

**Institution: St Mary's University**

**Unit of Assessment: 24, Sport & Exercise Sciences, Leisure & Tourism**

## **1. Unit context and structure, research and impact strategy**

### **Unit Context and Structure**

Research informing the submission to the Sport & Exercise Sciences, Leisure & Tourism Unit of Assessment (hereafter 'the Unit') is housed in the Faculty of Sport, Allied Health, and Performance Science of St Mary's University, Twickenham (hereafter 'St Mary's/the University'). The Faculty is comprised of four academic departments: the Department of Sport and Exercise Sciences, the Department of Health Sciences, the Department of Psychology and Pedagogical Sciences, and the Department of Drama. Alongside these academic departments, the Faculty is completed through a fifth, non-academic, department - Sport St Mary's.

Since the Research Excellence Framework 2014, the context and structure in which the Unit is housed has seen considerable development, having grown from a School to a Faculty in 2018 and incorporated academic provision in Psychology, Physical Education and Youth Sport, and Coaching to its portfolio. The formation of academic departments within the Faculty has ensured close alignment between research and teaching, with research activity being broadly aligned to one of three areas: Applied Performance Sciences; Applied Health and Exercise Science; Wellbeing and Inclusion. All the Faculty's academic staff who are research active, regardless of level, also teach. These staff are advancing knowledge and understanding and impacting society through their research and creating research-enriched learning environments as we strive to nurture future generations of critical thinkers and researchers in our students.

### **Research and Impact Strategy 2014-2019**

Following REF 2014, we identified three strategic priorities to enhance our research environment for the next six years and beyond. Specifically, we prioritised (i) the establishment of a thriving and vibrant research environment for our PGR community and developing researchers, (ii) increasing research capacity in the Unit across the breadth of sport and exercise sciences, and (iii) engaging in research addressing social issues and with clear applied value. These strategic priorities were informed by visions outlined in our REF 2014 Environment Statement and following reflection upon feedback received from the REF 2014 sub-panel.

*Priority 1: Establish a thriving and sustainable research environment with a specific focus on our PGR community and developing researchers.*

Feedback on our REF 2014 submission highlighted concerns over the vitality and sustainability of our research environment, along with a limited PhD community and lack of clear support for those PhD students. Following this feedback, and through our own self-critical reflection, we acknowledged that we could do more to create an environment that facilitated research, promoted opportunities for collaboration across staff, and stimulated and developed the next generation of independent researchers in our PhD community.

Structurally, we sought to achieve this strategic priority by coordinating research activity through the formation of research clusters. These research clusters enabled coherent groupings of researchers, offering a focal point of engagement around which staff with shared research interests and expertise could gravitate. Formation of these clusters enabled us to formalise research activity since REF 2014, resulting in the operationalisation of eleven research clusters (cognitive science; expert performance and skill acquisition; female health and wellbeing; injury and rehabilitation; gender and sexuality; lifestyle management, treatment, and prevention of chronic diseases; musculoskeletal mechanics; cross cultural; nutrigenetics and nutrigenomics;

professional practice in sport psychology). Each research cluster had an identified 'cluster lead' and comprised of established researchers alongside early career researchers and PGRs. Every PhD student in the Faculty was afforded the opportunity to be a member of a research cluster, enabling them to receive research mentorship and experiences beyond their immediate supervisory team.

To achieve our priority of establishing a prosperous research environment, we have invested considerably in our PGR community. Although we have grown our breadth of research active staff (see Priority 2), we have also added depth and vibrancy to our research environment by growing the number of PGR students in the Faculty to align with the University's strategic aim of developing this community. The University has invested in 10 funded studentships in the Unit since 2014 and we have seen a year-on-year increase in the number of PhD registrations, with the total number more than doubling from 16 in 2013-14 to 33 in 2019-20. Alongside growth in PhD registrations, the number of staff in the Faculty who have developed skills, experiences, and expertise to qualify as Director of Studies has increased from two in 2014 to eleven in 2020, with the number of approved supervisors more than doubling from 21 in 2014 to 59 in 2020. This growth in supervisory capacity and the international reputation and expertise of our research staff is reflected in the number of self-funded PhD students who invest in the research opportunities and research programmes that the Faculty offers. Of the PhD students registered in the Unit in 2020, 50% were self-funded. Finally, we have encouraged staff members without PhDs to pursue a research programme and offer an annual scheme for staff to apply for 75% funding of fees.

*Priority 2: To grow research capacity and expertise across the spectrum of sport, exercise, and health sciences.*

There has been a 128.4% increase in staff returned to the Unit since 2014 (2014: 8.1 FTE vs 2021: 18.5 FTE). This strengthening of our research capacity is in part due to the strategic recruitment of research active staff, as well as the structures and environment we have put in place to nurture ambitious researchers within our existing staff base. These complementary strategies are illustrated in the profiles of staff returned in this submission. Of those being returned, Wadey, Tallent, Mahaffey, Meijen, Murphy, Kelaiditi, Atack, and Coakley have all been recruited post-2014. Meanwhile, Hill, Patterson, Glaister, Brown, and Mavrommatis are staff members who were not returned in 2014, who have developed as independent researchers in the intervening period and are being returned now. Alongside these groups of staff, our return includes Pedlar, Winter, North, Roca, and Cleather, who were all returned in our REF 2014 submission, demonstrating how we have retained our leading researchers as a fundamental core to our research environment. To grow research capacity, our more experienced and established researchers have nurtured aspiring researchers and we have strategically recruited research active and research ambitious staff around them.

We have not just sought to increase our research depth, as illustrated in the data above, but have also maintained breadth in our areas of research activity. Consistent with our local strategic priority, and in keeping with our core institutional value of inclusiveness, staff returned within this Unit and their associated research outputs reflect the spectrum of sport and exercise sciences. These research outputs and expertise span childhood inactivity and obesity (Mahaffey), race, sport, and health (Dagkas), perception, cognition, and action (North, Murphy, Roca), injury and psychological growth (Wadey), exercise physiology (Patterson, Hill, Pedlar), ergogenic aids (Glaister), neurophysiology (Tallent), endurance performance and psychology (Meijen), nutrition and diet (Kelaiditi), and genetics (Mavrommatis) amongst others. Developing this breadth of research expertise has been fundamental in developing a Faculty-wide research culture and providing a base to ensure a thriving and sustainable research environment.

*Priority 3: To prioritise research which addressed contemporary social issues and with clear applied value.*

As outlined in Priority 2, since 2014 we have grown our research capacity and our staff have research expertise spanning the range of disciplines in sport and exercise sciences. However, we have challenged staff to specifically focus their research to address current social issues and engage in research with applied value. Our researchers have successfully risen to the challenge of satisfying this priority. Concerning research addressing contemporary social issues, Brown has undertaken research exploring breast health, breast education, and sports bra use, whilst Pedlar and Burden have investigated the effect of periods and the menstrual cycle on performance and participation in sport and exercise. Such research informs our Impact Case Study 2 and addresses the important issue of lower levels of engagement in sport and exercise for females in comparison to males. Post REF2021 we will continue to support research which addresses and realises impact concerning the female athlete, with Wadey having received funding from the English Institute of Sport to continue research in this field.

Patterson has investigated the application of clinical techniques for recovery and rehabilitation from injury and surgery. Recommendations arising from this research have led to changes in practice and policy by governing bodies and leading national sports organisations (The Football Association, English Institute of Sport, Lawn Tennis Association, Rugby Football Union, American Physical Therapists Association), with the clinical benefits also translating to application in medical and military environments (see Impact Case Study 1). Beyond our impact case studies, the focus on applied research which addresses social issues is evident across the Faculty. For instance, (i) Mahaffey's research focuses on addressing the challenge of an increasingly overweight and inactive adolescent population, (ii) Kelaiditi's work with the World Health Organisation addresses diet in elderly populations, (iii) Dagkas investigates engagement and access to sport and exercise in BAME populations, and (iv) Tallent's research on workload monitoring is used to manage injury risk by the England and Wales Cricket Board and Royal Ballet Company.

The applied nature of our research means staff have formed strong links with industry and applied organisations. Pedlar works with Orreco, a technology company specialising in data and sport science to optimise athletic performance. His research is contributing to the development of software applications FitrWoman and Zone, both of which are widely used across the general population and national and international sporting teams and organisations. Burden, Brown, and Pedlar's research has been used by the English Institute of Sport to inform their SmartHER and MiNT programmes. Patterson's work has informed policy development at the English Institute of Sport and benefitted practice in professional sports clubs and organisations and has also seen him collaborating with local NHS trusts. Wadey, too, is working in collaboration with the NHS and the charity LimbPower as part of his research that looks at wellbeing following amputation, post-traumatic growth following adversity, and the contribution of physical activity in these processes.

Our success in satisfying Priority 3 is reflected in the increased external funding our staff have received within this REF period (see Section 3).

### Post-2019

We have successfully achieved the three strategic priorities that were set following REF 2014, and this has enabled us to establish a thriving and sustainable research environment. Nevertheless, as the School grew to a Faculty in 2018, we recognised the importance of revisiting our Research Strategy and its aims and objectives, as well as the structures to support these.

Our updated Faculty Research Strategy was developed to align with the University's Vision 2025 strategy which states the University's ambitions to:

1. Develop research and enterprise capacity alongside a renewed emphasis on teaching excellence.

2. Intensify interdisciplinary research and scholarship to create and disseminate new knowledge.

3. Partner with public, private, and third sector bodies to influence public policy debate and decision-making.

4. Raise the University's profile and increase our impact through an active presence in the public square and development of solutions to key public policy concerns.

With these institutional objectives in mind, the Faculty research strategy set out to reflect: i) the increasing prioritisation of inter- and multi-disciplinary approaches to addressing problems, ii) the growing importance of impact from research, iii) priorities identified by UKRI and other funding bodies and charities, and iv) the importance of knowledge exchange and public engagement to communicate research and maximise its reach and benefit. With these at the forefront of our planning, and working towards the University's Vision 2025 research ambitions, the four strategic aims of our Faculty research strategy are to establish the Faculty as:

1. Engaging in research that is of an internationally excellent or world-leading standard.
2. Engaging in research activities that impact and benefit society.
3. Engaging in collaborative and interdisciplinary work with external partners to enhance both the quality of research and facilitate knowledge transfer.
4. Engaging in research that informs teaching and curriculum development.

Key to our updated research strategy is the development of research centres in the Faculty. As our research environment continues to develop, these research centres are a natural- yet necessary- step in its evolution. The research clusters that were formed post-REF 2014 have facilitated internal collaboration, which has resulted in published peer-reviewed research outputs (e.g., North et al., 2018, Journal of Sports Sciences). The clusters have been successful in promoting collaboration between individuals working within the same discipline and have been important in establishing a vibrancy to the research environment. As we look forward, however, and seek to continue enhancing the quality of research that we undertake, we recognise the need for our research structures and environment to develop to support this.

In striving for continued enrichment and growth of our research environment and culture, the Faculty research strategy (2018) outlined plans for the formation of new research centres to restructure the organisation of research. In May 2020, the University Research Committee approved the Research Centre for Applied Performance Sciences and the Research Centre for Applied Social and Health Sciences to sit alongside the Research Centre for Sport, Wellbeing, Inclusion and Faith that was established in 2019. Each research centre has an appointed Centre Director who has a proportion of their FTE allocated to this role. The research centres each have a clear strategic aim and focused research themes that work towards the centre's strategic aim.

The research centres and their themes have been purposely developed to be non-discipline specific to promote interdisciplinary research. A key strategic aim of both the Faculty and the University is to engage in more interdisciplinary research and establish a reputation for internationally excellent research. Interdisciplinary research is well positioned to target complex problems that challenge groups, communities, societies, and nations. By its nature, interdisciplinary research is collaborative and, in combining expertise from across disciplines, it promotes innovation and novel research questions, methods, and agendas, with the potential to be genuinely transformative in enhancing impact. Collectively, this will strengthen our position to undertake internationally leading research and create knowledge that we can use to realise impact and benefit society. These qualities are also prioritised by research councils and industry, and so we anticipate that the research centres will be important in increasing our research income from these sources. Although in their early stages, we are already realising the fruits of our updated

research and impact strategy as we have secured research funding from HSSRC, UK Space Agency, and EU Horizon funding programmes; satisfying the aim to increase research income and, importantly, all addressing applied and impactful programmes of research.

## 2. People

### Staffing Strategy and Staff Development

As a University, St Mary's seeks to retain its most talented staff. This is reflected at Unit level with a core of staff who were returned in REF 2014 being retained and returned again in REF2021. As detailed in Section 1, these staff have been key in supporting our strategy of creating an environment through which developing researchers can be supported, nurtured, and mentored. We have prioritised recruitment of staff who hold PhDs, or are approaching PhD completion, when advertising vacant posts. This is illustrated in the number of staff being returned in this REF submission who were recruited during this REF period (see Section 1 for details). These complementary strategies have allowed us to increase our research capacity and expertise and establish a vibrant research environment.

We pride ourselves on recruiting staff with research potential and with ambition to develop in this area. The Unit has successfully implemented the University's research mentor scheme, through which more experienced researchers act as mentors to provide advice, support, and guidance to facilitate the progression of developing researchers. Every staff member considered a 'developing researcher' (those on a 10% research tariff) is allocated a research mentor, and all staff can request and receive a mentor. The benefits of the research mentor programme have been realised and illustrated in several instances, with staff being supported to write and publish their first peer-reviewed research papers (e.g., mentee: Joffe, mentor: Tallent, *Journal of Sports Sciences*; mentee: Dancy, mentor: Murphy, *Journal of Sports Sciences*), and act as co-investigators on research funding applications (e.g., mentees: Hobson, Myrissa, mentor: Dagkas).

Our experienced researchers are critical in creating the environment to support early career and developing researchers. It is equally important, therefore, that support and opportunities are provided to ensure the continued development and progression of experienced staff. Each year, staff can apply for a research sabbatical which provides semester long remission from teaching to focus exclusively on agreed research activities. Since REF 2014, 10 Faculty staff have been granted research sabbaticals. An annual call for academic promotions is available to all staff, with those seeking to progress on a research route able to apply for promotion to Associate Professor and Professor. The research achievements of our staff have been recognised in this regard and are illustrated by six promotions to Associate Professor (Brown, Cleather, Hill, North, Patterson, Wadey) and one promotion to Professor (Gissane - left 2018) since REF 2014.

All staff can apply to the Faculty's research fund. Such funding may be used to support attendance at national and international conferences to continue the development of our external profile and dissemination of research. However, increasingly we are prioritising this budget to support seed-funding, start-up costs, and purchase of consumable and other equipment with a view to investing in future research returns. Applications to this budget are competitive and, to ensure our strategic aims are met, we list criteria which prioritise: (i) applications from early career researchers, (ii) those which demonstrate collaboration between experienced and early career researchers, (iii) research which is interdisciplinary in nature, and (iv) research which has clear potential to realise impact.

All staff have annual appraisals, which includes a review of research activity. To complement annual appraisals and support strategic planning, staff are also invited to complete Personal Research Plans (PRPs) which allow a substantive and in-depth consideration of

research activity (undertaken, ongoing, and planned) in several areas (outputs, income generation, external profile, impact, and knowledge exchange). All staff completing PRPs discuss these one-to-one with the Faculty's Associate Dean for Research and Enterprise, gaining feedback and agreeing specific targets and priorities. These plans are reviewed on an annual basis and allow both short (12 months) and longer-term (3 years) planning.

To support the development of its research culture, the Faculty holds monthly research seminars for its staff and PGRs. Research seminars are delivered by internal staff or PGRs and external guests. For internal speakers, the seminars provide an opportunity to present research proposals, update on ongoing research programmes, and report on projects that have been completed as preparation for dissemination at conferences or submission for peer-review. Internal feedback and discussion form a valued part of the research culture. The Faculty also holds an annual Festival of Research, which showcases research from Level 6 undergraduates through to experienced research staff, to celebrate research at all levels and inspire future research projects and collaborations. External speakers are also invited to contribute to these events to stimulate future research and collaborative ideas.

### Research Students

As per Strategic Priority 1 (Section 1), a focal point of attention in this REF period has been the development of our PGR community. Fundamental to creating a thriving research environment and its long-term success was an investment in, and commitment to, our PGR community. Budgets that were allocated from the University Research Office to the Faculty were heavily invested to fund PhD studentships to grow this community, which has also been supported by a growth in industry-funded PhDs (reflecting our prioritisation of applied research), and self-funded PGRs. Since 2014, the Unit has had 10 PhD studentships, and across 2019/20 and 2020/21 has created four GTA posts through which the Faculty covers PhD fees and salaries the candidate for graduate teaching support. The impact of prioritising investment and growth of the PGR community can be seen in the increase in PGR registrations within the Faculty (see Table 1).

**Table 1. Year-to-year new PGR registrations and total number of PGR students**

|                                     | 2013-2014 | 2014-2015 | 2015-2016 | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 |
|-------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>New PGR registrations</b>        | 4         | 4         | 7         | 7         | 9         | 8         | 4         |
| <b>Total number of PGR students</b> | 16        | 20        | 27        | 24        | 31        | 32        | 33        |

The focus, however, has not been to simply grow PGR numbers, but also create an environment that supports and values the PGR community as important Faculty members such that they can thrive and flourish. The research clusters formed following REF 2014 (see Section 1) created an environment which enabled PGRs to interact with research staff outside their immediate supervisory teams, providing opportunities for mentorship and a sense of belongingness and identity, as well as opportunities for personal research development. As an example, Pocock and Runswick (both PGRs) were members of the Expert Performance and Skill Acquisition (EPSA) research cluster, through which they collaborated on a research project with Faculty staff that was independent to each of their PhDs. This allowed these PGRs to contribute to research design and data collection before shadowing and editing the writing of the manuscript, which resulted in them being named as co-authors on a published research output (*Journal of Sports Sciences*). Creating an environment for PGRs which fosters a sense of belongingness and

being valued has also been supported by the Doctoral College. Alongside the world-class laboratories and research spaces (see Section 3), the Doctoral College, established in 2017, means our growing and thriving PGR community have a dedicated and premium workspace at which they are guaranteed desks and networked computers to support their research activities.

To ensure PGRs undertake excellent research and receive excellent research supervision, we have quality assurance and professional development processes in place. Prior to PhD registration, prospective candidates submit a 4,000-word research proposal which is reviewed by two independent Faculty members who are registered as eligible PhD supervisors. The candidate is then interviewed by the prospective supervisory team and an independent Chair. Internal reviews and recommendations are then reported to the Faculty Research Committee before final recommendations are made to approve (or not) the PhD application. The process is to ensure the proposal is suitable for PhD level research regarding the feasibility of the research programme, its theoretical underpinning, proposed methods, and ethical considerations.

Supervisory teams must consist of at least two members of St Mary's staff with the Director of Studies required to have at least two previous PhD completions. We also employ a strategy of including early career researchers on supervisory teams so that such staff can gain supervisory experience and shadow more experienced research supervisors. A Research Supervisor Training Programme is in place to facilitate the development of essential skills of staff members and to ensure quality is maintained. For staff members to be registered as PhD supervisors they must continue to undertake this programme to maintain relevant skills and knowledge. In this REF period, the programme has proved useful in increasing the number of eligible DoSs and the number of Faculty staff eligible to supervise PhDs (see Section 1 for details).

All registered PhD students must have at least eight PhD meetings each year (with most greatly exceeding this) with summary notes taken and actions recorded. Progression of PGRs is closely monitored; in addition to the required supervisory meetings, all PhD students have interim and annual monitoring reviews each year. For annual monitoring reviews, PhD students must present: (i) a detailed report (2,000 words) of their work and development that year and their reflections on it, (ii) a log of supervisory meetings with agreed notes and actions, and (iii) a researcher skills development profile. The student then has a one-hour interview with their supervisory team, following which recommendations are made regarding future progression of the PhD.

In addition to interim and annual monitoring reviews, between 12 and 24 months after registration (for part-time PhD students it is between 24 and 48 months), all PhD students must undergo a Confirmation Review Examination (CRE). This requires the student to submit a CRE thesis, which should be approximately 20,000 words and typically comprise a literature review plus at least one completed study, along with initial exploratory findings of subsequent investigations and a timeline plotting the remainder of the PhD. The CRE thesis is read by the supervisory team and an independent Chair, which is followed by an oral examination of the thesis. Following examination of the thesis and oral defence, a recommendation is made to confirm progress on to PhD or recommend transfer to MPhil. The CRE is intended to provide a challenge for the PhD students at the time, being particularly valuable as a quality process to ensure the necessary amount and quality of work has been undertaken and to assess knowledge of the candidate in their field, and for them to orally defend their work. Feedback from PhD students has indicated that the CRE and related activities are invaluable as a learning and development experience ahead of their final Viva Voce examination.

We seek to ensure PhD students are afforded the opportunity to not only undertake the best research programmes possible, but also maximise their professional development as rounded academics. Each PhD student is allocated £340 per annum by the Research Office, and they can apply to the Faculty's research budget for additional funds to support their research activity and development. The Faculty frequently makes such investments in its PhD students,

exemplified by allocations of £800 (Hughes), £1196 (Brown), £1000 (Lewis), £711 (Head), £300 (Runswick) to support purchases of research consumables and equipment.

It is also important for PhD students to disseminate their research at conferences, both for the value that external peer feedback provides and for the skills that are developed in communicating research. We aim to ensure that all PhD students are supported to disseminate their research at one national or international conference, at least, during their PhD programme. For example, in this REF period we have supported PhD students to present their research at international conferences in Montreal (Cavallerio), San Diego (Runswick), Kisakallio (Pocock), Sevilla (Levi, Sanders), Bern (Cavallerio), Belfast (Hughes), Dublin (Hughes), Leeds (Brown), Prague (Cushion), Birmingham (Head), Durham (Graham), London (Nolan).

Our investment to ensure that PhD students are supported to undertake the best research possible has borne fruit in several ways. In this REF period, our PhD students have published their PhD research in leading journals including *Sports Medicine*, *Journal of Science and Medicine in Sport*, *British Journal of Sports Medicine*, *Journal of Sports Sciences*, *American Journal of Health Education*, *European Journal of Sports Sciences*, *Frontiers in Physiology*, *International Journal of Sports Coaching Science*, *Applied Cognitive Psychology*, *Psychological Research*, *Psychology of Sport and Exercise*, *Adolescent Research Review*, *Journal of the Neurological Sciences*, *Physical Therapy in Sport*, *Qualitative Research in Sport, Exercise and Health*, *Journal of Strength and Conditioning Research*, *Frontiers in Bioengineering and Biotechnology*, *Journal of Public Health*, *Nutrition Reviews*, *British Journal of Nutrition*, *Food Quality and Preference*, *The Sport Psychologist*, *Qualitative Health Research*, *Journal of Sport Rehabilitation*, *Journal of Motor Behavior*. The experience of publishing their work provides confidence (and resilience in dealing with disappointment) and vital knowledge and skills in interacting with external peer-review by experts in their field.

A further indication of the quality of research undertaken by our PhD students is their being invited to present on symposia during their PhDs (Pocock, Sanders) and awarded prizes for their research; Sunita Kerai, was awarded dissertation of the year by the British Psychological Society for her MSc thesis, and Catherine Graham won first prize for her poster presentation at the European Nutrigenomics Organisation conference. Research from our PhD students has also been communicated in mainstream media (BBC Sport, The Times, Test Match Special) which highlights the applied scientific value and popular interest of their research.

A final indicator of the research quality undertaken by our PhD students is the number of successful PhD completions in this REF period (see Table 2). In the Unit, we have had 16 successful PhD completions in this REF period compared to one in the period preceding REF 2014.

**Table 2. PhD completions per year and cumulative since 2013/14**

|                                     | 2013-2014 | 2014-2015 | 2015-2016 | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 |
|-------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| <b>PhD completions</b>              | 0         | 1         | 1         | 8         | 2         | 1         | 3         |
| <b>PhD completions (cumulative)</b> | 0         | 1         | 2         | 10        | 12        | 13        | 16        |

Our complementary aim, that PhD students develop as rounded academics, is reflected in their appointments and career progressions following completion. These include Senior Lecturer in Sport Psychology at Anglia Ruskin University (Cavellario), Lecturer in Performance Psychology at Kings College London (Runswick), Lecturer in Sport Psychology at Chichester University (Pocock), Lecturer in Nutrition at Oxford Brookes University (Graham), Lecturer in Nutrition at St Mary's University (Pilic), Senior Lecturer and Programme Director in Strength and Conditioning at St Mary's University (Price), Lecturer in Biomechanics and Programme Director at St Mary's University (Atack), Senior Lecturer in Exercise Physiology at University of Hertfordshire (Muniz), Senior Lecturer and Programme Director at St Mary's University (Martin), Course Director and Lecturer in Health and Social Care at West Suffolk College (Omran).

Our strategy to undertake research with an applied focus is illustrated by Hughes, who is now receiving funding from an international industry partner to continue post-doctoral research at St Mary's. Other PhD students have taken up applied professional roles, such as Lead Sport Scientist (Sport Psychology) with City Football Group (O'Malley), Academy Innovation and Projects Manager at Fulham FC (Griffin), and Sport Psychologist for GB Shooting and English Institute of Sport (Sanders).

As part of our strategy to develop an environment that supports the development and transition of student researchers to postgraduate level, in 2016 we launched our MRes programme for those interested in studying for a Masters level qualification, but with a passion for research. The MRes focuses on developing research knowledge and skills, whilst enabling the student to undertake a year-long research project and investigate issues to a depth that might not be achievable in a research project on a taught MSc course. The MRes programme is especially designed to equip students with the knowledge and skills to progress on a career in research. Its success is illustrated in graduates from the course having progressed on to PhD programmes (Le Warne, Durrell, Uddin, Fowler) and having their research projects published in leading sport and exercise science journals (e.g., Wass et al., 2020, *Science and Medicine in Football*; Uddin et al., 2020, *Journal of Sport and Exercise Science*; Fowler et al., 2020, *European Journal of Sport Science*).

### **Equality and Diversity**

Consistent with the University's core value of Inclusiveness, the Unit has a commitment to providing equal research opportunities regardless of age, race, gender, religion, or sexual orientation. One of the terms of reference of the Faculty Research Committee is to "promote equality and diversity in research within the Faculty", and the Committee Chair, who is also the Unit lead, has attended a course on equality and diversity training to ensure this commitment is realised. All academic staff within the Faculty have received information regarding Personal Research Plans (through presentations and Q&As at Department meetings and email communications) and been encouraged to complete these, with every staff member who completed one then having a one-to-one meeting with the Associate Dean for Research and Enterprise. Of the staff returned in this Unit, 37.8% are female. However, a further 3.7 FTE of female staff from the Faculty are being returned in a separate unit of assessment given the nature of their research. Taking these staff in to consideration, the number of returned staff from the Faculty is 11.5 FTE male and 10.7 FTE female (51.8% male, 48.2% female). The staff returned also includes full- and part-time staff, and early career and experienced researchers.

### **3. Income, infrastructure and facilities**

#### **Income**

The Unit's research income in this REF period was £638,081, which is more than quadruple the research income reported in our REF 2014 submission (£137,028). Our strategic focus on applied research is reflected through the income received, with a large proportion coming

from applied partners and industry. For example, The Royal Ballet Company have funded research investigating workload in elite dance performance to manage injury risk. Hill and Pedlar have received funding from Southampton FC to fund research investigating recovery in elite sport. Wadey has received separate instances of funding from the EIS to research performance of elite female athletes and work stressors experienced by elite physiotherapists. Wadey's work on limb-loss and amputation has attracted funding from the charity Devices4Dignity to develop a user-led website for children with an amputation and their families, and separate funding to create videos, printable case-studies, and infographics for the Limbformation website. The charity LimbPower have provided funding to evaluate the physical activity advisor role and the Injured Players' Foundation have funded research into the support provided to injured rugby players and their social network.

Patterson's research investigating blood flow restriction training has received industry funding from Western Clinical Engineering Ltd to support post-doctoral research (2019-2021) and over £40,000 in-kind funding in the form of equipment donations. Although awarded too late to be included in our return for this REF exercise, the maturing research culture and reputation of our research expertise is reflected in Coakley (PI), Pedlar, Hough, and Patterson (all CIs) having been awarded £75,000 from HSSRC to investigate sleep, fatigue, and performance, whilst Cleather (PI) and Price (CI) have also recently received competitive research funding from the UK Space Agency.

Our strategy to nurture early career and developing researchers has borne fruit with Atack (PI) and Murphy (CI) receiving £2,000 for a research internship from International Society for Biomechanics in Sports, and Cushion receiving £2,000 from the UK Strength and Conditioning Association. External collaborations are also aiding staff in applications for research funding. Sampanis (CI) has collaborated with colleagues from St George's Hospital on a successful research grant application to the National Institute of Health Research (NIHR) as part of their Efficiency and Mechanism Evaluation (EME) programme. Majumdar (PI) has led a multi-university bid and received £4,500 in seed-funding from the Cathedrals Group to investigate First in Family attendees to university.

Beyond research income from industry partners and research bodies, our Human Performance Laboratory enables us to undertake applied sport science consultancy work, and during this REF period we have generated over £108,000 income through this facility.

### **Infrastructure**

Researchers and PGRs are supported by a designated administrator to support with activities such as consumable purchases, travel, invoicing, and who takes minutes at Faculty research committee meetings. For research students, the Faculty has a postgraduate researcher Programme Director (PGR PD) role such that all PGRs (PhD, MPhil, MRes) have an independent point of contact to offer additional support and guidance, if needed, beyond supervisory teams. The PGR PD manages interim and annual monitoring reviews, as well as PhD enquiries and enrolments. The research administrator and PGR PD work closely with the University's Research Office.

Research activity in the Faculty reports to, and is monitored by, the Faculty Research Committee. The Faculty Research Committee meets twice per semester and is chaired by the Associate Dean for Research and Enterprise, with the committee comprising of the Deputy Provost, research leads (formerly cluster leads, now centre directors), Head of Research Office, PGR PD, Library representative, and PGR student representative. To ensure that the student voice is heard, the PGR student rep has a fixed agenda item at each meeting to report on PGR activities and issues arising. The Faculty Research Committee receives and oversees reports on progress of research projects, research outputs, and grant applications, and is responsible for monitoring PGR progress and considering PhD applications. The Faculty Research Committee

reports into the University Research Committee on which the Faculty's Associate Dean for Research and Enterprise and PGR student representative also sit.

### Facilities

Our aim to establish the Faculty as engaging in internationally excellent and world-leading research is supported through specialist laboratories and research facilities. Since 2014, over one million pounds has been invested in purchasing research equipment and developing and upgrading our research laboratories.

Since REF 2014, the Faculty has invested £96,000 (2016/17) in its Human Performance Laboratory, with a further £10,000 on enhancements the following year, such that it now houses a state-of-art environmental chamber with capacity to simulate conditions of ambient temperature (5-50 degrees Celsius), humidity (30-90%), and altitude to 5000 m or 12% oxygen levels. This investment has enabled us to develop our research capacity in environmental physiology and supports PhD and MRes research projects.

The human performance laboratory is one of three exercise physiology labs, each of which is accredited by BASES. These laboratories house sport specific ergometry equipment (e.g., treadmill, cycle, rowing, kayak) to set exercise intensities across the physiological range, and are supported by facilities to record measures including breath-by-breath gas analysis (including portable gas analysis), cardiovascular measurement (e.g., heart rate, heart rate variability, blood pressure, oxygen saturation and electrocardiograph), haematological biomarkers and respiratory variables such as spirometry flow loops. Our laboratories also contain body composition equipment including the air displacement plethysmograph (BODPOD), bioelectrical impedance and skin fold caliper determination equipment (in line with the International Society for the Advancement of Kinanthropometry certification), supporting research in physical activity, female health, and body composition.

The biomechanics laboratory supports human movement science research in all forms (biomechanics, rehabilitation, S&C, motor behaviour, sport psychology). It houses a 12-camera Vicon 3D optoelectronic motion analysis system, Cybex and Kincom isokinetic dynamometers, three Kistler force plates, wired and wireless Biopac electromyography, RSScan pedobarograph and three-dimensional ultrasonography capabilities. The research taking place in this facility is further supported by equipment including head-mounted and desktop eye-movement tracking units, transcranial magnetic stimulation, a FitLight reaction system, GPS and accelerometry devices, and video-capture including GoPro drones and harnesses. The biosciences laboratory supports research in nutrigenomics and nutritional biochemistry, investigating links between health, nutrition, and genetics through analysis of physiological markers and hormones using ELISA techniques and equipment for category 1 cell culture. Our sports rehabilitation suites are accredited by the British Association of Sports Rehabilitators and Trainers (BASRaT). In 2020 a cognitive neuroscience laboratory has been developed in complement to a one-way observation room and separate environmentally controlled testing booths.

Investment in the research environment was also reflected by the development of the Performance Education Centre (PEC) in 2014 through an investment of more than £300,000. The PEC supports our strategic aim to conduct internationally excellent research with clear applied value as it is a space which allows us to link research and practice. As a facility, the PEC is unique in the greater London area and houses world-class, state-of-the-art equipment. Measuring 15 x 32m, the PEC is multipurpose and disciplinary in its offering. The Astroturf area provides a space for floor work and can accommodate portable VICON equipment as well as sport and task-specific equipment such as hurdles, sleds, prowlers, and scrum-machines. The running lane has a Kistler force plate built into it, and the S&C area has specialist flooring with in-built recesses for use of Kistler and Pasco force plates and Audio-Visual equipment allowing manipulation of video

feedback. The PEC has enabled staff to engage in research using increasingly realistic task designs and strengthen the applied nature of our research.

#### 4. Collaboration and contribution to the research base, economy and society

Faculty staff are engaged in research collaborations both national and internationally, making contributions to the broader research community and beyond, as evidenced by collaborations on publications in international peer-reviewed journals, and presentations at international conferences.

Nationally, we collaborate with partners such as the Centre for Sports Engineering Research at Sheffield Hallam University (North) through investigations in the field of human movement science. This ongoing collaboration has benefitted doctoral research at St Mary's (Pocock), resulted in research outputs (*Experimental Brain Research*; *Applied Cognitive Psychology*, *European Journal of Sports Science* as exemplars), dissemination at international conferences (NASPSPA; Scientific Conference on Motor Skill Acquisition), and knowledge transfer activities (London Irish RFC; Harlequins RFC). Wadey collaborates with Cardiff Metropolitan University and University of Chichester, with these collaborations also involving PGRs (Sanders, Leggatt, Okonkwo). Wadey's work on limb loss with the charity LimbPower (registered charity no. 1132829) has led to him being invited on to the charity's Advisory Board. Tallent collaborates with Northumbria University and the applied value of his work is illustrated in his research partnerships with the English and Welsh Cricket Board, the Royal Ballet Company, and Queens Park Rangers FC.

The collaboration with Royal Ballet Company also involves PGR research (Shaw, Mattiussi). Brown collaborates with University of Portsmouth and University of Chichester through her research in breast and female health, with this collaboration informing PGR work (Omran) as well as applied work with international sports apparel manufacturers. Pedlar collaborates with University College London and in 2019 he was awarded the role of Honorary Associate Professor, with his research informing application by Orreco (sport data science) and Premier League and NBA teams. Researchers in the submitting Unit also have ongoing collaborations with Swansea University (North, Patterson, Tallent), Cardiff Metropolitan University (North), University of Surrey (North), Newcastle University (Patterson, Tallent), Loughborough University (Murphy), University of Kent (Meijen), Wolverhampton University (Meijen), Kings College London (Murphy, North), Brunel University (Murphy, North), University of Gloucestershire (Mahaffey, Tallent, Patterson), University of Brighton (Mahaffey), Imperial College London (Cleather), Oxford Brookes University (Mavrommatis).

Internationally, our collaborations include projects with University of Utah, USA (Murphy, Roca, Wadey). North has engaged in collaborative research with Victoria University, Australia. Tallent has ongoing collaborations with Monash University, Australia, investigating neurophysiological adaptations to exercise and co-supervises a PhD research student there. Patterson has strong ongoing collaborations with Deakin University, Australia, Murdoch University, Australia, and Guelph University, Canada, as part of his international research programme in blood flow restriction training. Patterson's research has resulted in applied links with organisations such as the Football Association, Lawn Tennis Association, Rugby Football Union, English Institute of Sport, and professional sports teams (nationally and internationally). Roca is an invited Associate Member of the Research Center for Sport and Physical Activity at the University of Coimbra, Portugal, and he collaborates with colleagues at University of Porto, Portugal, the German Sport University, and Federal University of Viçosa, Brazil.

Our collaborations with international and national researchers are evidenced in the research outputs published and uploaded to the university's open research archive by Faculty staff. Of those research outputs published and uploaded since REF 2014, 87% involve external

collaborators, with such outputs involving 304 unique collaborative co-authors, spanning 100 different academic institutions across 17 countries and 5 continents, which demonstrates the reach and standing that the research community at St Mary's has established and continues to develop.

Staff in the Unit hold, or have held, positions of research leadership, including editorial roles with the *Journal of Sports Sciences* (North, Associate Editor, 2016- present), *International Journal of Sport Psychology* (North, Associate Editor, 2016-present), *Frontiers in Sports and Active Living* (Dagkas, Associate Editor, 2019- present), *Frontiers in Psychology* (Roca, Review Editor, 2015-present; Meijen, Guest Editor, 2019), *Cogent Psychology* (Roca, Section Editor, 2016-present), *Frontiers in Physiology* (Patterson, Guest Editor, 2019), *Frontiers in Bioengineering and Biotechnology* (Cleather, Review Editor, 2017- present). Staff are also members of editorial advisory boards for *Journal of Sports Sciences* (Brown, Eynon (left St Mary's 2018), Roca), *The Sport Psychologist* (Wadey), *Journal of Applied Sport Psychology* (Wadey), *European Physical Education Review* (Dagkas), *Educational Review* (Dagkas, 2012-2019), *Journal of Dance Medicine and Science* (Tallent).

Beyond editorial roles and advisory positions, our staff have provided expert peer-reviews for 85 unique journals and have written or edited leading textbooks in their respective fields: *Endurance Performance in Sport: Psychological Theory and Interventions* (Meijen); *Positive Psychology in Sport and Physical Activity: An Introduction* (Brady); *'Race', Youth Sport, Physical Activity and Health: Global Perspectives* (Dagkas); *The Little Black Book of Training Wisdom: How to Train to Improve at any Sport* (Cleather); *Critical Perspectives in Sport Injury Psychology* (Wadey); *Growth Following Adversity in Sport* (Wadey); *Advanced Personal Training: Science to Practice* (Hough, Penn- left 2018); *Subvert! A Philosophical Guide for the 21st Century Scientist* (Cleather).

Staff within the Unit have served as members of organising committees for international conferences, including the International Conference on Qualitative Research in Sport and Exercise (Wadey), United States Center for Coaching Excellence North American Coach Development Summit (McCarthy- left 2020), Women in Sport and Exercise (Brown, Pedlar), UKSCA conference (Cleather).

Since REF 2014, staff have delivered presentations as keynote speakers and on invited symposia at international conferences including the European College of Sport Science (Pedlar), North American Society for Psychology of Sport and Physical Activity (Murphy), the Royal Society of Medicine's Sport Injury Conference (Pedlar), National Basketball Players' Association (Pedlar), The Association of Chartered Physiotherapists in Sports and Exercise Medicine (Brown), Women in Sport and Exercise Conference (Brown), European Geriatric Medicine Society (Kelaiditi), R4: Rowers Conference (Brown), The Movement Conference (North), Sport Games Conference of the German Association for Sport Science (Roca), European Federation of Sport Psychology (Meijen), Endurance Research Conference (Meijen), Technogym Sport Performance Congress (Cleather), National Undergraduate Sports and Exercise Medicine Conference (Tallent), International Sports Science Medicine Conference (Tallent), World Congress in Sports Physical Therapy (Patterson), Catalan Sport Physical Therapy Conference (Patterson), Australasian College of Physical Scientists and Engineers in Medicine (Patterson). More broadly, staff have disseminated research at international conferences spanning four continents- emphasising the global appeal of research undertaken in this Unit.

In this REF period, staff have contributed to a broader research culture through reviewing grant applications for funding bodies and research councils including the Pain Relief Foundation (Brown), Biotechnology and Biological Sciences Research Council (Cleather), Health Improvement, Protection and Services Research Committee of the Scottish Government (Brown),

Rosetrees Trust (Wadey), Division of Sport and Exercise Psychology, British Psychological Society (Meijen), UKSCA (Tallent).

Further to these contributions, staff have examined PhD theses both nationally: (University of Stirling x2; Liverpool John Moores University; Leeds Beckett University x2; Swansea University; University of Portsmouth; Abertay University; University of Wolverhampton; University of Brighton x2; Manchester Metropolitan University; Liverpool Hope University; University of Birmingham; University of Essex x2; Edinburgh Napier University; Nottingham Trent University; Northumbria University); and internationally across five continents: (University of Wollongong, Australia; University of Granada, Spain; University of Valencia, Spain; Laurentian University, Canada; University of Western Australia; Victoria University, Australia; Queensland University of Technology, Australia; Deakin University, Australia; Griffith University, Australia; Stellenbosch University, South Africa; Federal University of Versoza, Brazil).