O27: One Night Of Partial Sleep Deprivation Impairs Recovery From A Single Exercise Training Session

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**Purpose:** The effects of sleep deprivation on physical performance are well documented, but data on the consequence of sleep deprivation on recovery from exercise are limited. The aim was to compare cyclists' recovery from a single bout of high intensity interval training (HIIT) after which they were given either a normal night of sleep (CON, 7.56±0.63h) or half of their usual time in bed (DEP, 3.83±0.33h).

**Methods:** In this randomized cross-over intervention study, 16 trained male cyclists (age: 32±7y, relative peak power output (PPO: 4.6±0.7W·kg<sup>-1</sup>) performed a HIIT session at ±18:00 followed by either the CON or DEP sleep condition. Recovery from the HIIT session was assessed the following day by comparing pre-HIIT variables to those measured 12h and 24h after the session. Following a two-week washout, cyclists repeated the trial but under the alternate sleep condition.

**Results:** PPO was reduced more 24h after the HIIT session in the DEP ( $\Delta$ PPO: -0.22±0.22W·kg<sup>-1</sup>; range: -0.75 to 0.1W·kg<sup>-1</sup>) compared to the CON condition ( $\Delta$ PPO: -0.05±0.09W·kg<sup>-1</sup>, range: -0.19 to 0.17W·kg<sup>-1</sup>, p=0.008, d=-2.16). Cyclists were sleepier (12h: p=0.002, d=1.90; 24h: p=0.001, d=1.41) and felt less motivated to train (12h, p=0.012, d=-0.89) during the 24h recovery phase when the HIIT session was followed by the DEP condition. The exercise-induced 24h reduction in systolic blood pressure observed in the CON condition was absent in the DEP condition (p=0.039, d=0.75).

**Conclusions:** One night of partial sleep deprivation impairs recovery from a single HIIT session in cyclists. Further research is needed to understand the mechanisms behind this observation.

## O28: 13% Of 56km, And 4% Of 21.1km Runners Use Analgesic/Anti-Inflammatory Medication During Events: A Cross-Sectional Study Of 76 654 Distance Runners

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**Introduction:** Mass participation distance running events have increased in popularity. Distance running is associated with a risk of injuries, and there is some evidence that runners use analgesic/anti-inflammatory medication (AAM) during events that may compromise their health. However, there are few data on actual patterns of AAM use by runners. The purpose of this study is to determine the prevalence of AAM use in 21.1km and 56km marathon runners, as well as any differences in usage patterns between 21.1km and 56km runners.

**Methods:** 76 654 consenting participants in the Two Oceans Marathon races (21.1km=47 069; 56km=29 585) were studied from 2012-2015. Data on AAM use (7 separate medication types) from an online pre-race medical screening and intervention system administered during the race entry process were analysed and crude (un-adjusted for age, sex) frequencies (% runners; 95% CI) of AAM use and type are reported.

**Results:** A total of 8 288 (10.8%; 10.6-11.0) runners reported using AAM in the week before an event, and this was significantly higher in 56km (16.0%; 15.6-16.5) vs. 21.1km (7.5%; 7.3-7.8) runners. 56km runners also used significantly more pain medication during an event (13.6%, 13.2-14.0) compared to 21.1km runners (4.1%, 3.9-4.3). The most common type of AAM used in the week before an event was non-steroidal anti-inflammatory drugs (NSAIDs), and use was significantly higher in 56km (9.7%; 9.4-10.1) vs. 21.1km (4.7%; 4.5-4.92). Similarly NSAIDs use was the most common type of AAM used during an event and this was also significantly higher in 56km (6.9%; 6.6-7.2) vs. 21.1km (2.1%; 1.9-2.2) runners.

**Conclusion:** 10% of the total runners reported use of analgesic/anti-inflammatory medication in the week before an event, while use during an event was 13.6% and 4.1% for 56km and 21.1km runners respectively. The most common medication type used by both 21.1km and 56km runners were the NSAIDs. These medications have the potential to negatively influence health, and performance of the athletes, and may be associated with increased risk of medical complications during events.

## O29: High Pre-Competition Injury Rate Dominates The Injury Profile At The Rio 2016 Summer Paralympic Games: A Prospective Cohort Study Of 51,198 Athlete Days

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**Objectives:** To describe the incidence of injury in the pre-competition and competition periods of the Rio 2016 Summer Paralympic Games.

**Methods:** A total of 3657 athletes from 78 countries, representing 83.4% of all athletes at the Games, were monitored on the web-based injury and illness surveillance system over 51,198 athlete days during the Rio 2016 Summer Paralympic Games. Injury data were obtained daily from teams with their own medical support.

**Results:** A total of 510 injuries were reported during the 14 day Games period, with an injury incidence rate (IR) of 10.0 injuries per 1000 athlete days (12.1% of all athletes surveyed). The highest IRs were reported for football 5-a-side (22.5), judo (15.5) and football 7-a-side (15.3) compared with other sports (p 0.05). Pre-competition injuries were significantly higher than in the competition period (risk ratio: 1.40, p 0.05), and acute traumatic injuries were the most common injuries at the Games (IR of 5.5). The shoulder was the most common anatomical area affected by injury (IR of 1.8).

**Conclusion:** The data from this study indicate that a) IRs were lower than those reported for the London 2012 Summer Paralympic Games, b) the sports of football 5-a-side, judo and football 7-a-side were independent risk factors for injury, c) pre-competition injuries had a higher IR than competition period injuries, d) injuries to the shoulder were the most common injuries. These results would allow for comparative data to be collected at future editions of the Games and can be used to inform injury prevention programs.

### **O30: Sport, Gender And Age Increase Risk Of Illness At The Rio 2016 Summer Paralympic Games: A Prospective Cohort Study Of 51,198 Athlete Days**

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**Objective:** To describe the epidemiology of illness at the Rio 2016 Summer Paralympic Games.

**Methods:** A total of 3657 athletes from 78 countries, representing 83.5% of all athletes at the Games, were monitored on the WEB-IISS over 51,198 athlete days during the Rio 2016 Summer Paralympic Games. Illness data were obtained daily from teams with their own medical support through the WEB-IISS electronic data capturing systems.

**Results:** The total number of illnesses reported was 511, with an illness incidence rate (IR) of 10.0 per 1000 athlete days (12.4%). The highest IRs were reported for wheelchair fencing (14.9), Para swimming (12.6) and wheelchair basketball (12.5) ( $p < 0.05$ ). Female athletes and older athletes (35-75 years) were also at higher risk of illness (both  $p < 0.01$ ). Illnesses in the respiratory, skin and subcutaneous and digestive systems were the most common (IRs of 3.3, 1.8 and 1.3, respectively).

**Conclusion:** The medical data recorded on the WEB-IISS in this study show that 1) the rate of illness was lower than that reported for the London 2012 Summer Paralympic Games, 2) the sports with the highest risk were wheelchair fencing, Para swimming and wheelchair basketball, 3) female and older athletes (35-75 years) were at increased risk of illness, and 4) the respiratory system, skin and subcutaneous system and digestive system were most affected by illness. These results would allow for comparative data to be collected at future editions of the Games and can be used to inform illness prevention programs.

### **O31: Runners Self-Optimize Their Kinematics In Response To Running-Induced Fatigue After Eight Weeks Of Endurance Training**

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**Background:** The incidence rate of Running related injuries among recreational runners have been reported to range between 30% - 80% per annum. Changes in running kinematics as a result of fatigue have been suggested as links to these injuries. It has been theorised that runners would automatically fine tune their running form to be more efficient after a brief exposure to training. This theory however has been investigated by only three studies (González-Mohino et al., 2016; Moore et al., 2012; Lake and Cavanagh, 1996) according to the knowledge of the authors. It is further unclear, how a training intervention could influence the changes in running kinematics associated with fatigue. This article reports on the effects of a customized eight-week endurance training programme on running kinematics.

**Methods:** Recreational runners ( $n=16$ ) were administered with an incremental speed to exhaustion protocol (modified Koblbauer et al., 2014) before and after an endurance training programme. Participants ran at a comfortable speed of (9km for men or 8km for women) for four minutes before and after the fatigue protocol for pre-post fatigue analysis. Spatio-temporal kinematic data (contact times, step length, flight times, and stride angle) were collected with an Optogait photoelectric system; arm carriage and forward trunk lean were captured with a camera positioned 200cm from the front and the side of the treadmill respectively.

**Results:** A two way ANOVA showed a significant reduction in step length ( $p = 0.03$ ) after the endurance training at post fatigue. Contact time increased with a medium effect size of 0.63 and 0.47 (Cohen's) at pre and post fatigue respectively. Independent of fatigue, forward trunk lean significantly reduced ( $p = 0.01$ ) after the endurance training. Flight time, stride angle, and arm carriage did not change after endurance training ( $p > 0.05$ ).

**Discussion and Conclusion:** This result suggests that training at certain anaerobic thresholds to improve endurance could affect the kinematics of recreational runners. Runners appear to self-optimize their running kinematics with running endurance training in response to fatigue.

### **O32: Leisure Athletes At Risk Of Medical Complications: Outcomes Of Online Pre-Participation Screening Among 15 778 Endurance Runners, Using Current European Guidelines - SAFER VI Study**

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**Introduction:** The European Society of Cardiology and the European Association of Cardiovascular Prevention and Rehabilitation developed guidelines for pre-participation screening of masters and leisure athletes. We determined the prevalence of runners who, according to the proposed guidelines, would require a full medical assessment before participating in a moderate- to high-intensity distance running event.

**Methods:** 15 778 runners participating in the 2012 Two Oceans Marathon races in South Africa completed an online pre-race medical screening questionnaire in line with European pre-participation screening guidelines.

**Results:** Based on current European guidelines, over 30% of entrants would require a full medical assessment prior to participation. A history of musculoskeletal complaints and the use of prescription medication were the main factors triggering the need for a full medical assessment. Risk factors (% runners; 95% CI) for cardiovascular disease (CVD) were present in 16.1% (15.5-16.7) of runners, and 2.3% (2.0-2.5) reported existing

CVD. Chronic respiratory (13.1%; 12.5-13.6), gastro-intestinal (4.3%; 4.0-4.6), nervous system (3.8%; 3.5-4.1) and metabolic or endocrine (3.5%; 3.2-3.8) conditions were also present. In addition, 13.9% (13.3-14.4) of all the runners had an allergic disease, 14.8% (14.2-15.3) used chronic prescription medication, 15.6% (15.0-16.2) used medication before or during races, and 1.4% (1.1-1.4) had a past history of collapse during a race.

**Conclusion:** Using current guidelines, a large percentage of runners (>30%) would require full medical assessments before race participation. Although this is mainly linked to runners that reported musculoskeletal conditions, CVD risk factors were identified in 16% of runners. We suggest a revision of current guidelines, based on pre-screening data that are linked to serious life-threatening medical complications including sudden cardiac arrest or death during exercise.

### **O33: Pre-Race Medical Screening And Educational Intervention Reduces Medical Complications In Distance Runners: A Prospective Study In 153 208 Race Starters (SAFER VII)**

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**Introduction:** We previously reported a high rate of medical complications (1/121 race starters) and serious (potentially life-threatening) complications (1/1786 race starters) in a cohort of 65 865 runners participating in 21.1km and 56km races over a 4-year period (2008-2011) (SAFER 1). The purpose of this study is to determine if an online pre-race medical screening and educational intervention program reduces medical complications in distance running events.

**Methods:** An online pre-race medical screening (based on the European guidelines for pre-screening of leisure athletes participating in moderate- to high-intensity sports) and an educational intervention program was designed and introduced as part of the race registration process, in the period 2012 to 2015 at the Two Oceans Marathon races (21.1km and 56km). The incidence of medical complications (per 1000 race starters; all and serious life-threatening) during the 4-year post-intervention period (2012-2015: 87 343 race starters) was compared with the pre-intervention period (2008-2011: 65 865 race starters).

**Results:** Compared to the pre-intervention (baseline) period, there was a significant reduction in the incidence (per 1000 starters, 95% CI; adjusted for age group, gender and race distance) of all medical complications in all runners by 29% [pre=8.6 (7.9-9.4); post=6.1 (5.6-6.7), p=0.0001], 21.1km runners by 19% [pre=5.1 (4.4-5.9); post=4.1 (3.6-4.8), p=0.0356], and 56km runners by 39% [pre=14.6 (13.1-16.3); post=9.0 (7.9-10.1), p=0.0001]. Serious life-threatening complications were significantly reduced in all runners by 64% [pre=0.6 (0.5-0.9); post=0.2 (0.1-0.4), p=0.0003; adjusted for age group and gender].

**Conclusion:** A pre-race medical screening and educational intervention program significantly reduced medical complications and serious life-threatening complications among all runners in community-based mass participation distance running events. The reduction in all medical complications was significant in both the 21.1km and 56km races. Pre-race screening and educational intervention programs could be introduced to reduce medical complications during endurance running events.

### **O34: Chronic Disease, Medication Use, History Of Injuries And Running Experience Are Associated With Exercise Associated Muscle Cramping (EAMC): Cross-Sectional Study In 15 778 Distance Runners**

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**Introduction:** Exercise Associated Muscle Cramping (EAMC) is a significant medical complication in distance runners, yet factors associated with EAMC are poorly documented. The purpose of this study was to document risk factors associated with EAMC in runners.

**Methods:** This was a cross sectional study of runners participating in the 2012 Two Oceans races (21.1km, and 56km). All participants completed a pre-race medical history screening and educational intervention tool. Data from 15778 consenting race entrants was analysed, including: training, cardiovascular disease (CVD), risk factors for, and symptoms of CVD, history of diseases affecting major organ systems, cancer, allergies, medication use, and running injury. Runners were grouped as having a past history of EAMC (hEAMC group = 2997) and a control group (Control = 12781).

**Results:** Independent factors associated with a higher prevalence ratio (PR) of hEAMC were any risk factor for CVD (PR=1.16; p=0.0002), symptoms of CVD (PR=2.38; p=0.0001), respiratory disease (PR=1.33; p=0.0001), GIT disease (PR=1.86; p=0.0001), nervous system or psychiatric disease (PR=1.51; p=0.0001), kidney or bladder disease, (PR=1.60; p=0.0001), haematological or immune disease (PR=1.54; p=0.0048), cancer (PR=1.34; p=0.0031), allergies (PR=1.37; p=0.0001), regular medication use (PR=1.80; p=0.0001), statin use (PR=1.26; p=0.0127), medication use during racing (PR=1.88; p=0.0001), running injury (PR=1.66; p=0.0001), muscle injury (PR=1.82; p=0.0001), tendon injury (PR=1.62; p=0.0001), and runners in the experienced category (PR=1.22; p=0.0001).

**Conclusion:** Novel risk factors associated with EAMC in distance runners were underlying chronic disease, medication use, a history of running injuries and experienced runners. These factors must be identified as possible associations, and therefore be considered in the diagnostic work-up, prevention and treatment of EAMC.

### **O35: Novel Risk Factors Associated With More Severe Exercise Associated Muscle Cramping (EAMC): A Cohort Study Of 41 698 Distance Runners**

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**Introduction:** EAMC is a common clinical syndrome in endurance runners, and can range in severity. Risk factors for EAMC have been identified and include age, gender, racing distance, a history of chronic diseases, medication, training and competition load, and running injuries. However, to date, risk factors for more severe EAMC (recurrent cramping) have not been investigated. The purpose of the study was to document risk factors associated with EAMC in distance runners, including more severe EAMC.

**Methods:** Data analysis from a 2-year prospective cohort study in 41 698 distance runners (21km and 56km) who completed an online pre-race medical screening questionnaire. Independent risk factors associated with EAMC (model 1: binary outcome), and risk factors associated with severe EAMC (defined as recurrent cramping history - > 10 times)(model 2).

**Results:** Significant risk factors (p < 0.05) included age, increased BMI, history of any GIT or kidney/bladder disease; chronic or regular medication use, history of a running injury in the last 12 months, running in the 56km race, running 5yrs, training 6min/km. In model 2, severe EAMC was associated with all the risk factors for EAMC in model 1, but also included a history of any cardiovascular disease (CVD) symptoms. In model 2, a lower BMI and running in the 21km race were also specific risk factors for severe EAMC.

**Conclusion:** Risk factors for the clinical syndrome of EAMC in distance runners are identified, including novel risk factors associated with more severe EAMC (a history of CVD symptoms, lower BMI and shorter race distance). Physicians need to consider secondary causes (including underlying chronic diseases) in the diagnosis and prevention of EAMC, and also consider different risk factor for recurrent (severe) EAMC in endurance athletes.

### **O36: Injuries And Illness In Athletes With Spinal Cord Injury: Lessons From London 2012 Summer Paralympics**

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**Background:** Despite significant growth in the Paralympic sport, limited research exists describing injury and illness in Paralympic athletes. Of all athletes with impairment, athletes with SCI constitute a unique group. Not only do they have physical restrictions due to loss of movement, but also have sensory and autonomic deficits that challenge their health and well-being.

**Objective:** The main objective of this study was to determine the incidence and nature of illnesses and injuries in a cohort of athletes with spinal cord injury (SCI) during the 3-day pre-competition and 11-day competition period at the 2012 London Summer Paralympic Games.

**Methods:** This study is a component of the large prospective cohort study conducted over the 14-day period of the London 2012 Summer Paralympic Games, coordinated by the Medical Committee of the International Paralympic Committee (IPC). A total of 3009 athletes, of which 709 were athletes with SCI formed part of this study. The Incidence Rate (IR) for illnesses and injuries in athletes with SCI was calculated as the number of illnesses and injuries per 1000 athlete days and was compared to a group of all other Paralympic athletes with injury and illness (who had other impairments).

**Results and Discussion:** Athletes with SCI injury have a higher rate of upper limb injuries (IR 6.4 injuries/ 1000 athlete days vs 4.4 injuries/1000 athlete days) and a lower incidence of lower limb injuries than other Paralympic athletes (IR 1.4 injuries/ 1000 athlete days vs 4.2 injuries/ 1000 athlete days).

Total-, skin- and genito-urinary illnesses were also significantly higher in athletes with SCI compared to all the other athlete impairment groups (IR 15.4, 3.9, 2.3 illnesses/ 1000 athlete days vs 11.0, 1.8 and 0.5 illnesses/ 1000 athlete days respectively).

The results of this study suggest that greater attention should be given to the prevention of upper limb injuries and skin- and genito-urinary illnesses in this group of athletes. Efficacy of prevention programmes should be assessed in the future.

### **O37: Cerebral Haemodynamics And Cognitive Performance In Stroke Survivors Following Exercise**

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**Purpose:** While there is evidence of differences in cerebral haemodynamics and cognitive performance between stroke patients and both elderly and young healthy individuals, no research have examined changes in cerebral haemodynamics and cognitive performance during exercise in stroke patients. This study aimed to determine whether light intensity exercise has similar effects on the cerebral oxygenation and cognitive task performance of stroke patients and healthy age-matched individuals.

**Methods:** Thirty two men and women (52 to 85 years), of which 14 were stroke patients and 18 were healthy age-matched controls, volunteered for this study. The post-event period for the stroke patients was 14.8 + 6 months and 11 of the 14 patients had left hemisphere damage. Each participant was required to attend one testing session where measurements of cerebral haemodynamics were obtained via near-infrared spectroscopy (NIRS). NIRS monitoring was done at rest, while the participant performed the modified Stroop Task and during a six minute walk test (6MWT). Cohen's effect sizes (d) were calculated to compare the magnitude of difference between groups.

**Results:** A decrease in O<sub>2</sub>Hb levels was observed after exercise in the experimental group during both the simple and complex tasks (-15.4 + 0.6 vs -8.33 + 0.5µMol), while the control group had higher oxygenation levels during both tasks (2.78 + 0.3 vs 16.7 + 0.5µMol). Practically significant lower O<sub>2</sub>Hb values were observed in the left prefrontal cortex of the stroke patients compared with the controls (ES = 0.4). After exercise, reaction (RT) on the simple cognitive task improved in both groups from resting levels (1.37 + 0.2s vs 0.96 + 0.1s; ES = 0.4), while performance was worse on the complex task in stroke patients, but not controls (-0.81 + 0.1s vs 1.27 + 0.2s; ES = 0.6).

**Conclusions:** Cerebral oxygenation was dependent on the complexity of the cognitive task and was blunted in stroke patients. While light exercise had a positive effect on cognitive task performance in both groups, it had a negative effect on the stroke patients during the complex task; this finding may suggest neural fatigue because of a delayed haemodynamic response or a reduction in regional cerebral blood flow.

### **O38: Plantar Foot Loading Patterns Of Healthy Weight And Overweight School Children From South Africa And Germany**

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Excessive plantar loading (peak pressures) can possibly cause deterioration of the soft tissue such as the fat pads in the foot during locomotion (Mickle, Steele & Munro, 2006). It is speculated that foot pain experienced by overweight individual's results from the higher mechanical loading of their feet because of the additional body weight they carry (Butterworth et al., 2015).

The study investigated the plantar loading differences between the healthy weight and overweight children aged 10 to 13 years from South Africa and Germany. Plantar loading measurements were obtained from 178 children (mean age 12.3 ± 1.2 years; body weight 49.2 ± 12.2kg; height 1.56 ± 0.01m; n = 178 of which 87 were girls and 91 boys) from South Africa and 139 children (mean age 12.3 ± 0.1 years; body weight 47.3 ± 1.0kg; height 1.55 ± 0.01m; n = 139 of which 61 were girls and 78 boys) from Germany with the Emed n50 pressure platform using the two-step method at a self-selected walking speed. Peak pressure, pressure-time integral, force-time integral and contact area variables were investigated for nine regions of the foot. Children were categorised into a healthy weight category or overweight category according to their body mass index (BMI) (Cole & Lobstein, 2012). A mixed model linear regression was used to analyse the data.

The overweight children from South Africa had statistically significantly higher peak pressure, pressure-time integral, force-time integral and contact area for most of the foot regions than the healthy weight children from South Africa. German children had significantly higher peak pressure, pressure-time integral and force-time integral values than the South African children of the same weight category. The healthy weight South African children had significantly greater contact area for most regions of the foot compared to the healthy weight German children.

Body weight is a primary factor influencing plantar loading values. It is possible that the significant differences found in midfoot region iii of the overweight children compared to healthy weight children could have been influenced by structural foot differences. Plantar loading differences between the German and South African children could be a result of structural foot differences.

### **O39: SA Case Studies: The Effect Of An Exercise Intervention Program On The Cardio-Metabolic Profiles Of A Diabetic; A Metabolic Syndrome; A Cardiovascular And A Depressive Patient**

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Exercise intervention programs are an effective treatment for patients with Non-communicable diseases (NCD) of lifestyle.

The Activate Health Exercise Intervention Program is a specific 12 week exercise methodology, delivered by Health Care Providers and using Cloud Technology to deliver health outcomes to NCD.

The changes in Cardiorespiratory Fitness; Muscle Strength; Weight; Blood Pressure; Waist circumference; Cardiovascular risk factors; Blood lipids; Blood glucose and the Hamilton Rating Score will be presented in each of the disease cases.

The positive health outcomes will be discussed.

### **O40: Prevalence And Etiology Of Injuries In Trail Runners**

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**Introduction:** Trail running is a fairly novel sport and although the literature is not definitive, it can be said that the sport was born when the World Mountain Running Association was established in 1984. In 1995, the British Athletic Federation approved a formal definition for trail running events. Since then the sport has taken off and become well known across the globe, however, there is very little research or literature regarding it.

**Aim:** This study aimed to determine the prevalence and potential etiological causes of injuries in trail running as an injury prevention initiative.

**Methods:** An epidemiological survey was undertaken among a group (n=50) of runners participating in trail running events over a 4 month period, probing their injury history over a retrospective period of 12 months.

**Results:** Fifty seven percent (57%) of participants reported an injury in the previous 12 months. Injuries were incurred at the ankle (35%), knee (30%) and calf (20%). The majority of injuries took place on rough trail surface (62.5%; p<0.0001) vs rocky terrain (12.5%) or cement, muddy or grassland surface (8.3%). Significantly more injuries took place on down-hill slopes (57.1%; p<0.05) vs level ground (33%) and up-hill (9.5%). In 80% of injuries trail running shoes were worn (p<0.001). A significant odds ratio for injury were found for genu varus OR = 2.0 (95% CI 0.19-20.3) and pronation OR=2.3 (95% CI 0.4-10.6) while a significant protective odds ratio was found for a neutral foot and non-injury OR = 0.32 (95% CI 0.06-1.5).

**Discussion/ Conclusion:** Trail running does expose participants to a fairly high risk of injury, with the lower limbs mostly involved. Specific ranges of training mileage were not linked to injury. The rough surfaces did pose a risk, particularly down-slopes and trail shoes do not necessarily protect against injury. The presence of bowed legs and flat feet are significant risks for injury while a neutral foot appears to protect against injury.

### **O41: Differences In Foot Posture Between Habitually Barefoot And Shod Children And Adolescents**

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During locomotion, the foot needs to be pliable for shock absorption, but also act as a rigid lever during push-off (Onodera, et al., 2008). Altered foot function can lead to muscle imbalances, balance problems or gait abnormalities, as well as decreased efficiency and effectiveness of the foot (Wegener et al., 2015). The growing feet of children are sensitive to external forces as the ligaments, muscles and bones are still in the process of maturing. Differences in foot morphology between habitually and barefoot individuals have been reported (Hollander et al., 2017).

Plantar pressure measurements can provide critical information on foot structure, foot function and general gait mechanics (Keijsers et al., 2009). The purpose of the study was to compare habitually barefoot (South African) and shod (Germany) children and adolescents in terms of foot posture and selected plantar pressure parameters. In a cross-sectional observational study with stratified sampling, 437 South African (boys: 228; girls: 209) and 214 German (boys: 96; girls: 118) children and adolescents between the ages of six to eighteen years old participated in the study. Testing equipment utilised included a manufactured foot calliper, as well as an EMED-n-50 (Hamburg, Germany) pressure plate. A barefoot scale was used to quantify the footwear habits of participants. Concerning contact area of the foot regions relative to total foot contact area, South African children had greater weight bearing on the medial side of the foot, as well as greater pliability of the foot, compared to the German children. The coefficient of spreading indicated that South African children have broader feet relative to foot length compared to the German counter parts. Wearing restrictive footwear could lead to decreased pliability of the foot and a narrower forefoot, which might affect plantar pressure distribution during gait.

#### **O42: Vitamin D Status Amongst Elite Rugby Union Players – An Observational Pilot Study**

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**Background:** Poor vitamin D status has far-reaching repercussions for health, well-being and human performance. Deficiencies are common amongst the general population, however, little is known about the status of this nutrient within athletes. The purpose of this pilot study was to determine whether vitamin D deficiency exists amongst elite South African rugby players and to ascertain if factors including seasonal climatic variation, dietary intake and skin type play a role in the clinical presentation thereof.

**Methods:** A cohort of elite rugby union players underwent a medical assessment to determine factors related to vitamin D status. This included i) collection of a blood sample to measure serum 25-hydroxyvitamin D [25(OH) D] concentration, ii) completion of a 3-day dietary recall and iii) a Fitzpatrick skin type classification questionnaire (evaluating genetic predisposition, reaction to sun exposure and tanning habits). An initial assessment of 41 players was performed during the summer months and a follow-up of 17 athletes during the winter period. These opposing seasons served as an indirect measure of absolute sunlight exposure.

**Results:** The mean s- [25 (OH) D] at the beginning of the study was 59.98ng/mL-1, while the mean s- [25 (OH) D] at time point 2 was 36.98ng/mL-1. Analysis of paired data revealed that 88% (2/17) of individuals displayed adequate s-[25 (OH) D] during summer with the remaining 12% (2/17) of cases showing signs of insufficiency. During winter, 82% (14/17) had adequate s- [25 (OH) D] while 6% (1/17) and 12% (2/17) of players displayed concentrations indicative of insufficiency and deficiency. No relationship was found between reported dietary intake and s- [25 (OH) D]. However, a negative correlation ( $p=0.05$ ) was found for summer s- [25 (OH) D] and the Fitzpatrick skin type score (i.e. players with darker skin types, had a lower s- [25 (OH) D]).

**Conclusions:** Vitamin D deficiency was relatively uncommon amongst this group of athletes. However, seasonal differences and differences in skin score were noted pertaining to s- [vitamin D]. This effect is likely due to changes in the length of sunlight exposure associated with normal seasonal climatic variation and endogenous vitamin D production.

#### **O43: Feasibility Of Higher Intensity Goal Oriented Gait Re-Training In Chronic Stroke Patients: A Pilot Study.**

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**Background:** Independent gait is a major goal in stroke rehabilitation. Goal-oriented training has yielded the most beneficial results in the recovery of gait and recently higher intensity training was reported as feasible. Further, it is known that gait ability and cognitive function are associated. Thus, this study aimed to assess the feasibility of moderate-to-high intensity and goal oriented gait re-training program in chronic stroke patients. Secondary, the association between gait ability and cognitive function was assessed.

**Methods:** In this pilot, a case controlled trial was implemented. Participants ( $n=3$ ) completed 8 weeks of moderate-to-high intensity goal oriented gait re-training that included both treadmill and overground training. Participants trained three times per week for 45 minutes.

**Results:** Clinically significant changes were found in the 6-minute walk test ( $854.47m \pm 120.79m$ ) and Global Cognitive Function ( $p=5 \pm 1$ ).

**Conclusions:** Chronic stroke patients may benefit moderate-to-high intensity goal-oriented gait re-training both in mobility and improved cognitive function.

#### **O44: Somatosensory Training Improves Sensory Integration But Not Haptic Feedback In Individuals With Mild To Moderate Parkinson's Disease**

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**Introduction:** Postural control is a complex perceptual-motor process that allows an individual to maintain balance through feedback and feed-forward mechanisms from visual, vestibular and the somatosensory systems (Brown et al., 2006). However, proprioceptive integration and the ability to interpret haptic feedback are reported to be impaired in individuals with Parkinson's disease (Jacobs et al., 2006; Salgado et al., 2013). Researchers investigated whether light haptic feedback would influence postural sway and if eight-weeks of somatosensory training can alter the haptic feedback influence on postural sway in individuals with Parkinson's disease.

**Methods:** Thirty-seven individuals with idiopathic Parkinson's disease (age:  $67 \pm 9.03$  years; Hoehn&Yahr:  $2.12 \pm 0.67$ ; MDS-UPDRS part III:  $28 \pm 14$ ) were divided into two groups i.e. a somatosensory training group (EXP;  $n = 24$ ) and a placebo group (PBO;  $n = 13$ ). The intervention consisted of an eight-week somatosensory training program, emphasising balance exercises, performed three times per week, each progressively increasing in complexity and difficulty. Postural sway was assessed with the Instrumented Sway tri-axial accelerometer to assess Root Mean Square during 4 sensory conditions i.e. eyes closed with no manual contact, eyes closed with light haptic feedback, both on a stable surface and on a foam pad. Secondary outcome measures were balance confidence and motor experiences of daily living. All assessments were done at baseline, before and after the intervention.

**Results:** Both groups presented with reduced postural sway amplitude when receiving haptic feedback compared to no manual contact, regardless of the surface area ( $p = 0.01$ ). EXP group improved sensory integration ( $p = 0.01$ ) and showed a tendency for improved balance confidence ( $p = 0.07$ ) and motor experiences of daily living ( $p = 0.05$ ) at post-intervention.

**Conclusion:** Light haptic feedback improves postural sway in individuals with Parkinson's disease, regardless of the surface area. However, somatosensory balance training did not alter the influence of haptic feedback, but it holds the potential to improve sensory integration, balance confidence and motor experiences of daily living in individuals with Parkinson's disease.

#### **O45: Lifetime Prevalence, Annual Incidence, And Incidence Of Common Running Injuries Differ Between 21.1km Versus 56km Runners: A Cross Sectional Study In 76 654 Distance Runners**

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**Introduction:** Long-distance running is very popular, but is associated with non-traumatic (overuse) injuries (NTI). There are little data on the differences in NTIs between 21.1km vs. ultra-marathon (56km) runners. The aim of the study was to compare the lifetime prevalence, annual incidence and types of common NTIs in 21.1 km and 56km runners.

**Methods:** 76 654 consenting participants in the Two Oceans Marathon races (21.1km=47 069; 56km=29 585) were studied (2012-2015). Non-traumatic (overuse) injuries (NTI) were self-reported as part of an online pre-race medical screening and intervention system administered during the race entry process. Crude (un-adjusted for age, sex) lifetime prevalence, annual incidence, and annual incidence of common running NTIs (% runners; 95% CI) were compared in 21.1km and 56km runners.

**Results:** The lifetime prevalence of NTI in all runners was 16.8% (16.6-17.1)(12 884 injured runners), and this was higher in 56km (22.3%; 21.9-22.8)(6 608 injured runners) than 21.1km (13.3%; 13.0-13.6)(6 276 injured runners) runners. In all runners reporting lifetime NTIs, the annual incidence of NTI in the previous 12 months was 64.7% (63.8-65.5), and this was higher in 21.1km (70.7%; 69.6-71.8) vs. 56km (58.9%; 57.7-60.1) runners. In runners reporting NTI in the previous 12 months, the annual incidence of typical running injuries differed significantly between 21.1km vs. 56km runners as follows: patellofemoral pain (21.1km=5.0%; 4.4-5.6: 56km=3.7%; 3.1-4.3), ITB (21.1km=19.0%; 17.9-20.2: 56km=16.2%; 15.0-17.3), Achilles tendon injury (21.1km=7.6%; 6.8-8.3: 56km=9.7%; 8.8-10.7), hamstring injury (21.1km=5.1%; 4.4-5.7: 56km=8.8; 7.9-9.7) and calf muscle injury (21.1km=6.6%; 5.9-7.4: 56km=10.8%; 9.8-11.7).

**Conclusion:** 21.1km runners report a lower lifetime prevalence of NTI but a higher annual (12 months) incidence of NTI vs. 56km runners. The annual incidence of patellofemoral pain and ITB is higher in 21.1km vs. 56km runners, but 56km runners report higher incidence of Achilles tendon, and muscle (calf, hamstring) injuries. Risk factors for running injuries in these race distances needs to be determined to develop appropriate prevention strategies.

#### **CASE STUDIES**

##### **CCP1: An Unusual Muscle Tear In A Cricket Fast Bowler**

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**History:** A 21-year-old collegiate cricket fast bowler was referred to the physiotherapy clinic by a sports physician after presenting with left sided proximal shin pain which had been aggravated during two consecutive training sessions- one involving bouts of sprinting on a grass surface and the other bowling in the cricket nets.

##### **Physical Examination:**

- No visible signs of swelling, discolouration or bruising were present.
- Palpation of the left tibialis anterior muscle revealed moderate tenderness proximally
- Walking was painful
- Isometric muscle testing of left tibialis anterior muscle proved painful
- Passive stretching of the left tibialis anterior muscle elicited pain

##### **Differential Diagnosis:**

1. Acute tibial stress fracture
2. Medial periostitis
3. Tibialis anterior muscle tear

**Test & Results:** A diagnostic musculoskeletal ultrasound scan was performed confirming a working diagnosis of a grade 2 proximal tear of the left tibialis anterior muscle.

**Final / Working Diagnosis:** A proximal Tibialis Anterior muscle tear in the left lower leg (Grade 2).

##### **Treatment and Outcomes:**

1. Initial management consisted out of rest and physiotherapy - soft tissue treatment, dry needling, eccentric muscle rehabilitation exercises and balance and proprioception training.
2. Six weeks post-injury the patient was still symptomatic, despite visible healing of the muscle tear upon musculoskeletal ultrasound.
3. Referral to a Biokineticist occurred at 6 weeks at which stage rehabilitation exercises were progressed.
4. The athlete had full pain free range of motion after 10 weeks and commenced with running as well as a graded return to training and sport.

## CCP2: Management Of Difficult Dislocation

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**Reduction of Important Dislocations:** Important to know the different types of dislocation of joints with how to reduce them nicely and accurately with new techniques which are incorporated in management with respect to sports medicine especially. Like, In different games, like Rugby or Football and other athletes, Shoulder dislocations can be reduced with One person technique and Elbow dislocation can also be reduced with one person technique which will be quick and easy to be done. To know the reduction techniques are important for sports physician because to maintain the accuracy and increased success rates for early healing and quick return to play plan. Although, during reduction, fracture can occur as complications but with new techniques, risk can be reduced for fractures with closed reduction of joints with evaluation of Neurovascular system. Patients would be followed in orthopedics clinic and would have been plan further to protect the future dislocations to be happen which is very important for players in sports medicine. There are different methods to reduce different joints with techniques which are helpful in managing the patient which may include reductions under conscious sedation to under General Anesthesia which depends on the complications like fracture with dislocations.

## CCP3: Longstanding Bilateral Hip Pain In A Field Hockey Player

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**History:** A 19-year-old collegiate field hockey player was referred to a physiotherapy clinic by a sports physician after presenting with a history of longstanding recurrent bilateral groin pain. Prior rehabilitation efforts (during the previous season) had failed and the athlete's condition had deteriorated to the point that all training had ceased and pain was experienced with walking. The option was given to the athlete to undergo further conservative treatment or instead to be referred to an orthopaedic surgeon for further management. Again, the decision was made to first pursue a conservative course of action.

### Physical Examination:

- Gait assessment revealed a slight limp with a shift in body weight towards the right side.
- Single leg stance assessment revealed inferior displacement of the left posterior superior iliac spine indicating a weak gluteus medius muscle.
- Limited ROM during hip flexion; pain experienced upon internal rotation and external rotation (especially with hip at 90° flexion)
- + adductor squeeze test
- + FABER
- + FADIR
- Bilateral lumbo-pelvic stiffness was evident together with associated muscle tightness in the hip flexors/gluteals/quadratus lumborum and piriformis muscles.

### Differential Diagnosis:

1. Labral tears of the hip with associated core instability
2. Adductor tendinopathy with pubic symphysisitis
3. Hip Impingement

**Test & Results:** Plain radiographs of the pelvis and both hips were requested which confirmed a working diagnosis of bilateral femoro-acetabular impingement (asymmetric R>L) with small acetabular accessory ossicles

**Final/Working Diagnosis:** Bilateral femoro-acetabular impingement (asymmetric R>L) with small acetabular accessory ossicles.

### Treatment And Outcomes:

1. Initial physiotherapy management consisted of soft tissue treatment (myofascial release / stretches and foam rolling) together with a home – based rehabilitation program.
2. Failure to respond to conservative management after 4 weeks resulted in the athlete being referred back to the sports physician.
3. Subsequent referral to an orthopaedic surgeon with bilateral hip arthroscopy procedures to remove the accessory ossicles.
4. The athlete is recovering well and currently still undergoing post-operative rehabilitation (week 5).

## CCP4: Lumbar Stress Injury Or Not? – A Case Study Of A Cricket Player

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**Case History:** A 18 year old male cricket player (fast bowler) presented with longstanding symptoms of stiff calves and hamstrings, and pain in the gluteal and lower back regions. He had been treated conservatively for a lumbar stress injury (including a full rehabilitation program) however his symptoms persisted. On further enquiry he had previous problems with his left Achilles tendon and a right-sided tennis elbow. Although his back pain was slightly relieved during warm up he did not respond to non-steroidal anti-inflammatory drugs. No further systemic complaints were elicited. He has a family history of an uncle diagnosed with Reiter's Syndrome.

**Physical Examination:** He had slight tenderness of the lower lumbar area to the left of the spinous process. Neurological examination was normal. The Schöber test and chest expansion were normal. The FABER test was positive on the right and left, and the sacroiliac joints were tender on palpation.

### Differential Diagnosis:

1. Lumbar spondylolysis
2. Ankylosing spondylitis
3. Vertebral disc lesion

### Test and Results:

Blood tests

- Erythrocyte sedimentation rate: Normal

- C-reactive protein: Normal
  - Human Leukocyte Antigen B27: Positive X-rays
  - Lumbar: No spondylolysis or spondylolisthesis. Slight narrowing noted of the L4/L5 intervertebral disc space. No vertebral body margin osteophytes or end plate changes identified.
  - Pelvis: Normal
- MRI
- Sclerosis of the lower lumbar facets, left (L4/L5 and L5/S1). Thought to be due to overuse.
  - Slightly narrowed L4/L5 disc space, but no herniation or prolapse.
  - Reactive changes of the right sacroiliac joint, but no bony edema.

**Treatment and Outcome:**

1. Because of the clinical picture, inconclusive radiography and positive HLA B27, the athlete was treated for inflammatory arthritis. He was prescribed a course of prednisone to which he responded dramatically well.
2. Following the significant improvement, a decision was made to treat for Ankylosing Spondylitis and include a stringent rehabilitation program for the other problems identified.
3. The athlete responded well, and after xxx weeks returned to full training.

**Final Diagnosis:** Ankylosing spondylitis complicated by overuse of the lumbar facets possibly due to his sport.

**CCP5: Complicated Synovial Cyst Tibiofibular Joint Squash – A Case Study**

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**Case History:** A 47-year old male veteran squash player presented with intermittent left knee pain and swelling below the knee joint. He also complained of back pain and reduced sensation in his left foot. He had no history of trauma and has been treated for gout for 5 months prior to consultation.

**Physical Examination:** He had tenderness on his medial joint line and 3 separate masses on the lateral aspect of his lower leg. The masses were soft, compressible and not tender to the touch. He also had reduced sensation in the L5 distribution, but no weakness of ankle dorsiflexion, toe extension or ankle eversion.

**Differential Diagnosis:** 1. Space occupying lesion (Benign, malignant) 2. Nodule (Gout, Rheumatoid arthritis) 3. Common peroneal nerve involvement vs L5 radiculopathy

**Test and Results:** Blood investigations: Uric acid 0.33 mmol/l (previously elevated at 0.59 mmol/l). Rheumatoid Factor was negative. Anticitrullinated protein antibodies was negative. Imaging: Ultrasound lower leg: Anterior proximal in the left lower leg a cyst of 44.5 x 19.9 mm. A second synovial cyst of 59.8 x 26 mm and a third synovial cyst measuring 17.5 x 5.4 mm were also visualised. All cysts were connected with small tracts. Xrays of the knee: Narrowed medial tibiofemoral joint space. Erosions of the tibiofibular (TF) joint. Xrays lumbar: L4S1 disc spaces narrowed. Grade 1 degenerative anterolisthesis of L4 in relation to L5. MRI lower leg: Cysts not in relation to peroneal nerve, well circumscribed, homogenous content with pressure effect on muscles. Intraosseous cysts TF joint. MRI lumbar: Confirmed listhesis identified on Xray. Paravertebral joint osteoarthritis (OA) L4,5 with degenerative cyst lateral resect of L5 and pressure effect on left L5 root.

**Final Working Diagnosis:** 1. Multilocular synovial cyst TF joint ± peroneal nerve involvement 2. Gout 3. L5 facet joint OA with nerve root radiculopathy

**Treatment and Outcomes:** This was the patient's first consultation. Keeping the possible double pathology in mind (i.e. L5 root pressure and/or peroneal nerve involvement) an EMG will shed more light on future treatment. Surgical excision of the cyst will probably be needed. In the meantime gout treatment was continued. Conservative management and reassessment of the lumbar pathology were advised.

**CCP6: Acute, Non-Traumatic Muscle Tear In A Provincial Rugby Player, All Is Not What It Seems To Be**

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**History:** A thirty (30) year old male rugby player, presented during a league rugby match with an acutely painful and swollen left thigh. He denied any history of contusion or extensive knee flexion happening during the game.

**Physical Examination:** The patient was unable to continue playing. Further assessment revealed severe tenderness over the midthigh associated with tense swelling and a reddish/purple discoloration. The athlete was an apparently healthy male, no other symptoms, no previous significant medical- / surgical history, no chronic medicine- / drug- / alcohol abuse and no allergies of note. One hour after injury, the athlete was unable to flex the knee at all. Two hours post-injury, his peripheral pulses subjectively became weaker, while affected thigh pain became worse.

**Differential Diagnosis:** 1) Quadriceps muscle tear / Quadriceps tendon tear with large haematoma. Developing Compartment Syndrome. Special investigations; An in office, musculoskeletal ultrasound revealed a tear of the rectus femoris muscle with accompanying large haematoma. The patient was transferred to Grootte Shuur Hospital (GSH) for further management +/- Fasciotomy. Further work up included a CT scan which confirmed soft tissue swelling and haematoma. CRP & ESR = above normal limits; White cell count 90 000 cells/L, decreased Hb (8.0g), increased basophils, increased Plt's, (normocytic, normochromic anemia), Myeloblast > 10%. A PCR was performed & revealed positive BCR-ABL oncogene highly suggestive of CML.

**Final Diagnosis:** CML(Chronic Myelogenous Leukemia) with muscle rupture & haematoma.

**Management:** Gleevec (Imatinio Mesylate) chemotherapeutic regime with 3 monthly follow-up. No return to play in contact sports for 12 months. He returned to play January 2017 (12months post injury/ diagnosis) – First game back he injured his right knee and was unfit for play for another six weeks. Played five games (with intermitted muscle cramps and pain/aches), injured his right side of rib-cage and has not played since.

## CCP7: Not All Acute Football Groin Injuries Are Groin Disruptions - A Multi-System Extra Pulmonary TB Masquerades As An Acute Sports Injury

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Mycobacterium Tuberculosis (TB) is an ancient disease seen in early humans, but remains amongst the top 10 causes of death globally, and the leading cause of death due to infection. Sub-Saharan Africa is the worst affected, with South Africa ranking 6<sup>th</sup> in the world. The HIV epidemic worsens the picture. It is imperative for clinicians to be aware of TB, extra-pulmonary TB (EPTB) and the multivariate ways in which EPTB can present. EPTB can mimic many multisystem illnesses and is difficult to diagnose. All doctors working in South Africa have to be vigilant with a very high index of suspicion for EPTB, in atypical patient presentations.

In our case, a patient who is known to be HIV positive on HAART, sustained a football groin injury and presented with a clinical severity out of proportion to the clinical and radiological pathology. He subsequently turned out to have musculoskeletal and genito - urinary TB.

**Key Words:** Human Immunodeficiency Virus/Acquired Immune-deficiency Syndrome (HIV/AIDS); Mycobacterium tuberculosis (TB); extra-pulmonary TB (EPTB); Highly Active Antiretroviral Therapy (HAART); HIV-TB co-infection; spine TB; multisystem TB; groin injury

## CCP8: To Catch A Red Herring? : Knee Pain In A Healthy Male Ultra-Marathon Runner

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A 58-year-old healthy male ultra-marathoner presented with a 3-month history of atraumatic, gradually worsening right-sided knee pain, aggravated by activity and associated with prominent morning stiffness and pain. Night pain was absent. Oral and parenteral NSAIDs provided no relief, nor did massaging. No history of smoking, alcohol or prior corticosteroid use was reported.

Examination revealed a slightly swollen right knee, with associated tenderness on palpation over the quadriceps tendon insertion and superomedial knee, without an effusion. In addition, the patient showed significant weakness of the right gluteus medius and quadriceps muscles. Tests for mechanical disruption and injury were negative.

A differential diagnosis of quadriceps tendinopathy and possible patellar-femoral pain was made and conservative management, consisting of physiotherapy and an eccentric strengthening program, advised.

X-ray of the R knee revealed a hypo-lucent area in the distal femur (just proximal to the condyles). MRI of the knees bilaterally revealed areas of increased signal in the distal femoral shaft highly suggestive of bilateral bony infarcts. Blood tests including FBC and CRP were normal.

**Conclusion:** Spontaneous osteonecrosis of the knee (SPONK), or Ahlback's Disease, described initially in 1968, is rare, idiopathic cause of knee pain, usually unilateral, and commonly affects females more often than males in their fifties and sixties. Whilst it is tempting to attribute the cause of this athlete's knee pain to this condition, the pain was unilateral and improved with rehabilitative exercise. This case should alert the clinician to be mindful of rare and unusual causes of knee pain in the athlete and the impact of chosen form of exercise thereon. It is still debated whether this athlete should return to full participation in ultra-marathon running.

## POSTERS

### P1: Sudan- Cupping Test For Radiating Pain In Sport Injuries, A New Tool For A Challenging Diagnosis

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**Introduction and purpose:** Sports injuries refer to the kinds of injury that occur during sports or exercise. It is commonly used to refer to injuries of the musculoskeletal system. They are usually present with onset of sudden and severe pain. It is constant symptom in sport injuries. Usually it forces the player to seek medical help. Radiating pain is a pain that results from injury or disease of neurons in the peripheral or central nervous system. Its character is often burning or electrical, and it can be persistent or occur in short episodes. This is usually because of nerve or plexus damage.

Sudan-cupping test is a newly applied and newly registered dry cupping test, based on the use of different sized cups for cupping over certain areas of the spine. The test can detect the radiating pain to the joints (knee, ankle or shoulder) and muscles. The use of cupping therapy as a diagnostic tool is not mentioned in the literature. This study (to our knowledge) is the first study to look into use of dry cupping as a diagnostic tool in sport injuries and regular dry cupping sessions as therapeutic tool as well.

**Methods:** The study includes 522 professional football players between the age of 18 -28 years for the period 2013-2015. They play on regular regimen in the Sudanese league. The players presented with different football injury pain such as ankle joint pain, knee joint pain, posterior thigh muscle group pain, anterior thigh group muscle pain, middle thigh muscle group pain and calf muscle pain. Instrumental investigations such as x-ray, muscle ultrasound and Magnetic Resonance Imaging (MRI) were used to diagnose serious injuries in the joint or muscle area involved. A group of 108 player had absolutely normal investigations. They showed some neurological symptoms such as numbness, burning sensation, heaviness and others. Their pain was fluctuating, one day up other down. The injury pain were as follows: 11 ankle joint pain, 20 knee joint pain, 22 posterior thigh muscle group pain, 16 anterior thigh group muscle pain , 28 middle thigh muscle group pain and 11 calf muscle pain .Sudan cupping test was also conducted to test for radiating pain from the spinal column.

This is a newly applied dry cupping test, based on the use of different sized cups for cupping over certain areas of the cervical, thoracic and lumbosacral spine. The cups are applied sequentially over the spinal column until the patient feels relieve of pain upon cupping a certain area, then the test is considered positive and that area is considered for therapeutic cupping.

**Results:** Sudan-cupping test was positive in 44 (40.7%) of the players with symptoms of radiating pain. They showed the presence of positive neurological examination supporting the nerve roots compression.

**Conclusions:** Pain is the most common reason for physician consultation in the United States.[1][2] It is a major symptom in many medical conditions, and can significantly interfere with a person's quality of life and general functioning.[3] Psychological factors such as social support, hypnotic suggestion, excitement, or distraction can significantly modulate pain's intensity or unpleasantness.[4][5]. Pain in sport players does not always indicate sport injury in the joint or muscle area where the pain is felt. Radiating pain from the spinal column should be excluded especially when the scenario does not fit. There are some cases in which during playing of sport, load over the spinal column occurs.

This leads to sudden compression of the nerve roots at the lumbosacral area. This causes radiating pain in sport injuries. Sudan-cupping test is sensitive in such cases, saves time to initiate therapy and shortens time to return to play. We recommend the Sudan-cupping test to be as initial screening test in sport injuries. The test is simple, fast, cheap and easy to apply. It could be made available even in the field and during the competitions.

## **P2: Seasonal Variation In Vitamin D Levels Of South African Male Football Referees**

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**Introduction:** Vitamin D can be obtained from exposure of the skin to ultraviolet rays. UVB rays can be used to enhance both cardiovascular fitness and muscular endurance. The agreed classification of 25(OH) D concentration are: 150ng/mL is toxic. Peak neuromuscular performance is associated with 25(OH) D levels of 50 ng/mL. Vitamin D deficiency has a marked impact on health, training, performance and injury profiles of sportspeople. Symptoms of vitamin D-deficiency diseases such as rickets include generalized musculoskeletal pain, muscle weakness, resultant gait abnormalities, muscle fibre atrophy, slow peak muscle contraction, prolonged time to muscle relaxation and increased risk of musculoskeletal pain. South Africa has a unique climate where referees who train outside during the day are exposed to high levels of sunlight. The aim of this study was to identify seasonal variation of vitamin D levels in elite football referees who trained outside and did not take any supplements.

**Methods:** Seventeen referees underwent four vitamin D (25(OH) vitamin D) evaluations for a duration of a year, with a test being conducted during each season (i.e. spring, summer, autumn and winter). All tests were done at Lancet Laboratories. The values were recorded and anyone with values lower than 30 ng/mL were classified as deficient.

**Results:** There were significant differences (p 0.05) in vitamin D values in the four seasons. In every season except in summer, there were participants who were vitamin D deficient. In Spring 23.53 % of the sample were deficient, in Autumn 41.18% and in Winter 76.47 % with 23.53 % of those classified as severely deficient. In Summer, 11.76% of the sample reached peak vitamin D levels of 50ng/mL and in autumn, only 5.88% reached those levels. In winter and spring no one had these values of vitamin D.

**Conclusion:** Despite sun exposure, South Africans are susceptible to vitamin D deficiency which can have performance and health impacts. Vitamin D levels should be monitored throughout the season and nutritional interventions, through dietary changes and supplementations, should be recommended.

## **P3: The Effect Of Different Hydration Strategies On Recovery On University Soccer Players.**

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**Introduction:** Soccer players are subjected to heavy training loads due to their intense fixture schedule intertwined with training which leads to players not giving their body enough time to fully recover and that tends to elicit symptoms of overtraining such as fatigue and mistakes. Correct recovery strategies enable players to recover at a faster rate ensuring they go into training and matches fully fit and without showing and symptoms of overtraining as well a reduced occurrence of injuries.

The aim of the study was to compare the effects of four different hydration strategies in amateur soccer players looking at the different effects of fluid intake on post-exercises recovery.

**Methods:** 36 Males university soccer players (age>18) were grouped (n=8) into four different groups. All groups underwent a three session football specific training, where each group was given a different post training hydration strategy. The first session was to establish base-line values and all groups were given water on pre, during and post session. Seven days later each group underwent the same football specific training session but with different post-session hydration strategies. Group one were used as the control and stayed with just water, group two were given a sports drink, group three were given low fat chocolate milk and group four were given a combination of the low fat chocolate milk and sports drink. The training session was also conducted 48 hours later. Physiological variables measured were (ECG /Heart Rate/ Respiration/ Heart rate variability/ Body activity & co-ordination) and performance scores were recorded for all three testing days.

**Results and conclusion:** Please note that this is an honours project that is currently on-going and the final results will be obtained at the end of August.

## **P4: Chronic Nec Pain And Headache After Cycling**

*Ramona Beeton<sup>1</sup>*

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**Case History:** In March 2011, a 59 yr old male patient presented with painful neck and headache after cycling. Progressively worse over the past 8 months. Pain on medial and lateral side of left elbow, worse on lateral side at night, causing sensation of weakness of left arm and hypersensitivity. He stopped all exercises for 2 weeks with no improvement of symptoms. Very little relief with N'SAIDS, muscle relaxants and physiotherapy. He is a known diabetic, hypertensive, hypothyroidism and hypercholesterolaemia. He cycles 5 times a week with rowing exercises and spinning in between.

**Examination:** Average built adult male, BMI=29. Neck has normal range of movement with tenderness over paravertebral muscles. Tender left Supraspinatus muscle and medial and lateral elbow areas. Equal motor function, sensation and reflexes of both arms.

**Differential diagnosis:** 1. Muscle spasm in neck. 2. Radiculopathy C5, C6 and 7

**Test results:** 1. MRI in March 2011 revealed C3-4 posterior disc protrusion with spinal stenosis. C5-7 broad based disc protrusion posterior with spinal stenosis and facet joint degeneration. C5-6 narrowing of bilateral neural foramina with compression of nerve roots. C6-7 left sided neural foramina narrowing. 2. Nerve conduction tests revealed decreased conduction in median nerve over wrist area but not yet Carpal Tunnel Syndrome. No sign of anterior inter-osseous syndrome.

Final diagnosis. 1. Neck: Multi-level degenerative changes of discs and facet joints with nerve involvement C5-7 more prominent left side. 2. Lateral Elbow pain: possibly due to "Double crush" sign of Median nerve entrapment in wrist but also nerve compression C5-7 left.

**Discussion:** These changes cause muscle spasm in his neck with aggravation of C5-7 symptoms. Thoracic thrust treatments as a treatment for muscle spasm of the back was initiated, directly after cycling.

**Outcome:** The pain in his left elbow cleared and his neck discomfort and headaches improved. He is not taking N'SAIDS or muscle relaxing medication. Since 2011, there was no need to repeat any of these tests for aggravating symptoms. He is still cycling and completed 4 Argus cycle races since then. Always check for aggravating conditions.

### **P5: Lower Backache In Long Distance Running**

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**Case history:** In September 2015, an active 46 yr old female complained of lower backpain while running, starting at around 20km into the race. Pain spreads into gluteal regions, down back of legs to bilateral fifth toes, later spreading to all the toes. Feeling of pressure over ischia's. Improves after resting. Physiotherapy and Biokinetic treatment did not improve the condition.

**Examination:** Slender built adult female, BMI=20. No sciatica. Reflexes, motor function and sensation of legs normal. Tender on pressure over lower vertebrae, bilateral superior Sacro-ileac joint areas, bilateral Piriformis muscles and ischia. No sign of hamstring injuries.

**Differential diagnosis:** Muscle strain of lower back due to enthesopathy.

**Examinations:** Xray of pelvis normal. Xrays lumbar vertebrae: spondylosis and degenerative disc changes on L5-S1 level. Bone density test reveals osteopenia of lumbar vertebrae (T-score -2.2), left hip (T-score -1.3), right hip (T-score -1.7). Hormonal profile test normal.

**Final diagnosis:** Mechanical lower backache with enthesopathy, osteopenic lumbar pain and muscle spasm.

**Treatment:** 1. Calcium increase in diet as well as supplementation. 2. Platelet rich plasma infiltration into bilateral superior sacro-iliac joint spaces, bilateral

implantation areas of Erectus muscles on sacrum, bilateral hamstring implant areas on ischia, interspinous ligament of L5-S1. 3. Stop cycling and running for 2 weeks, then rehabilitate into running again.

**Discussion:** Calcium increase has reduced osteopenic pain. Platelet rich plasma treatment reduced inflammation process and enthesopathy progress. She rehabilitated well and has done several half marathons since then and is still without lower backpain when running. Follow up of bone density test in 2017. Diet and PRP treatment had superior effects above traditional pain and ant-inflammatory treatment.

### **P6: The Incidence Of Injuries And Exposure Time Of Professional Football Club Players In The Premier Soccer League During Football Season**

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**Background:** Data on the incidence of football injuries and exposure time of players during matches and training in the South African (SA) Premier Soccer League (PSL) are lacking.

**Objective:** To calculate the incidence of injuries and the exposure time (practice and match) of the players of a PSL team over a full season.

**Methods:** Injury and training data of the players in the squad (N=32) were recorded on a daily basis by the medical support staff, according to the methods of the F-MARC protocol.

**Results:** One hundred and thirty injuries were recorded in the season. The most affected body parts were the thigh (n=27, 21%) and ankle (n=27, 21%). The overall incidence was 13.4 injuries per 1 000 player-hours. The incidence during training was 6.6 injuries/1 000 player-hours and during matches 88.9 injuries/1 000 player-hours. The most frequent injury was haematoma/contusion/bruising (n=43, 33%). Of the total injuries, 12% were recurrent. Injury through contact with another player was high (62%). Seventy-six percent of the injuries were not associated with any violation of the laws of the game. The average time off due to injury was 8 days. The total exposure time over the full season resulted in a combined average of 18 162 minutes (~303 hours).

**Conclusion:** These data differ from the data in European studies. Injury and exposure data measured throughout the season have the potential to identify risks and mechanisms of injuries. This study highlights the necessity for all clubs in the PSL to adopt a standardised injury monitoring programme, using standardised methodology, so that the management of professional players in SA may be improved.

**Implications:** The implications of such a study is ground breaking in the field of Football Medicine in South Africa and Africa. It has a far reaching effect in describing the football population and identifying what variables need intervention for change to occur progressing the level and standards in African Football.

### **P7: Case Study Of A Javelin Thrower With Medial Elbow Pain With Median Nerve Involvement**

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**Case history:** This 19 year old javelin thrower presented with shooting right medial elbow pain and tingling in the forearm after taking part in three competitions within a month. No specific throw produced the pain but the elbow pain began after the third competition. Patient was initially diagnosed with medial epicondylitis but after treatment no improvement in symptoms was noted.

**Physical examination:** No obvious swelling, discoloration or deformity of the upper limb or elbow was noted. Passive elbow range of motion was full and pain free. Active elbow range of motion was full and pain free. Elbow joint play was flexible and pain free. Wrist range of motion was full and did not reproduce the patient's symptoms. Resisted elbow and wrist isometrics were not painful. Upper limb reflexes, myotomes and dermatomes were normal.

**Differential diagnosis:**

Medial epicondylitis

Medial collateral ligament injury of the elbow

Ulnar nerve traction injury

Cervical radiculopathy

Pronator teres syndrome

**Tests/results:** An ultrasound of the elbow was requested. On the symptomatic right arm the median nerve measured 2.1mm in anterior-posterior diameter compared to the 1.5mm on the left arm. The transverse diameter of the median nerve of both elbows was symmetrical. One of the nerve fascicles on the right median nerve was swollen. All other soft tissue of the right elbow was within normal limits.

**Final diagnosis/outcome:** Median nerve sprain at the elbow.

A treatment approach using neural taping, wrist and elbow mobilisation, and rest with no throwing or gym activity for six weeks.

**Return to activity:** After six weeks the patient returned to normal training which included javelin throwing, cardiovascular fitness training and strength training without re-occurrence of the symptoms.

**Discussion:** Medial elbow pain may be common in athletes in sports that involve throwing such as javelin. While a ligament, tendon or muscular injury may be suspected, the clinician should be on the lookout for nerve injury especially when symptoms that characterise nerve pain are present.

## **P8: The Insightful Relationship Between Spiritual Intelligence And Workplace In 21<sup>st</sup> Century**

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Research on spirituality has identify the criteria to predict motivational and personality properties of individuals with their surrounding environment, based on specific characteristics of each person and to describe their workplace. Towards this direction notion of the Spiritual intelligence (SI) was introduced (Emmons,2000). This intelligence been found manifests through several capacities like the ability of the transcendent state of the consciousness: the ability to perceive life as whole; it is interlinked from personal level, to family, to organization, to country to the world and to the Universe. It is the ability to organise and integrate all life pursuits forwards unified goal; it is the ability to solve full range of life problems easier and quicker; the ability to engage in various behaviours like forgiveness, express gratitude, to be humble, to display compassion, to perceive uniqueness and sacredness of everyday reality, objects, people, places, relationships, roles, Global connectedness to everything, and UNIVERSAL CONNECTEDNESS. It is the flexible and adaptive use of Spiritual intelligence skills to solve real-life issues, to assist people to be more relevant in understanding of the manifestations of the spirituality in workplace settings. Furthermore, sanctified starvings are likely to lead to a greater integration and development of the personality. Spiritual intelligence influences life satisfaction, emotional wellbeing, and promote job related commitments.

The ability to vie own experience of the Spiritual intelligence as sacred and significant, and the understanding of the importance of the collective consciousness functioning.

When work is seen as a calling rather than a job, or as opportunity to serve bigger spiritual meaning, work related goals take on the new level, become significant and meaningful (Davidson and Caddel, 1994). Then meaning of the work gets to be transformed, to be the calling or sacred, people more likely invest more time and energy forwards work related goals and to protect this kind of goals and interests.

Using this intelligence, people can view their lives with extended view and act more efficiently.

Today, Spiritual intelligence discussed as psychological domain and in other human science area- such as management and leadership. Most of scientists believe that Spiritual intelligence is the most important type of intelligence which has the power to change our life, society, history and the world.

**Keywords:** Spiritual Intelligence, workplace, human intelligences, workplace, Improvement.

1) Series of related intellectual capabilities 2) Can be developed during life time 3) Simplifies problem solving process and compatibility with a natural specific environment 4) Enables individuals in accurate judgment and reasoning 5) Represents a compound component or biological bases of mind

Many years after introduction of Spiritual intelligence and its applications all over the world, researchers found and understood that many people with higher IQ have more problem in controlling their emotions and behaviours and cooperating with the other people, while people with lower IQ have possibility to achieved professional successes easier (Bradbury and Travis, translated by Ganji, 2005).

**Introduction:** When it comes to describe the variety of the reasons why people work, it can be illustrated as in the pyramid of Maslow (1960), shelter and food, clothing and transportation, socialisation and need for love, money and need for self-actualisation. For the social psychologist and the psychologists of religion previous description will not be accurate or enough. Instead we need to know what social and mental factors regulate the why people going to work, solve or unsolved their work related problems, embrace their identity and maintain it.

I believe that knowledge about these things can help us to create healthier, more productive work environment, can provide the psychological module for the improvement of work performance and to reduce conflicts, stress and fear, dissatisfactions or unhappiness of the work choices. Believing in what you are doing and emotional feeling of happiness is paramount in achieving better workplace. Workers more likely to pursue transcendent goals, foster trust, a team player, healthier atmosphere, commitment to the employer and the goals.

In order to build argument for this idea and the rationale for what can be called a healthy work- environment we need to encourage meaning aspect of the spirituality at work, which can emphasise norms, values and expectations associated with the benevolent and principled ethical climates of the learning organisation which goes beyond merely making profits. By encouraging values, norms that supports caring for each other and the organisation and for the country and for the Planet a such higher-order goals often reflect the spiritual values of the contribution to the society and make employers feel that they work has higher meaning.

### **P9: Novel Method To Decrease Core Temperature In Hyperthermic Athletes**

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**Background:** Athletes from several sporting disciplines train and compete in hot environments that do not only impair performance but also pose a potential risk to athlete health. In endurance sports, for every serious cardiac adverse event, there may be 10 serious events related to heat stroke.

**Purpose:** This study investigated a carbon based compound/cooling system which was designed for therapeutic hypothermia or temperature reduction after acute ischemic events. The aim of this study was to investigate the effect of using this method, directly after athletes exercised for a maximum period of 2 hours in a hot/humid environment, or until their core temperature reached 39°C. It was hypothesized that this method can significantly decrease the time to return to the normal baseline core temperatures.

**Methods:** Fifteen un-acclimatized healthy male athletes (20.3y) were asked to perform an exercise protocol in a climatic chamber (dry-bulb temperature= 39.0°C and a natural ventilated wet bulb temperature of 28.0°C). A workload of 80 Watts was achieved by means of a block stepping exercise on and off a 30.5cm stepping block (stepping rate=24 steps.min<sup>-1</sup>). During the recovery period, athletes were placed in a supine position and cooling pads were fitted on chest, back, neck and thigh area until core temperature returned to baseline. A telemetric system was used for continuous core temperature monitoring. The system included a pre-calibrated temperature sensor (radio pill) and data recorder which was inserted rectally, similar to the application of a rectal suppository. The protocol was repeated twice; once with the aid of the cooling pads and once without.

**Results:** The non-parametric Wilcoxon's signed rank test indicated a significant decrease ( $p=0.0023$ ) in cooling time, indicating that the cooling aid accelerated reestablishment of the athlete's normal core temperature with 13 minutes.

**Conclusion:** This technology may provide a new alternative to accelerate the rapid cooling of athletes that experience hyperthermia, thereby avoiding catastrophic injury and adverse cardiovascular outcomes in the collapsed endurance athlete. New sport applications to be investigated include pre-/post-exercise cooling as well as during the half time break in team sports to manage the athlete's core temperature.

### **P10: The Adverse Impact Of Schoolbag Carriage: A Systematic Literature Review (2007-2016)**

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**Introduction:** Heavy schoolbag carriage has become a serious concern that precipitates musculoskeletal pain and deviant vertebral posture. The objectives of the study were to: (i) identify common anatomical sites of pain due to heavy schoolbag carriage, (ii) determine what is the maximum mass that a scholar can carry on both shoulders, as well as one shoulder before the onset of pain and/or deviant posture, (iii) different methods of carrying schoolbags and its relation to pain and deviant posture, (iv) the impact of carrying heavy schoolbags on the child's lung capacity, (v) biomechanics of pelvic alignment when carrying heavy schoolbags, (vi) the effectiveness of back care and strengthening intervention programmes to reduce pain and deviant posture, and (vii) global research regarding schoolbag carriage on children health and well-being.

**Methods:** A systematic review of literature following the PRIMSA guidelines from 2007 to 2016 was used. The literature review identified 589 English papers that were related schoolbag carriage, which caused pain and deviant posture among scholars.

**Results:** Literature demonstrates that a schoolbag mass exceeding 10% of boys' and 5% of girls' body mass (BM) produces pain and abnormal posture such as kyphosis, lordosis and scoliosis that diminishes their lung capacity and cardiorespiratory function. The method of carrying schoolbags (over both shoulders versus single shoulder) changes the appendicular skeleton and axial skeletal alignment that produce deviant posture.

**Conclusion:** Most prevalent anatomical sites of pain include cervical vertebrae, shoulders and lower back. The fundamental problem prevailing is the lack of agreement on the maximum percentage mass of the schoolbag load that can be carried. The educational and exercise intervention programmes has shown promise to reduce deviant posture and pain.

### **P11: Evidence Of Benefits Of Exercise And Its Mechanisms In Inflammatory Arthritis**

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**Introduction:** Rheumatoid arthritis (RA) and Ankylosing spondylitis (AS) are systemic, autoimmune diseases causing severe joint inflammation, leading to joint damage and functional disability. Both diseases may feature comorbidities e.g. cardiovascular disease (CVD) and hypercholesterolemia. RA is most prevalent in individuals aged  $\geq 18$  years, with an estimated prevalence distribution of 0.41.3% worldwide. AS has an age onset of 1535 years, typically affecting 79/ 100 000, with a 3:1 male-to-female ratio. Evidence of benefits of exercise, and its hypothesised mechanisms in RA and AS patients were explored.

**Methods:** Research literature on stage of disease, amount and type of exercise and classification levels were assessed using Medline and Scopus databases.

**Results:** Pre-evaluation includes staging of level of function (class IIV) and assessment of disease activity and comorbidities. Recommended amount and type of exercise vary depending on the site and amount of impaired joints, presence/absence of inflammation, joint stability and previous joint replacements. The FITT-Pro principle (frequency, intensity, time, type and progression) is followed in exercise prescription. Evidence of benefit of aerobic and resistance exercise programs shows an increase in aerobic capacity, muscle strength, self-reported functional ability, endothelial function, blood pressure, lipid profile, autonomic function and muscle mass, with a decrease in body fat percentage and trunk fat mass. Inflammatory disease is characterised by increased levels of circulating TNF $\alpha$  that induces cachexia and lead to deterioration of muscle strength. Pro-inflammatory cytokine production may also predispose patients to atherosclerosis, loss of muscle mass, and metabolic disorders (insulin resistance and dyslipidemia). Exercise not only improve functional outcome, but also induces an anti-inflammatory response, specifically suppressing TNF $\alpha$  production and stimulating the production of anti-inflammatory cytokines (IL-1ra and IL-10) via muscle derived IL-6.

**Conclusions:** Scientific literature supports the benefit of exercise to both improve functional ability and reduce CVD mortality and other comorbidities. Mechanisms of the effect of exercise are on functional and anti-inflammatory level.

## **P12: Selected Fitness Values Of Male And Female Junior Provincial Swimmers**

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**Introduction:** Participation in sport leads to physiological adaptations, especially at competitive and elite level. These adaptations may enhance performance, but they may also predispose the athlete to possible injury.

**Aim:** The primary aim of this study was to profile male and female junior provincial swimmers, using selected fitness tests.

**Methods:** A descriptive, quantitative research design was used. Nine junior male (Age=15.7±1.00) and nine junior female (Age=15.1±0.78) provincial swimmers participated in the study. Body composition was analysed using the following methods: body mass index (BMI), percentage body fat (BF%) and somatotype. Concentric isokinetic peak torque for shoulder lateral and medial rotation were measured using a Humac Norm isokinetic dynamometer. Antagonist-agonist ratios (lateral shoulder rotation divided by medial shoulder rotation) were also calculated. Data was analysed using descriptive statistics (mean and standard deviation).

**Results:** BMI values of 22.5±1.23kg/m<sup>2</sup> and 21.8±0.76kg/m<sup>2</sup> were reported for males and females, respectively. Males swimmers presented as ecto-mesomorphs (3.3-4.3-2.5), while female swimmers were characterised as meso-endomorphs (2.9-3.3-4.2). Isokinetic antagonist-agonist ratios of 74.2% and 77.9% were found for the right and left sides in females, while the males exhibited ratios of 71.7% and 67.6% for right and left, respectively.

**Conclusion:** Both male and female swimmers demonstrated unique and sport-specific adaptations with regard to body composition and isokinetic shoulder peak torque values when compared to the general population or to other athletes.

**Keywords:** swimming, body composition, somatotype, isokinetics.

## **P13: Effects Of An Integrated Movement Programme On Motor Proficiency, Visual-Motor Integration And Scholastic Achievement In Grade One Learners Of Quintile Five Schools In Port Elizabeth**

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**Introduction/background:** Globally, the association between physical fitness, motor proficiency and scholastic achievement has been well researched. However, information concerning the effectiveness of integrated movement programmes in pre- adolescent children from various socio-economic disparities, is less well studied. A lack of studies exists on the relationship between perceptual-motor development and scholastic performance in literacy and numeracy in children from low-middle income countries such as in sub-Saharan Africa.

**Purpose (Aim):** To determine the effects of an integrated movement programme on motor proficiency, visual-motor integration and scholastic achievement in six- to nine-year-olds from quintile five primary schools in Port Elizabeth.

**Methods:** A quasi-experimental comparison group pre-test – post-test design was used in a preliminary study in two quintile five schools in Port Elizabeth. Non-probability sampling resulted in 45 participants. Test batteries included the Beery-Buktenica Developmental Test of Visual-Motor Integration and the Bruininks-Oseretsky Test of Motor Proficiency Brief Form. Scholastic achievement was assessed using the Department of Education report card scores for numeracy, reading and writing compiled by the relevant teachers. Statistical significance was set within a 95% interval ( $p < 0.05$ ). Central tendency measures were reported. Data were analysed with t-tests and ANOVA and inferences were made based on results from Chi-square tests, Cohen's d, and Cramer's V analysis. Pearson's correlation (r) was applied to determine associations between dependent variables.

**Results:** The experimental group showed a significant increase of 44% in motor proficiency over the four-week intervention period. Motor proficiency in the control group declined by 4%. A significant positive association between motor proficiency and scholastic achievement in numeracy, reading and writing as well as in total scholastic achievement was found. Findings indicated no significant correlation for scholastic achievement and visual-motor integration.

**Conclusion:** Results highlight the strong relationship between motor development and cognitive abilities with regards to scholastic achievement and indicate the need for more longitudinal studies to be done on a national level.

## **P14: Two-Year Changes In Body Composition, Physical Activity, And Selected Metabolic Risk Factors Among Adolescents Living In The North West Province Of South Africa: The PAHL Study**

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**Background:** Childhood overweight and obesity has been found to be on the increase in low- to middle-income countries and is linked to both individual and clustered metabolic risk factors. The purpose of this study was to determine the two-year changes in body composition, physical activity (PA) and selected metabolic risk factors (abdominal obesity and blood pressure) among adolescents from the North West Province of South Africa

**Methods:** A total of 289 fourteen-year-old adolescents (116 boys and 173 girls) from the Physical Activity and Health Longitudinal Study (PAHLS) participated in the study. Body composition was measured according to the International Society for the Advancement of Kinanthropometry (ISAK) standard procedures. PA level was measured using the International Physical Activity Questionnaire (IPAQ). Abdominal obesity was determined using the waist circumference measurements and blood pressure was determined by Omron MIT Elite Plus.

**Results:** BMI classification for the whole group showed that 70.9% were in the normal weight category in 2011, and the number decreased (9.2%) to 63.9% in 2013. Overweight gradually increased by 3.5% in 2012 and 4.1% in 2013. Overweight increased by 2.2% among the boys compared to (12.2%) for girls ( $p \leq 0.001$ ). Total physical activity (PA) level increased by 608.28 METs among the boys and 214.3 METs among the girls. Participation in low-physical activity (LPA) increased by 8.2% for the whole group while moderate PA gradually decreased (15.2%) during the period. With regard to the metabolic risk factors (abdominal obesity and blood pressure-BP), waist circumference (WC) increased (2.97 cm) among the boys and (0.73 cm) among the girls. Boys had significantly higher WC at every measurement point ( $p \leq 0.001$ ). For BP, 90.3% of the group was in the normal BP category in 2011 and the percentage decreased (5%) to 85.3% in 2013 while the percentage of those in the hypertensive / hypertensive category increased (5%) from 9.7 (2011) to 14.7% (2013). The increase was greater in girls than boys ( $p \leq 0.001$ ).

**Conclusion:** It was concluded that adolescent girls were more overweight, obese and less physically active compared to the boys over a period of time. Additionally, boys showed a significant abdominal increase on one side, whilst on the other hand, an increase in the prevalence of hypertension was evident.

**Keywords:** Body composition, Physical activity, Metabolic risk factors, Adolescents

### **P15: Physical Characteristics And Anthropometric Profiles Of KZN Male Taekwondo Team**

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**Background:** Taekwondo (TKD) is a martial sport that originated in Korea. It is an Olympic sport characterized by fast high kicks, spinning kicks and effective punches. Aim: The purpose of this study was to examine the physical fitness and anthropometrical profile of the KZN male Taekwondo team players during training performance after a 6 weeks of TKD intervention.

**Methods:** This was a prospective experimental study. Thirty (n=30) active TKD athletes aged 18-25 years voluntarily participated in a 6-weeks interval TKD and resistance training. Anthropometrical parameters (weight, height, BMI & fat percentage) and Physical parameters (push-ups, sit-ups, speed, stork standing, sit & reach and straight leg raise test) were determined. Data were analysed using t-test for independent samples. Results: After 6 weeks of training, the male athletes showed a significant reduction in body weight (p<0.05), BMI (p<0.001), SBP (p<0.05), RHR (p<0.05), SS (p<0.05), and fat % (p<0.001) and significant improvement (p<0.05) in sit ups, push ups, stork standing (p<0.05) and even significantly higher speed and agility (p<0.001). The improvement in horizontal jump was not significant after 6 weeks of taekwondo training.

**Conclusion:** Our findings support the effectiveness of 6 weeks TKD training in improving body composition, cardiorespiratory response and physical performance that could enhanced combat skills of Taekwondo athletes.

**Key words:** Physical, Anthropometric, Interval, Taekwondo and Male.

### **P16: Effects Of A Six-Week High Interval Taekwondo And Resistance Training On Anthropometrical And Physical Parameters In KZN Taekwondo Athletes**

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**Introduction:** Taekwondo (TKD) is a Combat martial art sport that emphasises fast spinning kicks. The aim of this study was to assess the impact of high intensity interval training on anthropometrical and physical parameters in KwaZulu Natal male and female Taekwondo athletes.

**Methods:** Thirty (n=30) active TKD athletes aged 18-25 years, volunteered for this study. The athletes were divided into control (n=15) white belts and experimental group (n=15) coloured belt. The experimental group performed high interval TKD and resistance training and control group performed recreational taekwondo training. The subjects (white and coloured belts) trained one hour in the morning and one hour in the afternoon, four times a week for six weeks. All subjects were pre and post tested on anthropometrical parameters (BMI, weight and height) and physical parameters [flexibility (seat and reach test) strength (push ups) endurance (sit ups) power (horizontal jump), speed (50-meter sprint) and agility (T-test) and VO2max (12-meter cooper test).

**Results:** The experimental group (Taekwondo athletes) showed significant improvements (p<0.05) in upper body muscle power, flexibility, speed and agility after training, whereas the VO2max did not change (p>0.05).

**Conclusion:** The findings of this study support the effectiveness of the 6 weeks high interval training in Taekwondo and resistance training improves anthropometrical and physical parameters and contribute to performance to the fighting skills.

**Key words:** Taekwondo, Anthropometrical, BMI, Shuttle run

### **P17: Overweight, Obesity, Chronic Disease Risk And Physical Activity Levels Of Urban And Rural Women In Zimbabwe.**

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**Introduction:** Obesity is a well-recognised risk factor for various chronic diseases which is the largest cause of morbidity and mortality. Maintaining a physically active lifestyle helps to keep a healthy weight and lowers the risk of chronic diseases. The aim of this study was to compare weight, chronic diseases risk and physical activity levels of rural and urban women in selected Zimbabwean communities.

**Methods:** A descriptive, comparative, and cross sectional design was followed. A sample size of 280 women; age (35.17± 10.49 years), weight (68.88±14.65 kg) and height (1.62±0.05 meters) participated in the study. Anthropometric variables, blood pressure, blood glucose and blood cholesterol were also measured among participants. International Physical Activity Questionnaire, Quality of Life, and Nutritional questionnaires were administered. Descriptive statistics as well as independent t-tests and Chi-square test of independence were used and the significance was set at p≤0.05.

**Results:** The results indicated an increase prevalence of overweight and obesity in urban women compared to rural women. There was a significant difference between urban and rural women in terms of BMI p=0.009, WHR p=0.003 and WC p=0.005. Regarding disease risk urban women were classified as high and very high risk compared to rural women, p=0.019. There was a significant difference between location and blood pressure p=0.025, with rural women having a higher raised blood pressure than urban women. A significant difference in cholesterol was noted between rural and urban women, p=0.003. A significant difference was noted between rural and urban women in the transport domain, p=0.046. There was a significant difference between energy consumption and location, p=0.0005. Urban women had significantly high protein consumption p=0.007, and fat consumption p=0.0005.

**Conclusion:** There is an increase in the prevalence of overweight and obesity in urban women compared to rural women. Urban women also show an increased chronic disease risk compared to rural women. Both urban and rural women showed high levels of physical activity and quality of life. High consumption of micronutrients was noted among urban women. The information gained in this study can assist health policy makers in the country to provide a platform to implement appropriate interventions.

## **P18: Acute Quadiceps Muscle Radiating Pain During Football Game, Wrongly Diagnosed As Acute Muscle Strain. Sudan Cupping Test Sorted The Problem.**

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No Souleymane Cisse is a 23 years fit football player, He started his professional carrier since 2008 .he is 176 cm high and his weight is 74 kg playing as defender at ALHILALI sport club the champion of the Sudan. Souleymane felt a sudden sever left thigh upper compartment pain during an official football game in the Sudanese league 10 minutes before the end. It's his first time to have such injury at this area. The pain appeared when he was tiring to change his position to pass the opportune player. The player said he felt very severe pain as if something is cut in the muscle that forced him to fall down. He asked for team doctor assistance and decision was made to send him out. He was not able to walk so he was transported on a stretcher.

The first clinical examination showed a very tender, spastic left thigh upper compartment. The area was edematous and difficult for palpation. There was loss of function of the thigh and restriction in the normal movements. First aid was given for the player as the RICE protocol (Rest, Ice, Compression, and Elevation). The player received Cataflam 50mg, a non-steroidal anti-inflammatory medication (NSAID) two times a day after meals and Baclofen 10mg, a muscle relaxant once per day. Magnetic Resonance Imaging (MRI) for the left thigh was scheduled for the next day and he was sent home to rest.

The same night the player was not able to walk normally and couldn't sit to do his prayers as every day and did that sitting on a chair. He was not able to step. The next morning there we unexplained reduction in the intensity of the pain. The player was sent for MRI. We have been told that the MRI report will be ready after 24 hours from the day of examination. At night the player said that the pain increased again. This was not characteristic for sport muscle injuries. The player continued his treatment as described. The next day the MRI result showed normal thigh muscles findings. Regarding quadriceps strain various ways of grading muscle strains have been proposed [4, 5, 6]. Factoring in pain, loss of strength, and physical exam findings in a grading system helps provide guidance for treatment, rehabilitation, and eventual return to play. Table 1 provides an outline of a clinical grading system for muscle strains.

Clinical grading system for quadriceps strains

Grade Pain Strength Physical exam

1 Mild None or minimal loss of strength No palpable muscle defect

2 Moderate loss of strength May feel a small palpable muscle defect

3 Severe Usually complete loss of strength often feel a palpable muscle defect

This hassled us to consider the possibility of radiating pain from the lumbosacral area. We then started to ask the player more about complains of neurological origin. The player described feeling that the lower left limb is heavier than the right and a slight numbness and hotness at the planter of the left foot. Then we considered conducting Sudan cupping test.

This is a newly applied dry cupping test, based on the use of different sized cups for cupping over certain areas of the cervical, thoracic and lumbosacral spine. The cups are applied sequentially over the vertebral column until the patient feels relieve of symptoms upon cupping a certain area, then the test is considered positive and that area is considered for wet cupping.

The cupping test was done for the player using KANGLING Chinese cupping sets. The pain disappeared when the cup was applied at his lumber are at the level of L4/ L5 vertebral disc space. Only then, he was able to sit, and felt relieve of the heaviness, numbness, hotness of the left foot. That means positive Sudan cupping test.

The diagnosis of muscle pain of neurological origin was based on the fact that the pain decreased the next morning of the injury and then increased again, as well as the later neurological complains. The positive Sudan-cupping test confirmed the diagnosis and thigh muscle strain was excluded. The player preferred to be treated with wet cupping. He underwent one session the next day after injury and went back to training 48 hours later. He received vitamins B1, B6& B12 with the already started treatment. The player's condition improved dramatically and he was able to play two official games in the League within 7 days and an official African championship game at day ten after the injury.

Injury to the quadriceps muscle group can be painful and debilitating. Strains and contusions of the quadriceps are common in athletics and result in lost time from training and competition. Several studies have shown quadriceps strains commonly occur at the mid to proximal portion of the rectus femoris [1,2,3]. Pain in sport players does not always indicate sport injury. We have to think about radiating pain especially when the force that causes the injury is not strong enough to cause damage of the tissues. This nerve roots injury will produce a radiating pain which appear at the tissues innervated by the injured nerve or its branches. The Sudan-cupping test is sensitive in such these cases in which instrumental investigations such as MRI or muscle ultrasound cannot help in the diagnosis. We recommend the Sudan-cupping test to be as initial screening test in sport injuries. The test is easy, simple, fast, cheap, simple and easy to apply test and We recommend the Sudan-cupping test to be as initial screening test in sport injuries. The test is easy, simple, fast, cheap, simple and easy to apply and available even in the field and during the competitions. available even

## **P19: Physical Activity Levels And Sedentary Behaviour Of High School Learners In Soshanguve, Gauteng Province**

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**Background:** Physical inactivity among adolescents is associated with an increasing prevalence of overweight and obesity (De Vos, Du Toit and Coetzee (2016). This is a public health concern as high school learners are becoming more and more sedentary and engage in poor dietary habits. The aim of the study was to investigate physical activity level and sedentary behaviour of high school learners in Soshanguve, Gauteng Province. Objectives of the study were to determine body mass index of the participants using height and weight measurements; to determine the prevalence of being overweight and obese; to determine physical activity levels and sedentary behaviour of participants.

**Methods:** A cross-sectional survey was used and data was collected using a validated tool, 2010 National Youth Physical Activity and Nutrition Survey (Lee, 2013). Weight and height of participants were measured.

**Results:** Seven hundred and eleven (n = 711) learners participated in the study. Sixty five percent (65%) were females. The mean age was 15.92 (SD ± 1.68); mean weight was 58.12 (SD ± 13.78); mean height 1.57 (SD± 0.10); mean BMI 23.56 (SD ± 5.34). Participants who had ideal weight were the highest 430 (60.5%) followed by overweight participants 126 (17.7%) and obese participants 115(16.2%). Gender and age were statistically significant when correlated with obesity. The odds of females to being obese were 2.8 (CI: 1.99 – 4.09). Four hundred and thirty one (61%) participants do not engage in any jogging or exercise while 264(39%) exercise for one hour or more per day. Only 135(19%) exercise frequently during physical education classes. Physical activity after school is as follows: 308(43.3%) do not engage in any physical activity after school while 309(43%) seldom engage in physical activity after school. Only 94(13%) participants engage frequently in physical activity after school. Three hundred and seventy five (53%) spend three hours or more watching TV; 301 (42%) on social network; 139(20%) studying and 95(13.4%) spend three hours or more on video games

**Conclusion:** The study showed low levels of physical activity and a high prevalence of overweight and obesity. Strategies are needed to improve physical activity levels of learners.

### **P20: A Novel Coaching Cricket Bat: Can It Be Used To Enhance The Backlift And Performance Of Junior Cricket Batsmen?**

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**Background:** In the current literature, it is questionable whether cricket bats in their current form and dimensions allow a young cricketer to hit the ball effectively. The aim of this study was to test the effectiveness of a novel coaching cricket bat among junior cricket batsmen with regards to enhancing performance and the direction of the backlift.

**Methodology:** A cross-sectional research study with analytical research methods was employed, in which two groups (coached: n = 12 (n = 6: Experimental and n = 6: Control) and uncoached: n = 35) of participants (ages 9 – 13) took part in both a pilot and intervention study. Participants were required to use a novel coaching cricket bat in a coaching game format. Biomechanical and video analysis was conducted in both the frontal and lateral planes. A Student T-test (pilot group) and a Two-Way Analysis of Variance (ANOVA), Chi-squared test and effect sizes (intervention group) were performed. These analyses were performed using R at a significance level of  $\alpha = 0.05$ .

**Results and Discussion:** Pilot study results demonstrated that participants scored an additional 100 runs when utilising the coaching cricket bat compared to a conventional cricket bat ( $p = 0.003$ ). Six weeks post intervention (training with the coaching cricket bat), the experimental group displayed improved performance (ES = 5.41). Players' backlifts had subsequently become more lateral which may have promoted more effective ball striking as a result of this training effect.

**Conclusion:** The recommendation from this study is that coaches should encourage young cricketers to use the coaching cricket bat as it is perceived to be a potentially significant training aid for enhancing their performance and the direction of their backlift when they utilise conventional cricket bats in match play.

**Key words:** Cricket batting, junior cricket, coaching cricket bat, batting backlift techniques, performance, coaching

### **P21: The Lateral Backlift In Cricket: Does It Affect Other Components Of The Batting Technique?**

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**Background:** This study aimed to investigate the batting backlift technique (BBT) among semi-professional, professional, county and current international cricket players. A key question was to investigate whether the lateral batting backlift technique (LBBT) is more common at the highest levels of the game. The secondary aim was to examine the extent to which the LBBT may affect other components of the batting technique (stance and preparatory movements).

**Methodology:** The participants in this study sample (n = 155) were South African semi-professional players (SP) (n = 69) and professional players (P) (n = 49), English County professional players (CP) (n = 25) and South African international professional players (SAI) (n = 12) Biomechanical and video analyses were performed on all participant groups. Classifiers were utilised to identify the batting backlift technique type (BBTT) employed by all batsmen. All statistics and wagon wheels (scoring areas of the batsmen on a cricket field) were sourced online. A Pearson's Chi-squared test, Student T-test and T-test were performed in this study. All analyses were performed using R (R Core Team, 2014) at a significance level of  $\alpha = 0.05$ .

**Results and Discussion:** This study found that a LBBT is more common at the highest levels of cricket batsmanship with batsmen at the various levels of cricket having percentages of the LBBT as follows: SP = 37.7%; P = 38.8%; CP = 40%; SAI = 75%;  $p = 0.001$ . This study also found that batsmen who used the LBBT were more proficient at scoring runs in various areas around the cricket field (according to the wagon wheel analysis). A LBBT was shown to positively affect the stance and footwork of batsmen whereby most batsmen have an open stance at the crease.

**Conclusion:** A LBBT is more common at the highest levels of cricket batsmanship. Cricket coaches should pay attention to the direction of the backlift with players, especially when correlating the backlift to various scoring areas on the field. Further research is required to investigate the BBT among batsmen at junior and adolescent levels.

**Key words:** Batting backlift techniques, semi-professional, professional, county, international, stance, scoring areas, cricket batting, cricket

### **P22: The Biomechanics Of The Achilles Tendon: A Digital Image Correlation Study Using A High-Speed Camera**

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**Introduction:** Annually, 5-10 new cases of Achilles tendon (AT) rupture occur per 100.000 people and affects both professional and recreational athletes. However, partial rupture is more common among professional competitors. While many authors have hypothesized on potential weak parts of the AT, there is no scientific consensus.

In the field of experimental biology, methods comparing changes in particular patterns during tensile tests, in real time, are used to assess and describe strain fields of material. The aim of this study was to evaluate the deformations of AT specimens during tensile testing and provide comprehensive biomechanical data describing the strain patterns of the AT in order to identify the weakest parts of the tendon.

**Methods:** The study was conducted on 28 AT fresh-frozen cadaveric specimens. First, black dots were marked on the specimens. Then, the specimens were mounted in a fatigue testing system (Instron). During the tensile biomechanical test, the displacements of particular patterns were observed in real time using a high-speed digital camera (Phantom). Finally, the deformations were evaluated using digital image correlation techniques in the MATLAB environment. The strain was calculated based on distance changes between particular points in time.

**Results:** Both 2D and 3D displacement fields were obtained. The average Young's modulus value was 264.8 MPa. Based on averaged data, a slow motion movie of AT strain during the tensile test was produced. The zones where strain was greatest and lowest were determined. The majority zones most vulnerable to strain were located in the middle portion of the AT. Based on the obtained data, a map of the strains of particular AT regions was generated.

**Conclusions:** The presented biomechanical results on AT weak zones during elongation will allow for an improved understanding of AT physiology in healthy individuals. The obtained findings confirm previous hypotheses regarding weak zones in the middle of the AT, which correlates with the commonly observed clinical picture. These results may help to improve of AT repair techniques and physiotherapy, as well as aid in injury prevention.

### **P23: "What Gives The Achilles Tendon A Spin?" - Anatomy Of The Achilles Tendon And Its Subtendons**

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**Introduction:** Rupture of the Achilles tendon (AT) is a common problem in sports medicine. The anatomical structure of the AT has a strong impact on its pathophysiology and the therapeutic approaches for treatment of its disorders. The AT is made up of three subtendons originating from: (1) lateral head of gastrocnemius, (2) medial head of gastrocnemius, and (3) soleus muscle. Functional loads affect the AT in a very specific way, as the fibers of this tendon are not parallel to the axis of the lower limb. Instead, they descend in an oblique fashion towards their insertion into the calcaneal bone. This study aimed to describe the morphology of the AT (including the torsion of each subtendon) and its insertion.

**Methods:** A total of 116 fresh-frozen, tendon cadaveric specimens were dissected. Microdissection tools were utilized to distinguish and separate the subtendons. A layer-by-layer blunt dissection technique was used to preserve the tendon's fibers. A 3D printed tool designed by the authors was utilized to measure the angle of torsion of each subtendon. Additionally, morphometric parameters of the AT were measured.

**Results:** The mean angle of torsion of the deep fibers was 134.4 and 126.7 degrees, for the GCL and SOL, respectively. In contrast, the mean torsion angle of the superficial fibers originating from the GCM was only 27.1 degrees. There were no statistically significant differences between left and right subtendons. The cross-sectional area of the AT was significantly greater at the level of its insertion into the calcaneal bone than at the level of the musculotendinous junction ( $p < 0.001$ ). The mean length of the AT's insertion point was 45.7 mm and its mean width was 34.4 mm.

**Conclusions:** The anatomy and torsion angle of AT's subtendons are significantly variable among individuals. However, in all specimens examined, the degree of torsion of the AT's superficial fibers was significantly less than that of fibers located in the deeper part of the tendon. Such knowledge is essential for improving surgical reconstruction techniques and for providing a basis for the development of a computer model of the AT.

### **P24: Age-Related Changes In The Anatomy Of The Achilles Tendon Insertion**

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**Introduction:** The insertion point of the Achilles tendon (AT) into the calcaneal bone (CB) is known to be highly variable. However, only a few studies have investigated the cause of this variability. The aim of this study was to evaluate if the AT insertion point on the CB changes with age.

**Methods:** A total of 170 foot and ankle MRI scans were evaluated to assess the AT and its insertion into the CB using the follows measurements: distance from the most inferior point of the CB to the most inferior point of the AT's insertion, length of the AT's insertion, and height of the CB. The age of patients ranged from 4 to 76 years (mean:  $35.64 \pm 13.29$ ). Patients were classified into three groups based on age: (I)  $< 18$ , (II) 18-65, and (III)  $> 65$  years old. Statistical analysis included one-way analysis of variance (ANOVA) and Fisher's least significant difference (LSD) procedure. A p-value of  $< 0.05$  was considered as statistically significant.

**Results:** The mean distances from the most inferior part of the CB to the most inferior point of the AT's insertion were 1.18, 1.44, and 1.57 cm for groups I, II, and III, respectively.

Differences between these groups were statistically significant ( $F$ -ratio=5.13,  $p < 0.01$ ). To confirm the obtained results, the above mentioned distance was divided by the height of the CB and compared. The results of this analysis were also statistically significant ( $F$ -ratio=3.99,  $p < 0.05$ ).

**Conclusions:** This study found that the insertion point of the AT changes with age, with the insertion point of the tendon located more superiorly on the calcaneus bone in older adults as compared to younger individuals. This anatomical variability may influence the biomechanical properties of the tendon and may, in part, explain why AT pathologies are more commonly observed in older adults.

### **P25: High Ankle Sprains. Case Series Of Conservative Treatment With PRP**

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Management of high ankle sprains. Case series involving the use of PRP and its efficacy.

Lervasen Pillay (MBChB) Pret.; (MSc (Med) Sports Med) Wits

**Objectives:** Using PRP in high ankle sprain management helps to reduce pain and augment healing to make for more effective rehabilitation and quicker return to play.

**Methods:** Athletes were assessed and either clinically, dynamic xrays, ultrasound or MRI . Diagnosis of high ankle sprain was made involving AITFL, PITFL, ITL, IOL or combinations. A standard rehabilitation was done with all athlete including acute management, non weight bearing booting, early mobilisation and proprioception together with a strength program. A visual assessment pain scale was used to monitor pain and progress rehabilitation accordingly. Those athletes that were out for a longer period than 10 days had a cardiovascular/fitness program added to their rehabilitation.

**Results:** Over 6 seasons a total of 55 high ankle sprains were treated of a total of 597 athletes (9.2% or 1.3 injuries per 1000 playing hours) in sub-elite and elite football players. A total of 42 players opted for PRP treated .Twelve opted for conservative treatment. One was surgically treated. Grade 1 strains 21 athletes opted for PRP treatment with an average return to play of 7 to 10 days with. The remaining 8 athletes opted for conservative treatment with return to sport 3 to 4 weeks. Grade 2 sprains had 20 athletes opting for PRP treatment and return to sport was 3 weeks. The remaining 2 athletes returned to sport in 6 weeks. Grade 3 sprains, one was treated surgically, one opted for conservative treatment and one athlete considered PRP treatment. The surgically treated athlete returned to sport at 8 weeks. The conservatively treated athlete returned to sport in 12 weeks. The PRP managed athlete returned to sport in 8 weeks. None of the patients suffered re-injuries and they follow a regular proprioception program after rehabilitation.

**Conclusion:** Using PRP as an adjunct in conservative treatment appears to allowing for earlier return to sport without high risk of re-injury. Conservative treatment may be comparable to surgical treatment in more severe injuries.

## **P26: The Use Of Regenerative Medicine Techniques In The Treatment Of Hip Labral Injuries: A Case Study**

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**Background:** This case highlights the consideration of use of non-surgical management in hip pathology using prolotherapy in the difficult to manage case.

**History:** A 31 year old elite endurance runner presented with ongoing and worsening right hip pain and posterior thigh pain for a period of 5 months. Non clinical aspects revealed the athlete suffering from a depressive mood as she had not been active for 5 months.

**Management:** The patient presented 5 months later with the above history. Available information revealed a anterosuperior labral detachment. The antero-lateral approach of the hip joint was used to infiltrate 2.5mls of 50% dextrose water together with 5mls of 2% Lignocaine (prolotherapy) using a 5ml syringe and a 20G spinal needle. This was done under ultrasound guidance.

The athlete was advised to start returning to road running, progressing from minimal mileage at slow pace to normal from after the 48 hours rest period post injection. During this progressive load period she should continue with strength and flexibility exercises prescribed to her.

**Response to management:** The athlete began the return to sport process after 48 hours and after 6 weeks revealed a full pain free range of movement of the hip running an average of 120 kilometres per week at an improved pace of 3.50 minutes per kilometre. Less than one year later, the athlete had no returning issues, place in a local half marathon and achieved a personal best at a european meeting.

**Conclusion:** Sports Medicine Practitioners should revisit the idea of using cost effective prolotherapy (with dextrose and lignocaine) as a treatment option especially in those athletes who are not improving with conventional treatment approaches and have no surgical treatment indication.

**Keywords:** Hip Labrum, Prolotherapy, Hip Pain, Runner Hip

## **P27: Exercise Therapy: Effectiveness On Activities Of Daily Living On HIV Lung Disease Patients**

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**Background:** Pulmonary conditions are opportunistic diseases in HIV patients, because of their pathology they seem to make the patient frail and decreasing their participation in performing Activities of Daily living (ADLs) thus decreasing Health Related Quality of Life. HRQL does predict survival of these patients. The effectiveness of a specific physiotherapy exercise therapy on patients with HIV related Lung diseases in Dr George Mukhari Academic Hospital (DGMH) are unknown and thus creating a gap for rehabilitation.

**Aim:** The study aimed at measuring the effectiveness of an exercise therapy on activities of daily living in patients with HIV related lung disease.

**Methods:** An experimental design comprising of one group pre and post-test was done. Three phases were used: Pre and Post Evaluation measured with St George's Respiratory Questionnaire (SGRQ) and a Six week Intervention using Australian Lung Foundation Pulmonary Toolkit (ALFPT) exercise program.

61 patients were selected using sample of convenience from the population. Data was analysed using SPSS version 21.0 and SGRQ manual. The significance level was set at 0.05

**Results:** The participant's age ranged from 22 to 67 years old with mean age of 42.92 and SD  $\pm$  9.105; there were more females (60.7%) than males (39.3%). Common diagnosis was PTB at 73.8%. Thirty percent (30%) of the participants felt breathless when doing daily activities pre intervention which improved post intervention with only 2% feeling the symptoms. House work was reported to take a long time or having to stop for rests in between with fifty nine percent (59%) of the participants, only twenty six percent (26%) remained the same after intervention. Initially fifty four percent (54%) felt uncomfortable playing sport which limited their social integration which improved post intervention when only eleven percent (11%) remaining.

**Conclusion:** The study shows that exercise therapy improves participatory in activities of daily living in patients who have HIV/AIDS related lung diseases.

**Implications:** There needs to be specific physiotherapy pulmonary rehabilitations programmes for patients with HIV related lung diseases to improve their quality of life.

## **P28: Resistance Training Reduces T Helper Cytokine Levels But Not Cardiometabolic Risk Factors In HIV-Infected Individuals Receiving ART.**

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**Background:** Lipodystrophy syndrome and cardiometabolic diseases are conditions that affect HIV-infected individuals on antiretroviral therapy (ART). A shift from T helper (Th) 1 to Th2 cytokine profile is associated with disease progression and has been linked with lipodystrophy. The aim of this study was to determine the effect of combined resistance training and whey protein on body composition, Th1 and Th2 cytokines and cardiometabolic risk in HIV-infected individuals receiving ART.

**Methods:** Forty HIV-infected participants (40.8 ± 7.7 yrs, 70.8 ± 16 kg, BMI 30.9 ± 7.2 kg/m<sup>2</sup>) receiving ART (≥ 18 months) were randomly assigned either whey protein/progressive resistance training (PRT) (n=18), placebo/PRT (n=14) or as a control (n=8). Participants received either 20g whey or placebo (maltodextrin) pre and immediately post each PRT session. Whole body RT was performed 2/week for 3 months with loads progressing from 40-85% of one repetition maximum (1RM). Measurements including height, weight, waist and hip, DEXA and 1RM testing were performed (pre = T1) and after 3 months (T2) PRT program and 3 months (T3) following cessation of the PRT program. Additionally, venepuncture was performed to measure systemic immune, inflammatory and cardiometabolic risk markers. Statistical analysis included two-way ANOVA with multiple comparisons in the PRT groups and one-way ANOVA with repeated measures in the control group. Alpha was set at p ≤ 0.05.

**Results:** There was a significant (p 0.001) main effect of time for PRT groups and control group for the HOMA-IR index. Post-hoc testing demonstrated that HOMA-IR index significantly increased in all 3 groups. There was a significant (p = 0.05) main effect of time for PRT groups for the Th2 cytokine IL-10. There was a significant main group effect for CD8% (p = 0.05), IL-10 (p = 0.01), IL-13 (p = 0.05) and IL-12 (p = 0.02). Post hoc testing revealed a significant group effect with placebo/PRT lower over the 3 time points for IL-10 (p = 0.008) and IL-12 (p = 0.016).

**Conclusion:** HIV serves as both a metabolic and an inflammatory challenge. Our study demonstrated that a PRT programme can decrease anti-inflammatory and pro-inflammatory cytokines possibly reflecting reduced systemic inflammation in HIV-infected individuals.

### **P29: Oat Beta-Glucan: An Alternate Cholesterol Management Nutrient For Athletes**

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The results from the SANHANES (South African National Health and Nutrition Examination Survey) data published in August 2013 typically display a cholesterol crisis. One out of four participants 15 years and older have an abnormally high serum total cholesterol (23.9%) and LDL cholesterol (28.8%), and one out of two an abnormally low HDL cholesterol level (47.9%).

Hypercholesterolemia is a major risk factor for cardiovascular disease

Statins are the most widely used drugs to lower blood cholesterol in people with hypercholesterolemia. Muscle symptoms such as pain (myalgia), myopathy and rhabdomyolysis are the most common side effects of long term statin treatment. Statin-related muscle symptoms (pain, weakness and injury) may be significantly exacerbated by intense physical activity and these symptoms are further enhanced by age

An alternative treatment for athletes with hypercholesterolemia is thus warranted in many cases.

Bioactive oat beta-glucan has been proven to reduce blood cholesterol levels. High cholesterol is a risk factor in the development of coronary heart disease. A European Food Safety Authority (EFSA) article 14 claim exists for oat beta-glucans inferring a reduction in the risk of heart disease. This benefit is achieved with a daily intake of 3g bioactive oat beta-glucan.

Additionally, an EFSA article 13.1 approval exists for oat beta-glucans for blood glucose control and gut health. Oat beta-glucan has been shown to prolong glucose absorption which may affect energy supply in endurance exercise, may increase time to exhaustion and recovery from fatigue. Oat beta-glucan should thus be considered in terms of cholesterol management, glucose control and gut health for athletes

### **P30: Release Parameters Of The Best Jump Shots In Elite Male Zimbabwe Basketball Players.**

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This study investigated release parameters (RPs) (angle of release (AOR), velocity of release (VOR), height of release (HOR) and spin of release (SOR) of the clean shot (CS), scored by Zimbabwe male league basketball players (ZMLBBPs). CS represents the most accurate jump shot (MAJS). Data for the study was collected from 26 male players, randomly sampled from the Bulawayo Basketball Association. Each player executed ten successive and uncontested jump shots (JSs) each from the free throw line. These shots were videotaped in the sagittal plane, using standard videography protocols. A Panasonic camera (model VDRD1160) placed 10.7 m away from, and perpendicular to the plane of motion of the subjects and mounted on a tripod 1.9 metres high, was used to capture the JSs. Mean (± s.d.) values of AOR, VOR, HOR and SOR were computed from the video data to describe the RPs of MAJS made by ZMLBBPs. The study found that the RPs (AOR, VOR, HOR and SOR) of MAJS made by ZMLBBPs were 55.5±8.4°; 5.4±1.33/s; 2.5±0.4m and 3.6±1.6 rev/s. It is concluded from the study that MAJS of ZMLBBPs are executed using comparable AORs, very low VORs, low HORs and high SORs in comparison to RPs used by players elsewhere, in executing JS. It is therefore recommended that ZBBPs design practices that compel players utilize high VOR, and high HOR when practicing for JS and that ZMLBBPs coaches use height as a criterion for selecting players for BB.

**Keywords:** Basketball, jump shot, velocity, successful shots, angle, spin

### **P31: Selected Release Parameters Of The Clean Shots Executed By Male League Zimbabwe Basketball Players.**

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Basketball is very popular in Zimbabwe. Shooting, an important skill in this sport, is achieved performing mostly the jump shot (JS). The low conversion rate of this shot suggests that Zimbabwean league basketball players have difficulties in executing JS. JS can be performed with varying levels of accuracy, the most accurate of which is the clean shot (CS), in which the ball is shot into the hoop without touching either the rim or the back-board. This study investigated release parameters angle of release (AOR), velocity of release (VOR), height of release (HOR) and spin of release (SOR), used to perform the CS by Zimbabwe male league basketball players. Data for the study was collected from twenty six male players recruited from the Bulawayo Basketball Association league. Each player executed ten successive and uncontested JSs from the free throw line. The shots were videotaped in the sagittal plane, using a Panasonic camera, model VDR D1160, placed 10.7m away from, and perpendicular to, the shooting plane of the subjects, and mounted on a tripod 1.9 meters high. Fifty six CSs were selected for processing and analysis. The video-

data obtained from the CSs selected were reduced to single units of analysis using ANY CONVERTER software, and then analysed for release parameters using Quintic Coaching 4.07 v 17 motion analysis software. Mean ( $\pm$  s.d.) values of AOR, VOR, HOR and SOR, parameters used to characterize the CSs, were found to be  $55.5 \pm 8.4^\circ$ ;  $5.4 \pm 1.33/s$ ;  $2.5 \pm 0.4m$  and  $3.6 \pm 1.6$  rev/s, respectively. The study further found that Zimbabwean players execute CSs using AORs which are similar to, VORs and HORs which are lower than, and HORs and SORs which are higher than, the same RPs used by players elsewhere, in executing the same shot. It is recommended that Zimbabwe basketball coaches design drills practicing JS that will compel players to utilize high VORs and HORs and low SORs, and that the same coaches use height as one of the criteria for identifying basketball players.

**Keywords:** Basketball, jump shot, velocity, successful shots, angle, spin

### **P32: Effects Of Exercise Intensity On Heart Rate Variability In Children**

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**Background:** The associated health benefits of exercise correlate to intensity rather than duration of exercise. Vigorous exercise intensity has received a lot of interest in cardiovascular autonomic adaptations. However, paediatric research on intensity-based prescription for autonomic adaptation are inconclusive. The purpose of this study was to investigate the effects of three isocaloric exercise programmes on heart rate variability in children.

**Methods:** One hundred-and-nine children ( $11.07 \pm 0.81$  y) were conveniently assigned to one of four groups 1. Moderate continuous intensity training (MCIT, n = 29) at 65% – 70% predicted maximum heart rate (MHR) 2. High intensity interval training (HIIT, n = 29) at > 80% predicted MHR and 3. HIIT and MCIT combined (HIIT + MCIT, n = 27) 4. Control group (CT, n = 24). All exercise groups trained for three sessions per week for 5 weeks, a total of 15 sessions. Heart rate variability was analysed with a Suunto t6 heart rate monitor. Linear data was computed in time and frequency domains, and quantitatively from the Poincare plot analysis. Data Analysis A two-way analysis of variance (group x time) was used to evaluate the effects of training on all HRV parameters ( $p < 0.0125$ ). Effect sizes (ES) were calculated to assess the magnitude of difference.

**Results:** Time domain HRV analysis revealed significant group x time interactions in IBI ( $p = 0.0001$ ), SDNN ( $p = 0.0003$ ), RMSSD ( $p = 0.0001$ ), NN50 ( $p = 0.0015$ ) and Pnn50; ( $p = 0.0002$ ). RMSSD was significantly higher in HIIT ( $94.41 \pm 38.32ms$ ; ES = 2.69) than in MICT ( $70.15 \pm 47.82ms$ ; ES = 1.75) and HIIT + MICT ( $67.71 \pm 37.28ms$ ; ES = 1.06). HIIT also showed superior results in IBI (ES = 2.94) SDNN (ES = 2.22) NN50 (ES = 2.47) Pnn50 (ES = 2.78) and SD1 (ES = 2.69) compared with MICT and HIIT + MICT.

**Conclusion:** HRV appears to be strongly influenced by exercise intensity with HIIT showing greater parasympathetic modulation in time domain and non-linear parameters of heart rate variability in children.

### **P33: Bridging The Gap Between Inpatient Rehabilitation And Outpatient Health And Wellness In Spinal Cord Injured Patients**

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**Background:** A spinal cord injury is a devastating and life changing neurological event that impacts many facets of life. One of the challenges include healthy living. In South Africa this outcome is seldom achieved due to the lack of physical activity opportunities. Without regular physical activity the physical gains that were achieved in hospital are easily diminished or lost, which contributes to rehospitalisation and prevents community reintegration (Mothabeng, 2011).

**Objective:** To determine whether an intervention based on identified barriers and facilitators to physical activity can be successful in promoting health and wellness in people with a spinal cord injury.

**Design:** An experimental research design incorporating both quantitative and qualitative methodologies was used to execute the study.

**Methods:** A self-developed research questionnaire was used to gather information regarding the barriers and facilitators to physical activity. This data was used to design and implement a 16-week intervention in two different environments (formal exercise setting and community based setting). The success of the intervention was measured by physical tests, the reintegration to normal living index questionnaire and the research questionnaire.

**Subjects:** Fifty-seven people with a spinal cord injury completed the research questionnaire and 16 participants partook in the intervention.

**Results:** The intervention showed that the participants from both groups improved their physical abilities (strength, endurance and functional abilities) and their satisfaction with community participation. The barriers that were identified prior to the intervention were also significantly reduced, especially in the community based group. At the end of the intervention the participants also acknowledged that physical activity was beneficial and important and that they would continue to stay physically active post-intervention.

**Discussion and Conclusion:** People with a spinal cord injury face many barriers in being physically active, however, by reducing the barriers to physical activity a community based physical activity program can be successful in introducing people with a spinal cord injury to healthy living. Although some of the environmental and program barriers remained, the personal facilitators that were identified were enough to ensure physical activity adherence and even led to growth of the groups and the establishment of new groups within other communities.

### **P34: A Comparison Between The Cardiorespiratory Responses Of A Speed Versus An Incline Motorized Treadmill Protocol.**

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**Objectives:** To compare the cardiorespiratory responses attained by elite male university-level distance runners of two maximal aerobic capacity (VO<sub>2</sub> max) graded exercise test (GXT) protocols on a motorized treadmill.

**Design:** A once-off cross-sectional design using elite male university-level distance runners.

**Methods:** Two GXT protocols were used, namely the Adapted Incremental Speed Protocol (AISP) and the Incremental Speed and Incline Protocol (ISIP). Both protocols commenced from a starting speed of 10 km/h, where after the AISP continuously increased by 1 km/h speed increments and the ISIP increased by 1 km/h speed increments up to 15 km/h, after which 1% gradient increases were applied. Both treadmill GXT protocols were performed to complete exhaustion. Cardiorespiratory responses (oxygen consumed, carbon dioxide produced, oxygen utilized, minute

ventilation, heart rate, time to exhaustion and respiratory exchange ratio) were used to determine exercise intensity markers, namely ventilatory threshold and respiratory compensation point (RCP). Rating of perceived exertion was measured after completion of each test level.

**Results:** The VO<sub>2</sub> max value (67.6 vs. 65.0 ml/kg/min), as well as the relative RCP value (64.1 vs. 60.7 ml/kg/min) attained by the ISIP, was statistically and practically higher ( $p < 0.05$ ;  $r > 0.5$ ) than those of the AISP despite the longer time to exhaustion (11.4 vs. 13.6 min) and the longer time to the attainment of RCP (11.1 vs. 8.8 min).

**Conclusion:** The ISIP VO<sub>2</sub> max result exceeded that of the AISP and it is consequently considered the more appropriate GXT protocol to attain the highest cardiorespiratory responses in an elite male university-level distance running population.

### **P35: Measuring Functional Balance In The Elderly: Comparison Of Three Balance Tests**

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**Background:** The global population of men and women over the age of 60 years is estimated to be approximately 841 million, and is predicted to reach two (2) billion by the year 2050. Falls in the elderly often lead to hospitalisation and high medical costs and have been attributed to poor balance. Different balance tests are used to measure balance in the elderly but it is unclear whether these tests are interchangeable with one another to render comparisons possible. The aim of the current study was to compare the Functional reach (FR) test and the Timed-up-and-go (TUG) test, with the Fall Risk measured by the Biodex balance system SD.

**Methods:** A non- experimental, retrospective descriptive correlational design was used. Data consisting of height (cm), weight (kg), waist-hip ratio, BMI (kg.m<sup>2</sup>), FR test (cm), TUG test (sec) and Fall Risk measured with the Biodex SD balance machine, collected in a South African elderly sample (n=31) in 2015, was analysed using nonparametric, descriptive statistics. Spearman rank order correlation was used to assess the relationship between the three (3) balance tests. Alpha was set 0.05 and categories of r classifications were set as weak ( $r < 0.6$ ).

**Results:** A weak relationship with no significant correlation was observed between the FR and TUG tests ( $r = 0.32$ ,  $p = 0.866$ ), FR test and Biodex fall risk ( $r = 0.014$ ,  $p = 0.941$ ), and between TUG test and Biodex fall risk ( $r = 0.349$ ,  $p = 0.055$ ).

The TUG test classified all the participants as low fall risk, whereas the FR test and the Biodex balance system SD both classified two (2) participants as high fall risk.

**Conclusion:** The FR, TUG and the Biodex balance assessment cannot be used interchangeably with one another, in an elderly South African population, despite all three (3) tests being considered to be valid and reliable tests to measure balance in the elderly. Further research should investigate the role of obesity on fall risk and the reliability and validity of these balance assessments in the elderly who are overweight or obese.

### **ORAL / "FLASH" POSTER PRESENTATION**

#### **PP1: The Effect Of Unilateral Transtibial Amputation On Locomotion And Postural Stability: A Systematic Review**

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**Introduction:** The locomotion and balance of trans-tibial amputees are affected by numerous factors. These factors may either positively or negatively influence the functional ability of this population. In order to implement relevant and effective rehabilitation programmes it is important to gain an understanding of the extent and manner in which the functional ability of trans-tibial amputees is affected. The purpose of this review was therefore to systematically review the literature available relating to the biomechanics of walking gait and postural stability in terms of muscle activation, asymmetry and the effect of rehabilitation methods in trans-tibial amputees.

**Methods:** Three databases were used for the literature search including Pubmed, CINAHL and MEDLINE. Google scholar was used to find additional articles pertaining to the subject. MESH terms including, unilateral trans-tibial amputees, gait, EMG, kinematics, balance and asymmetry. Titles and abstracts went through an individual two person review process according to strict criteria agreed upon beforehand. Articles fitting the criteria then underwent a full review with refined criteria by the same two reviewers.

**Results:** The review of the literature indicated that the walking gait of trans-tibial amputees in comparison to that of able-bodied counterparts is greatly affected. Several articles indicated that trans-tibial amputees have an asymmetrical gait and that the compensations negatively affect the functional ability of this population. One article however discussed that the asymmetry in step length and the foot forward placement found may be a functional compensation to help decrease the risk of falls. It was also made evident through the literature that factors including, prosthetic foot type, the socket fit and age may influence gait and postural stability in unilateral trans-tibial amputees.

**Conclusion:** Along with the external factors that may influence the gait or postural stability of unilateral trans-tibial amputees it is clear that the loss of structure and musculature results in asymmetrical and compensatory movement patterns. Unfortunately, there is limited research relating to the comparison of rehabilitation techniques of unilateral trans-tibial amputees. Future studies should aim to differentiate the efficacy of different rehabilitation strategies based on the age of the amputee.

#### **PP2: The Use Of Heart Rate Variability And Recovery To Determine The Fitness Levels Of A Cohort Of University-Level Rugby Players**

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The purpose of this study was to determine if heart rate variability (HRV) and heart rate recovery (HRR) can be used to determine the fitness levels of a cohort of university-level rugby players. 24 university-level rugby players (age  $20.1 \pm 0.41$  years; height  $182.70 \pm 6.20$  cm; weight  $89.70 \pm 12.70$  kg) of a South African University's Rugby Institute participated in the study. HRV was measured with the BioForce Heart Rate Variability System (Performance Sport Inc., Washington, USA) using a Fix Polar Heart Rate Transmitter Belt (Polar team pack, Polar Electro Oy, Kempele, Finland) as well as a wireless receiver and software that was downloaded on an iPad. During the test day players' fasting baseline HRV (baseline HRV) values were taken. This was followed by the post-breakfast HRV measurement (Pre-Yo-Yo IR1 HRV). Players were then required to perform the Yo-Yo Intermittent Recovery Test Level 1 (Yo-Yo IR1) while they were fitted with a portable gas analyser apparatus (Cosmed K4b2). After completion of the test, HRR was taken after 1 and 3 minutes as well as their HRV (Post-Yo-Yo IR1 HRV). Significant correlations ( $p \leq 0.05$ ) were found between Pre-Yo-Yo IR1 HRV and heart rate (HR) at the respiratory compensation point (RCP-HR (bpm)) ( $r = -0.468$ ) as well as oxygen

uptake at the RCP (RCP-vo2max (% of vo2max )) ( $r = 0.476$ ), respectively. A forward stepwise regression analysis showed that HR at ventilatory threshold 1 (VT1-HR (bpm)) contributed significantly ( $p \leq 0.05$ ) to the post-Yo-Yo IR1 HRV with a variance of 39.8%. The final Yo-Yo IR1 level also contributed significantly ( $p \leq 0.05$ ) to the 3 minute post-Yo-Yo IR1 heart rate recovery (HRR) with a variance of 16.5%. In conclusion, HRV and HRR have the potential to act as affordable and easy measurement tools of team sport participants' fitness levels.

### PP3: Big Data Analytics In Sport, Exercise And Physical Activity: A Systematic Review

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**Introduction:** Computational Sport is a new discipline applying systematically big data analytics to sport, exercise and physical activity. Advances in sensing technology have improved our ability to continuously monitor health, physiological and performance indicators. Although many people are now collecting a wealth of activity, nutrition, and health data from devices, apps and internet-enabled equipment, and may also be using data science methodologies for analysis; big data analytics in the areas of sport, physical activity, exercise and medicine is highly fragmented. The aim of this study was to perform a systematic review of big data analytic technologies and methodologies and their application in the areas of sport, exercise and physical activity.

**Methods:** We conducted an electronic search of peer-reviewed studies published in "PubMed" until 31 July 2017 using combinations of search terms relevant to big data analytics AND physical activity/sport/exercise. Studies were included if they were published in English, involved human participants and included 1) the measurement of, or outcome measures related to engaging in physical activity, exercise or sport and 2) data analysis, or the assessment of analytic techniques involving one or more big data analytics methodologies. Reviews, editorials and protocols were excluded.

**Results:** The initial electronic search retrieved 594 studies, and after applying exclusion and inclusion criteria 285 papers were reviewed. Preliminary results of this review suggest that approximately one third of studies applied big data analytics to activity classification/recognition, a quarter applied these techniques to prediction/forecasting and another quarter to the validation of indirect measurements, with 10% being applied to the characterisation of traits.

**Conclusion:** Big data technologies have potential to provide insight into people's actions and to determine patterns and predict future outcomes and trends. Examples include assessing the efficacy of new interventions designed to change health behaviours, or to prevent and manage injuries and illness, and improve performance in participants of sport and exercise. In so doing they may have a profound impact on how we address lifestyle diseases, how we create personalised and predictive medical care, and how we contribute to knowledge advancement in sports to achieve high performance outcomes.

### PP4: If The Shoe Fits... Should You Wear It? A Calcaneal Stress Fracture In A Female Recreational Runner

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**Case History:** A 43-year-old female, recreational runner presented with severe tenderness of the right calcaneus. She had been running for the past 12 years with no account of severe injury. On further history, it revealed that she had recently changed from a conventional shod- to a true minimalist type running shoe. Within 3 weeks of this conversion she had completed a 21km and 5km race respectively. The day after completion of the 5km race she struggled to weight bear on her right foot.

**Physical examination / findings:** On examination, she had unilateral, generalised tenderness over her right calcaneus.

Differential diagnosis:

Stress fracture of the calcaneus

Plantar fasciitis

Bruised heel

Heel spur

Retrocalcaneal bursitis

**Test results:** Magnetic Resonance Imaging (MRI) of the hind foot showed a linear STIR-hypointense line extending from the posterosuperior to the anteroinferior aspect of the calcaneus indicating a complete fracture of the right calcaneus, with associated bone marrow oedema. A DEXA Bone scan revealed normal Bone Mineral Density (BMD) and the relevant blood tests were all within the normal range.

**Final diagnosis:** Complete fracture of right calcaneus

**Discussion:** There has been a trend amongst runners towards minimalist shoes, which have possible performance benefits and may potentially reduce injuries through strengthened musculature, reduced forces, and a more natural gait. The benefits and risks related to minimalist shoes has been a much-debated topic in recent years. In the transition period of moving between traditional and minimalist footwear, there may be added stress placed on the bones as there is reduced cushioning and often there needs to be a transition from rear-foot strike to mid-foot or fore-foot strike.

Calcaneal stress fractures are the most common stress fracture of the foot in women, typically occurring in distance runners. In the case of this recreational runner, the stress fracture developed in a few weeks following the change in her shoe type and progressed to a completed fracture of the calcaneus. Following a period of no/low weight bearing, a graded return to sport programme was followed successfully without incident.

### PP5: Endocrine Response To Small-Sided Games And Match Play In Elite U19 South African Soccer Players

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**Purpose:** Small-sided games (SSGs) are used worldwide with the intention of stimulating significant physiological adaptations in players that are specific to match demands. The external load of SSGs and matches in soccer is well documented, but far fewer studies are aimed at measuring the internal response to these activities. The endocrine response to SSGs and matches in soccer is less well known although the respective

hormones; cortisol, testosterone and dehydroepiandrosterone (DHEA) provide a valid measure of training load and total stress in several other methods of exercise. This study aimed to measure the internal endocrine response to training and matches and identify any variations between playing position and whether SSGs were preparing the players for match demands.

**Methods:** 22 elite male soccer players (16–23 years old), divided into positional subcategories of goalkeeper (n = 4), defender (n = 7), midfielder (n = 5), and attacker (n = 6) provided saliva samples; at rest, in response to 11v11, 7v7, and 4v4 SSGs, friendly and competitive matches, and a yoyo level two intermittent endurance test (Yoyoll). Cortisol, testosterone, T:C, and DHEA concentrations were analysed using an ultra-high-performance liquid chromatographic method with mass spectrometric detection in response to small-sided games and matches. Statistically, hormones were analysed through one and two way ANOVA's to compare different time points and positions.

**Results:** Cortisol (ng/ml) increased significantly ( $0,70 \pm 0,40$  SD to  $3,94 \pm 3,26$  SD) from resting values in response to competitive match-play immediately after the match amongst the squad as a whole ( $p < 0.01$ ). Cortisol increased significantly during all small-sided games ( $p < 0.05$ ). T:C ratio (ng/ml) significantly decreased ( $0,89 \pm 1,93$  to  $0,19 \pm 0,28$ ) from resting values in response to competitive match-play ( $p < 0.01$ ) while testosterone showed no significant changes in response to match-play. No significant differences were found between the endocrine response of all positional subgroups over any SSGs or matches. DHEA presented no significant changes between all time-points and T:C ratio remained constant throughout the eight month testing period. SSGs presented no significant differences in endocrine response based on the number of players on the field. Yoyo2 produced comparable endocrine response to those at rest amongst the squad as a whole.

**Conclusions:** SSGs do not prepare soccer players for matches because they do not stimulate the same stress response than matches. The stress response is likely correlated to more than just physical exertion, therefore cortisol could be used as an indicator of total stress including anxiety and emotional stress as opposed to physical stress alone. Different positions do not result in different internal responses to training and matches regardless of differing external positional requirements. SSGs as a method of training seems to present no risk of overtraining. Future studies should seek to correlate cortisol, testosterone and DHEA with other, more affordable measures of internal training load or be used in conjunction with external training load measures. Future studies should perform repeated testing on smaller study samples due to the high intra-individual variability of endocrine response between time-points.

**Keywords:** Small-sided games; T:C ratio; match-play; soccer

### PP6: Effects Of Regular Aerobic Exercises On Lung Function In Zimbabwean Elderly Men

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**Background:** In healthy elderly persons, effects of natural aging, obesity, physical inactivity and pathological effects that may have arisen from youth are the main factors that affect respiratory function. The present study aims at evaluating the effect of regular aerobic exercise training on improving lung function in elderly people.

**Materials and Methods:** Twenty-two elderly men with low level physical activity were the subjects. A digital scale (Seca 710R) was used to measure weight (kg), height was measured by stadiometer (cm) and BMI ( $\text{kg}/\text{m}^2$ ) was calculated. Respiratory indices were mild: forced expiratory volume in one second (FEV1), forced vital capacity (FVC), and FEV1/FVC ratio in 1 second ere FEV1 control group  $3.19 \pm 0.30$  and  $3.19 \pm 0.30$ ; intervention group  $3.12 \pm 0.22$  and  $3.13 \pm 0.22$ . FVC control group  $3.35 \pm 0.21$  and  $3.38 \pm 0.39$ ; intervention group  $3.53 \pm 0.43$  and  $3.62 \pm 0.43$ . Both FEV1 and FVC indices did not reach the predicted values. There were no significant differences in pre and post exercise respiratory indices in the control group. There were notable improvements in respiratory indices with a positive correlation to maximum voluntary ventilation (MVV) improvement. Notable significant improvements in continuous aerobic exercises in the intervention group in FVC, FEV1 and MVV compared with members' pre-exercise values ( $p \leq 0.01$ ). Insignificant differences were found between the 2 groups in relation to pre and post exercise measures.

**Conclusion:** Appropriate aerobic exercise training can moderately improve lung function by strengthening the muscles of respiratory muscles. Therefore, regular physical activity progressively delay the age-related deterioration of lung function and promote healthy aging.

**Key Words:** FVC, FEV1, MVV, BMI, Aerobic exercise

### PP7: Schedule 5 Drug Fluoxetine In Dietary/Nutritional Supplements – Storm In A Teacup Or Requirement For Improved Regulation And Accelerated Enforcement?

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**Introduction:** Dietary/ Nutritional supplements have become popular in use by a spectrum of different consumers, including the elderly as a 'new' market. The elderly numbers have been increasing from 35 million in 2000, to a projected 69 million by 2030. Dopamine, serotonin, and epinephrine, neurotransmitter homeostasis is important in the 'healthy' physiological continuum of all ages. Imbalance in these neurotransmitters, over time, manifest in various 'disease' states, such as Obsessive Compulsive Disorder, Parkinson's disease, and Schizophrenia. In context, dietary/nutritional supplements may contain contaminants/adulterants that could distort the 'normal' equilibrium of neurotransmitters. Therefore, for this investigation fluoxetine a Schedule 5 (South Africa) selective serotonin reuptake inhibitor (SSRI) drug was investigated. The extent of fluoxetine as contaminant/adulterant in dietary/nutritional supplements is not widely known. Further, fluoxetine prescriber caution for treatment (elderly), are adverse effects, particularly CNS effects, such as nervousness, agitation, anxiety or excessive sedation, and insomnia. The aim of this study was to determine whether commercially available dietary/nutritional supplement products contained fluoxetine, even though the manufacturer may not declare this on the product label.

**Methods:** A total of 138 dietary/nutritional supplements products formed part of the assessment. The products were laboratory analysed for fluoxetine, as part of an extensive multi-compound 'screen', using Tandem Liquid Chromatography Mass Spectrometry. The concentration of fluoxetine was then estimated via calibration curve standards, which formed part of the extraction and analysis.

**Results:** The number of 'positives' for the tested products for fluoxetine in the overall cohort was 54%, for South African produced products 67%, and, for imported products, bought in South Africa 56%. The median concentration estimate for fluoxetine in the products were,  $3.9 \mu\text{g}/\text{g}$  for the overall cohort,  $5.2 \mu\text{g}/\text{g}$  for South African produced products, and  $20.1 \mu\text{g}/\text{g}$  for imported products, bought in South Africa

**Conclusion:** The number of products containing fluoxetine should place dietary/ nutritional supplement products under greater scrutiny. Further research pertaining to fluoxetine and its' metabolite, with respect to, (i) product prescribed dosage, (ii) actual dose consumption, and, (iii) the potential link to adverse health consequences physiologically becomes important. Rigorous monitoring and vigilance, by health safety authorities, for fluoxetine (metabolite) and other SSRI's in dietary/nutritional supplement products should be mandatory.

### **PP8: An Integrated Investigation Into The Determinants Of Putting Success: A Biomechanical, Cognitive And Anthropometric Approach**

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Golf is a game that requires gross motor outputs as well as fine motor control. When putting, accurate decision making, fine motor control and a fluid stroke are thought to be associated with improved accuracy. With more than forty percent of the game played on the putting green, putting accuracy is often the difference between winning and losing. Therefore, understanding the mechanisms that promote accuracy of the putt are important to advance training and competition performance. The aim of the current investigation was to identify key biomechanical, physiological, anthropometric and cognitive variables that promote putting accuracy. Further aims were to determine if these factors varied by a factor of putting distance. In a cross-sectional laboratory setting, 30 amateur golfers completed ten one meter (short) and ten three meter (long) putts on an artificial putting surface. Before putting, participants completed tests for executive function (Stroop word-colour interference), visual acuity, hand and eye dominance. Additionally, resting heart rate variability and anthropometric data were recorded prior to putting. During the putting stroke, a three-dimensional kinematic analysis system assessed club, hand and arm angles and their associated velocities. In the 20 seconds preceding each putt, heart rate variability was also recorded. Correlation analysis (Pearson) for short and long putts compared putting accuracy with each dependent variable. The study is still in the data collection phase and results will be collated and presented at the conference in October.

### **PP9: The Effectiveness Of The South African Sport Academy System Towards High Performance Sport Development**

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In most countries with high success rates in Olympic sports, High Performance Sport policies have shifted towards becoming more systematic and scientific, encouraging an institutionalist design of elite sport. In recent years, there has been growing interest from both researchers and policy makers alike, in determining international success of elite sport due to this evident shift worldwide. Sport operates in an open system that is significantly influenced by social, cultural and economic conditions of a country, which may be perceived as confounding factors influencing each nation's international sporting success separately. In literature, an elite sport development system is often a description of established practices with little regard for effectiveness, or its operations and relationships within its specific environment. This study investigates elite sport success dimensions, contextual factors and power relationships between stakeholders in South African sport. This project will apply the evaluation of sport policy effectiveness and advance current literature by analyzing the pragmatic approach of a theoretical framework. The Sport Policies Leading to International Success (SPLISS) model, which is a validated multi-dimensional comprehensive framework linking sport policy to success, is paralleled to this study. The convergent parallel mixed methods design is used to collect data at multiple points of the input-throughput-output phases. The policy analysis results in phase 1 revealed 53 success dimensions, which ultimately is the foundation of high performance sport in South Africa. The theories guiding the methods in phase 2 will be the systems theory, resources dependence theory and inter organisational relationships theory. In conclusion, this study intends to systematically address all factors aforementioned to identify how these aspects influence the elite sport policy effectiveness in South Africa as developing country. This will describe the environment of elite sport as a whole.

**Key Words:** High Performance sport, sport policy, effectiveness

### **PP10: Participation Likelihood Assessment Tool For Wheelchair Basketball**

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**Introduction:** Enhancing participation in wheelchair basketball (WB) needs a proactive approach, it is important that administration seeks objective information on potential participants for the sport.

**Purpose:** The development of a tool to be used as a practical and inexpensive means of gathering information on the probability of one being a WB player.

**Methods:** Using snowballing to identify research contributors, 137 respondents (106 participants and 31 non-participants) comprising 95 males and 42 females, ranging in age, from 19 to 58 years, were surveyed utilising three questionnaires: (a) Perceived Accessibility to Facilities Questionnaire (PAFQ), (b) Exercise Benefits Scale (EBS) and (c) Barriers to Exercise Scale (BTES). The non-parametric Wilcoxon rank-sum (Mann Whitney U) test, was used to establish if there were any areas of significant ( $p \leq 0.05$ ) differences in perception between participants and non-participants. Discriminant function analysis was performed as a multivariate test of differences between participants and non-participants and predictive discriminant analysis was used to determine the minimum number of dimensions needed to describe these differences.

**Results:** A 19 item Linkert scale ["1=Strongly Disagree to 5=Strongly Agree"] questionnaire, was developed. Conclusions: Within limited resources, an acceptable concise and expedient screening instrument (the PLAT - WB) was developed, which could be refined further to counter potential limitations.

**Key Words:** Analysis, Perception, Participation, Restrictions

### **PP11: 20.7% Cyclists Entering A 109km Race Report Risk Factors For CVD, And 3.7% Report Existing CVD: Pre-Participation Screening Among 22 650 Cyclists - SAFER Cycling**

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**Introduction:** European guidelines for the pre-participation screening of masters and leisure athletes are available to identify which athletes who should undergo a medical assessment prior to moderate- to high-intensity sports participation. These guidelines follow a pre-exercise screening process for risk factors of cardiovascular disease (CVD), other chronic conditions, and medication use. The purpose of this study is to determine the prevalence of CVD, risk factors for CVD, presence of other chronic diseases, and other risk factors for medical complications in cyclists participating in a community based mass participation cycling race using current European guidelines

**Methods:** This is a cross-sectional study on entrants that participated in the 2016 Cape Town Cycle Tour (109km). All race entrants (n=37 425) were required to complete an online pre-race medical screening questionnaire. We determined the crude (unadjusted) prevalence (% with 95% CI) of history of existing CVD, risk factors for CVD, history of chronic disease in other organ systems, and other risk factors for medical complications during moderate- to high-intensity sports participation in 22 560 consenting participants (60.3%). Results: 3.7% (3.5-4.0) cyclists reported existing CVD, and 1.1% (0.1-1.2) reported existing symptoms of CVD. Risk factors for CVD were present in 20.7% (20.2-21.3) cyclists and the prevalence of a history of chronic diseases in other organ systems was as follows: respiratory (11.4%; 11.0-11.8), gastrointestinal (5.4%; 5.1-5.7), nervous system (3.4%; 3.3-3.8), metabolic/hormonal (3.8%; 3.6-4.1), kidney/bladder disease (3.0%; 2.8-3.2), blood/immune disease (1.4%; 1.2-1.5), cancer (3.2%; 3.0-3.5), allergies (13.6%; 13.1-14.0). The prevalence of other possible risk factors for medical complications was as follows: chronic prescription medication use (25.3%; 24.7-25.8), use of medication before or during races (8.7%; 8.3-9.0) and a history of collapse (0.8%; 0.7-0.9).

**Conclusion:** Risk factors for CVD were reported by > 20% cyclists entering a community based mass participation cycling race, while 3.7% report existing CVD, and 1 in 4 use prescription medication. We suggest that further research to determine if pre-race medical screening, using the European guidelines, together with educational intervention can reduce the risk of medical complications during community based mass participation cycling events.

### **PP12: Relationship Of ASLR And Functional Movement Deficiencies In Physically Active Individuals With And Without Low Back Pain**

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Over 80% percent of people experience low back pain (LBP), of which 85% go undiagnosed and remain characterized as non-specific LBP. Consequently, researchers are proposing a multimodal approach to the assessment and management of the LBP, and classification of patients based on the functional movement impairment. Active straight leg raise (ASLR) is widely used diagnostic tests for LBP, but there is a lack of evidence of association with other clinical parameters, and functional analyses used in evaluation of LBP. Hence, the primary aim of this study is to investigate association of ASLR test with the movement deficiencies in muscles and joints responsible for lumbo-pelvic stability in populations with and without low back pain. 100 physically active participants with (n=50) and without LBP (n=50) volunteered for the study. One-way ANOVA was used to examine for potential differences between two groups, and multiple correspondence analysis (MCA) to examine the pattern of relationships between the measured variables. Participants without pain had significantly higher ASLR score ( $p < 0.001$ ), demonstrated better hamstring flexibility ( $p < 0.001$ ) and better gluteal activation pattern ( $p < 0.01$ ). On the other hand, participants with LBP had greater incidence of pelvic rotation during knee flexion, and hip internal rotation, relative to participants without LBP ( $p < 0.001$ ). Results also demonstrate that participants with pain scored largely 1 on the ASLR which was also associated with hamstring tightness, calf tightness, limited trunk flexion, hypomobility of the trunk, and posterior pelvic tilt. These findings indicate a strong association of low back pain with functional movement impairment and weakness in movement motor control. ASLR test should be used conjunction with other functional evolution tests to isolate the cause of LBP in physically active individuals.

### **PP13: The Impact Of Barefoot Versus Shod Running On Lower Limb Gait Cycle Pattern Among Recreational Club Runners In Durban, Kwazulu-Natal**

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**Introduction:** Despite health benefits that come with running, injuries are common with prevalence ranging between 18.2% and 92.4% worldwide. Differences in gait patterns between barefoot and shod running, can determine traits that could lead to running injuries. The aim was to assess and compare lower limb gait cycle patterns between barefoot and shod running among runners.

**Methods:** An experimental same-subject study design was used. The study population consisted of male and female adult recreational runners who were injury free from a running club in Durban. A convenience sampling method was used and 14 participants were recruited. The study was conducted in the physiotherapy performance laboratory at the University of KwaZulu-Natal. A Woodway Desmo Treadmill and KinePro gait analysis system were used. Descriptive & inferential statistics were analysed using Microsoft excel and Intercooled Stata.

**Results:** Participants included a greater percentage of females (57.1%, n = 8) than males (42.9%, n = 6). The mean population age was 38.57. A significant difference ( $p < 0.0009$ ) between barefoot cadence (177.9236steps/min) and shod cadence (171.9445steps/min) was observed. Right (0.261s) and left (0.257s) barefoot stand phase was shorter than right (0.273s) and left (0.270s) shod stand phase. Right barefoot swing phase exhibited less significant (0.420s) results when compared to right shod swing phase (0.427s), whereas left barefoot swing phase was quicker (0.416s) than left shod swing phase (0.432s). Significant differences between barefoot and shod stand ( $p < 0.009$ ) and swing ( $p < 0.040$ ) phase symmetry occurred.

**Conclusion:** A considerable difference was found between barefoot and shod running gait cycle patterns among participants. This difference may play a role in prevention of running related injuries.

**Keywords:** Barefoot running, Shod running, Gait cycle pattern, same-subject study design

### **PP14: Lifestyle Risk Profiles Of Primary School Teachers: A School-Based Professional Development Intervention**

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**Introduction:** Usually, teacher's habits and lifestyle at school are well observed by learners. If teachers are free from risk factors such as physical inactivity, tobacco use and alcohol abuse; only then can positive role modelling transmit to learners. The purpose of this study was to evaluate the impact of a professional development intervention on personal profile lifestyle risk factors relating to physical activity, smoking and alcohol consumption of primary school teachers in Zimbabwe.

**Methods:** A convenient sample of 28 primary school physical education teachers with a mean age of 37.9(±6.7) years and mean teaching experience of 9.1(±3.7) years participated in the study. The teachers were randomly allocated to an intervention group (n=15) and control group (n=13). Teachers completed a personal lifestyle risk questionnaire pre and post-intervention. The intervention was designed to introduce content, assessment methods, teaching material improvisation and teaching methods within the existing school curriculum.

**Results:** Results showed that there was a statistically significant difference in post-intervention measures between the intervention and control groups. This included frequency of vigorous exercise (p0.005); time taken per day performing moderate physical activity (p0.005), number of days per week walked for at least 10 minutes (p=0.021), total time spent walking (p=0.047), sitting time (p0.005) after correcting for the pre-intervention measures. After using the Wilcoxon signed rank test on the intervention and control groups separately, the intervention group showed a significant difference in walking pace post-intervention (p =0.008). All teachers did not smoke. There was no effect on alcohol intake, physical and mental health post-intervention.

**Conclusion:** A school-based professional development intervention can improve the lifestyle risk profile of primary school teachers.

### **PP15: Health Related Risk Behaviors Amongst University Residence Student**

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**Background / Context:** South Africa suffers from a double burden of both communicable and non-communicable diseases. The youth risk behaviour survey (YRBS) is designed to increase understanding and awareness of health-related behaviours that lead to high mortality and morbidity rates among the youth. There are very limited surveys conducted on university students in South Africa.

**Aim / Purpose:** The study aims to improve the understanding of risky behaviours that may lead to the development of communicable and non-communicable diseases amongst university residence students.

**Method / What was done:** A qualitative study performed amongst university residence students at 13 different university and two private residences. This student risk behaviours survey was conducted using the YRBS questionnaire, with physical activity profiling done through the IPAQ.

**Results and Discussion:** Seventy eight percent of students reported having had sex, of which 34.1% reported an initiation age of 17 years of age and above. Amongst the students who were sexually active, 22% had sex with more than 2 people whilst 7.3% of students stated that they had had sex with more than 3 people in the last 3 months.

Alarming 42.5% of students reported to have had sex under the influence of alcohol of which only 52% of them reported - using a condom. Amongst 63.4% students believed that being faithful to one partner would protect them from contracting HIV/AIDS, meanwhile 4.9% believed that traditional healers are able protect them against HIV/AIDS.

Thirty percent of students reported not having engaged in physical activity for more than 60 minutes. IPAQ revealed that 52% of the students scored low with regards to physical activity.

**Conclusion / Take home message:** The findings suggest there is a need for more research amongst university residence students. These studies will assist in updating data on priority risk behaviours which will aid in the understanding of student risk profiles and ultimately form part an intervention strategy.

### **PP16: The Effect Of Six Weeks Taekwondo And Strength Training Program On Body Composition And Physiological Parameters In University Taekwondo Athletes**

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**Introduction:** The aim of the study was to investigate the effects of 6 weeks taekwondo training on body composition and physiological parameters in university taekwondo athletes.

**Methods:** Fifteen (n=15) healthy taekwondo athletes with age range of 18 - 25 years participated in the study. Taekwondo and resistance training was performed in 6-weeks, 5 times per week, 1hr morning and 1hr afternoon per day. The participants were pre and post-tested on body composition (weight, height, SS, BMI, skinfolds, and hip to waist ratio) and physiological parameters (blood pressure, heart rate, and VO2max). Data was analysed using paired t test for independent samples.

**Results:** TKD showed a significant improvement (P0.05).

**Conclusion:** Taekwondo training was effective to change many body composition and physiological variables. Although this training can be useful for improving performance and health status of individuals, but complimentary habits such as nutritional interventions are necessary.

**Keywords:** Taekwondo, Physiological parameters, Body composition

### **PP17: Association Between Sport Participation, Body Composition, Physical Fitness And Social Correlates Among Adolescents: The PAHL Study**

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**Background:** Paucity exists about studies on social support, body composition and physical fitness in South African adolescents. The aim of this study was to examine whether sport participation in organizes sports is related to body composition, physical fitness and social correlates.

**Methods:** A cross-sectional data on 238 adolescents (90 boys and 148 girls) with the mean age of 14.9±0.8 years, who were participating in the Physical Activity and Health Longitudinal Study (PAHLS), were collected. The participants were divided into two groups: 'sport participation' (SP) group and 'non-sport participation' (NSP) group. Height, weight, body mass index, percentage of body fat and skinfolds were assessed according to standard procedures. The EUROFIT battery of tests was used to assess standing broad jump (SBJ), bent arm hang (BAH), sit-ups (SUP), sit and

reach (SAR) and predicted VO<sub>2</sub>max. Social Support for Physical Activity (SSPA) questionnaire was used to obtain information on social correlates for physical activity.

**Results:** The results show that NSP group significantly ( $p=0.011$ ) had high sum of skinfolds (SSKF) ( $25.00\pm 12.40$ ;  $33.06\pm 17.74$ ) and %BF ( $20.00\pm 9.67$ ;  $25.63\pm 11.76$ ) as compared to the SP. In terms of physical fitness, SP significantly outperformed the NSP in SBJ ( $165.25 \pm 28.84$ ;  $146.23 \pm 20.79$ ,  $p=0.000$ ), SUP ( $29.19\pm 10.51$ ;  $22.57\pm 10.08$ ,  $p=0.003$ ) and VO<sub>2</sub>max ( $34.25\pm 8.11$ ;  $27.29\pm 6.42$ ,  $p=0.000$ ), with boys were better than the girls. Significant gender different was also observed for the social support ( $19.95\pm 3.16$ ;  $17.04 \pm 3.60$ ,  $p=0.000$ ) with SP been more advantageous than the NSP, especially in boys. Generally, fatness measures were negatively associated with SBJ, BAH, VO<sub>2</sub>max. SAR was positively associated with %BF ( $\beta= 0.17$ ,  $p=0.015$ ) in SP. While in NSP, SAR was negatively associated with BMI ( $\beta= -0.49$ ,  $p=0.009$ ) and SKF ( $\beta=-0.40$ ,  $p=0.036$ ).

**Conclusion:** It can be concluded that adolescents who have had social support and participated in sports performed better in most of the physical fitness. Given the public health benefits associated with fitness, advocacy regarding the importance of 'social support' benefits towards physical fitness are urgently needed.

### **PP18: Exercise As Conservative Treatment For Shoulder Impingement Syndrome: A Systematic Review**

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**Background:** The aim of this systematic review is to evaluate the effectiveness of home-based or supervised exercise as treatment modality for persons with SIS.

**Methods:** Electronic searches were performed in Cochrane Central Register of Controlled Trials (CENTRAL), EBSCO Host, Science Direct, Scopus, PubMed and Web of Science. RCT's, involving male and/or female adults >18 years, with any history of SIS were included. Studies had to evaluate any mode of exercise as treatment modality or exercise in combination with other conservative interventions for treating SIS – only if the results of exercise treatment were provided separate from results for other modalities used. Two authors independently identified potential trials for inclusion, assessed methodological quality and extracted data. We calculated the MD, SMD and an overall effect size of 95% CI using Review Manager 5.

**Results:** Six studies ( $n=475$ ) were included (intervention period 3-12 weeks) and pooled according to the same control group for analyses. Outcomes of interest were pain at rest, pain during movement, shoulder ROM, function and patient satisfaction. One study reported statistically significant improvement favouring the exercise group for pain at rest (MD -1.90; 95% CI -3.36 to -0.44;  $p=0.01$ ) and pain during movement (SMD -0.81; 95% CI -1.18 to -0.44;  $p=0.0001$ ). No significant improvements were reported among groups for the remaining studies. Shoulder ROM was assessed and one study reported statistically significant improvement for medial rotation (MD 9.70; 95% CI 2.34 to 17.06;  $p=0.010$ ) and the remaining ROM measurements showed no significant difference among groups. The results for one study were inconclusive and another study showed no significant difference in active ROM between groups. Studies also indicated statistically significant improvement in laborious function (SMD -0.66; 95% CI -1.02 to -0.29;  $P=0.0004$ ). Two studies showed improvement in function for the exercise group but were not significant. One study showed statistically significant improvement for patient satisfaction for the exercise group (MD 1.20; 95% CI 0.24 to 2.16;  $P=0.01$ ).

**Conclusion:** The available evidence was too sparse and the variability of exercise prescription in relation to the FITT principles too broad to draw conclusions about the effect of specific exercise regimes in treating SIS.

### **PP19: The Carry-Over Effect Of An Aquatic-Based Intervention In Children With Cerebral Palsy**

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**Background:** Cerebral palsy (CP) is the most common motor disability in childhood. Children with CP are more likely to have decreased physical activity levels than their peers, thus they are at risk for negative health implications. However, there is a belief that aquatic exercise can be used for the improvement of the level of fitness among children with CP.

The aim of this study was to determine the carry-over effect of an aquatic-based programme (postural control and balance) on land (walking, running and jumping) in children with CP pre- and post-intervention.

**Methods:** The study was a pretest–post-test randomised groups, crossover design. Ten ( $n=10$ ) Children diagnosed with CP were divided into intervention group ( $n=5$ ) or a control ( $n=5$ ) group. The intervention group participated in two 30 minute sessions a week, while the control group continued with activities as per normal. Pre- and post-intervention testing was conducted using the Gross Motor Function Measure. The ten-point programme of the Halliwick Concept was used.

**Results:** Results demonstrated that the aquatic therapy had a significant effect on the Gross Motor Function Measure score. The aquatic-based group showed increased growth following the intervention compared to the control group ( $z= -2.803$ ,  $p= 0.005$ ). Furthermore, the aquatic-based therapy improved the average score for The Gross Motor Function Measure, post-intervention.

**Conclusion:** In conclusion, an 8-week aquatic-based intervention produced greater gains in gross motor function in children with cerebral palsy, hence producing a significant carry-over effect on land.

### **PP20: Growth Pattern Profile And Motor Performance Of Basic School Children In Sub-Urban Population In Nigeria**

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Growth profile is a significant indicator of pattern of developmental variables in children. The purpose of this study is to collage profile of growth of basic school age children (6-15years) on height, weight, body mass index (BMI), body girths and length. It also aimed at assessing motor performance of the children at their physical growth status. Values obtained would indicate nutritional status, health status and serve as parameter for identification and recruitment of potential athletes. Participants for the study were drawn from public basic schools (primary 1 to junior secondary school class 3) located at sub-urban areas in Nigeria. A multi-stage sampling technique was adopted in selecting a total of 1,300 boys and girls for the study. Measurement of body parameters and performance tests followed the guidelines of ICHPHER.SD Children/Youth Fitness Test Manual (2012) and ISAK (2001). Mean, SD, Range as well as percent count were analysed for each variable. Findings show that high

percentage of the children are underweight for their ages and it is more prevalent in boys. High percentage of them have low height for their ages. High percentage of them fall within normal range of BMI for their ages. There is sequential increase in both girths and length of the body parts with increasing ages though at a rate far below international standard. Children performed better in motor skill requiring repetition but poorly in those that require power.

In conclusion, basic school children in Sub-Urban areas in Nigeria are stunted in growth with low body weight, they need nutritional support. However the children have healthy weight for their height; they are free from problems associated with excess body fat. The category of the children could be focused upon for recruitment into endurance sports training programmes.

**Keywords:** Growth pattern; Motor performance; Basic school children; Sub-Urban population.

### **PP21: Pathways Of Fluid Leakage From The Retrocalcaneal Bursa To The Achilles Tendon - A Radiologic Study With Implications For Brusal Steroid Injections**

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**Introduction:** The retrocalcaneal bursa (RB) lies close to the Achilles tendon (AT) insertion. Its main role is to reduce AT friction during movement. Inflammation of this structure, retrocalcaneal bursitis, is a common clinical problem among athletes and is treated with corticosteroid injections. However, there are several reports suggesting that such injections increase the risk of AT rupture. The aim of this study was to determine whether fluids injected into the RB can spread outside of its anatomical structure.

**Methods:** The study was conducted on 10 fresh-frozen cadaveric specimens. Each specimen's RB was injected (5 under ultrasound guidance, 5 without ultrasound guidance) with 2ml radiological dye (iopromide). Then, four radiographs of each specimen were taken at subsequent time points: immediately after injection, 5 minutes, 30 minutes and 60 minutes after injection. All radiographs were digitally analyzed using ImageJ software.

**Results:** In all injected specimens, the dye injected into the RB spread to the AT. Dye spread was most extensive in two specimens that were injected without ultrasound guidance. The mean expansion of the dye in these two specimens was 4.1 cm superiorly covering a total area of 6.3 cm<sup>2</sup> one hour post-injection. In the other eight specimens, the dye diffused on average 1.0 cm in the superior direction covering a total area of 1.8cm<sup>2</sup>.

**Conclusions:** This radiological study confirms the existence of anatomical connections between the AT and the RB. Moreover, weak zones with especially high leakage (antero-inferior portion of the AT) were observed. Physicians performing injections into the RB should be cautious and be aware that fluids injected into the RB structure can spread outside of it and into the AT. We strongly recommend employing radiological guidance during RB injections.

### **PP22: A Comparison Between The Cardiorespiratory Responses Of A Non-Motorized And Motorized Treadmill Protocol.**

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**Objectives:** To determine which running modality, the motorized treadmill (MT) or the Curve non-motorized treadmill (NMT), will allow elite male university-level distance runners to attain the highest cardiorespiratory responses.

**Design:** A once-off cross-sectional design using elite male university-level distance runners.

**Methods:** Two GXT protocols were used to compare the above-mentioned running modalities - the Adapted Incremental Speed Protocol (AISP), performed on a MT, and the Adapted Non-Motorized Incremental Speed Protocol (ANMIP), performed on a Curve NMT. Both protocols started at a speed of 10 km/h, where after the AISP continuously increased by 1 km/h speed increments each 1 minute, and the ANMIP increased by 2 km/h speed increments every 2 minutes until exhaustion. Cardiorespiratory responses were recorded throughout the test from which the intensity markers, the ventilatory threshold (VT) and the respiratory compensation point (RCP) were determined.

**Results:** The maximal aerobic capacity (VO<sub>2</sub> max) value of the ANMIP exceeded that of the AISP significantly (p<0.05; d=2.61; r=0.89) and attained these values within a significantly (p<0.5) shorter time frame (8.31 ± 0.87 vs. 11.42 ± 1.19 min). The percentage of VO<sub>2</sub> max where VT and RCP were attained, was significantly higher (p<0.5) on the ANMIP (84.1 ± 4.3 vs. 97.2 ± 2.4%) compared to the AISP (75.7 ± 7.8 vs. 93.3 ± 3.9%).

**Conclusion:** The ANMIP is perceived as substantially more difficult, both physiologically and psychologically, compared to the AISP. The VT and RCP intensity markers attained by the ANMIP, are not practical for exercise prescription.

### **PP23: Comprehensive Cardiac Rehabilitation And Quality Of Life In Coronary Artery Bypass Graft Patients**

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The overall success of coronary artery bypass graft (CABG) surgery is much dependent on the postoperative rehabilitation. Cardiac rehabilitation (CR) programmes should be comprehensive and multifactorial to enhance education and quality of life of the patient.

This was a quasi-experimental and longitudinal intervention study to which 18 patients who had undergone CABG surgery were referred. Two questionnaires were administered and patients participated in a 12 week exercise programme.

Significant improvements were noted in waist circumference (99.7±8.3 to 97.8±8.8; p=0.042), body fat percentage (22.7±5.3 to 20.5±4.9; p=0.000), resting systolic blood pressure (125.7±13.7 to 119.7±8.9; p=0.000), stairs climbed (3.6±3.5 to 5.9±4.4; p=0.003), duration of exercise per week (329±383.7 to 527±482.7; p=0.001), kilocalories expended per session (827±765 to 1173±699; p=0.001), kilocalories expended per week (2550±1858 to 3996±1849; p=0.000), chair sit-and-reach (0.7±3.4 to 1.3±3.4; p=0.001), up and go (6.0±1.3 to 5.1±1.2; p=0.002), chair stand (13.4±2.3 to 16.2±2.3; p=0.000), maximum workload (82±23.0 to 110±29.4; p=0.000), maximum duration (08:35±02:41 to 11:57±03:51; p=0.000), physical component score (38.8±6.1 to 52.1±4.2; p=0.000) and mental component score (49.5±8.5 to 56.9±3.1; p=0.002).

It can be concluded that CR encompassing lifestyle intervention, education and psychological support results in a faster recovery of health and desired performance of the CABG patient.

## PP24: The Prevalence, Risk Factors Predicting Injury And Severity Of Injuries Sustained During Competition In Professional Mixed Martial Arts In Africa

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**Background:** Professional mixed martial arts (MMA) has gained international popularity. No African based studies have reported the prevalence or severity of injuries, risk factors associated with injuries or return-to-play (RTP) time.

**Objective:** To determine the prevalence of injuries and associated risk factors, as well as severity of injuries sustained by professional male MMA athletes competing at Extreme Fighting Championships Africa (EFC Africa) from 2010 to 2014.

**Design:** Results from this prospective cohort study were compared to a similar study done in the United States of America (USA). An injury was defined as any damage to an athlete's body that needed the attention of the ringside physician.

**Setting:** Permission to do the study and the medical records of all professional events (2010 – 2014) were obtained from EFC Africa.

**Participants:** Data were obtained from 173 male competitors aged 18 to 44 years, participating in 300 professional MMA fights.

**Methods:** Statistical analyses included descriptive statistics and a stepwise logistic regression. Odds of an injury were predicted with six independent variables: fight outcome, age, weight division, number of fights, injuries in preceding fight and years of fighter experience.

**Results:** Head, face and neck injuries were most common (22%), followed by traumatic brain injuries (knock-outs) (6%). Losing a fight was a significant predictor of injury when using a stepwise logistic regression model ( $p=0.040$ ). The odds ratio indicated that preceding fight injury almost doubled the risk of injury in the following fight (OR 1.91;  $p= 0.163$ ). Traumatic brain injuries (TBIs) in this study of African based competitions (6%) were substantially higher than reported in the American study (1.8%).

**Conclusion:** Head, neck and face injuries are common in African fighters. The high rate of TBIs in African competition compared to the USA study is concerning. This could reflect superior refereeing in the USA group, as fights may be ended sooner by stoppage. Further investigation of injury trends and preventative measures should be studied to reduce the incidence of injuries during African games.