Institution: St Mary's University College

Unit of Assessment: 26: Sport and Exercise Sciences, Leisure and Tourism

a. Overview

The body of research at St Mary's University College (SMUC) within UoA 26 occurs within the School of Sport, Health and Applied Science (formerly the School of Human Sciences). Within the School and since the RAE2008 there has been a consistent growth in, and emphasis placed upon research, manifest in a growing number of research outputs, REF eligible staff, post-graduate research students, external research collaborations and external research funding applications. An institutional Research and Enterprise Development (RED) Unit supports researchers at all levels. It also provides support for grant applications and oversees the development, dissemination and implementation of the institutional research strategy and research policies. The RAE2008 was deemed locally to be a great success for sport-related subjects at St Mary's, and the derived income has been fundamental in contributing to the development of the present research portfolio, expanded from four staff regularly publishing research articles in 2008 to around 15 staff in 2013. 8.1 FTE (9 staff) are being submitted to the REF in this UoA.

Embedded within the School, there are two vibrant Centres which encompass much of the research activity: The Centre for Health, Applied Sport and Exercise Science (CHASES; established in 2009) and the Centre for Workplace and Community Health (CWCH; established in 2005), both operating as centres of excellence for knowledge transfer and research, each with a number of core staff and a director. These centres build on a number of unique advantages that SMUC possesses owing to its history, location and assets, using the Centres' professional networks to undertake applied research and conversely using the research to deliver research-informed services.

Two overarching research aims are defined as follows:
Aim 1 - To improve elite sports performance and the safety of elite performers, for example, through the development of new training or coaching techniques and the reduction of sports injury/illness;
Aim 2 - To improve the health of community populations and the workforce through the investigation of health interventions and techniques, predominantly with a basis in increasing sport and exercise participation, improved dietary habits and cessation of smoking.

Aim 1 ('sports research') exists in part as a result of the strength of St Mary's position as a hub for sport and exercise education and training, along the continuum from community sport to elite international sport. This is evident through a number of its external partners which include the London Marathon (which has contributed considerable funding for facilities, coaching, services and accommodation for athletes in the Endurance Performance and Coaching Centre – EPACC), the English Institute of Sport, the Talented Athlete Scholarship Scheme and various links with local and national sporting bodies, particularly GB Rowing, the Rugby Football Union and local professional rugby teams, England Triathlon and England Athletics. Furthermore, St Mary's played an important role prior to, and during, the London 2012 Olympic Games as an Olympic and Paralympic Training Centre, hosting four international squads (China, Japan, South Africa and Ireland) and with a total of 10 nations represented by individual athletes preparing at St Mary's. These links have led to improved facilities for sport-related research, various research opportunities in elite sport and considerable scope for research to directly influence coaching, athlete behaviour and performance.

Aim 2 ('health research') exists in part owing to the significant health intervention projects delivered in local boroughs through CWCH, for clients such as the NHS, local borough councils and local work forces. Within the current REF assessment period, the Centre is delivering or has delivered workplace health interventions in the London Boroughs of Sutton and Merton (NHS LiveWell South West London; project funding: £333K over two years), the London Borough of Hounslow (project funding: £772K over three years), the Department of Health's 'Responsibility Deal' (£80K funding for one year), NHS London's 'Move4Life' covering six NHS trusts and training 104 health champions (project funding £100K over one year) and the London Borough of Tower Hamlets' workplace health project which recruited 49 workplaces training 38 workplace champions. These projects have affected thousands of people, by using behaviour change techniques such as motivational interviewing to increase physical activity and improve health, and the Unit's research will provide a strong evidence base to design better interventions and rigorously test their efficacy and effectiveness in the future.

The UoA considers that the Centres' model is robust and has far more impact than a centre that only conducts research, because equal emphasis is placed on delivery of sport and health services, ensuring that research questions are relevant and contemporary, and findings have an impact on the end user.

The institution is raising standards for research on a continuous basis and current developments include full alignment with the Concordat for Research Integrity and the Concordat to Support the Career Development of Researchers. Action plans for both will ensure their full implementation by the end of the 2013-14 academic cycle.

b. Research strategy

To achieve the research aims 1 and 2 above, within a department historically rooted in teaching and lacking established research professors in sport and exercise, the School has sought to recruit lecturing staff with research ambition, quality publications and doctorates. This approach has considerably expanded the research portfolio and capacity.

Given the CWCH's success in winning funding for the delivery of health interventions, as described in section a, it has invested in post-doctoral research fellows in order to grow a research portfolio in health and physical activity. These individuals have been recruited for their research skills: they do not have a responsibility to deliver services and can therefore focus wholly on research. There are currently three contracted individuals working in this capacity in health (Drs Allison, Waite and Morton). There is one research fellow in CHASES (Dr Hemmings). The research fellows draw in non-research specialist staff to assist with their research projects, thus enabling both parties to gain valuable research experience in the process. Similarly, the Centres aim to maintain strong external collaborations in order that staff are able to work with excellent established researchers, to reach new cohorts of research participants (see section e below), and to ensure that the diversity in research activity does not lead to researchers working in isolation.

Within the REF assessment period, embryonic specialist research groups have formed where common research interest exists, for example, a biomechanics research group encompassing strength and conditioning staff (Goodwin, Price and others) and biomechanics staff (Bezodis, Atack, Cleather and others), and a psychology research group (Winter, Hemmings, McGregor, Martin, O'Malley and others). As research activity grows, these specialist groups will be formalised as subdivisions of the Centres, and staff with complementary research interests will be recruited in

order to develop research depth in areas of strength. An example of this is recent recruit Dr Andre Roca, who has a similar research profile in skill acquisition to Dr Jamie North.
The Unit aims to develop research in health and physical activity in response to national and international trends towards an obesity epidemic with a host of associated diseases. This is clearly an important area for sport and exercise scientists to have an impact in the future, by designing and testing new approaches to tackling health through sport and exercise. The most significant step taken to facilitate this is the recruitment of the research fellows within our Centres structure as described above. The intention following the next REF assessment period is to submit to both sport and health units of assessment.

The School has sought to grow research from within the teaching staff team, by offering relief from teaching, recruiting PhD students and by providing training opportunities for its own staff in research supervision. Although SMUC has no formal institution-wide sabbatical leave scheme in operation at present (which is under review), a targeted scheme was implemented to support staff in preparing for the REF2014, and staff workload is allocated on an individual basis across discipline areas to facilitate planned periods of research activity. Dr Nicola Brown benefitted from this REF preparation scheme, taking a semester's relief from teaching to write up two papers, build a research collaboration, and design further research studies.

The School has a strong record of achieving what it has set out to do. In the RAE2008, it pledged to set up CHASES to form a focal point for developing excellence in research, knowledge transfer and enterprise activity with a particular focus on sports performance. CHASES is now flourishing within the School, and facilitating research and research dissemination. A good example of this was the Rehabilitation Symposium held by CHASES in partnership with the British Olympic Medical Institute's Intensive Rehabilitation Unit which mixed together practitioner speakers in elite sport and the military, with contributions from research-active staff speakers from CHASES in areas pertaining to rehabilitation, for example, occlusion training (Patterson), anti-gravity treadmill running (Burden), hypnosis (Calvert) and hypoxic training (Pollock). This stimulated discussion and has led to a number of collaborations and changes in practice. The future strategy is to replicate this type of event with external partners in sport and health.

Finally, the Unit continues to seek research funding through grant applications to charities and research councils, and have recently submitted research grant proposals to the Leverhulme Trust, the Wellcome Trust, Bupa, the Arthritis Research UK charity and the BBSRC.

c. People, including:

i. Staffing strategy and staff development

Aim 1 ('sports research') encompasses the applied sports science and sports medicine work of Dr Glaister (repeated sprints; caffeine supplementation), Dr Gissane (epidemiology of sports injury), Dr Pedlar (endurance; hypoxia; sleep), Dr Bezodis (biomechanics of sprint starts; biomechanical aspects of elite rugby performance), Dr Hemmings (psychology of performance and rehabilitation), Dr North (skill acquisition), Dr Cleather (in-silico modelling of the lower limb), and Dr Patterson (occlusion training and ischemic pre-conditioning).

Aim 2 ('health research') encompasses the work of Dr Morton (psychology of physical activity behaviour, particularly amongst adolescents) and Dr Patterson (applications of blood flow restriction training across the lifespan). Dr Brown is investigating anthropometric measurement of breast size, and the experience of breast pain during exercise, and maintains a collaboration with Portsmouth University in this area. Dr Dancy (nee Woods) is researching the impact of health

checks and behaviour change in a local workforce of bus drivers. Dr Bunsell is investigating the sociology of the body, feminism, identity, gender, sporting subcultures, embodiment, deviance and health, with a particular focus on female bodybuilding.

Despite the obvious absence of research professors within this unit, there has been considerable growth in research activity since 2008. Dr Glaister (Sports Physiology) and Dr Gissane (Sports Injury Epidemiology) now hold Readership positions in the School. Furthermore, a number of other staff are beginning to accumulate impressive research publication records, for example, Dr Hemmings and Dr Cleather. Dr Pedlar has a research management role as an Academic Director for research, representing and coordinating research at school leadership level.

Each staff member produces a research action plan, integral to their annual staff appraisal process. The School Research Committee defines and monitors yearly action plans for the development of research activity. An institutional workload-planning model promotes the recognition of research activity in line with the staff appraisal scheme.

Research is positively encouraged throughout the School, formally recognised through workload planning for all academic staff and stimulated through a series of research seminars throughout the academic year with a mixture of internal and external speakers. The School holds 45-minute research seminars on a monthly basis, outside of typical teaching hours to which all academic staff are invited. Approximately a quarter of these seminars are delivered by external, well-established researchers and three-quarters by our own research active staff and research students.
Opportunities for research staff development include: initial training and updates for supervisors, supervisor discussion fora at school and institution level, specific skills training, and funding workshops.

ii. Research students

During the REF assessment period a total of eight competitive studentships have been offered in the area of Sport and Exercise Science. This has enhanced the research student culture and richness of the environment in the School.

The number of students enrolled and actively pursuing studies on the RDP at SMUC in UoA 26 are as follows:

Year	2008/9	2009/10	2010/11	2011/12	2012/13
Registered Research Student FTE	1.0	1.5	1.0	5.5	8.5

This table demonstrates the significant development in RDP provision that has taken place in UoA 26 during the REF assessment period a corresponding increase in the Unit's capacity to support additional numbers of PGRs. This positive pattern reflects developments across the PGR programme at SMUC as a whole.

The current research students studying areas of sport and exercise comprise the following:

Sports performance research:
Richard Burden is investigating iron deficiency, total haemoglobin mass and performance in elite rowers and distance runners. Jessica Hill is investigating the use of compression garments on performance and recovery. Burden and Hill are supervised by Dr Pedlar.

Alex Atack is investigating the biomechanics of rugby kicking and James Wild is investigating the

biomechanics and technique of sprinting. Atack and Wild are supervised by Dr Bezodis.

Kevin Merry is investigating aspects of maximal oxygen uptake in athletes. Daniel Muniz-Pumares is investigating limitations in the measurement of anaerobic capacity. Merry and Muniz are supervised by Dr Glaister.

Emily Martin is investigating the use of observation as an assessment tool in the delivery of sports psychology. Lorraine O'Malley is investigating the triadic relationship of coach, athlete and parent in coaching. Martin and O'Malley are supervised by Miss Stacy Winter.

Phillip Price is seeking to validate the Imperial College Lower Limb Model through a series of studies under the supervision of Dr Daniel Cleather.

Sports injury research:
A new studentship funded by the School of Sport, Health and Applied Science has recently been filled by Dearbhla Gallagher to investigate concussion in youth rugby at club and school level. Gallagher is supervised by Dr Gissane, who has a growing research portfolio in the topical issue of concussion in sport.

A postgraduate research study space is available to research students. Space and facility requirements for students on a studentship is considered and agreed as part of the approval process and prior to advertising the post.

Directors of Studies are responsible for ensuring that appropriate training is made available to their research students, in line with a skills audit based on the Vitae Researcher Development Framework. The Sub-Committee reviews the support and training provided by Schools for each of their research students through the Annual Report process.

A central PGR skills training programme is provided at SMUC in addition to the sessions available at School level and via the University of Surrey's SPLASH programme. The SMUC programme culminates annually in a multidisciplinary PGR student conference held in June.

d. Income, infrastructure and facilities

Research activity has been able to grow through the targeted use of funding generated as a result of the RAE2008 exercise, and through income generated through knowledge transfer activities such as specialist clinics and workshops (CHASES), and delivery of health promotion interventions (CWCH).

The suite of laboratories has been upgraded since 2008 to include a relocated, extended and upgraded biomechanics laboratory with a range of equipment including a Vicon motion capture system, multiple Kisler force plates, a Kincom isokinetic dynomometer and various electromyography systems; a refurbished physiology laboratory dedicated to knowledge transfer and research houses a range of equipment including a normobaric hypoxic chamber, equipment for measuring total haemoglobin mass (CO-rebreathing technique), Oxycon Pro metabolic cart, various ergometers and treadmills, near infrared spectroscopy and controlled blood pressure occlusion equipment. Furthermore, existing teaching laboratories have been upgraded and extended. There is an annual round of capital bid funding at SMUC. Any research unit can submit an application as appropriate through their Head of School to fund research equipment and facilities.

SMUC as an institution has made significant steps forward in supporting research since the RAE2008. The institution participated in the 2013 CROS survey and is preparing an application to the European Commission's HR Excellence in Research Award. In doing so, it supports fully the principles of the Concordat to Support the Career Development of Researchers and is working towards full implementation through its institutional policies and procedures. The institution is also in the process of aligning fully with the Concordat for Research Integrity. An action plan will ensure its full implementation by the end of the 2013-14 academic cycle.

As a small and specialist institution, St Mary's has invested in and benefitted from being a member of the GuildHE Consortium for Research Excellence, Support and Training (CREST), a collaboration of 27 HEIs working together develop research potential. Students and staff have had opportunities to attend a number of research symposia, workshops and conferences across a range of disciplines at CREST partner institutions.

e. Collaboration and contribution to the discipline or research base

Notable UK collaborations:
A research culture has formed that integrates research activity with the work of the Centres. Development of research activity and dissemination of research has benefitted from a number of external collaborations, for example:
Professor Bull (Imperial College London) continues to work closely with Dr Cleather on the *in silico* modelling of the lower limb and together they have authored a number of high quality articles. This work feeds into a number of applications, for example the GB Rowing biomechanical modelling and Imperial's Arthritis research group. Prof Bull is also co-supervising the PhD studies of Phillip Price at St Mary's and Jon Goodwin (a lecturer at St Mary's), both of whom are registered at Imperial College.

Dr Pedlar has formed a collaborative link with Mr Toby Richards (University College London, UCL) to investigate iron repletion in iron deficient, non-anaemic athletes. Mr Richards is a vascular surgeon and has recognised the parallels between pre-surgery patients and the fatigued athlete. Together, Dr Pedlar and Mr Richards are investigating iron repletion in iron deficient elite distance runners, and this is forming part of the PhD work of Richard Burden. Furthermore, Mr Richards has been able to direct funding for this work from the Swiss pharmaceuticals company Vifor towards iron-therapy consumables and to run specialist assays at UCL.

Professor Jo Scurr (Portsmouth University) works closely with Dr Nicola Brown to investigate breast biomechanics during exercise. Recently they were able to benefit from CHASES links to the London Marathon and conduct a large survey of mastalgia in marathon participants.

International collaborations:
Dr Morton maintains a working collaboration with Prof Mark Beauchamp (University of British Columbia, Canada), to mentor and supervise her post-doctoral work in CWCH.
Dr Gissane maintains a number of international collaborations, such as Dr Doug King (Auckland University of Technology, New Zealand) and Dr Fiona Wilson (Trinity Centre for Health Sciences, St James's Hospital, Dublin, Ireland).

Contribution to the discipline or research base:
The most extensive output records are those of Dr Gissane and Dr Glaister; however, as a group of young researchers, others within sport and exercise science field are rapidly developing

excellent research portfolios, and working collaboratively within the delivery of services and with delivery partners to ensure that their research outputs are excellent and have high ecological validity and impact. An example of this is Dr Brown's recent work on the experience of mastalgia in marathon runners which has been extensively covered in the popular press with real implications for the enjoyment of sport in women. Another is Dr Patterson's work on occlusion training where a recent collaboration with the Defence Medical Rehabilitation Unit at Headley Court investigating the use of occlusion training in service personnel is ongoing. These collaborations are considered to be extremely important to UoA 26 at St Mary's, in order to grow excellent research with an impact on sport and exercise science and medicine practitioners.

Dr Pedlar works closely and collaboratively with sports medicine practitioners, nutritionists and physiologists to undertake applied research and this is highlighted in the impact case study which is concerned with the two themes of the female athlete triad and iron-deficiency non-anaemia in endurance athletes. Pedlar has recently been invited to speak at a number of sports science and sports medicine conferences including 'Marathon Medicine' (the annual sports science and medicine conference hosted by the London Marathon), the British Association of Sport and Exercise Medicine annual meeting the Running 2012 conference, and the European Athletics Endurance Conference, and 'KNO_2WLEDGE VIII' (an annual meeting at the Centre for Altitude, Space and Extreme Environmental Medicine) in order to present his work to fellow practitioners in sports science and sports medicine. He has also published an 'Expert Statement' for the British Association of Sport and Exercise Science (BASES) on the topic of altitude and hypoxia. Pedlar continues to work with Dr Noel Pollock (British Athletics) and Dr Ken van Someren (GlaxoSmithKline Human Performance Lab) on a number of research projects, as well as maintaining ongoing research collaborations with English Institute of Sport sports scientists.

Dr Glaister has published an extensive series of papers to investigate aspects of performance in repeated sprint sports, for example, the effects of caffeine and sodium nitrate supplementation. He has presented this work regularly at the American College of Sports Medicine's annual meeting, and has also been invited to speak to end users such as the Rugby Football Union.

Dr Gissane's work is extensive, spanning more than two decades, documenting the incidence of injury in Rugby League, Rugby Union and Rowing. Gissane's work forms the subject of one of the Unit's impact case studies, highlighting his work in the rapid (pitchside) diagnosis of concussion, and the effects of a rule change in rugby league on injury rates. On a number of occasions Gissane's work has been highlighted in editorials in academic journals, and on one occasion a statistics-based piece was re-published in a different journal at the request of the editor - Gissane C, (2012) The P value, do you know what it means? *Physiotherapy Practice and Research* 33(2); and Gissane C (2013) The P value do you know what it means? *Fagkronikk i Fysioterapeuten*, 2/13 (http://fysioterapeuten.no/Fag-og-vitenskap/Fagartikler/The-P-value-do-you-know-what-it-means).
The Society of Occupational Medicine awarded Gissane the Esso research prize in 2004, recognising his important contribution to research in rugby league.

Research in sport and exercise continues to grow strongly at St Mary's and there is now a strong foundation for continued development of its applied research portfolio. The research environment is vibrant and dynamic, and increasingly well supported at an institutional level.