

Institution: Sheffield Hallam University
Unit of Assessment: UOA24 - Sport and Exercise Sciences, Leisure and Tourism
1. Unit context, structure, research, and impact strategy Overview <p>Our mission is to deliver excellent applied research which makes a difference to the lives, and particularly the quality of life, of individuals and communities. Through the creation of the Sport and Physical Activity Research Centre (SPARC) and the Advanced Wellbeing Research Centre (AWRC), expansion into a new £14 million facility, and a strategy that prioritises researcher support and development, we have grown research in scale and quality and fostered an environment where research excellence flourishes.</p> <p>Indicators of our significant achievements include i) growth in research, knowledge transfer and consultancy income - from £11.7m in REF 2014 to £16.8m in REF 2020, as well as attracting an additional £14m in capital investment; ii) growth in research activity - with a doubling of the number of staff returned in this submission compared to REF 2014 from 34 to 67, plus a doubling in doctoral completions from 36 to 71.</p> Structure <p>Our submission represents a large group of researchers who have had impact nationally and internationally, influencing interventions and policy in sport, physical activity (PA) and health, and leisure, tourism and hospitality sectors.</p> <p>The Unit comprises 67 staff (64.1 fte), contributing 149 research outputs and five impact case studies (ICS). The Unit sits within two University research institutes: Health Research Institute (HRI) and Social and Economic Research Institute (SERI) - see Institutional Environment Statement - with three internal structures providing departmental identity. First, the Sport and Physical Activity Research Centre (SPARC), which is the research hub for the Academy of Sport and Physical Activity. Second, the Department of Service Sector Management (SSM), which includes staff from tourism, events and hospitality management. Third, the AWRC (opened in 2019) which is a specialist interdisciplinary centre of excellence. AWRC is the centrepiece of the new Olympic Legacy Park and consists of a large cross-disciplinary team, with a range of specialisms including sports engineering, sports science, public health, materials engineering, software development and psychology. SPARC launched in May 2019, fulfilling an ambition of integrating all core sport-related research. SPARC's predecessors and SSM have a heritage of delivering excellent research and impact extending back decades. Within the units of SPARC, SSM and AWRC, the following groups detail the intellectual focus and critical mass of our research across the Unit.</p> Research Groups <p>Physical Activity, Health and Wellbeing brings together research from a range of discipline areas including behavioural psychology, exercise physiology and nutrition. Our expertise lies in research aligned to PA programming, and the design and evaluation of interventions to support behaviour change across clinical and community settings. We have successfully applied research to support people to lead healthy and active lives through the prevention and treatment of a range of chronic diseases, including multiple sclerosis (Carter, ICS5), systemic sclerosis (Klonizakis), obesity (Copeland), cardiovascular disease and stroke (Nichols, Shafizadeh), and mental health (Myers). Our cancer research (Bourke, ICS4; Humphreys) has developed cutting-edge interventions in the field of pre- and rehabilitation using PA programming and counselling, leading to additional support from major cancer charities, including Macmillan and Yorkshire Cancer Research. Another strand of expertise relates to exercise behaviour and psychology (Breckon, Jones). Notable examples of our success include the Sheffield National Centre for Sport and</p>

Exercise Medicine (NCSEM, £10m capital grant during the REF 2014 census period) leading to successful community programmes such as *Move More*, and the follow-on funding we received to develop the AWRC (£14m funded by the Department of Health & Social Care (DoHSC) and European Regional Development Fund (ERDF)). Other significant funding for this group includes the National Institute for Health Research (NIHR, £2.5m) and Innovate UK (£270k).

Our **Sports Engineering and Sport Science** research, which spans several interconnected disciplines, focuses on improving sports performance and coaching, alongside understanding athlete health and reducing injury risk. We have a globally leading strength in research relating to motor learning and sports coaching - ecological dynamics (Davids, Stone, Shafizadeh, Rothwell) - and our work in this area has changed the practice of sports coaches and organisations nationally and internationally (ICS1). As examples of our biomechanics research, we investigate the mechanics of sprint running (Churchill, Barnes) and develop, validate and utilise lower cost, readily accessible equipment for analysis in representative environments (Heller, Dunn). We have also used 3D surface imaging technologies for understanding human morphology and individual-specific calculation of body segment parameters (Wheat, Choppin, Bullas). Additionally, we apply our breadth of expertise in areas such as design engineering (Foster, Senior), applied computing and performance analysis (Haake, Goodwill, Kelley), exercise physiology (Maden-Wilkinson, Nichols, Ruddock, Thompson), and sports nutrition (Ranchordas, Rogerson) - to understand performance across a broad spectrum from elite to wider participation in sport. Much of our work is funded through long-term partnerships with high performance sport organisations (£1.9m). Other significant funding for this group includes awards from H2020 (£150k), ERDF (£800k) and Sports Equipment and Apparel industrial partners (£700k).

Our research relating to the **Social Sciences of Sport** draws together the subject areas of economics, management science, policy studies and sociology. We apply our strength in the application of economic techniques to generate new knowledge about the sport and leisure industries, which is relevant to policy nationally and internationally. Notable examples include our research on: Social Return on Investment (Davies), major events (Coleman, Ramchandani), facility performance management (Kung) and participation (Bullough, Gregory, Griffiths, Kokolakis, Moore). Influenced primarily from financial accounting, we also have a strong programme of work relating to the performance of team sports, notably professional football (Plumley, Wilson). We have built upon areas of strength from REF 2014, such as elite sport policy, illustrated by the work of Shibli with the Sports Policy factors Leading to International Sporting Success (SPLISS) consortium. Moreover, we have developed new themes of research including representation and national identity in sport and leisure (Black, Cherrington, Fielding-Lloyd, Woodhouse). Our work on the economic and social impacts of major sports events is the subject of an impact case study (ICS2), illustrating the coherent application of social and management science to a specific field that has made a positive difference to society. Funding for this group includes awards from Sport England / Youth Sport Trust (£825k), ERASMUS (£330k), UK Sport (£450k), Department for Digital, Culture Media and Sport (£130k) and The Royal and Ancient (R&A, £270k).

Our interdisciplinary and applied research in **Tourism, Hospitality and Service Sector Management** focuses on analysis of tourism policy, planning and marketing (Kim, Mellon, Tresidder), accessibility and adventure (Doran, Pomfret), and the hospitality experience, marketing and strategy (Ali, Martin). This group is strongly connected to the Social Sciences of Sport theme through research on the outdoors and the University's Outdoor Recreation Research Group, which facilitates high quality cross-disciplinary and cross-university working with external partners in this field. Funding for this area of research comes from sources including ESRC and H2020.

2014 Strategy

The strategy in 2014 aimed to consolidate and build upon our research strengths, capability and successes. This vision focused on promoting solutions with positive impact on quality of life and

public policy, contributing to the development of knowledge and the economy. The period 2013-2020 has been a success in meeting those five objectives with illustrative examples outlined below.

Continue to develop expertise and academic excellence in a sustainable manner in existing research areas. Staff developed clear research themes to increase collaborative applied research. Notable examples, evidenced in our ICSs and outputs, include: PA promotion and community engagement (ICS3), PA interventions in clinical settings (ICS4 and ICS5), the impacts of investment in major sport events (ICS2), engineering and technological interventions in sport and health, and ecological dynamics in elite sport and coaching (ICS1). The investment awarded to the Unit's NCSEM enabled us to deliver meaningful and sustainable interventions in three locations across the city, prioritising low-income areas, with the aim of reducing health inequalities whilst promoting physical and mental health. We have continued to be funded by a range of high-profile sports organisations and event funders, to continue to develop our areas of strength.

To exploit opportunities for developing expertise and academic excellence in new research areas. We have grown our research toward PA and lifestyle change. The NCSEM (a £10m investment in the previous REF cycle) has led a major shift in this period in NHS models of care - including the transfer of 80,000 hospital-based appointments into community venues co-located within three Sheffield leisure centres (ICS3). These centres bring together patients, researchers and clinicians, delivering meaningful impact on patients' lives through collaboration and innovation in healthcare services. Through local and national PA campaigns, such as Move More Month and Active 10, the NCSEM has helped to engage close to 1 million members of the public in PA using mobile digital technology. The success of our applied work, including the NCSEM, also led to the awarding of a £14m grant in 2015 to develop the AWRC, to deliver innovations that help people move; plus an additional £885k from Research England to establish a University Enterprise Zone (UEZ), including a Wellbeing Accelerator and Investor Club.

To continue to focus on applied research that can create impact in society and make a substantial contribution to evidence-informed policy making. Staff have contributed to significant sport and wellbeing interventions, as well as policy development. The Unit hosts and chairs the International parkrun Research Committee, and we carried out one of the UKs largest PA surveys as part of the parkrun project. The publication of the government's Sporting Future strategy in 2015 created the conditions for researching the social value and social return on investment from sport. As policy shifted from 'sport for sport's sake' to 'sport for individual and societal benefit', we have been able to take a national and increasingly international role in deriving the non-market value of sport. Research has also contributed to decision making and policy - for example the findings from the Accessible Gastronomy project in 2014 (European Commission Growth Fund), in collaboration with the University of Girona, have informed policy around disability access to hospitality and tourism facilities. Staff have consulted for the Council for Hospitality Management Education and the Institute of Hospitality on the Future of Hospitality Management Education.

To sustain or increase the number of research-active staff. The number of staff contributing to UoA24 in 2020 is 67 staff (64.1fte), compared to 34 staff (32fte) in 2014. This 110% increase in staff being submitted reflects a concerted effort to support staff through a combination of strategic appointments, enhanced research support, modified work planning, the recruitment of research active staff, mentorship and staff development strategies.

At least to maintain research income and numbers of research students. Research and Knowledge Transfer (KT) (including consultancy) income during the period has risen significantly from £11.7m in REF 2014 to £16.8m in REF 2020 (see 'Income' section). When the capital investment for AWRC (£14m from DoHSC and ERDF) is considered, income is over £30m in this period. Research student numbers have increased from 36 to 71 successful completions.

Research and Impact Strategy until 2027

Our forward-looking strategy will consolidate significant achievements since 2014 and is consistent with the University's vision of becoming a world leading applied University and striving to 'Transform Lives' (see Institutional Environment Statement). The five key objectives for the next reporting period are:

To increase the quality, impact and overall culture of academic research excellence in our Unit, and exploit synergies between and across research themes. We will build on the success of the current period by increasing the number of staff with Significant Responsibility for Research (SRR) to 50% of our staff total by 2027, in line with the institution's ambitions (see Institutional Environment Statement). Having put several strategies in place already, we will achieve this objective by focussing recruitment largely on identifying Early Career Researchers (ECRs), and supporting their career advancement within the University, as well as ensuring that all new and existing staff have a research mentor. Our research will continue to be driven by cross-cutting synergies and interdisciplinary expertise across, for example, public health, wellness, elite sport, and with community and clinical populations. Our partnership and collaborative work will embed Patient and Public Involvement (PPI) at its heart, and our interventions will be tested and scaled nationally and internationally, ensuring impact. We will continue to focus on the design of sporting equipment, testing and modelling principles, artificial intelligence, digital platforms, analysis of major sporting events and valuation of the sports sector.

To enhance and develop competitive advantage in research and innovation in collaboration with UK and international partners. We have a strong reputation internationally for applied innovations in elite sport and wellbeing contexts. We will further the visibility and quality of our international research collaborations, and increase our non-academic engagement and impact, to promote our offer externally. We will leverage existing and potential future partnerships through the AWRC, including collaborations with industry. This will be based on successful sponsorship models (e.g. Westfield Health) and the Wellbeing Accelerator and Investor Club, as well as with other HEIs. Likewise, we will continue to develop sustainable and adventure tourism research, both nationally and internationally, with successful large-scale grant applications, again based on strong, strategic partnerships with HEIs and industry. Success will be measured through continued growth in the number of funded projects undertaken with international collaborators.

To increase the equality, diversity and inclusion (EDI) of our research across the Unit. While there has been a significant increase in staff with SRR in 2021 compared to 2014, there is a commitment to increase the opportunities for underrepresented groups - BAME and female academics in particular. We will work with the University and our wider networks to actively recruit research leaders, ECRs and Postgraduate Research (PGR) students from diverse and underrepresented populations. This will be achieved by creating research programmes that are more likely to leverage interest in diversity and inclusion. We will target specific funding calls from funders such as Sport England and UKRI that support the inclusion agenda. This will reflect the vitality and sustainability of our environment and is a key tenet of the University - enhancing the research culture and increasing opportunities for all to engage in research. Importantly this objective will also include the explicit promotion and celebration of our diversity and inclusion research achievements, internally and externally, using a range of digital platforms and seminar series.

To grow R&I income. We aim to continue to increase external funding, both research and KT. This will be achieved by explicitly targeting the scaling-up of existing research networks and collaborations into new projects (UKRI, NIHR and major charitable funding bodies). We will align our strategic growth to emergent areas and draw on enhanced institutional support to identify and support proposals to relevant academic funding streams. We will support our experienced researchers and ECRs to develop strategic funding plans and increase the number of staff achieving external funding. We will identify and support ECRs to bid for funded fellowships (internal and external) and support their development as future research leaders and income generators.

Increase the numbers of Postgraduate Research Students. We aim to further develop our offer to continue to attract high-quality students and support effectively our PGR community. Future projects and joint PhDs will be developed in international collaborative research around our strategic themes, with more scholarships funded from external sources. Moreover, we will align PhDs, match funded (industry partnership) PhDs, Graduate Teaching Assistantships (GTA) and collaborative PhD scholarships with large-scale project proposals, to increase the impact and value of our research. We will increase the number and diversity of staff that are able to supervise and support our PGR community.

Enabling Impact

We are part of the University's wider mission to create a critical mass of research around key distinct themes of global economic, social and cultural importance. This period has enabled us to bring together a highly interdisciplinary environment in which partnerships have been cemented and distinct impact platforms developed for Enabling Healthier Lives, Driving Future Economies and Building Stronger Communities (see Institutional Environment Statement). Given the inherent nature of our subject disciplines, impact is rooted at the heart of our work and is fundamental in how we plan, collect, analyse and report our research with relevant partners, funders and research stakeholders. Our research has influence and impact on policy and practice, and results in high-quality publications.

In response to the feedback from the 2014 sub-panel, we have made more explicit our overarching strategy for achieving impact. In line with our 2014 Impact Strategy, we have invested in Unit's infrastructure, including the AWRC and the NCSEM, which have created pathways to impact which enhance our collaborative working. One of the unique value propositions of the AWRC is providing business, industry and public sector partners with rapid access to world-leading expertise from multiple academic disciplines at the University. For example, the UEZ, Wellbeing Accelerator and Investor Club enables the AWRC to work with start-ups, SMEs, funders and agencies - to accelerate the development of health and wellbeing technologies and applications. We have expertise in working with patients with positive impact on improving health outcomes in the prevention and treatment of cancer, diabetes, frailty, heart disease, mental illness and obesity. This health expertise transcends departments and includes public health and behavioural scientists, who combine their health and community engagement knowledge to deliver meaningful change across the health and care system. The AWRC therefore provides a unique and world-class environment for PA research and impact.

The NCSEM has also been at the centre of our applied research offer, with community, local authority and clinical partnerships providing clear and meaningful impact. This has seen the development of PA pathways and co-located clinical services, embedding practitioners and researchers in the same physical spaces, allowing for evidence-based innovations to be evaluated and their effect reported. These interventions include the design, delivery and evaluation of lifestyle behaviour change across populations, including older adults, those with MS (Carter), cancer pre- and rehabilitation (Bourke) and collaboration with community centric organisations such as parkrun (Haake, Bullas). Examples also include our hospitality management workshop series through Scale Up 360: free webinars and interactive workshops to support local hospitality businesses through the Covid-19 pandemic and optimise post-virus recovery.

Our five ICSs illustrate and evidence the impact of our diverse collaborative research and are the products of symbiotic relationships with our research partners. All our ICSs are products of collaborative working, in clinical contexts (ICS4, ICS5) and the community (ICS1, ICS2, ICS3).

Interdisciplinary Research

By its nature, the Unit brings together interdisciplinary expertise from traditional sport and exercise science (e.g. psychology, physiology, biomechanics, strength & conditioning, coaching), with sports engineering, sociology, sport business, economics, and leisure and hospitality. We bring

together scientists applying a range of research methods, which facilitates interdisciplinary research (regarding intervention, context and methodological expertise) and enables the pollination of skill sets to form expert research groups from a variety of backgrounds. Our research outputs reflect the fact that staff are encouraged to work across interdisciplinary themes, which is core to the research strategies of all our research groups.

We work closely with researchers from across the University, including Health and Social Care, Engineering and research centres including the Centre for Regional Economic Social Research (CRESR) and Centre for Behavioural and Applied Psychology (CeBSAP). The majority of our external funding applications and projects are made with colleagues outside of the Unit. Our focus is toward cross-cutting, collaborative and predominantly interdisciplinary research with partners, both inside and outside of the University.

Open Research and Research Integrity

Within our Unit an environment has been established that ensures the effective sharing of research outputs and management of research data. We take a strategic approach to support outputs for gold open access, selectively targeting APC funding at high-quality outputs which would most benefit from enhanced dissemination to wider audiences; operationalised through a transparent review process. Approximately a third of our outputs within scope of the open access policy for REF have been published via gold open access. Staff systematically make all other publications available as green open access through the institutional repository (see Institutional Environment Statement).

The University developed a responsible research metrics policy and is a signatory of DORA, informing the responsible assessment of research outputs.

All research activity is subject to strict ethical scrutiny via the University ethics procedures and is compliant with the University commitment to the Concordat to Support Research Integrity (see Institutional Environment Statement). All staff are required to have ethical approval in place before starting research. Almost all staff also act as research ethics reviewers, while Ranchordas is Head of Ethics for the HRI.

2. People

Staffing Strategy

Developing a cohesive and supportive research environment for staff is fundamental to our growth, vitality and sustainability. We support staff to develop as researchers and have effective systems in place regarding work loading and self-development. In addition, we apply a recruitment policy that complements and builds upon our existing and future research strategies, capital investment, and integrates effectively with our PGR community and taught provision.

There is a blend of experienced researchers, ECRs and research associates (RAs). Since 2014, nine new permanent staff were appointed, with a further 10 RAs to support research projects. There is a proactive approach toward creating opportunities for all staff to grow and develop their research portfolios and, as a result, increase our capacity and quality of research, whilst ensuring alignment to the University strategy of becoming a leading applied university. Our approach has seen a significant increase of around 110% in the number of staff submitted in 2021, a reflection of the increase in broader research activity and support across the Unit, and a movement beyond pockets of excellence in this period. In recent years, the integration of teaching and research has also enabled opportunities for a more research-informed curriculum, expanded the scale of collaborative funded projects, and increased the number of ECRs being involved in the writing of bids and running of projects.

The strategy in this period has been to increase the quantity and quality of our research, while maintaining a focus on engagement, impact, social responsibility, and ensuring that the

experience and attainment of our PGR students increases in line with expectations. We have moved to a position where new academic appointments require at least a doctoral qualification, unless there are compelling reasons otherwise (e.g. requirement for professional experience and/or qualifications).

Career Development

Staff development is a cornerstone of our approach and includes both formal and informal structures. This support includes: research mentorship, annual research planning and appraisal in line with the [Academic Career Framework](#) (ACF – see Institutional Environment Statement), and access to the University's Researcher Development Programme.

The increase in staff being included in the submission is a consequence of a concerted effort to support their research. In line with the University's REF code of practice all staff with approved forward-looking research plans are allocated a minimum 10% research time, in addition to the standard 10.8% allocation. Significant time investment in ECRs across the REF period - an additional c.£140k/3.4 fte per annum above the SRR minimum - has enabled 11 to be included in this submission.

Staff whose work is primarily on UKRI, NIHR and contract research have one day a week ringfenced for PhD supervision, professional development and other broader academic activities. Staff development budgets are used mainly for conference attendance and training, and our total investment for conference attendance is c.£45k pa, with around 40 staff supported annually. Career development is guided by the University's ACF, which recognises research as a route through which career development and promotion can be achieved. Colleagues who are seeking to develop careers in research are expected to perform excellently in relation to the expectations of research performance, and also to make contributions in relation to teaching and learning or external and professional engagement.

The ACF structure forms the underpinning framework for regular staff appraisal (annual, with six-monthly update) via Performance and Development Reviews (PDR), which take place between individual colleagues and their line manager. These discussions review progress, consider any issues or constraints that may have arisen, and agree an action plan for the forthcoming year. They also record details of outputs produced and pinpoint development activities (including conference attendance and training activities) that might help colleagues to work towards their career targets.

Other mechanisms to support colleagues in relation to their research career development comprise regular internal seminars and workshops. These events provide a platform for ECRs and PGR students, who are an integral part of our research community, as well as experienced researchers. Examples of events and support for staff include:

- Fieldwork Fund and Pedagogic Research Fund - two competitive, inclusive calls per year for each fund, with an annual budget of £14,000 and up-to £2,500 available per project.
- Project catalyst funding (12 projects at £2k pa for two years).
- Six La Trobe University-Sheffield Hallam University funded projects, involving staff exchanges (see section 3).
- Funding for staff to undertake doctorates.
- Skills workshops/development schemes, including shut up and write, research design, statistics/quantitative data analysis and write a paper in a year.

Early Career Researchers

The development and support of ECRs are a vital component of our strategy to enhance our research capacity and environment. 11 ECRs are included in this submission (**Bullas, Clarke, Dunn, Foster, Griffiths, Humphreys, Kelley, Kesterton, Myers, Nichols, Ruddock**) with all staff having access to a research mentor. These programmes have seen the provision of 25

research mentors, and initiatives are aligned with annual individual R&I plans. This approach supports the development of 3-year planning for research, which maps against annual PDR and business planning. These programmes are horizontal, in so far as the mentors provide support across all of our strategic research themes; and vertical, by representing all grades of research staff, so that mentees are able to access staff that are appropriate role models, around 2-3 years ahead on their research career pathway.

Mentoring from senior researchers includes support to develop bid writing skills and journal publication, apply for fellowships and funding applications, increase their external profiles, and build networks and collaborations. In the context of the wider University, all newly appointed staff are required to follow a new two-year Hallam Academic Award (HAA), which includes modules on research plus a research project supervised by an experienced researcher. Newly appointed colleagues, and ECRs more generally, also have access to a range of programmes from advanced research methods training, publishing, writing and supporting their development. The University's ECR Network also runs several events focused on ECR development.

Other elements of support for ECRs include:

- ECR representation on the University's Concordat Steering Group
- ECR Network at University level and emerging networks across the Unit
- Writing up sabbaticals for staff doctoral candidates who are near completion
- 20%-time allowance for two years following doctoral completion to develop publications
- Open invitations to research staff development events and workshops
- Access to the University's Researcher Development Programme

Recognition and Reward

One of the best indicators of the success of our staff development and support strategy is the promotion and progression of our team. Of the 67 staff in the submission, 42 were promoted or regraded during the assessment period. Four staff achieved a personal Chair (Bourke, Breckon, Copeland, Wheat), with a further seven awarded Readership (Crowther, Heller, Klonizakis, Kokolakis, Pomfret, Ramchandani, Ranchordas). All Reader and Professor appointments follow the University's process for internal and external panel review, to ensure integrity and commensurate standards for those in the sector. Staff who consistently deliver beyond their job descriptions are regraded and given enhanced responsibility. Other promotions include eight staff to Principal Research Fellow or Principal Lecturer (NFA grade 9), 16 staff to Senior Research Fellow or Senior Lecturer (NFA grade 8), and seven to Research Fellow or Lecturer (NFA grade 7).

Research Students

Recruitment and Studentships

	13-14	14-15	15-16	16-17	17-18	18-19	19-20	Total
PhD	9	6	9	4	15	12	10	65
DProf	1	2	-	-	1	2	-	6

Table 1. PhD and Professional Doctorate (DProf) completions (in the reporting period)

We have successfully supported 71 PhDs (65 PhD, six Professional Doctorate) completions during this period (Table 1). We offer GTA PhD positions, as well as traditional PhDs studentships. GTAs gain structured teaching and learning experience alongside their PhD research, to increase employability as rounded academics. The University's Doctoral School and research institutes hold induction events for all new students to guide them through the PhD experience and the associated processes associated with research.

Throughout the reporting period we have achieved external funding for many of our doctoral studentships from prestigious funders including: EPSRC, English Institute of Sport, Adidas,

International Tennis Federation, Lawn Tennis Association, Adidas, British Swimming, UK Sport. The majority were fully funded, with the remainder match funded.

Supervision and Training

Each PhD student is allocated at least two supervisors that have a minimum of two completions between them. The Doctoral School offers compulsory supervisor training for new supervisors and staff who are new to doctoral supervision are matched with a more experienced researcher, who serves as a doctoral supervisor mentor. CPD is also provided for existing doctoral supervisors. 39 staff from the Unit supervised PhD students during the assessment period.

All new PhD students go through a bespoke training needs analysis. PhD training is consistent with the Vitae Researcher Development Framework and operates at three levels: research methods competence; research skills common to cognate disciplines; and transferable skills, such as time management and personal development planning. Our PhD students also receive training and development workshops (and opportunities) for teaching, and relevant work experience through current research and consultancy contracts. Where required, PhD students are also provided with supervision of specialist accreditations (e.g. British Psychological Society (BPS) stage 2, Motivational Interviewing (MI), British Association of Sport and Exercise Sciences (BASES) accreditation). We strongly encourage our students to take part in the Vitae "Three Minute Thesis" competition to gain experience in public engagement. In 2018, a PGR student from our Unit (Thelwell) won the local competition with a talk on his thesis titled "Assessing human morphology using statistical shape analysis", progressing to the national phase.

PhD students are encouraged to present at research seminars and conferences, to publish in peer reviewed journals and are funded to undertake fieldwork. Each student is allocated £1,500 per year to support research engagement activity (conferences, travel etc.), although students are expected to supplement this by applying for external funding. Internally, dedicated poster and presentation space is provided for PGR students at the annual University Creating Knowledge Conference. An annual doctoral student symposium is held in collaboration with the University of Girona, Catalonia, where doctoral students present their research in Girona and Sheffield in alternate years. In 2018 the Unit hosted the national Tourism Research Network (TouRNet) PhD/ECR Symposium.

Operations and Support

The University's Doctoral School is responsible for the oversight of all PGR activity, policies, regulations, and training. A Code of Practice for Research Students and Supervisors outlines the quality framework, thus helping to facilitate timely completion and a high-quality student experience. Each research unit has a PGR Tutor who oversees the progression and wellbeing of PGR students.

An annual progress review takes place through feedback and monitoring, completed by both students and supervisors. Formal progression checkpoints are held to review student progress at 3 and 12 months for full-time students (6 and 24 months for part-time). This process has been successful in providing a foundation for the student and to gain objective feedback from independent reviewers. Two examiners provide independent assessment for each phase.

Since 2014, the Unit has seen three staff receive University Inspirational Research Supervisor Awards (Choppin, Davids, Senior). In addition, our PGR administration lead also received an award for Outstanding Student Support.

We participate in the Postgraduate Research Experience Survey (PRES). In the 2019 survey our Unit of Assessment was in the upper quartile of results for overall experience, supervision, resources and research skills - with 86%, 92%, 91% and 91% of survey respondents replying positively respectively.

Career Progression and Employability

PhD students gain experience by supporting the delivery of knowledge transfer and consultancy projects as part of their extra-curricular paid activity. Moreover, PhD students gain experience including UG and PG project supervision and delivery of taught provision and assessment. PhD students are supported in their career progression and nine have been recruited as staff within the Unit during the assessment period, of whom two are submitted in the current assessment (Bullas, Dunn). Examples of posts held by former doctoral students are: Research and Innovation Manager at the International Tennis Federation, Machine Learning Engineer in the fashion industry, Programme Manager for the Academic Health Sciences Network, Research and Development Engineers in the sports industry, Sports Intelligence Consultant for EIS, and academic researchers and lecturers at other universities (e.g. University of Portsmouth, Leeds Beckett University, University of Bedfordshire, Tamale Technical University in Ghana and University of Maribor in Slovenia).

Equality, Diversity and Inclusion

Sheffield Hallam holds a Bronze Athena Swan award and is committed to the Concordat to Support the Career Development of Researchers. Within this framework and context, our departments have a strong commitment to EDI, and deploy institution policies, procedures and processes – such as Hallam Deal, Race Equality Charter and mandatory staff training (including specific training for leaders and managers). These processes help ensure we embed EDI in all aspects of our environment for staff and postgraduate research students – from the recruitment of staff and students, to supporting career progression and deploying resources to support research and researcher development. These approaches and principles are key enablers of our people strategy, aligning to University Equality Objectives. All members of staff involved in recruitment, promotion and assessing research outputs are required to undertake mandatory unconscious bias and EDI e-learning modules.

At entry-level to our research community, talented students are empowered to pursue doctoral study - advancing equality of opportunity, experience and outcome - regardless of where they undertook their first degree, their socio-economic background, or their particular protected characteristics. We have a strong record of widening participation with initiatives across the student lifecycle, including training to support the progression of students from non-traditional backgrounds from undergraduate into research degree programmes. Furthermore, we employ a learning contract system with our PGR students, which ensures supervision, progression monitoring and assessment activities are adapted to meet the learning requirements of students with a disability or additional learning needs. Adaptations include recording of supervisory meetings, extension of deadlines, submission of written questions for students to consider prior to supervisory meetings, use of notetakers, and briefings for external examiners around what additional factors need to be considered in the *viva voce* examination, e.g. regular breaks, re-wording/re-formulating questions.

We are a member of the Race Equality Charter (REC) and recognise that racial inequalities continue to exist; we are committed to taking a strategic approach to making cultural and systemic changes that will make a difference to our minority ethnic staff and students. Participation in the REC helps us assess our current position, and shape and develop our action plan for change. We have supported minoritised staff in the Unit to attend the AdvanceHE Stellar HE programmes, and we have a member of staff who co-founded a cross-departmental anti-racism group (HWLS Minoritised).

We take an inclusive approach to supporting staff within the Unit to develop their research careers around other commitments and responsibilities. We have a range of programmes and initiatives to support staff, which include flexible working and support for staff on maternity leave through KIT days. In accordance with the wider group of staff within our three departments, 7% of staff in the Unit have been or are currently supported to work part-time. Indeed, one of our ICS leads (Bourke) was awarded a personal chair during the reporting period and has been supported to work flexibly

around other life commitments. Staff can change contracts to address health issues, work-life balance, caring responsibilities or new disabilities, without implication for their role or research time allocation. This represents an equality of access to a research career pathway, and a commitment to support staff to develop their careers, contributing to the vibrant research activity of the Unit alongside personal responsibilities.

Staff in the Unit have accessed support programmes and leadership training designed specifically for women. For example, Doran received a research sabbatical and participated in the Aspire programme, Kim participated in Hallam Leaders programme, Ali completed Chartered Association of Business School (CABS) Development Programme for Directors of Research and participated in Aurora (AdvanceHE's leadership development initiative for women). Ramchandani completed the StellarHE Programme for Diverse Leaders in Higher Education.

All staff in the submission are on permanent contracts. This represents a commitment to the long-term support of staff and the avoidance of uncertainties associated with regular renewal of temporary positions. If staff are recruited on a temporary contract associated with one or more research projects, they are maintained on a temporary contract for a maximum of four years. During their time in a temporary position, staff are supported and mentored to develop their skills and experiences, such that they are most often in a position where we can strongly support their progression to a permanent contract at the end of the maximum four-year period.

Our staff have access to generous funding schemes for conferences, internal fellowships, doctoral study support, seed corn research projects and open access article processing charges. All staff have equal access to these schemes, regardless of their stage of career, protected characteristics, or part-time status. In accordance with institutional policies and processes, allocation of funding is achieved through open, transparent application and review processes, with consideration to principles of EDI. This includes ensuring that review panels are diverse, and that the diversity of the profile of supported colleagues for a particular scheme is considered.

3. Income, infrastructure and facilities

Income

The Unit has a breadth of world class research which has driven a collaborative approach to income generation. This is reflected by the variety of sources of income and a mixed economy that increases both our sustainability and resilience within an ever-changing financial landscape.

Our research, KT and consultancy income has risen significantly over the assessment period from £11.7m (£5.7m Research; £6m KT) in REF 2014 to £16.8m (£5.7m Research; £11.1m KT) in REF 2020 - an increase of over 43%. This income is derived from funding council grants (£2.7m), Government, Local Education Authorities, the Health sector (£3.3m), industry and commerce (c.£2.1m), and knowledge transfer (e.g. consultancy, non-research regional funds and KT partnerships) (c.£7.8m). Other sources include course related fees, CPD and other income (c.£900k). This reflects the significant increase in infrastructure and targeted research strategies.

We work to develop and maintain large research, KT and consultancy partnerships with key clients, to create continuing research and income-earning opportunities. These include the DoHSC, Department for Digital, Culture, Media and Sport (DCMS), Council for Hospitality Management Education, Public Health England, UK Sport, English Institute of Sport, Sport England, International Tennis Federation, Royal and Ancient, Welcome to Yorkshire and Decathlon. The nurturing of these partnerships leads to new sources of income, principally because the reputation built up with long term collaborators is used to help secure wider funds. Research conducted under these larger partnership models has a wider impact, as methods/techniques developed in one part of the partnership can be applied in other areas. We have also generated significant income from UKRI, NIHR and charitable funders for intervention-based projects (e.g. MS Society, Macmillan Cancer).

Our international collaborations have added to this increase in our income, including a collaborative grant with University of Girona (Kim), which secured £137,936 in response to the European Commission Enterprise and Industry call: transnational cultural tourism products and tourism and accessibility for all. Our strategic partnership with La Trobe University, Melbourne (LTU) has seen the generation of externally funded research of c.\$1.6m. This includes the LTU partnership between the University, LTU, Swinburne University, University of South Australia and University of East Anglia for a \$1.1m dementia trial (MedWalk) funded by the NHMRC Australia (Breckon); plus a \$0.5m grant funded by the Australian Defence Science and Technology Group's Human Performance Research Network (Wheat). Staff have secured a further c.£100k from the LTU collaborative project initiative, which has led to several staff from the University working with LTU colleagues in pilot projects that will lead to submissions for larger scale grant support.

Nine projects from our Unit have been funded by the University/LTU research development fund. These are in addition to a recently launched Sheffield Hallam-LTU PhD collaborative programme (£160K investment per annum), which will see 6 joint PhD scholarship opportunities per year from 2020.

Organisational Infrastructure

The Unit's researchers and leaders shape the strategic direction for each of our themes and manage the direction of our income generation. Research groups oversee their income generation activity in weekly meetings, which include updates on funding opportunities, bids in preparation, bids won, and ongoing performance of projects being serviced. This oversight provides awareness at an operational and strategic level and enables adaptations to be implemented at any phase of the process. We align our approach to income generation by areas of specialism, so that we play to our strengths and sustain income generation that facilitates public-facing peer-reviewed outputs and reports. Moreover, we have drawn on expertise from across the Unit, and work collaboratively with funders, other HEIs and industry partners.

We have 6 fte dedicated research administrative staff that support all stages of our projects, from bid development and submission, to the ongoing management of awarded projects. We have 5 fte of dedicated technical staff that support the delivery of R&I projects and these colleagues are embedded within the Unit across the respective departments. We have robust project management procedures, methodological rigour and close relationships with clients. Project management is directed by senior staff (supported by our research administration team) and focuses particularly on resource use and scheduling. We have a 'live' work planning model in research in order that staff and resource allocation can be managed efficiently and effectively.

The search for external funding is driven by an appropriate blend of reactive and proactive actions. We have invested in external databases and search processes (e.g. FCS tracker) to continually monitor appropriate organisations and websites for procurement notices. A fortnightly grants meeting is held by the Health Research Institute, where opportunities for funding and fellowships are filtered, presented, then cascaded to relevant research groups. We use our professional networks to gather intelligence on forthcoming R&I funding opportunities. Most external research income is achieved after open competition with other HEIs and commercial consultancies. Bidding is typically a collective process, with appropriate teams formed by the bidding PI to meet a project's methodological and subject specialism requirements. Where internal resources are insufficient, or internal capacity constraints pose a risk to project feasibility, partnerships are formed with appropriate research and/or consultancy organisations. All projects are managed through our online project management system (including ethics and management sign off), as well as ongoing oversight of projects. We also work closely with Research and Innovation Services (RIS) (see Institutional Environment Statement) who provide, for example, support when negotiating contracts and intellectual property rights.

Infrastructure

All staff have dedicated office space and necessary equipment to carry out their role and are located close to relevant facilities such as laboratories, hospitality facilities and engineering resources. The Unit has the following: a 90 m² biomechanics laboratory with a 12 camera MAC system, 4 fixed and 2 mobile Kistler force plates, an instrumented Kistler treadmill, 3 Phantom high speed cameras, two 90 m² physiology laboratories for full blood analysis, a 20 m² environmental chamber with -20°C to +40°C and 0-100% relative humidity range, a 30 m² fitness suite for clinical populations, a bespoke S&C suite for athlete consultancy, and two fully instrumented interviewing suites. Existing sports engineering facilities were recently supported with a complete refurbishment (c.£300k) and equipment investment of £250k.

In 2019, around 20 staff co-located to the AWRC. A capital grant from the DoHSC enabled the development of this world class facility, and also facilitated a EDRF equipment grant of £900k (total funding £14m). This, together with our own investment, funded the following spaces:

- 500 m², 7.5 m high indoor 3D movement analysis lab
- 3D morphology scanning lab
- Rapid prototyping and makerspace
- Design engineering and manufacturing workshop
- Human movement and performance lab
- Emerging technologies hub

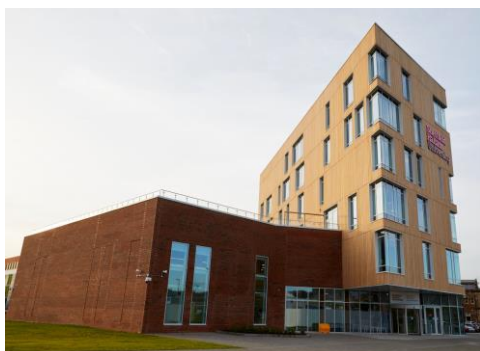


Figure 1. The Advanced Wellbeing Research Centre and Olympic Legacy Park.

The NCSEM Sheffield has translated the £10m DoHSC capital grant from the previous assessment period into a whole systems PA programme, including an innovative hub and spoke model comprising three centres located in communities in Sheffield known to experience poor health and high inequality. Each centre includes a mix of clinical and activity spaces, and co-locates patients, researchers, PA specialists and public health professionals - enabling a viable treatment option within the NHS. This approach is unique in the UK, and the iconic nature of the NCSEM model has also attracted additional funding from Sport England, national governing bodies for tennis and gymnastics, as well as local investment from the City Council - which in sum has resulted in a £24m investment in facilities to enhance PA in Sheffield. **In 2015, the International Olympic Committee (IOC) designated the NCSEM one of 11 research centres globally for the prevention of injury and promotion of athlete health.** This has created an exciting and innovative infrastructure that is already benefiting our staff and PGR research community with access to patients' groups and clinicians.

In addition to physical space and hardware, the Unit has software licences to enable us to carry out core research: Fluent licence for computational fluid dynamics, MATLAB licences for data capture and analysis, individual Microsoft Developer Network subscriptions for core researchers, and access to high performance computing via a University Microsoft Azure subscription. The readily available access to Azure allows our researchers to train and develop machine learning models based on big data (a future priority for us), which would be time prohibitive when using traditional local cluster computing power.

4. Collaboration and contribution to the research base, economy and society**Collaborations, Networks and Partnerships**

We have a strong collaborative approach across the Unit, demonstrated through our strategic partnerships, networks with academic colleagues at other institutions, and with organisations in the sport and PA, leisure, tourism and hospitality sectors. Opportunities created for collaborative research (internally and externally) have continued to maintain and enhance a significant R&I culture.

Strategic Partnerships

Strategic partnerships between the University and other institutions/organisations provide staff with opportunities for collaborative research. Notable examples are LTU (Melbourne), Sheffield Teaching Hospitals, parkrun, and research partners of the AWRC (e.g. Westfield Health).

Sport and PA are central to the strategic partnership with LTU, and one of the three strategic priority areas, alongside health and wellbeing, and food and nutrition. The formal partnership has strengthened existing relationships (Breckon) and created new partnerships and collaborations between staff at both institutions, including research in adventure tourism and sustainable tourism (Pomfret, Tadjeddini, Tresidder), motor control (Davids), biomechanics (Wheat) and social value (Davies). Notable outcomes include the generation of externally funded research (see Income and Infrastructure), as well as several peer-reviewed outputs (Davids, Breckon) and collaborative PGR opportunities.

The principal aim of the AWRC is to bring together multiple and diverse stakeholders including: the public, patients and citizens, families, designers, digital technologists, charities, industrialists and business leaders - to work with a range of academic researchers to co-produce new technologies, interventions and services that will increase PA, improve health outcomes and drive economic growth. The AWRC has several strategic partners, who provide investment and opportunities for collaborative research. Notable examples include Westfield Health, who are providing £700k over a 7-year period to develop the evidence base for products and services relating to wellbeing at work. Ingesport and GO fit LAB are investing £180k to support three PhD studentships every three years. Strategic partners also provide opportunities for cutting edge equipment and technology, expertise in the health and wellbeing sector, and research and development opportunities for staff. For example, Cannon Medical – leveraging investment made on the Olympic Legacy Park Sharks basketball stadium with imaging (CT/MRI/ultrasound) facilities. Engaging in partnership has led to further economic and cultural investment in the city region, with the University at the heart of this partnership.

The NCSEM partnership provides University researchers with a rich environment that includes access to, and input from, policy makers, commissioners, chief executive officers and their organisations across the health system in Sheffield. Through this diverse, research-ready environment, multiple collaborations have developed with local, national and international impact. The NCSEM has led a major shift in NHS models of care, including the transfer of 80,000 hospital-based appointments into community venues co-located within leisure centres (ICS3). These centres bring together patients, researchers and clinicians - delivering meaningful impact on patients' lives through collaboration and innovation in healthcare services. Through local and national PA campaigns such as Move More Month and Active 10, the NCSEM has helped to engage close to 1 million members of the public in PA using mobile digital technology.

Haake and Bullas took over the parkrun Research Board in 2015. This strategic partnership aims to lead international research into the benefits of parkrun across 22 countries. The Board has international members (South Africa, Australia, Ireland) and has produced more than 40 journal and conference papers on parkrun as a large-scale population intervention. Haake and Bullas published a survey, sent to all registered parkrunners over the age of 16 in the UK and Ireland - resulting in 60,694 responses from the UK and 4,493 from Ireland. This makes the survey one of

the largest pieces of independent research into the impact of PA in the world. The results have been presented by Haake to Public Health England and the House of Commons, and by parkrun at the House of Lords review on PA in the community.

Research Networks and Collaborations with International and National Partners

In addition to high level strategic partnerships, collaborations between academic staff in the University and other institutions - locally, nationally and internationally - are an important means through which to progress research ideas, deliver high quality outputs and develop ECR researchers. For example, the research programme of Davids and colleagues has emerged from established collaborations and research links with scientific and educational organisations, academic institutions, and commercial and high performance sports organisations locally (e.g. Zen Oracle, Sheffield United FC), nationally (English Institute of Sport, UK Sport, British Canoeing) and internationally (e.g. University of Lisbon in Portugal, University of Rouen in France, Singapore Education Ministry, Queensland University of Technology in Australia, NTNU at Trondheim in Norway, Finnish Olympic Research Committee, and University of Jyväskylä in Finland). The indicators of success, in the assessed period, for these collaborations can be seen in: the funding received for 20 PhD student positions, a Postdoctoral Research Fellow appointment, applications from four Visiting Fellows to gain research experience from collaborative research projects conducted at the University, publication of over 200 peer-reviewed articles in journals with high impact factors, 60 invited communications and keynotes to educational and training workshops, international scientific conferences, organised symposia, presentations to NGOs, six research funding applications, six appointments with grant funding international agencies seeking evaluation expertise, and five positions of leadership in international sport science and education research organisations.

Another example of effective collaborative partnership working is demonstrated by our partnership with the European Network of Outdoor Sport (ENOS). ENOS is a network organisation of academics and practitioners committed to the development, promotion and management of outdoor sports across Europe (shaping policy and practice within the sector and representing outdoor sports at a strategic level within Europe), contributing to expert groups and forming collaborative partnerships (Gregory, Davies, Ramchandani). We were collaborators in a successful Erasmus+ European consortium bid on the benefits of outdoor sport to society (£500k), with Technical University of Munich and 11 other partners. In a further example we formed the 'Alliance for Sports Engineering Education' in 2019 (Choppin). The alliance is composed of European Sports Engineering Universities (Delft TU in the Netherlands, Chemnitz TU in Germany, Vienna TU in Austria and Aalborg University in Denmark) and companies (Vaude, Magura, Motek, EPSI EU, Labosport, Catapult and the International Tennis Federation). We were awarded a €1m Erasmus+ bid that will better co-ordinate the development of Sports Engineering education across Europe. During the reporting period, staff (e.g. Gregory, Davies, Choppin) have accessed internal DIFRO funding to enable international travel to develop research applications for funding to support collaborative working.

In the current period, staff within the tourism, hospitality and service sector management area have strengthened their research partnership with the University of Girona, building on its annual PhD research colloquium with PhD collaboration, examination, staff exchanges and research collaboration (Kim, Whalley). Strong ties have been formed with the University of Johannesburg and University of Pretoria on strengthening university-enterprise cooperation in South Africa to support regional development (Ali). This will continue to develop over the next period, alongside the Unit's new research partnership with the UNWTO TedQual accredited Excelia Tourism and Hospitality School, La Rochelle – driven by shared interests and expertise in tourism policy, accessibility and sustainability.

A final example of an effective collaboration is the work of Shibli with the Sports Policy factors Leading to International Sporting Success (SPLISS) consortium, along with colleagues at Vrije Universiteit Brussel (Belgium), the School of Governance at the University of Utrecht (Netherlands) and Victoria University (Australia). This consortium has published several world-

leading research outputs, held international workshops and conferences, and generated funding for further international funding applications and research.

Partnerships with Clients and Funders

We develop and nurture 'rich' partnerships with key clients, to create continuing research and income-earning opportunities, and to create and disseminate knowledge. There is a symbiotic relationship between research staff submitted in the Unit and funders/clients. Many of the outputs submitted by the Unit are generated as direct products or value added from research contracts. There is mutual benefit derived from partnership because access to data enables our researchers to advance academic knowledge and, in turn, the publication of outputs enhances the dissemination, impact and credibility of clients' work. Successful partnerships include, but are not limited to, UK Sport (Ramchandani, Coleman), Sport England (Davies, Shibli, Kung, Bullough, Gregory, Griffiths), Sport Northern Ireland (Shibli, Coleman), Westfield Health (Breckon), Decathlon (Wheat, Hart), Sheffield Teaching Hospitals (Humphreys, Bourke), Youth Sport Trust, Badminton England (Hart), MS Society (Carter, Humphreys) and EIS (Goodwill).

Wider Public and Non-Academic Engagement

Staff in the Unit also engage in wider dissemination activities with the media. The Unit generates a disproportionately high share of the University's media coverage due to our embedded impact and engagement strategy. A particularly notable area of our research, which receives significant coverage, is the economics of professional team sport (Wilson, Plumley) and sport events (Shibli, Coleman). Wilson engaged in circa 360 interviews with national and international media in the last 12 months with an estimated reach of this work c.60million people pa. The world's first Satellite Account for Golf was launched (Shibli and colleagues) at the Houses of Parliament by the All-Party Parliamentary Group for Golf (APPGG), with two further presentations to the APPGG on the impact of Covid-19 on the golf industry. Other examples include Haake, who has presented across media outlets including TEDx and as a featured guest on BBC Radio 4's The Life Scientific. Wheat was invited to present at *New Scientist Live* in 2016, and several staff have provided content for local and national radio, television and newspaper articles and commentaries (Fielding-Lloyd, Ranchordas, Breckon, Copeland, Martin).

Engaging Research Users/Beneficiaries

We have a focus toward applied research in clinical settings and engaging research beneficiaries. For example, the AWRC Public Involvement in Research Group enables researchers to engage and listen to the public, as well as enabling the public to directly support, challenge and participate in the design and delivery of research. Our researchers can access the group at any stage of their research: before and after funding application submission, during the life of a project, and after completion to feedback on findings. Members being from the local area offers a chance to explore how the research could impact the local community.

A specific example of engaging research users in clinical settings is evidenced through a series of research studies and outputs, which developed and co-produced PA/musculoskeletal (MSK) pathways for the NHS with clinicians and patients at co-located sites (Speake, Copeland, Breckon, Haake). This innovative research involved sustained and meaningful co-production led by researchers at Sheffield Hallam, listening to the voices of users and giving power to them to influence the pathway through the research process. The impact was the implementation of adapted MSK services (in conjunction with NCSEM) at the three co-locations in Sheffield (Concorde, Thorncliffe and Graves). The NCSEM co-location approach embeds service-users at its core. This research also gave rise to an applied and theoretical underpinning of the model, based on interviews and engagement with a wide range of users of the co-located sites (MSK physiotherapy, diabetes, podiatry and/or pain management).

Wider Contributions to the Economy and Society

Much of the breadth of research impact generated by our staff extends beyond the impact case studies submitted. We have a strength in research around the economics of sport, and this has impact beyond academia. For example, the work of Davies, Ramchandani, Coleman, Shibli and Kokolakis on valuing various aspects of the sport and PA sector, and major events, has led to the development of measurement tools and methods (such as Social Return on Investment (SROI) and Sport Satellite Accounts) for measuring the sector locally, nationally and internationally. Research on the SROI of sport has fed into the development of a Social Value Calculator tool for measuring the value of activity in leisure centres, which is used across more than 500 sites in England and Wales. This has won awards for research and knowledge innovation (see prizes). Our sport economic research is having impact by feeding into and developing national policy, providing evidence for advocating the benefits of sport and PA for a range of stakeholders, and informing planning and investment decision making within sport and PA.

An example of impactful sports engineering research is the body of work conducted with the International Tennis Federation (ITF) for 20 years. The ITF is the governing body for tennis, the 4th largest sport in the world, and the premier ITF competition is the Davis Cup, played by 130 Nations. Our research (Goodwill, Senior, Choppin and Kelley) with the ITF includes the development of the points system for the new format of the Davis Cup (our algorithm is used to determine rankings), surface testing of all Davis Cup matches, data analytics (embedding hawkeye data) and modelling the impact between the ball and racket. As an example, this work has shaped changes to the Davis Cup and a new Fed Cup competition format, which in-turn led to investment in tennis for the 20 elite nations and into the development of tennis in sub-elite nations.

Our research also makes wider contributions to the economy and society in the field of sport and PA related to children and young people. We have a track record in analysing and evaluating the provision of sport and PA within schools for Sport England, the Youth Sport Trust and DoHSC, as well as various national governing bodies of sport. Examples include the School Games Mark Award - analysis of around 9,000 online award applications and 300 onsite inspections per year. The purpose of this research has been to help drive up standards in schools, which is enabling good practice to be shared widely across the schools' network and across society.

Contributions to the Discipline

The number and diversity of esteem indicators listed in this section demonstrate the significant wider influence and reputation of staff submitted in the Unit. Evidence includes advisory board memberships, journal editorships, invited conference communications and work with professional associations.

Contributions to **professional associations, national and international committee and initiatives** (n=38) to develop the disciplines includes: **Ali** (Member of the CHME Executive Committee), **Bourke** (European Association of Urology: Prostate Cancer Treatment and Management Guidelines Panel), **Breckon** (Behaviour Change Guidelines and Training Advisor – British Association of Cardiac and Pulmonary Rehabilitation; Research Advisory Group, National Institute of Preventive Cardiology, Ireland; Member of the BPS Qualification in Sport and Exercise Psychology Qualification Reference Group), **Brunton** (British University Colleges Sport – Chair of the Research and Impact Group), **Bullas** (parkrun Research Board Member (Vice Chair); Institute of Electrical & Electronics Engineers, IEEE Industry Connections 3D Body Processing Group), **Choppin** (IEEE Industry Connections 3D Body Processing Group), **Copeland** (International Olympic Committee Research Centre for Prevention of Injury and Protection of Athlete Health; Public Health England Moving Healthcare Professionals Advisory Board; Chief Medical Officer's Expert Working Group for Older Adults - PA Guidelines Update), **Davids** (Athlete Development Futures Lab - UK Performance Pathway Team, British Olympic Association; Member of the Scientific Evaluation Committee, 14th European Congress in Sport Psychology), **Davies** (Co-Chair of the Sport Outcomes Evidence Review Group for Sport England; member of the parkrun

Research Board; member of the Go Fit Scientific Advisory board; Research Associate of the Observatory for Sport in Scotland), **Dunn** (Executive Advisory Board, International Sports Technology Association; Treasurer, International Sport Engineering Association), **Haake** (ITF Technical Commission; Chair of the parkrun Research Board; EIS, Technical Steering Committee; Sheffield City Region Chair of the Active Travel Advisory Board), **Jimenez** (Member of the Board of Directors at Europe Active - Ethics & Strategy Committee; Member of UKactive Research Institute Scientific Advisory Board), **Klonizakis** (expert panel member for Scleroderma and Raynaud's UK; Chair of UK Youth Committee Chapter & Member of the IUA Youth Committee Council), **Nichols** (British Heart Foundation Clinical Research Collaborative Steering Group Committee Member; Guideline Writing Committee member for the Association of Chartered Physiotherapists in Cardiac Rehabilitation), **Pomfret** (committee member of the Adventure Tourism Research Association), **Shibli** (Research Associate of the Observatory for Sport in Scotland), and **Wilson, R** (Advisory Board for In Sport Education; Treasurer, The Football Collective).

Contributions to *journal editorships, associate editorships and editorial board memberships* (n=41) include: **Breckon** (Associate Editor of International Journal of Sport Psychology), **Choppin** (Associate Editor, Sports Engineering), **Heller, Wheat** (both Review Editors - Frontiers in Sports and Active Living), **Wilson, R** (Editor of Managing Sport and Leisure), **Ali** (Regional Editor (Europe): Journal of Hospitality and Tourism Technology), **Dunn** (Lead Guest Editor for the Topical Collection in Football Research, Sports Engineering), **Foster** (Guest Editor "Sports Materials" special edition), **Nichols** (Associate Editor for British Journal of Cardiology); and **Ramchandani** (Guest Editor for Performance Management special issue on 'Performance management in professional team sports'). In addition to the journal editorships outlined, many staff in the Unit sit on the editorial boards of major sport, leisure and tourism journals (including **Tresidder, Davies, Shibli, Plumley**).

In addition to editorial positions our staff have also *contributed as reviewers* to over 250 academic publications, journals or research proposals. The majority of the Unit support the discipline by reviewing including, but not limited to; **Barnes** (European Journal of Sport and Exercise Sciences), **Bullas** (Sports Engineering), **Bullough** (International Journal of Sport Politics, and Policy), **Cherrington** (Qualitative Research in Sport, Exercise and Health), **Churchill** (Prosthetics & Orthotics International), **Clarke** (Managing Sport and Leisure), **Doran** (Tourism Management, Current Issues in Tourism), **Fielding-Lloyd** (Sociology of Sport Journal), **Foster** (Sport Engineering), **Griffiths** (Sport in Society), **Humphreys** (Disability and Rehabilitation), **Kokolakakis** (Journal of Sport Management), **Maden-Wilkinson** (Medicine & Science in Sports & Exercise), **Myers** (International Journal of Obesity), **Platts** (International Journal of Sport Policy & Politics), **Plumley** (Sport Business Management), **Pomfret** (Tourism Management, Journal of Sustainable Tourism), **Ruddock** (International Journal of Sports Physiology & Performance), and **Rumbold** (Leverhulme Trust Early Career Fellowship; ESRC).

The international contributions and profile of our ECRs regarding journal editorial positions, (e.g. **Dunn, Foster, Nichols**) reviewing (e.g. **Bullas, Clarke, Dunn, Foster, Griffiths, Humphreys, Myers, Ruddock**) and panel and committee memberships (e.g. **Bullas, Nichols**) reflect the growth of our future research leaders.

Conference Communications and Invited Keynotes

The international profile of staff is also evidenced by over 300 invitations to our staff to speak at national and international conferences. Examples during the reporting period include: **Dauids** who has delivered 60 invited communications and keynotes to educational and training workshops, international scientific conferences, organised symposia, presentations to NGOs; **Breckon** who has delivered over 30; and **Jimenez, Haake, Wheat** and **Bourke** who have each delivered over 10 invited presentations and keynotes. Other invited keynotes include **Nichols, Copeland, Davies, Shibli, Wilson, Klonizakis**. **Ali** co-chaired the Business and Management track for CHME in 2019; **Pomfret** and **Doran** organised the International Adventure Tourism Conference hosted by the University (2015); and **Klonizakis** has Chaired five international and national

symposiums. **Wheat** and **Choppin** were on the organising committee for the International Sports Engineering Association conference (2014).

Prizes and Awards

External recognition for research contributions for our staff includes 20 prizes and awards from national and international organisations. Notable examples include **Haake** who was awarded an OBE in 2020 for his services to sports engineering research. He was also awarded EPSRC Recognised Inspirational Scientists and Engineers 'Inspirational Leader in the field of engineering and physical sciences' (2014) and Grant Thornton's 100 Faces of a Vibrant Economy 'Realising Inspirational Scientists & Engineers' (RISE) award (2018); **Rumbold** who was awarded the Association for Applied Sport Psychology (AASP) Doctoral Dissertation of the Year (2015); **Hart** who received the Best Paper Award from *Sports Engineering* (2019); **Wheat** who received the Recognised Inspirational Scientists and Engineers, Rising Star in the field of engineering and physical sciences award, EPSRC (2014); **Ali** was awarded the Institute of Hospitality Research Award for the best research paper at the European Council on Hotel, Restaurant and Institutional Education conference (2014); **Davids** won the European Journal of Sports Science Best Paper award (2019); **Plumley, Ramchandani** and **Wilson** won the Emerald Literati award for 'highly commended paper' in the Sport, Business and Management (2020) - an award previously won in 2014 by **Davies, Coleman** and **Ramchandani** for a paper in the International Journal of Event and Festival Management.