Institution: University of the West of Scotland		
Unit of Assessment: 24: Sport and Exercise and Leisure and Tourism		
Title of case study: Enhancing Athlete Health and Wellbeing		
Period when the underpinning research was undertaken: 2014 - 2020		
Details of staff conducting the underpinning research from the submitting unit:		
Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Prof Nicholas Sculthorpe	Professor	2013 - 2020
Prof Viswanath Unnithan	Professor	2017 - 2020
Prof Chris Easton	Professor	2013 - 2020
Dr Laura Forrest	Lecturer	2014 - 2020
Dr Hayley McEwan	Senior Lecturer	2006 - 2020
Dr Fergal Grace	Reader	2009 - 2016
Period when the claimed impact occurred: 2014-2020		
Is this case study continued from a case study submitted in 2014? No		

1. Summary of the impact

Our group's ground-breaking research has generated wide-ranging impacts, including informing clinical recommendations for cardiac assessment of elite athletes both within the UK and internationally. We have impacted the policy and practice of the British Association for Sport and Exercise Sciences (BASES) training for sport psychologists with a greater focus on athlete mental health, and changed policy and practice in high performance female sport. Athlete health and wellbeing is receiving increasing recognition globally, with support extending beyond performance, and including physiological and psychological health concerns. This work has made a significant contribution to supporting athlete health and wellbeing both nationally and internationally.

2. Underpinning Research

The underpinning research was undertaken by staff within the Institute for Clinical Exercise and Health Science (**ICEHS**) and covers studies examining cardiac adaptation in competitive and elite adults (**Sculthorpe**; **Grace**) and youth athletes (**Unnithan**); support for athlete's mental health (**McEwan**) and menstrual health in female athletes (**Easton** and **Forrest**).

Cardiac Health

Sculthorpe and **Grace** published the first systematic review and meta-analysis of cardiac function in athletes using the relatively new technique of Ultrasound Speckle Tracking **[3.1].** This identified that the systolic rotation of the left ventricle, known as twist mechanics, differs between strength and aerobic athletes, and also between elite levels versus competitive athletes. Earlier work identified a novel approach to the assessment of right and left ventricular mechanics, including a unique method of assessing ventricular strain throughout the cardiac cycle (temporal mechanics), again identifying sport-specific differences **[3.2]**. These studies highlighted the importance of tissue mechanics as a sensitive tool for the evaluation of athlete's cardiac health.

Elite youth soccer academies are a recent phenomenon, yet the effects of sustained and high-intensity training on adolescent cardiac mechanics is under investigation. **Unnithan** led a series of empirical studies using a novel temporal assessment of cardiac mechanics to inform our understanding of how such training approaches impact the health of young athletes. This work - both at rest and during exercise - resulted in the identification of youth athletes having increased cardiac size and function despite lacking the hormonal profile usually associated with such changes **[3.3].** The work also identified - for the first time - evidence of altered twist and strain mechanics, some of which would have been missed without the novel temporal approach pioneered by this group **[3.4].** This work was supported via GBP225,000 of football industry funding obtained from one English Championship and one Premier League club to support PhD bursaries and consultancy work in their Category 1 Elite Youth Academies.

Female Athlete Health

Historically, research on female athletes has been underrepresented, resulting in a lack of understanding of the impact of the menstrual cycle on female athlete health. Ground-breaking research by **Forrest** and **Easton** resulted in the first in-depth insight into athletes lived experiences and perceptions of managing their menstrual cycle and menstruation, and its impact on daily life, training, and performance. This work explored elite female athletes' responses to menstrual cycle symptoms and concerns, and the support mechanisms provided by coaches and governing bodies **[3.7]**. The results highlight the heterogeneity of responses between female athletes, and the importance of monitoring menstrual cycle and associated symptoms. The findings emphasised the need for support teams to initiate conversations with all female athletes to normalise conversations surrounding the menstrual cycle, especially within male-dominated environments, in an attempt to minimise any negative impact.

Psychological Health

Research in exercise psychology has predominantly focused on the efficacy of interventions to improve performance. Less is known about applied sport and exercise psychologists (ASEPs) as instruments of service delivery. **McEwan's** research has focussed on improving the training of applied sport psychologists to better support the athletes they work with. Research by McEwan draws on comparisons between the development of exercise psychologists and professionals practicing in the longer-established sub-disciplines of clinical and counselling psychology. This research identified that supervision and networks of practice are not well established in the development of exercise psychologists, whereas clinical and counselling professionals consistently identified the developmental importance of early career supervision and personal therapy **[3.5].** Subsequently, longitudinal research tracking trainee exercise psychologists over three years has identified the critical role of supervisors in mentoring and the development of professional judgement and decision making **[3.6].**

3. References to the research

3.1 Beaumont, A., **Grace, F**., Richards, J., Hough, J., Oxborough, D. and **Sculthorpe, N.,** (2017) 'Left Ventricular Speckle Tracking-Derived Cardiac Strain and Cardiac Twist Mechanics in Athletes: A Systematic Review and Meta-Analysis of Controlled Studies', *Sports Medicine*, 47(6): 1145–1170. https://doi.org/10.1007/s40279-016-0644-4

3.2 Oxborough, D., Heemels, A., Somauroo, J., McClean, G., Mistry, P., Lord, R., Utomi, V., Jones, N., Thijssen, D., Sharma, S., Osborne, R., **Sculthorpe, N**. and George, K., (2016) 'Left and right ventricular longitudinal strain-volume/area relationships in elite athletes', *The International Journal of Cardiovascular Imaging*, 32(8): 1199–1211. https://doi.org/10.1007/s10554-016-0910-4

3.3 Unnithan, V. B., Rowland, T. W., George, K., Lord, R. and Oxborough, D. (2018) 'Left ventricular function during exercise in trained pre-adolescent soccer players', *Scandinavian Journal of Medicine & Science in Sports*, 28(11): 2330–2338. https://doi.org/10.1111/sms.13258

3.4 Beaumont, A., Oxborough, D., George, K., Rowland, T.W., **Sculthorpe, N.,** Lord, R. and Unnithan, V.B., (2020) Superior cardiac mechanics without structural adaptations in pre-adolescent soccer players. *European Journal of Preventive Cardiology*. 27(14):1494-1501. https://doi.org/10.1177/2047487319890177

3.5 McEwan, H. E., & Tod, D. (2015) Learning Experiences Contributing to Service-Delivery Competence in Applied Psychologists: Lessons for Sport Psychologists. *Journal of Applied Sport Psychology*, 27 (1), 79-93. https://doi.org/10.1080/10413200.2014.952460

3.6 Smith, M., **McEwan, H.E.,** Tod, D., & Martindale, A., (2019) UK trainee sport psychologists' perspectives on developing professional judgement and decision-making expertise during training. *The Sport Psychologist,* 33(4), 334-343. https://doi.org/10.1123/tsp.2018-0112

3.7 Findlay, R., Macrae, E., Whyte, I., Easton, C. and Forrest (née Whyte), L., (2020) How the menstrual cycle and menstruation affect sporting performance: experiences and perceptions of

elite female rugby players. *British Journal of Sports Medicine*, 54(18): 1108-1113. https://doi.org/10.1136/bjsports-2019-101486

4. Details of the impact

Dissemination / Pathway activities:
In order to link the group's research activity to impact, members of the group have presented their work at key national and international conferences and workshops and have hosted further symposia and discussion with sport governing bodies.

Impact on athlete assessment: Our work in adults **[3.1]** has been cited in developing the first guidelines for cardiac assessment of athletes in **Brazil [5.1a]** and has been identified as one of three key papers to inform practice **[5.1a].** Similarly, our development of strain-volume loops **[3.2]** was cited in a joint guideline statement by the **British Society of Echocardiography** and the charity **Cardiac Risk in the Young (CRY) [5.1c]** and was also identified as one of the key imaging papers of 2016. The normal response to athletic training includes an increase in heart size, making identification of underlying pathology challenging. A major impact from this group's work has thus been to effect significant change in the cardiac assessment of athletes via inclusion in consensus statements and recommendations. Indeed, such publications are the primary method of changing contemporary clinical decision making and therefore have global reach. These guideline documents, including those endorsed by CRY have impacted the pre-participation screening of **all UK athletes**, and systematically enhanced the delivery of clinical echocardiography services to athletes both within the UK and Brazil.

Impact on sport science support training: Research findings on the training and development of ASEPs have contributed towards the design of a **new training pathway for BASES**. The professional body commissioned a two-year project (2017 to 2019) to design a new training pathway for an application to the Health & Care Professions Council (HCPC) for Sport & Exercise Psychology. McEwan led a workstream to develop training and support materials for supervisors. This involved the design of documentation including a supervisor handbook, reflective practice workbook and three training modules (two online, one face-to-face). The training modules detail application of research findings from McEwan, including how supervisors can promote and support the individuation process in trainees **[3.6]** and how to contextualise good practice learned from clinical and counselling psychology for ASEP supervision **[3.5]**.

The BASES Sport and Exercise Psychology Accreditation Route (SEPAR) was approved by HCPC in November 2018 **[5.2b]** and launched in February 2020 **[5.2c]**. The underpinning research of McEwan has been central to the redevelopment of the SEPAR pathway **[5.2a],** impacting on the education and development of current and future trainee's and, by extension, their clients. This has contributed an additional training route for **ASEPs within the UK**, raised the standards of service to clients, and enhanced exercise psychology's standing as a profession. More widespread, currently the UK is considered to be a leader in the higher education sector and is one of a select group of countries where the regulation of sport and exercise psychology practitioners has been enacted in government legislation, offering some protection to the profession. Our impact in the development of SEPAR will contribute to the UK's reputation as a leading provider of high-quality sport and exercise psychology research and education worldwide.

Impacts on Sport Science Support Practice: Work from this group has had direct impacts on the knowledge and understanding of elite coaches in both soccer and rugby, the practice of soccer and rugby coaches and sport science support personnel, and on women's rugby policy.

We know little about the effects of sustained high-volume, high-intensity training on the health of young athletes in professional soccer academies. Pioneering work by Unnithan regarding the effects of such training **[3.3, 3.4]** on childhood cardiac health has impacted practitioner knowledge and sport science support practice. Over the course of three seasons, two **category one English Premier League Academies** undertook novel cardiac evaluations of their youth soccer players by incorporating resting and in-exercise echocardiographic evaluations of the young players. These changes also improved the quality of pre-participation screening available to those athletes,

improved the understanding of athlete health by coaches, athletes, and their families, and altered practice through the initiation of cardiac screening in this cohort **[5.3a, 5.3b].** As evidence of reach, a **tier one Scottish Premier League** club have also initiated wider evaluations of both their academy and women's football squads **[5.3c].**

World-leading research by Forrest and Easton has had global reach by directly influencing **International Women's Rugby practice**, including a change in practice by athletes, coaching staff, sport science support practitioners, and medical services. Ongoing research to better understand the implications of female menstrual health on performance has led to a variety of impacts within women's rugby in response to education workshops for athletes, coaches and support staff. Based on this research, **Scottish Rugby** has initiated the provision of ongoing education sessions for the medical staff and changes of practice outlined in the letter of support **[5.4a].** Similarly, in 2017, and directly due to this work, Scottish Rugby mandated the provision of an identified individual within the athlete support team whom athletes are comfortable in approaching with menstrual cycle/menstruation-related concerns **[5.4a].** A further impact was the implementation of daily monitoring of cycle phase and symptomology to inform medical treatment and training where necessary. Subsequent pilot evaluation has shown that regular monitoring of the menstrual cycle has impacted elite athletes by enhancing their knowledge and understanding of their menstrual cycle and improved the knowledge and understanding of the coaching team. It has also improved openness and communication of the menstrual cycle within the sporting environment **[5.1b].** In addition, Scottish Rugby also implemented the provision of sanitary products in training and competition and avoiding light coloured competition shorts where possible in 2017 **[5.4a, 5.4b].**

5. Sources to corroborate the impact

5.1 Evidence on Impact of the cardiac evaluation of athletes

a. Ghorayeb, N., et al. (2019) The Brazilian Society of Cardiology and Brazilian Society of Exercise and Sports Medicine Updated Guidelines for Sports and Exercise Cardiology - 2019, *Arquivos Brasileiros de Cardiologia*, 112(3). https://doi.org/10.5935/abc.20190048

b. Forsythe, L., George, K. & Oxborough, D. (2018) Speckle Tracking Echocardiography for the Assessment of the Athlete's Heart: Is It Ready for Daily Practice?, *Current Treatment Options in Cardiovascular Medicine*, 20(10), p. 83. https://doi.org/10.1007/s11936-018-0677-0

c. Oxborough, D. et al. (2018) A guideline update for the practice of echocardiography in the cardiac screening of sports participants: a joint policy statement from the British Society of Echocardiography and Cardiac Risk in the Young, *Echo Research and Practice*, 5(1), pp. G1–G10. https://doi.org/10.1530/ERP-17-0075

5.2 Evidence of Impact on applied sport and exercise psychologists (ASEPs) pathway development

a. Testimonial from British Association for Sport and Exercise Sciences (BASES)

b. HCPC validation event documentation

c. McEwan H, Kentzer N (2020) Empowering our trainee sport and exercise scientists: a framework for supervisors. *The Sport and Exercise Scientist* 64, 26-27

5.3 Evidence of Impact on soccer academy coaching practice

a. Testimonial from the Academy Sport Science, Blackburn Rovers FC

b. Testimonial from the Medical Department at Wolverhampton Wanderers FC (2012-2019)

c. Testimonial from Sport Science at Celtic FC

5.4 Evidence of Impact on Women's rugby policy and practice at Scottish Rugby

a. Testimonial on Women's health and education changes in Women's Rugby from the Scottish Rugby Union

b. Testimonial from coaching team at the Scottish Rugby Union