HUB Research Day 2020

Programme & Abstracts Booklet

09 December 2020

HUB
Department of Human Biology

Compiled by: HUB Departmental Research Committee

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About Department of Human Biology (HUB)

The Department of Human Biology within the University of Cape Town's Faculty of Health Sciences brings together several medical scientific and clinical academic disciplines. These disciplines are divided into four Divisions, namely (1) Biomedical Engineering, (2) Cellular, Nutritional and Physiological Sciences, (3) Clinical Anatomy and Biological Anthropology, and (4) Exercise Science and Sports Medicine. The Divisions are located in the Anatomy Building on the Faculty of Health Sciences Campus, except for the Division of Exercise Science and Sports Medicine, which is located at the Sports Science Institute of South Africa (SSISA) in Newlands.

Apart from research activities in the various fields of the academic disciplines, the department also conducts research into curriculum development and intervention strategies for transformation in, and broadening access to, medical education. The department's undergraduate teaching contributes to the MBChB, Health and Rehabilitation, as well as Faculty of Science programmes. Human Biology has a large cohort of postgraduate students in the Faculty of Health Sciences. It offers a wide range of post-graduate programmes in niche areas such as: (1) applied anatomy, (2) biokinetics, (3) biological anthropology, (4) biomedical engineering, (5) cell biology, (6) exercise science, (7) health care technology management, (8) nutrition and dietetics, (9) physiology and neurosciences, (10) sports and exercise medicine, (11) sport management (offered together with the Faculty of Commerce), and (12) sports physiotherapy (offered together with the Division of Physiotherapy in the Department of Health and Rehabilitation Sciences).

The department also hosts the Confocal & Light Microscope Imaging Facility which is a modern inter-faculty unit that provides a service relating to light and fluorescence microscopy, including the new LSM confocal microscope. The unit specialises in advanced fluorescence imaging acquisition and image analysis supported by computer workstations equipped with state of the art software. The department is also part of a multi-departmental multi-institutional Cape Universities Body Imaging Centre (CUBIC) on the premises of Groote Schuur Hospital. CUBIC features Africa's first full-body high-field Magnetic Resonance Imaging (MRI) scanner.

The department has a body donor programme where interested people can bequeath their bodies to help train future health professionals.

Website: http://www.humanbiology.uct.ac.za/

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HOD's Message : Professor Sharon Prince

It is my pleasure to invite you to our HUB Research Day 2020 which will be held virtually on 09 December 2020. The event is being organized by our Departmental Research Committee (DRC) and will showcase the outstanding and diverse research being done by postgraduate students (Honours, Masters and Doctoral) and postdoctoral fellows within our Divisions of Biomedical Engineering (BME), Exercise Science and Sports Medicine (ESSM), Clinical Anatomy and Biological Anthropology (CABA) and Cellular, Nutritional and Physiological Sciences (CNPS).

We are grateful for the many abstracts which were submitted. Each abstract was reviewed by at least two members of the DRC scientific and technical committee and the top 50 were selected for either oral or poster presentations. Independent national and international experts will judge the presentations and the top presenters will receive the HUB Research Day's Best Presentation Awards.

The HUB Research Day will also feature invited keynote talks by Prof. Glenda Gray, the CEO of the South African Medical Research Council (SA-MRC), and Prof. Jonathan Jansen, the President of the Academy of Science of South Africa (ASSAf). I am sure that these talks will inspire and reaffirm our commitment to contributing to scientific research and training in Africa.

I wish to take this opportunity to thank the DRC for organizing an outstanding Programme, the Chairs, Judges, our participants as well as our sponsors for their continued support of the Department and for their generous contributions towards the awards.

Please join us online to enjoy and celebrate the diverse and fascinating research activities happening within the Department of Human Biology. Let us use this opportunity to establish inter-disciplinary, cross-disciplinary and trans-disciplinary research in the Department.

HUB Research Day 2020 Programme

From 08h45		Sign in online	
09h00-11h00		**Session 1**	***Chair: Prof. Sharon Prince & A/Prof. Sudesh Sivarasu***
09h00-09h05		Welcome from HOD	
09h05-09h35		Keynote speaker	
Presenter		Title	
Prof. Glenda Gray, SA-MRC		***A Journey in HIV Research***	
09h35-10h00		*Oral Presentations Group 1:*	***Chair: Prof. Tania Douglas & Dr. Dorit Hockman***
Presenter	Abstract ID	Title	
Trevor S Mafu	OP01	Associations between angiogenesis and proteoglycan gene polymorphisms and shoulder morbidity in breast cancer survivors	
Mihlali Vuyo Mlaza	OP02	Marine-derived chromomycin A5: a novel strategy to treat TBX2-driven rhabdomyosarcoma	
Alexandra Lancaster	OP03	Effect of subscapularis attachment position on tendon length, post-RTSA: An OpenSim modelling study	
10h00-10h05		5 minute Q&A	
10h05-10h15		10 minute comfort break/ Exhibitors e-showcase	
10h15-10h40		*Oral Presentations Group 2:*	
Presenter		Title	
Elizabeth Dinkele	OP04	A mixed-methods investigation into the aetiology of Mseleni Joint Disease: Biocultural risk factors and explanatory models	
Lara Paul	OP05	The relationship between tackle technique and Player Load during a simulator tackle: An exploratory study	
Victoria Damerell	OP06	The role of the oncogenic TBX3 in the transformation of mesenchymal stem cells into a subset of sarcomas	
10h40-10h45		5 minute Q&A	
10h45-11h10		*Oral Presentations Group 3:*	
Presenter		Title	
Catherine Gordon-Grant	OP07	Design and Development of a Sensory Feedback System for Transradial Amputees using Body Powered Prostheses	
Samantha Beckley	OP08	The effect of variants within Types V, XI and XII collagen genes on knee joint laxity	

Arul Jothi Nagarajan	OP09	Galenia africana plant extract exhibits cytotoxicity in breast cancer cells by inducing multiple programmed cell death pathways	
11h10-11:15		5 minute Q&A	
11h15 -11h25		10 minute comfort break/ Exhibitors e-showcase	
11h25-13h25		**Session 2**	***Chair: A/Prof. Delva Shamley & Dr. Sharief Henricks***
11h25-11h40		*Poster Presentation Group 1:*	
Presenter		Title	
Athi Baliso	PP01	Identification of the deceased: Use of forensic anthropology at Cape Town's busiest medico-legal laboratory	
Leanne Haworth	PP02	Development of a Sensor Assembly to Measure Vertical, Horizontal and Tilt Motion of the Glenoid Edge during the ASTM F2028 Test	
Saif Feroz Khan	PP03	Repurposing drugs that target the interaction between HPV and TBX3 to treat cervical cancer	
Claire Shackleton	PP04	Robotic walking to mitigate osteoporosis and adverse body composition in individuals with SCI: A randomized control pilot study	
Liesl Margo Arendse	PP05	Growth analysis of South African Mixed Ancestry infants	
11h40-11h45		5 minute Q&A	
11h45-12h00		*Poster Presentation Group 2:*	
Presenter		Title	
Robert Evans	PP07	Robotic locomotor training leads to cardiovascular changes in individuals with spinal cord injury over a longer rehabilitation period of 24-weeks: a randomized controlled pilot study	
Ngaka John Nchejane*	PP08	Regional tissue deformations at cellular length scale during scar development in the presence of biomaterial injectates following myocardial infarction	
Kedebone Oliver	PP09	Designing the concept for a mobile health (mHealth) solution, to aid in educating young female scholars in Cape Town about HPV and its vaccine.	
Lara Paul	PP10	Quantifying collision frequency and intensity in rugby union and rugby sevens: A systematic review	
12h00-12h05		5 minute Q&A	
12h05-12h20		*Poster Presentation Group 3:*	
Presenter		Title	

Francesca du Toit	PP12	An investigation into the variations of the cerebral venous drainage patterns of adults and adolescence
Isaac Lebogang Khobo	PP13	Multimodal MR neuroimaging signatures of early cART-treated paediatric HIV
Daneil Feldmann	PP14	Investigation of multiple populations highlight VEGFA polymorphisms to modulate anterior cruciate ligament injury
Stephanie Fillmore	PP15	Exploring the gene regulatory dynamics of the maturing human brain
12h20-12h25		5 minute Q&A
12h25-12h35		10 minute comfort break/ Exhibitors e-showcase
12h35-12h50		*Poster Presentation Group 4:*
Presenter		Title
Thabang Matseke*	PP16	Mechanobiology of the chikungunya virus during the infection process
Arron Correia	PP17	A systematic review of the relationship between sleep, the autonomic nervous system and psychiatric disorders.
Justine Dominique van Greenen	PP18	Deciphering the dynamic gene regulation driving differential gene expression in the maturing brain.
Simone Williams	PP19	The effects of in utero antiretroviral treatment exposure duration on regional neurometabolite concentrations in neonates: A magnetic resonance spectroscopic imaging study
Dominique Rosslee	PP20	Associations between habitual sleep and sport-related concussion in youth rugby players
12h50-12h55		5 minute Q&A
12h55-13h10		*Poster Presentation Group 5:*
Presenter		Title
Christopher Brian Currin	PP21	Depolarising inhibition underpins a network model of status epilepticus
Moegammad Ameen Bardien	PP22	The Design and Development of an Electromechanical Adaptation for a Novel 3D Printed Functional Hand Prosthesis
Warren Lucas	PP23	Trends of treatment admissions for alcohol and other drugs among youth and younger adults in South Africa: A descriptive analysis of the South African Community Epidemiology Network on Drug Use project between 2009-2019
Matthew Trusler	PP24	Design and Development of a Lower Limb Rehabilitation Device for Spinal Cord Injury Patients

Bhaveen Lalla	PP25	The Development of a Solution Method to Assist Transfemoral Amputees with Proper Residual Limb Bandaging to Promote Desired Healing and Maturation	
13h10-13h15		5 minute Q&A	
13h15-13h30		*Poster Presentation Group 6:*	
Presenter		Title	
Yawovi Dodzi Motchon*	PP26	Cellular Deformation in Intramyocardial Cell-biomaterial Injectates for Myocardial Infarction Therapies	
Christina Steyn	PP27	Investigating cell-type-specific gene expression dynamics of long non-coding RNAs in the maturing human brain	
Claire Bellis	PP28	The marine-derived antibiotic chromomycin A5 targets the oncogenic TBX2: a new strategy to treat breast cancer	
Roopam Dey	PP29	How well do the anatomical fracture fixation plates for the scapula perform? - A story of two halves	
Dian Haasbroe	PP30	Role of extracellular environment in mechanical properties of human cardiac fibroblasts and myofibroblasts	
13h30-13h35		5 minute Q&A	
13h35-14h15		Lunch Break	
14h15-		**Session 3**	
14h15-14h40		*Oral Presentation Group 4*	***Chairs: Prof. Mike Lambert & A/Prof. Victoria Gibbon***
Presenter		Title	
Mayur Prag	OP10	Deciphering the regulatory code driving neural crest evolution and development	
Natalie Rose Erskine	OP11	The effect of tweeting video abstracts on journal article impact	
Habtamu Yimam	OP12	Determination of design considerations for the design of novel anatomical scapular fracture fixation plates	
14h40-14h45		5 minute Q&A	
14h45-15h10		*Oral Presentation Group 5*	
Presenter		Title	
Oluyemisi Folake Folasire	OP13	A dietary and physical activity behaviour change weight loss (DaPWL) intervention results in weight loss in obese patients attending medical outpatient (MOP) clinics at a secondary level hospital in Ibadan Western Nigeria: A feasibility study	
Paula Roxana Pienaar	OP14	Association between self-reported sleep duration and cardiometabolic risk in corporate executives	

Roopam Dey	OP15	Proposed humeral head implant design modification to reduce post-Total Shoulder Arthroplasty implant-bone mismatch.	
15h10-15h15		5 minute Q&A	
15h15-15h25		10 minute comfort break/ Exhibitors e-showcase	
15h25-15h50		*Oral Presentation Group 6*	
Presenter		Title	
Stephanie Maria Ncube	OP16	The c-Myc/TBX3/Nucleolin signalling axis in breast cancer	
Ghodeejah Higgins*	OP17	Metastatic melanoma cells depend on increased deformability and increased actin and microtubule content for rapid migration	
Mary-Jessica Nancy Laguette	OP18	Fluoroquinolone-induced rat tendinopathy model: examination of relative gene expression changes within the tendon tissue.	
Martin Kiwanuka*	OP19	Paclitaxel treatment induces cytoplasmic stiffening in oesophageal squamous cell carcinoma	
Philippa Forshaw	OP20	Sleep, nocturnal blood pressure dipping and cardiometabolic health in adults: a systematic review.	
15h50-15h55		5 minute Q&A	
		Closing Session	
15h55-16h30		Keynote speaker	**Chairs: HOD Prof Sharon Prince & A/Prof. Sudesh Sivarasu**
Presenter		Title	
Prof. Jonathan Jansen, ASSAf		***On being a Scholar in Africa Today***	
16h30 -16h50		Awards and closing remarks	

* *Abstracts not included in the booklet as requested by the authors*

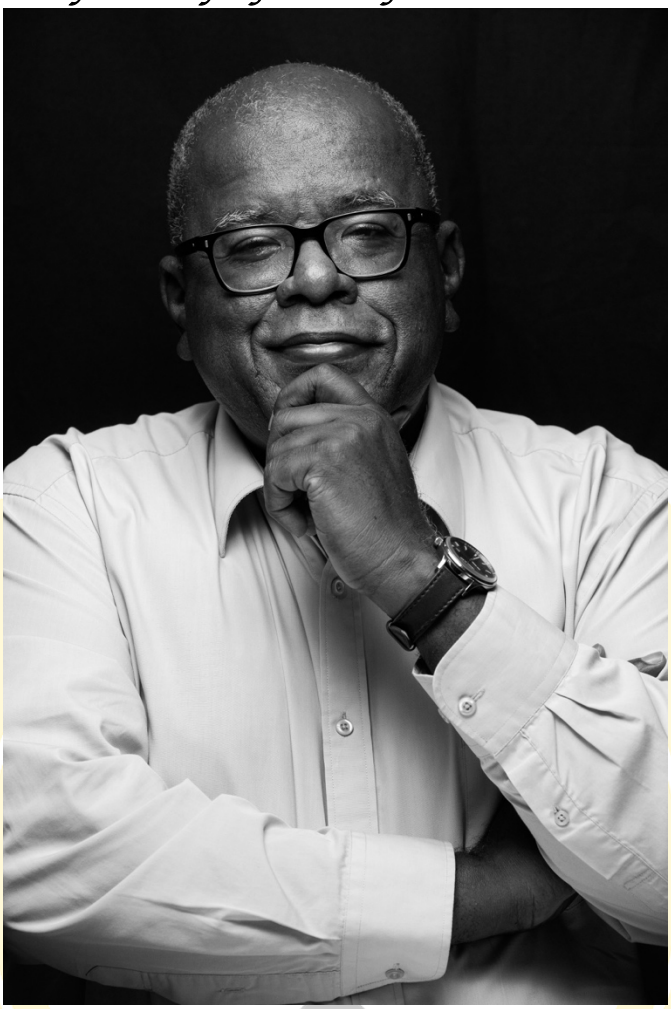
Keynote speaker's profile : Professor Glenda E. Gray

Professor Glenda E. Gray MBBCH, FCPaeds (SA), DSc (honoris causa, Simon Fraser University 2013), DSc (honoris causa, Stellenbosch University 2018), Honorary Doctorate in Law (Rhodes University, 2019), an NRF A rated scientist, is the first female President and CEO of the South African Medical Research Council. Gray, who trained as a Medical Doctor and Paediatrician at the University of the Witwatersrand, co-founded and led the Internationally renowned Perinatal HIV Research Unit, based at the Chris Hani Baragwanath Hospital in Soweto. She is internationally known for her research in HIV vaccines and interventions to prevent mother to child transmission of HIV. She is the Co-PI of the of the NIH funded HIV Vaccine Trials Network and is responsible for the expansion of HIV vaccine research in Africa. In 2002, she was awarded the Nelson Mandela Health and Human Rights Award for pioneering work done in the field of Mother-to-Child Transmission of HIV-1.

As a scientist, she has published over 300 peer-review science papers. She is a member of the Academy of Science in South Africa, the African Academy of Science and The World Academy of Sciences (TWAS). She is one of a handful of foreign associates of the USA National Academy of Medicine, of the National Academies of Science, and has served on their Global Health Board. She was the Chair for the Global Alliance for Chronic Diseases (GACD). Gray has also been awarded the IAPAC "Hero of Medicine" award for work done in the field of HIV treatment in children and adults. In 2009, James McIntyre and Gray received the N'Galy-Mann lectureship in recognition of their HIV research contribution in South Africa. In June 2012 she received a DSc (honoris causa) from the Simon Fraser University, Vancouver for her work in the field of mother to child transmission of HIV. She has also been admitted into the American Academy of Microbiology in 2012. In 2013 she received the country's highest honour, the Order of Mapungubwe, granted by the president of SA for achievements in the international area which have served South Africa's interest as well as the EDCTP's outstanding Africa scientist award. In 2017, she was listed amongst the Times 100 influential people in the world. Her focus now is on capacity development in Science with a special focus on transformation and increasing diversity in Science. For this, in 2018 she has received the Regional World Academy of Science award for science capacity development in Africa.

She is a CoVPN investigator and is the Protocol Co-Chair of the phase 3 JNJ Ad26 COVID-19 vaccine efficacy study.

Keynote speaker's profile : Professor Jonathan Jansen



Jonathan Jansen is Distinguished Professor of Education at Stellenbosch University and President of the Academy of Science of South Africa. He is a curriculum theorist, and his research is concerned with the politics of knowledge. His 2019/2020 books (co-authored, co-edited) include South African Schooling: The enigma of inequality, Fault lines: a primer on race, science and society, Who gets in and why: the politics of admission in South Africa's elite schools, Learning under lockdown: voices of South Africa's children, and Learning Lessons. His current research includes a national study on the impact of the pandemic on the academic work of women scholars. He holds a PhD (Stanford) and five honorary degrees in education.

Oral

Presentation

Abstracts

Abstract ID	Title
OP01	Associations between angiogenesis and proteoglycan gene polymorphisms and shoulder morbidity in breast cancer survivors
Authors	Trevor S. Mafu, Alison V. September, Delva Shamley
Presenting Author	Trevor S. Mafu
Presenting Author Email Address	MFXTRE001@myuct.ac.za
Division	ESSM
Abstract	Introduction: Up to 68% of breast cancer survivors report chronic shoulder pain/disability. Whereas angiogenesis and proteoglycans have been implicated in non-cancer-related connective tissue conditions of the shoulder such as rotator cuff disease, their role in shoulder pain/disability in breast cancer survivors is unknown. This study explored the role of polymorphisms in candidate angiogenesis and proteoglycan genes. Materials and methods: A cross-sectional study was conducted on 254 South African breast cancer survivors to evaluate associations between shoulder pain/disability and seventeen single nucleotide polymorphisms (SNPs) within nine angiogenesis-related/proteoglycan genes. Participants were grouped into no–low and moderate–high shoulder pain/disability based on total pain/disability scores: <30 and ≥30, respectively, using the shoulder pain and disability index (SPADI). Results: The minor T alleles of Integrin beta 2 (ITGB2) rs2230528 C>T and Matrix metalloproteinase 3 (MMP3) rs679620 T>C were associated with increased (p=0.048; OR=1.657, 95% CI= 0.979 – 2.774) and decreased risk (p=0.035; OR=0.582, 95% CI= 0.342 – 0.968) of being in the moderate – high shoulder pain category, respectively. In addition, the GG genotype of Versican (VCAN) rs11726 was independently associated with an increased risk of being in the moderate to high shoulder pain (P=0.005, OR=2.326, 95% CI=1.259 - 4.348) or disability (P=0.011, OR=2.439, 95% CI=1.235 - 4.762) categories, after adjusting for participants' age. Discussion: This study is the first to report associations between gene polymorphisms and shoulder pain/disability in breast cancer survivors. These findings contribute key evidence to the identification of risk factors for developing upper limb morbidity. Larger GWAS studies are planned for the future.

Abstract ID	Title
OP02	Marine-derived chromomycin A5: a novel strategy to treat TBX2-driven rhabdomyosarcoma
Authors	Mihlali, Mlaza., Binca. Del Bianco Sahm., Paula, Rezende Teixeira2., Leticia, Costa-Lotufo., and Sharon, Prince.
Presenting Author	Mihlali Vuyo Mlaza
Presenting Author Email Address	mlzmih001@myuct.ac.za
Division	CNPS
Abstract	Introduction: Rhabdomyosarcoma (RMS) is the most common soft tissue sarcoma of paediatric cancers. To date, localized RMS can be cured with multi-modal therapy, however overall survival for patients with metastatic or recurring RMS has not improved over the last five decades. This highlights the need for developing novel and targeted therapies to treat RMS. TBX2, a T-box transcription factor is overexpressed in RMS and is required to drive oncogenic phenotypes such as promoting proliferation and bypassing cellular senescence. Importantly, the depletion of TBX2 inhibits these oncogenic phenotypes, suggesting that targeting TBX2 may be a promising anti-RMS strategy. Recently, we have reported that the marine derived compound, chromomycin A5 (CA5), an anti-tumour antibiotic, interacts with TBX2. This study describes the anti-cancer activity of CA5 in RMS. Methods: MTT and clonogenic assays were carried out to elucidate the cytotoxicity of CA5. Western blotting, qRT-PCR and immunocytochemistry were used to investigate the molecular mechanism of CA5 by assessing the levels of TBX2, and its downstream targets alongside the markers of the DNA damage response pathway. Results & Discussion: We show that at 48 hr treatments CA5 has IC50 values of <5 nM, and that it displays selectivity (≥2) towards non-malignant cells. Importantly, CA5 depletes TBX2 protein levels, resulting in increased mRNA levels of TBX2 targets. CA5 induces DNA damage, exhibits long-term cytotoxicity, and our preliminary data suggests that CA5 induces the extrinsic apoptotic pathway in RMS. Taken together, our data show CA5 to have great promise for the targeted treatment of TBX2-driven RMS.

Abstract ID	Title
OP03	Effect of subscapularis attachment position on tendon length, post-RTSA: An OpenSim modelling study
Authors	Stephen Roche, Sudesh Sivarasu
Presenting Author	Alexandra Lancaster
Presenting Author Email Address	LNCALE001@myuct.ac.za
Division	BME
Abstract	Introduction The effectiveness of subscapularis (SSc) tendon repair in reverse total shoulder arthroplasty (RTSA) remains uncertain, studies have linked SSc repair to improved stability and decreased rates of dislocation. However, the SSc function as abductor, forward flexor and internal rotator could impede external rotation post-RTSA. This study aimed to investigate the effect of attachment position of SSc on post-RTSA shoulders. Methods The RTSA shoulder joint was modelled in OpenSim. SSc tendon length was measured, using both Delta and Biomet implant configurations, for abduction, flexion and internal and external glenohumeral (GH) rotation at 20° and 90° abduction at three attachment points, native, superior, on the greater tubercle, and inferior, 20mm below native. Modelling was repeated for anatomical and total shoulder arthroplasty (TSA) shoulders for comparison. Graphs produced show the change in tendon length through the GH joint range of motion (ROM). Results For both RTSA implants SSc length in the superior attachment position peaks towards the mid-point of ROM, indicating that the SSC is applying tension, which will impede external rotation. SSc length in native and inferior attachment peak towards the extremes of ROM, providing stability. When compared to the TSA and the anatomic shoulder, SSc length is significantly shorter, indicating that the SSc contributes less to ROM in RTSA. Discussion Results indicate that while the SSc plays a smaller role in ROM for RTSA than TSA or an anatomical shoulder, its contribution depends on attachment points with superior attachment contributing to ROM and native or inferior attachments contributing to stability.

Abstract ID	Title
OP04	A mixed-methods investigation into the aetiology of Mseleni Joint Disease: Biocultural risk factors and explanatory models
Authors	Elizabeth Dinkele, Robea Ballo, Victor Fredlund, Victoria Elaine Gibbon.
Presenting Author	Elizabeth Dinkele
Presenting Author Email Address	ptteli001@myuct.ac.za
Division	CABA
Abstract	Introduction Mseleni joint disease (MJD) is a crippling arthropathy that is endemic to KwaZulu-Natal, South Africa. The geographic confinement of MJD to a remote community of Zulu-language speakers is puzzling as affected individuals are neither genetically nor culturally isolated. While environmental, socio-cultural and epigenetic factors are suspected aetiologies of MJD, these are yet to be verified. Methods and Materials To identify biocultural causes of MJD, the spatial and demographic distribution and anatomical localisation of pathology were assessed using data from patient surveys and a medical record review (HREC 079/2019). Explanatory models of MJD were assessed through a grounded analysis of survey transcripts from patients and healthcare providers. Results Medical records confirm that MJD initiates in synovial joints, most commonly the hip (68%) and knee joints (45%). Pathology in the fibrocartilaginous lumbar spine was only identified in patients with advanced MJD and an altered gait due to joint pain. Aging ($p \leq 0.0001$) and female gender ($p=0.01$) were risk factors of MJD. Approximately 96% of MJD patients were local to regions with limited access to potable water and all patients reported carrying water by head-loading from off-plot sources (rivers, boreholes and wells). Explanatory models of MJD were variant in patients, including the supernatural (witchcraft or evil spirits), natural (physiology, genetics, environmental conditions and sanitation) and/or social (gender-based practices and lifestyle). Healthcare providers believed unique physiological, genetic and environmental conditions to be aetiological of MJD. Conclusion This work demonstrates the value gained from considering biomedical and traditional knowledge systems when assessing causation and explanatory models of disease.

Abstract ID	Title
OP05	The relationship between tackle technique and Player Load during a simulator tackle: An exploratory study
Authors	Lara Paul
Presenting Author	Lara Paul and Sharief Hendricks
Presenting Author Email Address	lapinla@hotmail.com
Division	ESSM
Abstract	Introduction: The tackle is the most frequent contact event in rugby and has a high injury risk. It is a physically and technically demanding skill, with poor tackle technique being a major injury risk factor. However, not much is known on the relationship between technical and physical demands of the tackle. The purpose of this study is to explore the relationship between the external load and tackling technique using microtechnology. Materials and Methods: Nineteen amateur rugby union players each performed 12 tackles on the UCT collision sport simulator over two testing sessions (3 tackles on each shoulder per session). This equated to a total of 228 tackles. Each tackle was recorded and analysed for tackle technique using a standardised set of tackle criteria. External load was measured by Catapult OptimEye S5. Tackle technique scores were spilt into three categories: Low scoring tackles (≤ 5 AU), medium scoring tackles (6 and 7 AU) and high scoring tackles (≥8 AU). Results: Low scoring tackles recorded a mean external load of 5.4 (4.3-6.5) AU, medium scoring tackles: 5.9 (5.5-6.3) AU and high scoring tackles: 5.9 (5.5-6.2) AU on contact. Dominant shoulder tackles have significantly higher tackle technique score (7.9 (7.4-8) AU) than non-dominant shoulder tackles (7.1 (6.8-7.3) AU). No difference was found in external load. Discussion: The initial hypothesis was that high scoring tackles experience higher external load than lower scoring tackles. Unexpectedly there was no relationship - only a difference in post-contact external load. Microtechnology may be an efficient way for coaches to access tackle technique but more research needs to be done.

Abstract ID	Title
OP06	The role of the oncogenic TBX3 in the transformation of mesenchymal stem cells into a subset of sarcomas
Authors	Victoria Damerell, Tarryn Willmer, Michelle du Toit, Shanel Swartz, Katie Lennard, Nicola Mulder, Dhirendra Govender, Michael S. Pepper and Sharon Prince
Presenting Author	Victoria Damerell
Presenting Author Email Address	dmrvic001@myuct.ac.za
Division	CNPS
Abstract	Introduction: Sarcomas are diverse malignancies of mesenchymal origin and their clinical management is severely challenged. This is in part due to a lack of understanding of the molecular mechanisms underpinning the transformation of mesenchymal stem cells (MSCs), the cells of origin of sarcomas. We have shown that TBX3 is upregulated in several sarcoma subtypes and that it promotes proliferation, tumour formation, migration and invasion. This study aims to determine whether (1) TBX3 may be a potential biomarker for the diagnosis of sarcomas and (2) TBX3 can drive the transformation of MSCs into sarcomas. Materials and Methods: TBX3 mRNA and protein levels of patient-derived sarcoma tissues were determined using a PCR array and immunohistochemistry. The impact of TBX3 overexpression on bypass of senescence, proliferation, migration, and invasion was measured by senescence-associated β-galactosidase staining, MTT and 3D-spheroid growth, 2D-scratch motility and 3D-spheroid invasion assays respectively. Markers of senescence, cell cycle progression, migration and invasion were assessed using western blotting. Results: TBX3 mRNA and protein levels were overexpressed in a range of patient-derived sarcoma tissues and were associated with advanced sarcoma stages. Overexpression of TBX3 in MSCs promoted bypass of senescence, proliferation, migration and invasion which corresponded with a decrease in levels of senescence markers and an increase in levels of cell cycle progression, migration and invasion markers. Discussion: Our study provides evidence that (1) TBX3 may be a biomarker for the reliable diagnosis and prognosis of a subset of sarcomas and (2) TBX3 alone may be enough to drive MSCs into sarcomas.

Abstract ID	Title
OP07	Design and Development of a Sensory Feedback System for Transradial Amputees using Body Powered Prostheses
Authors	Catherine Gordon-Grant, Sudesh Sivarasu
Presenting Author	Catherine Gordon-Grant
Presenting Author Email Address	GRDCAT003@myuct.ac.za
Division	BME
Abstract	Introduction: Prosthetic devices play a critical role in rehabilitation after the amputation of a limb, but one of their major limitations is the failure to provide the user with sensation. Presented here is a non-invasive sensory feedback system to be used in conjunction with existing body powered prostheses, which provides the user with sensory feedback on the arm stump. It is mediated by vibro-tactile stimulation in a closed loop system connecting capacitive sensors on the prosthetic hand with vibrating motor discs on the amputation stump. The discs vibrate at different frequencies and at different positions on the stump to provide the user with a spatial and tactile experience of ""real sensation"". Materials and Methods: Four healthy non-amputees participated in a preliminary study to test the efficacy of the capacitive sensor-vibrating motor disc combination. The capacity of the system to mediate detection of touch and proximity for a range of materials, discriminate between different intensities of vibration and the ability to locate touch/proximity was investigated. Preliminary Results: The results from the preliminary study show that all participants are able to distinguish between 3 levels of touch (proximity, light and hard touch) intensity and locate the position of the stimulation for good electrical conductors such as metal, human skin, wood and sometimes ceramic and glass materials depending on the coating. Ceramic material or glass that has not been coated with a metallic substance is not registered by the sensor. Preliminary Conclusions and Discussion: The sensory feedback system has the potential to restore sensory feedback in transradial amputees and; thus, it could be a useful tool to enhance prosthesis use by improving the amputee's connection to the device.

Abstract ID	Title
OP08	The effect of variants within Types V, XI and XII collagen genes on knee joint laxity
Authors	Samantha Beckley, Roopam Dey, Shaun Stinton, Willem van der Merwe, Thomas Branch, Alison V. September, Malcolm Collins, and Mike Posthumus
Presenting Author	Samantha Beckley
Presenting Author Email Address	sambeckley@gmail.com
Division	ESSM
Abstract	Background: Previous studies have suggested joint laxity, a risk factor for anterior cruciate ligament rupture has a genetic component. Therefore, the purpose of this study was to evaluate if variants within genes encoding collagen play a role in modulating knee laxity measurements. Methods and materials: In total, 114 healthy participants were assessed for generalised joint laxity, sit and reach, genu recurvatum, anterior and posterior tibial displacement and rotational knee laxity. Ligament length changes during knee rotation were measured using an OpenSim musculoskeletal knee model. Participants were genotyped for COL5A1 rs12722 (T/C), rs13946 (T/C), COL11A1 rs3753841 (C/T), rs1676486 (T/C), COL11A2 rs1799907 (A/T) or COL12A1 rs970547 (A/G). Genotype scoring was used to explore gene-gene interactions. Each of the COL5A1 rs12722 CC, COL11A1 rs3753841 CC, and COL11A2 rs1799907 AA genotypes were given a score of 2; such that participants with none, one, two or all three of the identified genotypes had a total score of 0, 2, 4 or 6, respectively. Results: Individuals with higher genotype scores seemed to have significantly lower genu recurvatum measurements ($P < 0.05$). Additionally, individuals with the COL12A1 rs970547 AA genotype were found to have significantly smaller ligament length changes in bundles of the MCL compared to those with the AG or GG genotypes ($P < 0.05$). Discussion: The findings of this study provide evidence supporting the interdependent role of variants within COL5A1, COL11A1, COL11A2 and COL12A1 in modulating measurements of laxity. These results provide further insight into the aetiology of ACL injuries and the role of genetics as an intrinsic risk factor.

Abstract ID	Title
OP09	Galenia africana plant extract exhibits cytotoxicity in breast cancer cells by inducing multiple programmed cell death pathways
Authors	Luqmaan Mohamed, Suparna Chakraborty, Lawrence Mabasa, Kenza Sayah, Leticia V. Costa-Lotufo, Anwar Jardine, Sharon Prince
Presenting Author	Arul Jothi Nagarajan
Presenting Author Email Address	arul.nagarajan@uct.ac.za
Division	CNPS
Abstract	Introduction: Globally, breast cancer is the most common malignancy in women and the second most common cause of cancer-related death among women. There is therefore a need to identify more efficacious therapies for this neoplasm. Galenia africana (Kraalbos) is a perennial shrub found in Southern Africa and is used by the indigenous people to treat various ailments but very little is known about the scientific basis for this. This study aimed to investigate and characterise the anti-cancer activity of an ethanolic extract of Kraalbos leaves, KB2, against oestrogen receptor positive (ER+) and triple negative (TN) breast cancer cells. Methods: Short- and long-term cytotoxicity were assessed by the Cell-Titer Glo® and clonogenic assays respectively. The effects of KB2 was assessed on migration by the scratch assay; oxidative stress by ROS-GloTM H2O2 and GSH-GloTM Glutathione assays; cell cycle by flow cytometry and western blotting with antibodies to cell cycle regulators; morphological and molecular markers of DNA damage, apoptosis, necroptosis and autophagy. Results and Discussion: LC-MS/MS analyses identified the phytochemicals 7′-hydroxyflavanone, 5′,7'-dihydroxyflavanone, 2′,4′-dihydroxydihydrochalcone and 2′,4′-dihydroxychalcone in KB2. KB2 exhibited an IC50 of 114 µg/ml in ER+ and 130.5µg/ml in TN breast cancer cells, inhibited their long-term survival and reduced their migration. It induced oxidative stress, DNA damage, and triggered cell cycle arrests in both breast cancer cell types tested. Importantly, KB2 activated breast cancer cell death by intrinsic and extrinsic apoptosis, necroptosis and autophagy. Together, KB2 exhibited anti-cancer activity in ER+ and TN breast cancer cells by activating multiple programmed cell death pathways.

Abstract ID	Title
OP10	Deciphering the regulatory code driving neural crest evolution and development
Authors	Megan Martik, Tatjana Sauka-Spengler, Marianne Bronner, Dorit Hockman
Presenting Author	Mayur Prag
Presenting Author Email Address	mayurprag@gmail.com
Division	CNPS
Abstract	Introduction Neural crest (NC) cells are a unique feature of vertebrates. This embryonic cell population is multipotent, giving rise to many structures including peripheral neurons. The sea lamprey, Petromyzon marinus, is at the base of the vertebrate lineage and offers an ideal model for the ancestral NC. Comparisons to the modern NC gene regulatory network (GRN) such as that of the chicken can elucidate essential conserved regions of the GRN. Methods and Materials Previous studies in P. marinus revealed a NC-specific enhancer for the NC-specification gene, SoxE1, which showed conserved activity in chicken and zebrafish NC. Here, we subdivided the SoxE1 enhancer to find the core active regions, using enhancer-reporter assays in chicken and lamprey. Additionally, the segments were analysed for putative transcription factor binding sites, which were mutated. Results The central 610 bp of the SoxE1 enhancer retained its activity in lamprey and chicken NC. Mutation of a putative Sox10 and Tfap2 binding sites within the core enhancer did not result in complete loss of enhancer activity in the chicken or lamprey, however the number of positive embryos was reduced. Further subdivision of the SoxE1 enhancer core revealed that 5' half drives reporter expression exclusively in the chicken neural tube, while the 3' half drives expression in the branchial arches. NC specific-reporter activity will be confirmed by immunological staining embryo sections. Discussion The identified core region of the SoxE1 enhancer shows a conserved regulatory mechanism in vertebrates. Future work will interrogate how this enhancer region interacts directly with NC GRN members.

Abstract ID	Title
OP11	The effect of tweeting video abstracts on journal article impact
Authors	Natalie Rose Erskine, Andrew Jones, Anni Vanhatalo, Kate Nuttal, Thomas Delaveaux, Alejandra Black, Sharief Hendricks
Presenting Author	Natalie Rose Erskine
Presenting Author Email Address	nats.erskine@gmail.com
Division	ESSM
Abstract	Introduction: Journals are increasingly implementing a variety of Twitter strategies to promote their research. One novel strategy is the creation of video abstracts. The aim of this study was to determine the effect of tweeting articles using two different video abstract formats on journal impact metrics. Material and Methods: A randomized case-controlled study design was used. Forty-two articles where randomized equally into 3 groups: animated video abstracts (AN), author-provided video abstracts (AU) and title-only (TO) (control). Each article was tweeted only once. The primary outcomes were 7-day and 30-day article page views, article altimetric score (AAS), Twitter impressions, Twitter engagements and link clicks. Secondary outcome measures included 7-day and 30-day media engagements and media views. Results: Page views did not differ between groups after 7 (p=0.393) or 30-days(p=0.905). After 7-days, AN received significantly higher AAS, impressions (AN 3879±1784; AU 2221±997; TO 2328±900), media views (AN 827±813; AU 373±247) and media engagements (AN 49±59; AU19±11) than AU or TO. After 30-days, AN received significantly more AAS, impressions (AN 4783±2438; AU 2539±1145, TO 2723±1163), engagements (AN 148.9±134; AU 51±16; TO 57±39), media views (AN 739±738; AU 387±252) and media engagements (AN 59±62; AU 22±11) than AU or TO. TO received significantly more link clicks than AU or TO after 7-days (AN 28±27; AU 9±6; TO 34±25) and 30-days (AN 34±33; AU 10±6; TO 36±26). Conclusion: The AN group received the greatest number of engagements, impressions and AAS. Interestingly, despite the success of animated video abstracts, TO posts received more link clicks.

Abstract ID	Title
OP12	Determination of design considerations for the design of novel anatomical scapular fracture fixation plates
Authors	Habtamu Yimam (MSc), Stephen Roche, (MD), Roopam Dey, (PhD), Sudesh Sivarasu (PhD)
Presenting Author	Habtamu Yimam
Presenting Author Email Address	ymmhab001@myuct.ac.za
Division	BME
Abstract	Background: Anatomical plates are the recent development in the evolution of osteosynthesis plate designs. They are designed to satisfy biomechanical and clinical requirements. Precontoured anatomical scapular plates (Acumed, Hillsboro, Oregon) are one of these developments. They are designed for specific scapular anatomical regions and assist fracture reduction being as a template. However, due to the complexity of the scapular fracture patterns and the variations in scapular anatomy these plates do not accommodate all types of scapular fractures and they do not fit well. New anatomical scapular plate designs are required to consider the variations in the fracture patterns and anatomical variability of the scapular bone to improve the usability of the plates. The purposes of this study are i) to determine zones of frequent and critical scapular fracture patterns ii) to create statistical shape model of the target population (South African population) using a statistical shape model. Methods: The first step was to determine the fracture patterns. The location and distribution of frequent and critical fracture patterns were identified by creating fracture and heat maps using three-dimensional (3D) computed tomography (CT) images of seventy scapular fracture patients. Frequent fracture zones were identified graphically using the colour frequency change of the heat map. Additionally, specific critical fracture patterns that cannot be fixed using the existing anatomical plates were identified. In the second step, 3D reconstructed models of forty-five South African population were created and all the 3D models were registered to a template. The rest of this step is under construction. Results: The common fracture zones were identified as overall, intraarticular, and extraarticular fractures. Extraarticular fractures (body + process) fractures were the most common type (61%). The lateral and medial borders were the common fracture exit zones, 69% and 67% respectively. The superior medial border and the medial extent of the base of the scapula spine were the higher intensity exit zones. Intraarticular fractures that extend to the infraspinatus and scapular neck fracture extending to the superior border are critical fracture patterns. An average shape model demonstrating the size and shape variations around the identified regions of interest are expected results from the second step mentioned in the method. Discussion: The aim of this study was to determine the design considerations for the design of novel anatomical scapular fracture fixation plates. The frequent

	fracture zones and the critical fracture patterns identified in this study are used to decide the anatomical region of interest and to develop preliminary anatomical plates model. Together with the result expected from the statistical shape model, the novel plate design could accommodate most fracture patterns and will fit well the target population.

Abstract ID	Title
OP13	A dietary and physical activity behaviour change weight loss (DaPWL) intervention results in weight loss in obese patients attending medical outpatient (MOP) clinics at a secondary level hospital in Ibadan Western Nigeria: A feasibility study
Authors	
Presenting Author	Oluyemisi Folake Folasire
Presenting Author Email Address	yemisifolasire2011@gmail.com
Division	CNPS
Abstract	Introduction: Overweight/obesity is increasing in Nigeria, but weight loss programmes that consider the indigenous Nigerian diet, culture and health care system are lacking. This research aimed to explore the weight loss and lifestyle changes in patients attending (MOP) clinics at secondary hospitals in Nigeria who followed the 12-week DaPWL intervention (weight screening; education on diet, physical activity and vegetable gardening, self-monitoring and monthly follow-ups) that was designed for the target population using the Behaviour Change Wheel and Theory of Planned Behaviour. Method: A pre-post intervention design was used. Outcome measures included weight and dietary and physical activity indicators (servings of vegetables, starchy staples and proteins; use of oil in cooking; times/week walked, did chores inside and outside the house and worked in a vegetable garden). Seventy patients BMI>=30kg/m2 were recruited, 29 were lost to follow-up. Data of the 41 completers were analysed using non-parametric statistics. Results: Weight loss was significant [-3.1(5.0) kg, p=0.000]. The number of servings of vegetables [-0.2(-.1;.0.1) p=0.001] and starchy staples, [-1.9(-5.8;0.4), p=0.000] and use of oil in cooking [0.0(-0.2;0.0), p=0.000] decreased significantly, while the number of protein servings did not change, [-0.4(-3.7;0.9). The times/week patients did chores inside the house [0.0(3.8; -0.7), p=0.001] and worked in the vegetable garden [1.5(0.0;3.5), p=0.000] increased significantly, while the times/week of walking, [0.0(0.0;0.0)] and doing chores outside the house [0.0(0.0;0.0)] did not change. Discussion: The DaPWL intervention has potential for the treatment of obesity in patients attending MOPs in Nigeria. Further testing in a randomized controlled trial is recommended.

Abstract ID	Title
OP14	Association between self-reported sleep duration and cardiometabolic risk in corporate executives
Authors	Dale Rae, Laura Roden, Vicki Lambert, Cecile Boot, Willem van Mechelen, Jos Twisk
Presenting Author	Paula Roxana Pienaar
Presenting Author Email Address	Paula Pienaar <PNRPAU001@myuct.ac.za>
Division	ESSM
Abstract	Introduction: Short sleep duration is associated with adverse cardiometabolic consequences. Less is known about the sleep of corporate executives. This study aimed to investigate the occupational and psychological correlates of self-reported sleep duration; associations between self-reported sleep duration and cardiometabolic risk (CMR) factors; and effects of potential mediators of this relationship in corporate executives. Material and Methods: Health risk assessment data of 3583 corporate executives were used in sex-stratified regression analyses to examine the relationships between occupational and psychological variables with self-reported sleep duration, and sleep duration with CMR and a composite CMR score. Mediation analyses explored the effects of work, psychological and lifestyle factors on the relationships between self-reported sleep duration and CMR factors. Results: Longer work hours and daily work commute time, depression, anxiety and stress were associated with shorter sleep duration in both the men and women (all $p<0.05$). Shorter sleep duration was associated with higher BMI, larger waist circumference and greater CMR scores in both men and women (all $p<0.05$), higher diastolic BP in men ($p<0.05$) and lower HDL cholesterol in women ($p<0.05$). Physical activity, working hours and stress significantly mediated the relationships between self-reported sleep duration and BMI, waist circumference, diastolic BP and CMR score in men only. Discussion: Shorter self-reported sleep duration is associated with poorer psychological, occupational and CMR in both men and women. Given that physical activity, working hours and stress mediate this association among the men, these findings emphasize the case for sleep health interventions in workplace health programmes.

Abstract ID	Title
OP15	Proposed humeral head implant design modification to reduce post-Total Shoulder Arthroplasty implant-bone mismatch.
Authors	Roopam Dey, Stephen L Roche, Ntambue Kauta, and Sudesh Sivarasu
Presenting Author	Roopam Dey
Presenting Author Email Address	roopam.dey@uct.ac.za
Division	BME
Abstract	Background: Current humeral head components for Total Shoulder Arthroplasty are spherical in shape. These components do not optimally fit on the resected surface of the humeral shaft, resulting in a mismatch with either exposed head or overhang of the prosthesis. The purpose of this study was to analyze the size difference between commercial and healthy humeral head base diameter and propose a possible design modification of the humeral component to improve anatomic replication. Materials and Methods: Base widths and radius of curvature for cohort of 88 healthy cadaveric humeral heads were measured. These heads were obtained from shoulder CT scan images that were reconstructed using Mimics® and the morphometric measurements were carried out in Matlab®. Details of spherically shaped commercial humeral head prosthesis' dimensions were obtained from the literature. Modeling of elliptically shaped humeral head implants was performed by increasing the base width of the commercial prostheses. Two sets of base width differences were calculated; 1. Between the cadaveric humeral heads and the spherical prostheses; 2. Between the cadaveric humeral heads and the elliptical prosthesis. These two mismatch groups were compared to determine which set of implants better restored the anatomy of the humeral bone. Results: Cadaveric humeral head base width in the superior-inferior axis was found to be consistently greater than the anterior-posterior base width by 4.07±0.48mm ($p<0.0001$). The average commercial implant and resected bone base width differences were measured to be 1.93 ± 1.3mm (anterior-posterior) and 5.09 ± 2.28mm (superior-inferior). 48.9% of these mismatches were above the acceptable limit of 3mm. Most of these mismatches (82.6%) were observed in the superior-inferior axis. Altering the shape of the humeral head prosthesis, into an asymmetric elliptical shape by changing the superior-inferior width, reduced the superior-inferior width mismatch between the healthy heads and the prostheses by 59.7% ($p<0.0001$). By comparing the redesigned implant with humeral head morphometric information from the literature, we found that the elliptical prosthesis better replicated the geometry of asymmetric osteoarthritic bones than the current commercial humeral implants, but it failed at replicating symmetric osteoarthritic humeral head morphometry. Moreover, these implants were compatible with the healthy humeral head geometry of different populations groups.

	Conclusions: By increasing the SI base width and changing the shape of the humeral head from spherical to elliptical we can reduce the amount of exposed bone around the implant. This redesigning process was effective in creating implants that can satisfactorily fit different populations and asymmetric osteoarthritic humeral heads.

Abstract ID	Title
OP16	The c-Myc/TBX3/Nucleolin signalling axis in breast cancer
Authors	Stephanie Maria Ncube, Jonathan Blackburn, Sharon Prince
Presenting Author	Stephanie Maria Ncube
Presenting Author Email Address	ncbste003@myuct.ac.za
Division	CNPS
Abstract	Background The transcription factor TBX3 is critical for breast development and is an important breast cancer oncoprotein and has been proposed as a novel therapeutic target for this neoplasm. To identify more amenable ways of targeting TBX3, this study determined whether in breast cancer (1) c-Myc upregulates TBX3 expression and (2) nucleolin cooperates with TBX3 to drive migration. Materials and Methods The MCF-7 breast cancer cell line was used in all experiments. c-Myc was knocked-down by siRNA and TBX3 expression was assessed by qRT-PCR and western blotting. To confirm that c-Myc transcriptionally regulates TBX3, it was overexpressed in breast cancer cells in the presence of the transcription inhibitor, Actinomycin D, and TBX3 expression measured by qRT-PCR and western blotting. Mass spectrometry identified nucleolin as a TBX3 co-factor. This was validated by immunoprecipitation assays and confocal microscopy/co-localisation. The effect of nucleolin on TBX3 function was determined using RNAi rescue experiments coupled with scratch motility assays. The nucleolin targeting aptamer, AS1411, was tested as a therapy for TBX3-driven breast cancer. Results Results show that in breast cancer, c-Myc transcriptionally activates TBX3 and that nucleolin and TBX3 cooperate to promote migration. Furthermore, treatment of breast cancer cells with AS1411, the nucleolin targeting aptamer, mislocalizes TBX3 and nucleolin to the cytoplasm and causes a reduction in cell viability while having no effect on the viability of normal fibroblasts. Discussion Here we show that c-Myc/TBX3/nucleolin is an important oncogenic pathway to target in the treatment of TBX3-driven breast cancer and that AS1411 may be used to achieve this.

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Abstract ID	Title
OP18	Fluoroquinolone-induced rat tendinopathy model: examination of relative gene expression changes within the tendon tissue.
Authors	Mary-Jessica Nancy Laguette, Stuart James, Ebonie Rio, Sean Docking, Alison Victoria September, Malcolm Collins, Jillian Cook, Tomislav Samiric.
Presenting Author	Mary-Jessica Nancy Laguette
Presenting Author Email Address	mary-jessica.laguette@uct.ac.za
Division	ESSM
Abstract	Introduction: Tendinopathy is a common painful condition that occurs in physically active and sedentary individuals. While its pathology is poorly understood, it is disabling and often requires early retirement from a sport or change in occupation. The use of fluoroquinolones for the treatment of various bacterial infections in humans is implicated as a risk factor for tendinopathy and spontaneous tendon ruptures clinically. These antibiotics have been used in animals to study aspects of drug toxicity, arthropathy, and to a lesser extent, tendinopathy. Using the literature, an optimised rat model for fluoroquinolone-induced tendinopathy was proposed towards understanding its development. This aspect of the project focused on gene expression changes of extracellular matrix (ECM) proteins over time. Materials and Methods: Forty juvenile rats were maintained and monitored daily. Twenty rats were allocated to either the treatment (Tx: 900mg/kg Pefloxacin in water; oral gavage) or the control group (CON: vehicle), and humanely killed at time-points (24hrs, 1- and 2-weeks). cDNA was derived from dissected tendon tissue and relative gene expression levels quantified. Results: Differential gene expression levels between Tx and CON tendons were noted for genes encoding members of the collagen and proteoglycan family as well as matrix remodelling enzymes. Discussion: Altered expression of ECM genes is present in the tendon tissue of rats administered with Pefloxacin. Histological changes and protein expression are currently being examined to validate this model. Pathways highlighted by this induced model will allow for other aspects of the condition to be studied in vivo.

Abstract ID	Title
OP20	Sleep, nocturnal blood pressure dipping and cardiometabolic health in adults: a systematic review.
Authors	Philippa Forshaw, Dale Rae, Estelle Vicki Lambert, Arron Correia
Presenting Author	Philippa Forshaw
Presenting Author Email Address	FRSPHI002@myuct.ac.za
Division	ESSM
Abstract	Introduction: Rapidly accumulating evidence suggest that poor sleep quality is associated with adverse health outcomes, including the increased risk for the development of cardiometabolic diseases. Nocturnal blood pressure non-dipping has also been associated with an increased risk for cardiometabolic diseases although the exact mechanisms involved in dampening the nocturnal dip remain unclear. One explanation for the non-dipping pattern may be a state of hyperarousal during sleep where the sympathetic arm of the autonomic nervous system dominates. This review aims to investigate the relationship between sleep, nocturnal blood pressure dipping and cardiometabolic health in adults.

Poster

Presentation

Abstracts

Abstract ID	Title
PP01	Identification of the deceased: Use of forensic anthropology at Cape Town's busiest medico-legal laboratory
Authors	Athi Baliso, Chandra Finaughty, Laura Jane Heathfield, Victoria Elaine Gibbon
Presenting Author	Athi Baliso
Presenting Author Email Address	
Division	CABA
Abstract	South Africa is faced with a serious issue of unidentified human remains, made more difficult when bodies are decomposed. In this regard, the cases may be referred to Forensic Anthropology Cape Town (FACT) laboratory at the University of Cape Town (UCT). The aim of this study was to assess the impact of anthropological analyses on local medico-legal death investigations. Cases which FACT analysed from Salt River Mortuary between the years 2008 – 2018 were retrospectively evaluated. During the study period, FACT was consulted in 73 (involving 75 individuals) cases of medico-legal significance. Most decedents were found in high crime areas or rural sparsely populated areas. Males (61%) and adults (80%) represented the majority of decedents and presented with the most trauma. Police case outcomes were known in 51% of cases, and 76% of these were closed and 24%. Positive identifications were reached for 31% of decedents and 16% were unidentified and buried as paupers by the state. The sex, age-at-death and stature estimations were correct in all of these cases, whereas ancestry estimations were correct in 89%. This study highlighted that communication between different stakeholders is poor and that forensic anthropology is underutilised; indicating that the legislation of the field in the country is needed. Despite these challenges, the high accuracy of the biological profiles showed that the methodology utilised by FACT performed well for the South African population. When used forensic anthropology in South Africa has the potential to assist with case resolution, victim identification and social/criminal justice.

Abstract ID	Title
PP02	Development of a Sensor Assembly to Measure Vertical, Horizontal and Tilt Motion of the Glenoid Edge during the ASTM F2028 Test
Authors	Tim Peach, Bhushan Borotikar, Steve Roche, Sudesh Sivarasu
Presenting Author	Leanne Haworth
Presenting Author Email Address	hwrlea001@myuct.ac.za
Division	BME
Abstract	The most common cause for failure of a shoulder joint prosthesis is loosening of the scapular cup (glenoid) component. This loosening is attributed to eccentric loading of the edges of the glenoid component. The American Society for Testing and Materials (ASTM) set out a standardised test to evaluate glenoid loosening, in which the glenoid is cyclically loaded and the vertical displacement of the edges is measured. However, FEM studies of the glenoid under load have shown that the edges do not only deflect vertically, but also horizontally and with a tilting motion as the material of the component is deformed. Therefore, the standardised test does not fully quantify the glenoid reaction to loading. To measure vertical and horizontal displacement, as well as edge tilt, a specialised sensor assembly was designed, to be used in conjunction with an ASTM conforming test rig developed at UCT BME. The sensor assembly uses two sets of 3 LVDT sensors which track the motion of rigid blocks, connected to the glenoid edges by lever arms. The rotation, and vertical and horizontal deflection of the block (and hence the glenoid edges) are calculated using an analytical algorithm in MATLAB, with the sensor readings as inputs. The sensor assembly and algorithm were validated in-silico by means of a Solidworks motion simulation. The sensor assembly has been manufactured and pilot study results are expected by December 2020.

Abstract ID	Title
PP03	Repurposing drugs that target the interaction between HPV and TBX3 to treat cervical cancer
Authors	Saif Feroz Khan, Jenna Bleloch, Amsha Ramburan, Colin Goding and Sharon Prince
Presenting Author	Saif Feroz Khan
Presenting Author Email Address	khnsai002@myuct.ac.za
Division	CNPS
Abstract	Background: Cervical cancer (CC) is the leading cause of cancer related deaths in South African women. Human Papillomavirus (HPV) is the causative agent of CC and its oncoproteins, E6/E7, cooperate with host factors to induce and maintain CC. A potential approach to facilitate rapid and cost-effective drug development is to identify and target these host factors with commercially available non-cancer drugs. In this regard, TBX3 is a key driver of several cancers, but little is known about its status and role(s) in CC. Furthermore, we have identified commercially available drugs, niclosamide, piroctone and pyrvinium (hit drugs) that target TBX3 and exhibit anti-cancer activity. Materials and Methods: TBX3 status was determined in HPV+ CC patient tissues using immunohistochemistry. TBX3 was depleted by siRNA in HPV+ (HeLa and CaSki) and HPV- (C33A) CC cells and the impact on proliferation (growth curves) and migration (scratch assay) assessed. CC cells were treated with hit drugs and the impact investigated on TBX3 levels (western blotting), CC cell survival (MTT and clonogenic assays), migration, cell cycle profile (FACS), senescence and spheroid formation. Results: This study reveals that (1) TBX3 is upregulated in advanced stages of HPV+ CC; (2) TBX3 promotes specifically HPV+ CC proliferation and migration; (3) hit drugs reduced TBX3 levels, induced cell cycle arrests and senescence, inhibited CC cell survival, migration and spheroid formation. Discussion: Here we show that E6/E7 interacts and co-operates with TBX3 to promote HPV+ CC proliferation and migration and we identify cost-effective drugs that can potentially be repurposed to treat CC.

Abstract ID	Title
PP04	Robotic walking to mitigate osteoporosis and adverse body composition in individuals with SCI: A randomized control pilot study
Authors	Robert Evans, Sacha West, Wayne Derman, Yumna Albertus
Presenting Author	Claire Shackleton
Presenting Author Email Address	SHCCLA001@myuct.ac.za
Division	ESSM
Abstract	Introduction: Robotic Locomotor Training (RLT) may improve bone density and body composition in people with spinal cord injuries (SCI). However, as RLT is a novel technology, there is a lack of powered studies addressing it's influence on these indices. We aimed to describe the impact of RLT and activity-based training (ABT) on these health measures in individuals with SCI. Material and methods: 16 participants with chronic tetraplegia were randomised into two groups, each 3x/week for 45 minutes per session, over 24 weeks. RLT involved walking in a bionic suit. ABT involved exercise training combined with regular weight-bearing. Outcomes included bone mineral density (BMD) and body composition, including fat mass (FM) and fat-free soft tissue mass (FFSTM). Results: Hip BMD was maintained during RLT but was significantly reduced ($p = 0.04$) during ABT, with a mean difference of 0.06 g/cm2 (5%) from pre to post intervention. No change in leg FFSTM occurred between groups or over time ($p = 0.32$). There was a significant 7% increase in arm FFSTM over time for both groups ($p < 0.01$). The ABT group showed a significant decrease in visceral adipose tissue (VAT) ($p = 0.04$) and gynoid FM ($p = 0.007$) over time, with a mean decrease of 23 cm2 (15%) and 0.54 kg (13%) respectively. Discussion: RLT prevented the progressive decline of BMD usually occurring in this population group. Both interventions improved arm FFSTM but neither intervention resulted in leg muscle gain. ABT is an effective rehabilitation strategy to reduce FM and improve adiposity distribution in individuals with SCI.

Abstract ID	Title
PP05	Growth analysis of South African Mixed Ancestry infants
Authors	Liesl Margo Arendse, Desiré Brits, Estelle "Vicki" Lambert, Victoria E. Gibbon
Presenting Author	Liesl Margo Arendse
Presenting Author Email Address	lieslarendse@gmail.com or ARNLIE002@myuct.ac.za
Division	CABA
Abstract	The South African National Demographic and Health Survey (2016) showed 27% of South African children under five years were stunted and 13.5% overweight/obese, according to WHO Multicentre Growth Reference standards. The aim of this study was to document infant growth, against this international reference standard, in a cohort of 0–18 month old South Africa children of Mixed Ancestry. Mothers were recruited from 3 clinics (2 public, one private) and 163 (male=73, female=90) infants were divided into three age groups. Standard nutritional anthropometry was conducted (length-for-age, weight-for-age, weight-to-length-for-age and head circumference-for-age z-scores). The 0-5.9 month age group, for both sexes, aggregated between +0.50 and -1.5 for length (57%) and weight (69%) z-scores. Boys aged 6-18 months tended to aggregate below +0.50 for length (63%) and/or weight (72%) z-scores, but had higher z-scores for head circumference (65%). Girls aged 6-18 months tended to aggregate above -0.50 for length (60%) and weight (68%) z-scores. Only 2.5% of infants fell below 2 standard deviations (SD) for length-for-age or stunted. Further, only 4.3% were above 2 SD for weight-for-age and would be considered overweight/obese. 52% (85/163) of head circumference z-scores data fell between -0.50 and +1.00. Results for the 0-5.9 month cohort indicate a downward deviation for length/weight from the WHO's growth median whereas head circumference z-scores for all infants (0-18 months) indicate a positive deviation from the WHO's median. Further work is needed to determine if the WHO growth reference is an appropriate standard for Mixed Ancestry infants in South Africa.

Abstract ID	Title
PP06	Insula, thalamus and anterior cingulate volumetric changes after mindfulness training in novices
Authors	Karen Fitzgerald, Patricia Lück, Ben J.M. Steyn, Francesca Little, Ernesta M. Meintjes
Presenting Author	Karen Fitzgerald
Presenting Author Email Address	kfitzgerald@polka.co.za
Division	BME
Abstract	Introduction: Brain morphometry findings associated with mindfulness training have been inconsistent. This may be due to methodological differences, including meditation experience and technique, different research designs, different morphometric measures, reporting bias and small sample sizes. Here we used automated surface-based reconstruction models to examine morphometric changes in novices following mindfulness-based training (MBT) bilaterally in 8 regions previously implicated in novices. Methods: Forty-four healthy novice adults were recruited in Pretoria, South Africa. A randomized control pre-test post-test design was used. The experimental group completed 8 weeks of MBT while the control group received no training. High-resolution T1-weighted structural MR images were acquired in the experimental group before and after MBT, and in controls at baseline and again 8 weeks later. Regional volumes were determined using FreeSurfer. Pre-and post-test measures were compared within each group using Wilcoxon signed rank tests, and changes from pre- to post-test between groups using Mann-Whitney U tests. Results: Only the left insula and right thalamus showed volumetric increases and decreases, respectively, in the experimental, but not the control group. Only the left rostral anterior cingulate showed greater volumetric changes (post-pre) in the experimental than the control group. These regions suggest that mindfulness may alter behavioral outcomes through increased attentional and emotional control, and increased self-awareness. Discussion: This study demonstrates that morphometric changes are already evident in novices following 8 weeks of MBT, and highlights the potential role of the insula, thalamus and anterior cingulate in functional domains that have been linked to mindfulness.

Abstract ID	Title
PP07	Robotic locomotor training leads to cardiovascular changes in individuals with spinal cord injury over a longer rehabilitation period of 24-weeks: a randomized controlled pilot study
Authors	Robert W. Evans , Jason Bantjes , Claire L. Shackleton , Sacha West , Wayne Derman , Yumna Albertus & Leslie Swartz
Presenting Author	Robert Evans
Presenting Author Email Address	robertevanssa@gmail.com
Division	ESSM
Abstract	ABSTRACT Purpose: This study discussed the reports by participants in a randomised controlled trial of a novel intervention for spinal cord injury (SCI) rehabilitation in Cape Town, South Africa. Materials and methods: Sixteen participants were randomised to rehabilitation involving the use of robotic locomotor training, a novel technology, or to a group receiving an activity-based intervention. All participants were interviewed before the intervention and at six months follow-up. Results: In a context in which rehabilitation services for SCI are virtually non-existent, all participantsapproached the study with enthusiasm and expressed gratitude for participation. They had high hopes for what the programme could achieve, with many believing, perhaps incorrectly, that the programmewould help them walk independently again. While hope and enthusiasm are useful for adherence to experimental intervention studies, there is a danger, especially in poorly resourced contexts, for participants to experience considerable disappointment following false hope not being realised. This raises important ethical issues for researchers interested in the potential of new technologies to promote health in poorly resourced contexts. Conclusions: For clinicians, the path between supporting positive emotions (which may lead to positive outcomes), and confronting unrealistic hope (which may lead to negative outcomes) may be difficult. Follow-up with participants after re-integration into their communities is important to determine longterm psychological impact. Pan African Clinical Trial Number: PACTR201608001647143 IMPLICATIONS FOR REHABILITATION - In low-resource contexts where there is a low level of access to rehabilitation services, such access inthe context of a trial of a new intervention may engender hope in a group of people with spinal cord injury. This hope may increase when a new technology is used, as was the case in this study. - Hope can be very helpful to people entering rehabilitation, but unrealistic hope and expectations may have negative implications in the longer term. - In this study, expectations of participants centred, unrealistically, around regaining the ability to walk again, despite past experiences and medical advice suggesting otherwise.

	- A thin line exists between supporting high expectations and confronting unrealistic hope. This conundrum is difficult for the clinician, as both inappropriate hope and undue pessimism about an intervention have the potential to cause harm. - Participant follow-up after the end of any innovative trial is important, not just to monitor physical progress, but also, where necessary, to support participants through a potential period of disillusionment when they find their expectations have not been fully met.

Abstract ID	Title
PP09	Designing the concept for a mobile health (mHealth) solution, to aid in educating young female scholars in Cape Town about HPV and its vaccine.
Authors	Kedebone Oliver, Jill Fortuin and Tania Douglas.
Presenting Author	Kedebone Oliver
Presenting Author Email Address	OLVKED001@myuct.ac.za
Division	BME
Abstract	Introduction Cervical cancer is the second most common cancer in South African women, and 90% of cases are caused by human papillomavirus (HPV) infection. HPV infection can be prevented, especially in younger, non-sexually active individuals through a 2- or 3-dose vaccination, which is provided free of charge to female grade 4 learners (9-15-year-olds) in South African government schools. Consistent education is important for eligible and vaccinated learners, especially because the available vaccines don't protect against all HPV types. Mobile devices may be an effective way to engage with young people, as they use mobile technologies extensively. This project aimed to design the concept for a mobile health (mHealth) solution, to aid in educating young female scholars in Cape Town about HPV and its vaccine. Methods and materials The needs and knowledge of the target population (grade 4-7 female scholars in Cape Town) were assessed through a quantitative survey. The survey results guided the development of a prototype which was presented during two focus group discussions. The attitudes and preferences of the participants towards the prototype and towards learning about HPV were discussed. The survey and focus group discussion data, combined with information from the literature, were used for the design of the concept mHealth tool. Results and discussion The level of mobile technology access and lack of knowledge among the 43 participants who completed the survey, indicated that an mHealth solution would be feasible and beneficial. The strong preference for interactive learning (52%), as well as other findings, support the incorporation of a chat portal, educational videos, and entertainment within the mHealth solution.

Abstract ID	Title
PP010	Quantifying collision frequency and intensity in rugby union and rugby sevens: A systematic review
Authors	Lara Paul, Mitchell Naughton, Ben Jones, Demi Davidow, Amir Patel, Mike Lambert and Sharief Hendricks
Presenting Author	Lara Paul
Presenting Author Email Address	lapinla@hotmail.com
Division	ESSM
Abstract	Introduction: Collisions between players in rugby union and rugby sevens have a high injury risk and burden, and associated with player and team performance. Understanding the frequency and intensity of these collisions is important for coaches and trainers to adequately prepare players for competition. The aim of this study is to summarise the literature using video-based analysis and microtechnology to quantify collision frequencies and intensities in rugby union and rugby sevens. Methods and Materials: A systematic search using key words in four databases (PubMed, Scopus, SPORTDiscus and Web of Science). Results: Four studies focused on training, two studies focused on both training and match-play, while the remaining fifty-nine studies explored collisions from match-play. Most of the studies used video-based analysis to quantify collisions (n=35). In rugby union, on average, a total of 32±19 scrums, 124±40 rucks, 22±9 mauls and 163±40 tackles occur per match. In sevens, on average, a total 2±1 scrums, 8±4 rucks and 0.4±0.7 mauls occur per match. Discussion: This review showed more studies quantified collisions in matches compared to training. To ensure athletes are adequately prepared for match collision loads, training should be prescribed to meet the match demands. To improve the reciprocal relationship between training and matches and ensure athletes are adequately prepared for match collision loads, studies should compare training and matches. To do this, integrating video-based analysis and microtechnology is recommended. The frequency and intensity of collisions in training and matches may lead to adaptations for a “collision-fit” player and lend itself to general training principles such as periodisation for optimum collision adaptation.

Abstract ID	Title
PP012	An investigation into the variations of the cerebral venous drainage patterns of adults and adolescence
Authors	Francesca du Toit; Prof Graham Louw
Presenting Author	Francesca du Toit
Presenting Author Email Address	francescadutoit@gmail.com
Division	CABA
Abstract	Introduction Limited information is available on anatomical variation of the complete cerebral venous system. It is important to have an understanding of the usual drainage pattern the cerebral venous system and its anatomical variations to provide a foundation for future studies on anomalous venous structures. Materials and Methods For the current study 302 magnetic resonance images with contrast medium from the Groote Schuur and Red Cross Children's War Memorial Hospitals were retrospectively reviewed. The volumes of the dural venous sinuses were traced using a novel approach developed for the study. The approach included constructing 3D models of the dural venous sinuses and using the tracings for statistical and morphological analyses. Results Statistical analyses were performed to determine if there are any associations between venous sinus volume and sex, age, cerebral dominance and/or variations. Significant differences were noted for sex, dominance and variations of the cerebral venous system. The confluence of sinuses (CS) showed the most abundant number of variations. Discussion The study improved on the current literature by using contrast enhanced images as opposed to non-enhanced images or results obtained at autopsy. It is also the first study to establish a tracing protocol for venous volume to determine cerebral dominance and describe variations of the dural venous sinuses.

Abstract ID	Title
PP013	Multimodal MR neuroimaging signatures of early cART-treated paediatric HIV
Authors	Isaac Khobo, Frances Robertson, Marcin Jankiewicz, Martha Holmes, Ernesta Meintjes
Presenting Author	Isaac Lebogang Khobo
Presenting Author Email Address	
Division	BME
Abstract	INTRODUCTION: HIV-related brain alterations can be identified using magnetic resonance (MR) neuroimaging modalities such as spectroscopy (MRS), structural imaging (sMRI), and diffusion tensor imaging (DTI). Few studies have combined multiple modalities to identify a signature that typifies HIV infection. Therefore, we aimed to determine (1) whether classification performance improves when combining modalities, and (2) the most useful features across MRI modalities to separate children living with HIV from controls. METHODS: The sample comprised 72 virally suppressed 7-year-old children living with HIV from the Children with HIV Early Antiretroviral Therapy (CHER) trial, and 55 control children from a related vaccine trial. We used the embedded feature selection of elastic-net regularisation to identify a subset features characteristic of paediatric HIV infection and measured classification performance via the area under the receiver operating characteristic curve (AUC) using repeated cross-validation. RESULTS: sMRI volumes performed the best (AUC=0.71), followed by DTI (AUC=0.62). Spectroscopic, gyrification and cortical thickness measures showed no class discrimination capability (AUC≈0.5). Adding DTI measures to sMRI volumes increased AUC to 0.78 and adding MRS in basal ganglia to this combination produced the highest classification performance (AUC=0.80). The final multimodal signature consisted of 22 DTI and sMRI volume features. DISCUSSION: While the ability to predict HIV-status based on neuroimaging is not clinically advantageous particularly in resource-limited settings, demonstration of its feasibility could help identify neuroimaging signatures that are common to treated HIV infection and offer a separate yet complementary dimension to the clinical diagnosis.

Abstract ID	Title
PP014	Investigation of multiple populations highlight VEGFA polymorphisms to modulate anterior cruciate ligament injury
Authors	Daneil Feldmann, Masouda Rahim, Mathijs AM Suijkerbuijk, Mary-Jessica N Laguette, Paweł Cieszczyk, Krzysztof Ficek, Kinga Huminska-Lisowska, Charlotte K. Häger, Evalena Stattin, Kjell G Nilsson, Javier Alvarez-Rumero, Nir Eynon, Julian Feller, Oren Tirosh, Michael Posthumus, Emile R Chimusa, Malcolm Collins, Alison V September
Presenting Author	Daneil Feldmann
Presenting Author Email Address	daneilfeldmann@gmail.com
Division	ESSM
Abstract	Introduction: Polymorphisms in VEGFA and KDR encoding proteins have been associated with anterior cruciate ligament rupture (ACL) risk. We leveraged a collective sample from Sweden, Poland and Australia to investigate the association of functional polymorphisms in VEGFA and KDR with susceptibility to ACL rupture. Materials and Methods: Using a case-control genetic association approach, polymorphisms in VEGFA and KDR were genotyped and haplotypes inferred from 765 controls, and 913 cases clinically diagnosed with ACL rupture. Results: A significant overrepresentation of the VEGFA rs2010963 CC genotype (p = 0.0002, OR 2.86, 95% CI: 1.60-5.13) in the combined ACL group (18%) compared to the combined control group (11%). The VEGFA (rs699947 C>A, rs1570360 G>A, rs2010963 G>C) A-A-G haplotype was significantly (p = 0.009, OR: 0.85, 95% CI: 0.69-1.05) under-represented in the combined ACL group (23%) compared to the combined control group (28%). In addition, the A-G-G construct was significantly (p = 0.036, OR: 0.81, 95% CI: 0.64-1.02) under-represented in the combined ACL group (12%) compared to the combined CON group (16%). Discussion: Our findings support the association of the VEGFA rs2010963 CC genotype with increased risk and (ii) the VEGFA A-A-G haplotype with a reduced risk, and are in alignment with the a priori hypothesis. Collectively identifying a genetic interval within VEGFA to be implicated in ACL risk modulation and highlight further the importance of vascular regulation in ligament biology.

Abstract ID	Title
PP015	Exploring the gene regulatory dynamics of the maturing human brain
Authors	Stephanie Fillmore, Dorit Hockman
Presenting Author	Stephanie Fillmore
Presenting Author Email Address	stefillmore@gmail.com
Division	CNPS
Abstract	Introduction The human brain develops gradually overtime where distinct molecular profiles are established in the embryo. These molecular profiles continue to change through aging and in response to environmental factors. The complexity and dynamics of gene expression and regulation at the cell type-specific level are still poorly understood, especially during the process of brain maturation. Our aim is to determine the cell type-specific gene regulatory dynamics of the maturing brain, which would serve as a reference for understanding dysregulation of these profiles in response to disease. Materials and Methods Biobanked juvenile and adult brain tissue samples, obtained during surgery to treat epilepsy, were used to generated single nuclei RNA-seq (snRNA-seq) libraries using the 10x Genomics Platform. snRNA-seq datasets were sequenced and analysed using bioinformatics tools, including Cell Ranger and Seurat. In addition, we have used Assays for Transposase Accessible Chromatin (ATAC-seq) on bulk tissue, to identify cis-regulatory elements (CREs). Results and Discussion Two technical replicate juvenile snRNA-seq datasets (14-year old frontal lobe) have been analyzed and all the major cell types of the brain have been successfully identified, including glial and neuronal cells. Additional juvenile and adult snRNA-seq libraries are being sequenced after which we will conduct an integrated analysis of all samples to identify genes that are being differentially regulated. Juvenile ATAC-seq libraries have been sequenced and analyzed and the adult ATAC-seq libraries are being sequenced. Differential accessibility analysis will be performed on the juvenile and adult data to identify putative CREs that are dynamically used across samples.

Abstract ID	Title
PP017	A systematic review of the relationship between sleep, the autonomic nervous system and psychiatric disorders.
Authors	Arron Correia, Dr. Dale Rae
Presenting Author	Arron Correia
Presenting Author Email Address	arron.correia197@gmail.com
Division	ESSM
Abstract	Introduction: Poor sleep is a risk factor for cardiovascular disease and psychiatric disorders – both of which are among leading global health concerns. Additionally, psychiatric disorders are frequently associated with co-morbid cardiovascular disease and altered autonomic nervous system (ANS) function. Heart rate variability (HRV) is a frequently used marker of ANS function and gives an indication of ANS input to the heart. Combined, this suggests an underlying relationship between sleep, cardiovascular disease and psychiatric disorders. Materials and Methods: According to PRISMA guidelines, Pubmed, Scopus and Web of Science were scanned for articles containing the selected search terms. Duplicates were removed and titles and abstracts scanned to remove irrelevant articles. Results: A total of 36 articles were included in this review. Majority indicated poor/insufficient sleep, psychiatric disorders and altered autonomic functioning are closely linked. Participants with psychiatric disorders largely reported poorer sleep while those with sleep disorders reported more depressive symptoms. Both poor sleep and psychiatric disorders were associated with altered HRV. In apparently normal populations, sleep, ANS function and psychiatric disorders appear to be closely linked. Discussion: Hyperarousal potentially mediates this link between poor sleep, ANS dysfunction and psychiatric disorders. Hyperarousal (characteristic of many psychiatric disorders) leads to diminished HRV and reduced HRV is overwhelmingly observed in psychiatric disorders. This represents a potential mechanism for the frequent co-morbidity of cardiovascular disease with psychiatric disorders. Additionally, hyperarousal is widely considered to play a role in insomnia and a “continuum of basal arousal levels” could underpin the genetic component of insomnia.

Abstract ID	Title
PP018	Deciphering the dynamic gene regulation driving differential gene expression in the maturing brain.
Authors	Dorit Hockman, Justine van Greenen
Presenting Author	Justine Dominique van Greenen
Presenting Author Email Address	justine.vgreenen@gmail.com
Division	CNPS
Abstract	Introduction: Spatiotemporal differential gene expression during human brain maturation is tightly regulated by a highly complex gene regulatory network (GRN). An in-depth understanding of this GRN, which includes the interaction between cis-regulatory elements (CREs) and their target genes, can help elucidate the onset and pathophysiology of various neuropsychiatric disorders, infections or diseases that affect the brain. Multiple parts of the GRN are still unknown therefore the identification of putative CREs and their respective targets can aid in expanding our understanding of this GRN. Unfortunately, there is a lack of gene expression and gene regulatory data for the juvenile period of brain maturation. Furthermore, there is no simple and cost-effective method to verify and validate putative enhancer activity in the context of the human brain. Methods and expected results: This study aims to address these caveats by conducting Assays for Transposase Accessible Chromatin followed by high-throughput sequencing (ATAC-seq) on juvenile brain samples and analysing the results in conjunction with single nucleus RNA sequencing data (snRNA-seq) from the same patient samples. Genes that are being dynamically regulated during brain maturation will be identified and analysed alongside ATAC-seq datasets to pinpoint putative CREs regulating this dynamic expression. This information will supplement existing epigenomic data, giving a holistic overview of the regulatory mechanisms guiding brain maturation. In addition, a novel electroporation system will be developed. This system will drive gene reporter vectors, containing the putative CREs upstream of fluorescent reporter proteins, into human organotypic brain slices to test and validate enhancer activity in the context of human tissue.

Abstract ID	Title
PP019	The effects of in utero antiretroviral treatment exposure duration on regional neurometabolite concentrations in neonates: A magnetic resonance spectroscopic imaging study
Authors	Simone Williams, Dr. Frances Robertson, Prof. Ernesta Meintjes
Presenting Author	Simone Williams
Presenting Author Email Address	WLLSIM020@myuct.ac.za
Division	BME
Abstract	Introduction Interventions aimed at reducing the mother-to-child transmission of HIV has led to a decreasing number of new perinatal infections, but an increasing population of HIV-exposed uninfected (HEU) children in whom little is known about the effects of inutero exposure to antiretroviral treatment (ART). The aim of this study was to use magnetic resonance spectroscopic imaging (MRSI) to examine whether the timing of ART initiation affects neurometabolite concentrations in the basal ganglia (BG) and mid-frontal grey matter (MFGM) in HEU infants. Methods MRSI data for 29 HEU neonates were acquired on a 3T Siemens skyra MRI scanner, with a multi-voxel slab covering the BG and MFGM regions. After quality control, MRSI spectra from 10 HEU infants were retained in our analysis: 5 HEU infants (2 males/3 females) whose mothers initiated cART prior to conception (HEU pre-conception) and 5 HEU infants (1 male/4 females) whose mothers initiated cART later in pregnancy (HEU post-conception). Ratios of N-acetylaspartate (NAA), combined NAA and N-acetyl-aspartyl-glutamate (NAA.NAAG), glutamate, glycerophosphocholine (GPC), and combined glutamate and glutamine to creatine were quantified using LCModel. Metabolite differences between HEU pre-conception and HEU post-conception groups were examined using boxplots and non-parametric Wilcoxon rank-sum tests in R. Results Boxplots showed between group differences in NAA and GPC levels, markers of neuronal integrity, and cell membrane turnover respectively. The HEU pre-conception group had lower BG NAA/Cr and NAA.NAAG/Cr ratios compared to the HEU post-conception group and in MFGM, a trend towards lower GPC levels was observed in the HEU pre-conception group compared to levels in the HEU post-conception group. The group differences were however not statistically significant (p-values >0.05). Discussion Although the findings were not statistically significant, a larger sample size is required to determine whether the timing of ART initiation during gestation does indeed affect neurometabolite concentrations in neonates.

Abstract ID	Title
PP020	Associations between habitual sleep and sport-related concussion in youth rugby players
Authors	Dominique Rosslee, Dale Rae, Caroline D'Alton
Presenting Author	Dominique Rosslee
Presenting Author Email Address	rssdom001@myuct.ac.za
Division	ESSM
Abstract	INTRODUCTION Concussion is the most common form of traumatic brain injury worldwide. The prevalence of sports-concussion, usually observed in contact sports like rugby, is approximately 1.6-3.8 million cases each year in the United States. Sleep disturbances such as insomnia, hypersomnia, a delayed phase shift, disordered breathing and periodic limb movements are common post-concussion, with insomnia specifically being reported in 30-60% of patients' post-concussion. Several factors influence risk for concussion, severity of symptoms and recovery timeframe. These factors include a prior concussion, younger age, pre-existing neurological conditions, migraines and mood disorders. Poor sleep has also been shown to exacerbate concussive symptoms, increase sensitivity to pain and prolong the recovery time. MATERIALS AND METHODS Male rugby players who are members of a Western Province rugby club or training squad between the ages of 18 and 25 years will be recruited. Players taking part will be asked to complete an online questionnaire which includes questions relating to concussion history, sleep quality, daytime sleepiness, insomnia symptoms and risk for obstructive sleep apnoea. RESULTS AND DISCUSSION Data is currently being analysed, however, sleep and concussion characteristics of youth rugby players with sports-related concussions will be reported on. This forms part of an honours project which will be completed on 25 November 2020.

Abstract ID	Title
PP021	Depolarising inhibition underpins a network model of status epilepticus
Authors	Christopher Brian Currin, Henning Sprekeler, Joseph Valentino Raimondo
Presenting Author	Christopher Brian Currin
Presenting Author Email Address	chris.currin@gmail.comhttps://twitter.com/ChrisCurrin
Division	CNPS
Abstract	Seizures represent the result of highly synchronous and high frequency neural activity. Recurrent seizures are the hallmark of epilepsy, a debilitating disease, which affects 65 million people worldwide. The most severe form of an epileptic seizure is a state called status epilepticus (SE), which is characterised by unrelenting seizure activity that does not stop of its own accord. The first-line treatment for SE uses a class of anti-convulsants known as benzodiazepines that target γ-aminobutyric acid (GABA) receptors, yet they only appear to have a ≈ 50% efficacy rate. Failure to terminate a seizure, either spontaneously or by application of anti-convulsants, can lead to persistent synchronous activity which results in significant morbidity and even mortality. Given the severe implications of SE, investigation into the mechanisms underlying its possible persistence, despite benzodiazepine application, is needed. Here, we construct a computational model with synaptic plasticity and dynamic chloride ions (Cl^-) that is constrained by an experimental slice model of SE-like activity. Here we demonstrate that 1) elevated $[Cl^-]_i$ is sufficient to have a balanced network enter a SE-like state, 2) the model recapitulates experimental findings in that SE-like activity is resistant to increases in $GABA_A$ receptor conductance (akin to benzodiazepine treatment), 3) recovery from SE can be facilitated by strong Cl^- extrusion with the application of positive GABA conductance modulation, and 4) SE is driven by elevated $[Cl^-]_i$ in pyramidal cells while interneuron Cl^- has a minor influence. Together, these results provide clues to the mechanisms and potential therapies for status epilepticus

Abstract ID	Title
PP022	The Design and Development of an Electromechanical Adaptation for a Novel 3D Printed Functional Hand Prosthesis
Authors	Moegammad Ameen Bardien, Sudesh Sivarasu
Presenting Author	Moegammad Ameen Bardien
Presenting Author Email Address	brdmoe003@myuct.ac.za
Division	BME
Abstract	Introduction While there is much research in advanced myoelectric prosthetics, these prostheses are unaffordable for those in lower to middle-income countries, thus they use body-driven prostheses instead. However, users of body-driven prostheses often abandon their prostheses because of the overexertion of their shoulder. The study aimed to design an electromechanical hand prosthesis which meets the functional and grasping requirements of prosthesis users, bridging the functional gaps between body-driven and myoelectric prostheses. Methods The Self-Actuated Tenim Hand (SATH), a functional electromechanical prosthesis, was developed using principles of rapid prototyping. The SATH was then modified for use by a participant with no amputation, after which the Anthropomorphic Hand Assessment Protocol (AHAP) was used as a design validation tool. AHAP comprises completing 26 tasks divided into eight grasp types and two non-grasping tasks. Each task is repeated three times and is then scored against predetermined criteria. The output measurement of AHAP is the grasping ability score (GAS): a percentage measurement of healthy hand function. Partial GAS scores, which measure the GAS for a specific grasp type and both non-grasping tasks, were also measured. Results The SATH scored an overall GAS of 75% while scoring above 50% for every partial GAS measurement and above 75% for six of the eight grasp types and both non-grasping tasks. Discussion These results were comparable to scores obtained by a more advanced prosthesis. The SATH performed satisfactorily in AHAP and by implementing minor modifications to address the lower partial GAS scores, the SATH can be validated using amputee participants.

Abstract ID	Title
PP023	Trends of treatment admissions for alcohol and other drugs among youth and younger adults in South Africa: A descriptive analysis of the South African Community Epidemiology Network on Drug Use project between 2009-2019
Authors	Warren Covelé Lucas, Sharief Hendricks, Siphokazi Dada, Arvin Bhana, Charles Parry, Estelle (Vicki) Lambert, Bronwyn Myers, Nadine Harker
Presenting Author	Warren Lucas
Presenting Author Email Address	warren.lucas@mrc.ac.za
Division	ESSM
Abstract	BACKGROUND The use of psychoactive substances by youth and young people globally and in South Africa is of major concern, particularly given young people's increased access to legal and illegal substances. Up to 86% of youth return to substance use behaviour within 12 months following SUD treatment. The purpose of this study is to describe the trends of youth admission to treatment in a South African youth between 2009-2019. METHODS This study adopted a quantitative approach for the descriptive secondary data analysis of the SACENDU dataset to determine the trends of alcohol and other drug use among youth between the ages of 15 to 34 years old, who have accessed specialist AOD treatment services in South Africa between 2009-2019. RESULTS Descriptive statistical results revealed that the mean age of patients in this sample was 23.60 years old (SD=5.610) between 2009-2019. Youth aged 15-19 years (n=42240) and 20-24-year old patients, (n=35565), cannabis presented most frequently (61.3%; 30%) upon admission. Among youth aged 25-29 years old (n=36170) and 30-34 years old (n=26192), cannabis (20.4%), alcohol (30.7%) and methamphetamine (18%) as the most frequently reported substances of abuse. There were 19.5% of youth in this study (n=26007) reported having previous SUD treatment experiences in the past. DISCUSSION The majority of youth admitted for SUD treatment presented with cannabis-, alcohol-, methamphetamine- and heroin-related use as their primary substances of abuse. Results suggest that further exploration may be required to understand youth needs for SUD treatment in order to reduce patient readmission rates.

Abstract ID	Title
PP024	Design and Development of a Lower Limb Rehabilitation Device for Spinal Cord Injury Patients
Authors	Matthew Trusler, Dr Juliette Stander, Assoc. Prof Sudesh Sivarasu
Presenting Author	Matthew Trusler
Presenting Author Email Address	trsmat005@myuct.ac.za
Division	BME
Abstract	Introduction: Clinicians at the Acute Spinal Cord Injury unit (ASCI), operating from within Groote Schuur Hospital, have found that many of their patients have a missed opportunity for recovery, due to the lack of technology available in the public healthcare sector. There is as such, a lack of exercise of patients' lower limbs in the ASCI ICU and post-acute wards such as the one at Groote Schuur. Hypothesis: The device to be designed, which allows for repetitive practice of the lower limbs, will replicate early mobility exercises that are prescribed by physiotherapists and, when compared to literature, will simulate conditions that enable earlier recovery and a faster more focused rehabilitation such as a gait similar movement pattern and ground reaction forces. Methodology: Kinematic testing would involve the active use of the device through several rehabilitation and exercise modes, in which the ROM and the pace of the device are altered. This movement would be tracked to develop a model of the lower legs during rehabilitation. The model will be compared to the standard gait cycle and compared. Additional EMG measurement will be made to determine the activation of muscle groups with the exercise device. This measurement will be compared to those muscle groups usually activated during walking. The design process will focus on developing the core working mechanisms, being the leg drive mechanism, patient interface, as well as the clinician interface, to create an integrated device that will be adaptable to different hospital beds.

Abstract ID	Title
PP025	The Development of a Solution Method to Assist Transfemoral Amputees with Proper Residual Limb Bandaging to Promote Desired Healing and Maturation
Authors	Bhaveen Lalla, Sudesh Sivarasu, Michael Awood, Roopam Dey
Presenting Author	Bhaveen Lalla
Presenting Author Email Address	lllbha004@myuct.ac.za
Division	BME
Abstract	Introduction: Bandaging an amputee's residual limb requires skill and frequent reapplication. In many cases, the amputee is unable to bandage the residual limb effectively following surgery and professional assistance may not be readily available to perform bandaging as often as required. This leads to improper bandaging that may result in permanent damage. Proper bandaging is therefore required to shape and shrink the residual limb for successful prosthetic fitting. Materials and Methods: The methodology involves three sub-systems in an overall solution method to assist transfemoral amputees with the bandaging process to achieve a shorter healing period and promote faster prosthesis integration through residual limb re-shaping. The first sub-system is a mobile application (MA) that takes input in the form of circumferential measurements of the amputee's current residual dimensions and outputs a patient specific bandaging template (BT). The MA will also act as a guideline to instruct bandaging based on each step of the BT. The second sub-system is the BT that is applied directly onto the residual limb for bandaging to occur over. The BT medium is a printable template for A4-sized paper, for easy accessibility and low pressure application. The third sub-system is a bandaging dispenser (BD) that indicates the length of bandage unrolled to control bandage application based on instructions given by the MA and BT. Testing will then be performed on an anatomically correct residual limb model, as well as constructed models to test template and bandage application, as well as pressure testing.

Abstract ID	Title
PP027	Investigating cell-type-specific gene expression dynamics of long non-coding RNAs in the maturing human brain
Authors	Christina Steyn
Presenting Author	Christina Steyn
Presenting Author Email Address	christinacsteyn@gmail.com
Division	CNPS
Abstract	Abstract Rationale Gene expression underpins all neural processes as it is the basis of cell identity, cell function, and ultimately brain function. Recently, single nucleus RNA sequencing (snRNA-seq) technology has emerged, which, unlike bulk RNA sequencing, allows for an exploration of transcriptional dynamics within individual cells. The period of brain maturation from pre-adolescence to adulthood sees many changes in cell differentiation, proliferation, cell metabolism and circuitry. Exploring the transcriptional basis for these changes in neurotypical individuals may serve as a reference for understanding how dysregulated transcriptional control contributes to neurological conditions. Interestingly, long non-coding RNAs have recently been found to play important regulatory roles in the brain. They show cell type-specific gene expression patterns which may contribute to specialised cellular functions. Investigating the role of long non-coding RNAs in human brain maturation is a necessary step in contributing to the knowledge base with the hope that these could one day serve as novel therapeutic targets for treating neurological disorders. Approach Our lab has generated snRNA-seq datasets from a 14-year-old brain tissue sample obtained during elective surgery. Further paediatric and adult samples will be similarly processed. Bioinformatics analysis has been performed on existing datasets and cell-type-specific markers have been identified which will be validated in situ using hybridisation chain reaction on cryosections from the paediatric and adult samples. Differential expression analysis will also be performed to identify long non-coding RNAs which are up- or down-regulated in children compared to adults and candidate molecules of interest will be selected for further characterisation.

Abstract ID	Title
PP028	The marine-derived antibiotic chromomycin A5 targets the oncogenic TBX2: a new strategy to treat breast cancer
Authors	Claire Bellis, Suparna Chakraborty, Mihlali Mlaza, Bianca Del Bianco Sahm, Paula Rezende Teixeira, Leticia Costa-Lotufo and Sharon Prince
Presenting Author	Claire Bellis
Presenting Author Email Address	claire716@gmail.com or bllcla010@myuct.ac.za
Division	CNPS
Abstract	MATERIALS AND METHODS: The effects of C-A5 was assessed on BC cell viability by MTT and clonogenic assays; levels of TBX2 and TBX2 targets by western blotting and qRT-PCR; cell cycle by flow cytometry; morphological (microscopy) and molecular markers (western blotting) of DNA damage (yH2AX) and apoptosis (caspase activity and cleaved PARP). RESULTS: We show that C-A5 exhibits potent and selective short- and long-term cytotoxicity in TBX2-driven BC with IC50 values of ≤ 6.5 nM and a selectivity index of >5. Mechanistically, C-A5 induces DNA damage, cell cycle arrests and apoptosis which correlate with decreased TBX2 levels and increased TBX2 tumour suppressor target genes. Importantly, the efficacy of C-A5 was contingent on TBX2 expression. DISCUSSION: Results from this study suggest that C-A5 may be a novel drug to treat TBX2-driven breast cancer.

Abstract ID	Title
PP029	How well do the anatomical fracture fixation plates for the scapula perform? - A story of two halves
Authors	Roopam Dey, Johan Charilaou, Japie de Wet, Sudesh Sivarasu, and Stephen Roche.
Presenting Author	Roopam Dey
Presenting Author Email Address	roopam.dey@gmail.com
Division	BME
Abstract	Introduction: The scapula is an important bone of the shoulder girdle. Apart from forming three separate articulations with the humerus, thoracic cavity, and the clavicle the scapula houses a number of important muscles. As the scapula is mostly under the influence of higher tensile stress and lower compressive load the bone fractures under the influence of high energy forces. These forces are generated during a motor vehicle accident, contact sports, fall from a height, and bullet wounds. Fixation of comminuted scapula fractures is performed using plates and screws using a surgical technique called Open Reduction and Internal Fixation (ORIF). Current anatomical scapula plating systems, used in ORIF, are often found inadequate by surgeons and in South Africa, the surgeons have only one supplier for these plates. The purpose of this study was to investigate the anatomical fit of scapula plates on fractured scapulae. Methods: The RedCap database was surveyed, after obtaining ethics clearance, and CT scans of fractured scapulae were obtained and reconstructed using Mimics® and 3D printed. Five observers templated the available commercial scapula fixation plates on the fractured region and rated the plate's performance. Results: According to the ratings provided, the scapula spine, the glenoid, the scapula body and the coracoid fractures are not addressed by the current scapula plating system. Discussion: This study was able to highlight the regions of the scapula that not served by the current scapula plating system. The development of a novel scapula plating system should be considered in the future.

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