Institution: UNIVERSITY OF BIRMINGHAM

Unit of Assessment: C26 Sport & Exercise Sciences, Leisure & Tourism

a. Overview

UoA26 is based in the School of Sport, Exercise & Rehabilitation Sciences, which is one of four Schools in the College of Life and Environmental Sciences. Housed in a bespoke SRIF2-funded building, the School has been through a period of considerable growth over the past two years. We have doubled in size through the incorporation of two departments with whom strong research and teaching collaborations had developed over time: the Department of Sport Pedagogy and, most recently, the Department of Physiotherapy. Throughout these changes, from inception to delivery, the School has benefited from significant support and investment from the College and University, including funding for new research appointments and adaptations to the building and laboratories to accommodate additional areas of activity and add capacity for future collaborations. The expanded School is comprised of four cognate groups: Exercise Physiology with Metabolism and Nutrition, Motor Control/Movement Rehabilitation, Sport and Exercise Pedagogy with Policy, and Sport and Exercise Psychology with Behavioural Medicine. Within and across these groups and in conjunction with key collaborators across the University (such as the School of Psychology and the College of Medical and Dental Sciences) and institutions beyond Birmingham, our research addresses five dynamic multi- and inter-disciplinary themes: Active Lifestyles, Effective Learning, Optimal Performance, Movement Rehabilitation and Healthy Ageing.

b. Research strategy

Aligned with the University's Strategic Framework "Shaping our Future: Birmingham 2015," the School conducts research in the sciences of sport, exercise, health and rehabilitation. Our mission is to address one of the key challenges facing contemporary societies: increasing the quantity and quality of lifelong engagement in physical activity to enhance health and well-being. We are interested in finding new ways to support the physical activity, movement and performance needs of diverse individuals and communities ranging from elite athletes to children in physical education, learners across the life-course, elderly exercisers, 'hard to reach' and at-risk physically inactive groups and those recovering from illness or injury. The School's mission is underpinned by three core principles that are reflected in the organisation and processes embedded in the research environment: (i) undertaking the highest quality scientific research *within* our core sport and exercise science disciplines, while also contributing to the growth and development of the generic disciplines, (ii) addressing problems from single, multi-and inter-disciplinary perspectives and across the range of our expertise, and (iii) working with stakeholders beyond the School to inform and define problems and practical solutions, translate theory and evidence into practice settings, and disseminate through multiple channels (see REF3a).

The changes to the size, structure and disciplinary profile of the School address priorities outlined in RAE2008 where we identified plans to sustain excellence in existing areas whilst opening up new areas of research and adding further translational capacity. We also stated that, based on our ability to offer a supportive and research-intensive environment within which early career academics can flourish, we would increase the number of postdoctoral research fellows in the School. During this REF census period, we have achieved this aspiration and there has been a significant increase in post-doctoral fellows (20) with positions funded by the European Commission (FP7), RCUK, ARUK, British Heart Foundation, Winning Scotland Foundation, and BUPA. Another key strategic aim was to enhance the School's involvement in the establishment of multi-disciplinary research centres, primarily with colleagues from the School of Medical and Dental Sciences. We have also achieved this goal, being appointed as theme leads in the successful bid to host the MRC-ARUK Centre for Musculoskeletal Ageing Research (**Duda, Grey**). We also proposed, and have delivered upon, our plan to submit more grant applications directed at local Birmingham NHS Research Trusts and the National Institute for Health Research, resulting in funding from the Dudley NHS Group of Hospitals (**Duda, Veldhuijzen Van Zanten)** and a successful cross-college bid to the NHS R&D National Coordinating Centre for Health Technology Assessment (**Duda**). In addition, we have secured a major EU award, the EU FP7-funded 'PAPA' project worth €2,980,686 with more than a million euros coming to the University of Birmingham.

We have worked to strengthen existing collaborations with the Schools of Biosciences and Psychology and the new College system has facilitated these efforts. For example, our School has

secured funding from the College (**Philp, Aldred, Wallis**) to develop a cell biology/human tissue facility. This facility, physically located in the School and representing a new resource, is the central hub of a cross-university network of research. Additionally, we have enhanced our imaging capabilities in collaboration with the School of Psychology which has resulted in an AXA Postdoctoral Research Fellowship (**Ginty**). This project is extending our use of imaging tools such as fMRI and Doppler Echocardiography along with stress hormone measures and self-report data to examine the interactions of systems in response to acute stress.

Key developments in cognate groups

Research within our Exercise Physiology with Metabolism and Nutrition group builds on the long-standing reputation of the School in exercise biochemistry, physiology, nutrition and metabolism as applied to human beings at an integrative level. Previously, work in this area centred primarily on elite performance and we have retained a focus in this area (e.g., the appointment of **Wallis** who studies the response of fuel metabolism to nutritional intake in the context of sporting performance). In addition, we have gained new research expertise in muscle growth and sarcopenia (**Breen, Philp, Greig**) and metabolic factors that are relevant to health (**Wallis**). As a result, our research is relevant to the needs of an ageing population and the maintenance of muscle function that can facilitate active retirement and an improved quality of life. In addition, we have appointed a Chair (**Thompson**) with expertise in Public Health Nutrition related to physical activity, obesity, type 2 diabetes, and ageing. Our research on the determinants of physical activity behaviours, sedentary time and dietary practices of older adults and ethnic minorities ensures the School is well placed to respond to research questions arising from key demographic changes. This is of particular importance in the West Midlands, which is the most ethnically diverse region in the UK outside of London. These shifts strengthen our position as a key player in the MRC-ARUK Research Centre in Musculoskeletal Ageing, as does a joint appointment with the School of Medicine (**Greig**). We are well placed to conduct nutritional, physical activity and pharmacological interventions to maintain muscle mass in older healthy men and women and in frail patient groups. Our research also focuses on the integration of multiple inputs that cause metabolic and mechanical perturbations impacting the regulation of blood flow, blood pressure and respiration in health and disease. An early appointment during this REF census period (**Fisher**) has resulted in productive collaborations with Medical School colleagues in research on the mechanisms underlying sympathetic neural hyperactivity in chronic disease (such as patients with heart failure). Strengthening connections with the Centre for Healthy Ageing, we also now have expertise in cerebrovascular function in relation to ageing and exercise (**Lucas**).

Our research capacity in Motor Control/Movement Rehabilitation has been increased during the REF census period by key appointments **(Gray, Grey).** With expertise in biomechanics, neurophysiology, psychology and, most recently, physiotherapy/rehabilitation, this group studies human movement from infancy to old age and across the range of human ability, from infirm participants to elite athletes or other skilled practitioners. Research projects focus on the dynamics of perception, cognition and action and performance under pressure in sport and other visuomotor activities such as driving. We investigate ways in which the brain and spinal cord change during motor learning and rehabilitation, and the effects of age and brain injury on vestibular control of posture and visual control of reaching and stepping. This work is leading to evidence-based rehabilitation strategies and also contributes to the wider research centres (MRC-ARUK, Healthy Ageing and 'trauma') furthering our collaborations with the School of Medicine and Queen Elizabeth Hospital, Birmingham. In a recent strategic development that further solidifies researchers' roles as part of the University's priority investment in neuroscience and cognitive robotics, researchers in this group (**Grey, Reynolds**) are participants in a cross-institutional neuroscience research and teaching programme. Other participating departments include Psychology, Computer Science, Neurotrauma and Neurodegenerative Diseases, Neuropharmacology, and Mechanical and Electrical Engineering.

Members of the Sport & Exercise Pedagogy and Policy group (**Armour, Griffiths, Grix, Makopoulou, Neville)** conduct research on the three key dimensions of pedagogy: learners and learning, teaching/coaching/instructing, and knowledge in context, including policy in sport and health. The new sub-discipline of Sport & Exercise Pedagogy is being developed in our School and

centres on the imperative to translate research and theory into forms that can support practice. The needs of practitioners (e.g., teachers, coaches, and exercise and health professionals) are fundamentally multi-disciplinary and interdisciplinary and researchers in pedagogy are pioneering new ways of establishing collaborations across disciplines to support practitioners. For example, in January 2014, the first book of interdisciplinary 'pedagogical cases' will be published by Routledge (**Armour**). Research funded by the British Council (**Grix**) is facilitating investigation into how the organisation and legacy of mega-sport events (such as the Olympics) can be optimised (in collaboration with Sao Paulo State University and the University of Sao Paulo, Brazil and the University of Illinois at Urbana-Champaign, USA). This work is complementing evolving collaborations with Brazilian sport policy and management teams so that the School is well poised to exploit the research potential presented via the 2014 World Cup and 2016 Summer Games. We have also recently created the Centre for Sport Policy Research (led by **Grix)** to further strengthen both national and international research collaborations in this area. The Centre specialises in real-world analysis and the application of research to sport policy issues ranging from school sport to performance sport (REF3a).

The research of the Sport & Exercise Psychology with Behavioural Medicine group cuts across all of the School's research themes and has translated into significant impacts within the contexts of sport, health and lifestyle physical activity (REF3a). We are internationally recognised for our work on motivational processes, the psychological determinants of performance, and moral functioning in sport. Another vibrant line of research centres on public health exercise and physical activity promotion, and the strategic appointment of **Fox** in this area will strengthen links with the MRC-ARUK and Healthy Ageing Centres and facilitate impact on policy and connections with key stakeholders. Led by **Phillips** and in collaboration with colleagues in the MRC-ARUK Centre and Centre of Healthy Ageing, we study the effects of behavioural (including exercise) and psychosocial exposures on biological systems and their implications for health and disease. The EU-funded 'PAPA' project and the Sport Wales funded Empowering Teachers project (**Duda, Quested;** see also Case Study 3), **Ntoumanis'** ESRC-funded work on goal striving, MRC and BUPA funded research on point-of-choice prompts to promote stair climbing (**Eves**), research on a worksite walking programme funded by BUPA (**Thogersen-Ntoumani**), and an on-going MRC project focused on exercise engagement in RA patients (**Duda, Veldhuijzen Van Zanten**), all exemplify this group's emphasis on developing and testing theory-based interventions to promote active living and well-being in diverse populations. Following the merger with Sport Pedagogy, we are better placed to build on our World Anti Doping Agency funded investigations on the psychosocial determinants of performance-enhancement drug use in sport (**Kavussanu, Boardley, Ntoumanis**), our research on imagery in sport and exercise settings (**Cumming, Williams**), and our funded projects on promoting performance-related mental skills and life skills with athletes and students (**Duda, Cumming, Burns**).

Future Priorities, Opportunities and Developments

The School's priority over the next six years is to remain at the forefront of our field by (a) continuing to conduct high quality research underpinned by excellent science developed in our four cognate groups; b) implementing our impact strategy, as outlined in REF3a; and c) initiating and contributing to new developments at the forefront of our field and related areas. The delivery of our priorities will be achieved through actions at three levels: within the School, across the University and with related partners, and through further growth in national and international partnerships.

Within the School, our strategic aim is to embed the recent mergers and exploit the potential of our enhanced capacity to deliver our research mission. Incorporation of the Sport Pedagogy research group (2012) is already embedded, with the addition of a new cognate group (Pedagogy/Policy), the strengthening of one of our research themes (Effective Learning) and staff entered as part of this REF return. Looking ahead, we see further potential for initiating new forms of translational research to serve the education and training needs of our practitioner users. The second major change has been the incorporation of Physiotherapy into the School and the extension of our focus on 'rehabilitation' research more widely. Although this merger builds on existing links in teaching (e.g., MSc in Exercise & Sport Medicine in Football), and research (in Motor Control) it is at a relatively early stage of development and for most staff, was too early for incorporation in this REF

return. We have, however, already made one new SL appointment (**Punt**) and are in the process of appointing a Chair and two further SLs. Our aim is to support the development of Physiotherapy as an increasingly research-led profession. In meetings with the Society of Chartered Physiotherapists, we have received strong support for this move.

Secondly, we will be working to extend our existing collaborations with Schools and Colleges across the University, especially Psychology, Education, Health and Social Policy, Engineering and Medicine, with other strategic partners in health, University Birmingham Sport (with the development of the new £55 million sports facilities) and local schools and education providers. Specifically, we are exploring new opportunities in collaboration with the College of Engineering and Physical Sciences in the field of rehabilitation robotics, and we see applications for this work across the human movement spectrum. We are also capitalising on our enhanced links to rehabilitation and trauma research undertaken in conjunction with a leading hospital (the Queen Elizabeth Hospital, Birmingham) located on the same campus as the University. Furthermore, we are forging new links with the University's Health Services Management Centre in an Institute of Advanced Studies project; and the Head of School has been appointed as a Governor of the University's Secondary School and Sixth Form (a Free School initiative opening in 2015) enabling us to influence and study PE/sport provision.

Thirdly, we intend to build on our existing national and international links and invest further in strategic partnerships that can enhance our capacity to win external funding and influence research, policy and practice. The University has developed an alliance with the University of Nottingham, and we engage in this through both the MRC-ARUK Centre and our investments in developing links with Brazil. We have already delivered joint seminars with Brazilian colleagues (funded by the British Council), formed part of joint university delegations to Sao Paulo, and hosted Brazilian research fellows in the School. We are bidding to host a further three fellows from January 2014, and to extend the partnership into a three way alliance with the University of Illinois Urbana Champaign. We also have plans to extend our policy links, for example as preferred providers for Sport England (literature reviews) and, in an entirely new venture, to develop a Social Enterprise from the Empowering Coaching™ research programme to maximise international impact. In the area of health, we are adding to our existing partnerships with clinicians to enhance our ability to be successful in NIHR and other health-related funding calls.

c. People, including:

i. Staffing strategy and staff development

All activities in the School are research-led. Protecting and enhancing the quality of research in the School is at the heart of our staff appointment and support/development strategies.

Staffing strategy. We have retained the majority of staff who had contributed to our successful submission in RAE 2008. In addition, during this REF census period, we have recruited 2 professors, 3 senior lecturers, and 5 lecturers to enable us to strengthen current or develop new research areas (described in Section b). Furthermore, our research capacity was further enhanced when 6 research active staff members joined the School through the merger with the Department of Sport Pedagogy. We have also been successful in securing promotions for research active staff. Since 2008, our 4 RCUK Roberts Fellows have been promoted to permanent academic positions, one member of staff has been promoted internally to a professorship, 5 staff members to readerships and 5 to senior lectureships.

Staff development and support. Academic staff members are fully supported to develop their research expertise. Newly appointed early career researchers complete a three-year probationary period (with probation plans approved by the Head of College) in which research is prioritised to meet the high standards of the School. The School-level Executive Committee Research Stimulation fund is used to support the pilot work of our early career researchers so that they can further develop forthcoming grant applications (six staff members were successful in the 2012-13 round). All newly appointed staff are offered at least a year of minimal teaching to ensure they can grow and embed their research. The School also provides newly appointed staff with generous equipment and consumable start-up packages (ranging from £10K – £100K), dedicated workshop and technical support, College-funded PhD students (new staff prioritised), and academic mentors.

All staff members participate in an annual Personal Development Review with a senior member of the School to ensure that clear research objectives are set, agreed and monitored. Additional support is offered through College mechanisms, for example workshops for staff at different career stages or the provision of seed corn funding through the College Grant Income Bonus Award.

Postdoctoral researchers (or research fellows; RFs) in the School are an integrated part of the staff. We adhere to Concordat recommendations ensuring that RFs are offered significant opportunities to develop their careers and to become full members of the academic community. Internal funding is available to support conference attendance, pilot work and impact events. RFs sit on research related committees in the School (e.g., the Research Committee) and at the College/University levels (e.g., University Ethics) and they are routinely involved in PGR supervision. Currently we have post doctoral fellows running research projects and acting as PIs in their own right, and we offer teaching opportunities for those who request it. Tailored professional development activities are offered to RFs; e.g., workshops on careers in higher education/industry and funding opportunities, participation in the Personal Development Review process, and regular formal and informal mentoring by senior staff.

Equalities and Diversity. The School is committed to the active promotion of equalities and diversity through its structures and processes. All members of staff are required to undertake the University's Diversity in the Workplace course. The University of Birmingham has earned an Athena Swan bronze award and an application for the School is in progress. Gender representation (female: male) of research staff across the School is relatively well-balanced (41:59) and across range of career levels [e.g., research fellows (50:50) to professors (50:50)]. Tangible evidence of our philosophy can be seen in the leadership of the School. Although women are often underrepresented in leadership positions in HE they occupy prominent positions in the School. The senior positions of Head of School (**Armour**), Director of Research (**Thompson**), Director of Education (**Aldred**), Director of Quality Assurance (**Burns**) and REF Lead (**Duda**) are currently held by women. We also ensure that the duties of women taking maternity or adoption leave (or men taking paternity leave) are fully covered, including an overlap period pre- and post- leave to ease the transition back to work. The University has been fully supportive of these additional funding requests. We are also family friendly. There are increasing commitments for academic staff at weekends (e.g. open days etc.), but we work to ensure that staff members with caring responsibilities are able to contribute at alternative times.

In terms of allocating and monitoring workload, we are wholly committed to ensuring that time for research is protected. We adjust our workload model for staff who are facing periods of acute pressure or personal distress, and offer additional research support where possible. We have also established a ring-fenced 'research stimulation and support fund', administered by the School's research committee, with the aim of supporting new or returning members of staff. We have recognised that following the merger with the Department of Sport Pedagogy, historic workload allocations were not equitable for research active staff in the two groups. We committed to addressing this imbalance within two years and, in fact, were able to address it within 12 months.

The School has always been proud of the internationality of its academic staff. Currently, almost a third of the research and teaching staff (including RFs) originate from another European country (e.g., France, Greece, Ireland) or are non-European in origin (e.g., Australia, Canada, United States). Importantly, for new international academic staff, our policy on protecting research time and offering mentoring support ensures they are able to succeed and can more readily adjust to the culture of the School and that of a British University. The School is also committed to ensuring that members of staff from different ethnic groups are supported to progress. Currently, an ethnic minority member of staff is being sponsored to attend the Birmingham/Nottingham Stellar Higher Education Leadership Programme for underrepresented groups.

Research students. As can be seen in the Table below, the School has maintained a vibrant postgraduate researcher (PGR) community with 58 full-time PhD students currently registered (Autumn, 2013). Our number of PhD awards has increased from nine per annum in RAE 2008 to more than 12 awards per annum during the REF census period. Staff have been successful in

attracting funding for PhD studentships from a wide range of sources including: GlaxoSmithKline, DSM Food Specialties, Winning Scotland Foundation, Astra Zeneca, Nestlé, US Air Force, ESRC, BBSRC DTC and MRC. Finally, international self-funded and government funded students are welcomed each year (rising from 0 in 2007/2008 to 21 in 2012/2013).

	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013
PGR Entrants	18	12	16	10	8	21
PGR Population	49	49	56	43	37	68
International PGR Entrants	0	1	2	4	2	12
International PGR Population	0	1	3	7	8	18

It is not just the size of our postgraduate community that is important, however, but also the quality of our training. Competitive recruitment is followed by highly structured supervision arrangements. Each PGR student has one student mentor and at least two staff supervisors. Formal meetings are held minimally once per month to monitor progress and set goals, and formal training is provided in generic and discipline-specific skills within and beyond the School. Importantly, PGR students are given regular informal opportunities to present their work internally (at meetings and journal clubs organised by each cognate research group) and offered support for participation in national and international conferences. Progress toward degree completion and in professional development is monitored in a formal, individual Annual Progress Review conducted by members of staff on the Postgraduate Research Committee in collaboration with the University's Graduate School. In addition, all PGRs engage in the Development Needs Analysis process to assess immediate and longer-term training requirements in personal effectiveness, research governance, the impact agenda, as well as in discipline-specific knowledge and methodological 'know-how'. Extensive in-house training is provided by School staff throughout their programme of study and the University's Graduate School also offers over 40 development courses to enhance research and teaching skills. Support for international students is provided by the International Students Advisory Service (ISAS), English for International Students Unit (EISU) and Counselling and Guidance Centre. Finally, the ESRC/BBSRC/AHRC Doctoral Training Centres offer funded students the chance to complete a Post Graduate Certificate in Advanced Research Methods and Skills (PGARMS programme).

Postgraduate students are an integral part of the research culture of the School. PGR reps sit on College and School Committees, with the PG Student-Staff Committee chaired by a doctoral student. Each year the students in all three years organize two Postgraduate Research Days at which they present their research to staff and fellow students via talks or poster presentations. Our students have led successful bids to the College and University Graduate School to organise student-led conferences (n = 10) attracting delegates from around the UK and also hosted the Universitas 21 Early Careers Conference on Healthy Living (2011).

As a key indicator of research quality, PGRs have been awarded an impressive number and range of prizes over the assessment period, including University Ratcliffe Prizes for best PhD research in science, student research presentation awards from the Physiology Society and the Division of Sport and Exercise Psychology of the British Psychological Society, and 13 Young Investigator Awards at the annual conference of the European College of Sport Sciences including a 1st place prize in the oral presentation competition (2013).

d. Income, infrastructure and facilities

Income. Over the census period, we have secured research funding from a broad and prestigious array of funders, including almost all of the major UK research councils (AHRC, BBSRC, ESRC, EPSRC, MRC) the European Union, charities and foundations (e.g., Alzheimers Research Trust, Arthritis Research, AXA, BUPA Foundation, Dunhill Medical Trust, Nuffield, The Wellcome Trust, industry (e.g., Astra Zeneca UK, GlaxoKlineSmith, Unilever, CocaCola), the NHS and national/international sport governing bodies (e.g., English Federation of Disability Sport, The Football Association, Scottish Rugby Union, Sports Council for Wales, Triathlon England UK

Athletics, World Anti-Doping Agency) and learned societies (e.g., Association for Applied Psychology, British Academy, The Physiological Society, the Royal Society). Overall, our research income per annum has risen annually from £503k in RAE 2008 to £1,185, 009 in 2012/13 up to a maximum of £1,570,676 in 2011/2012.

Infrastructure to support research. The School organises the management and support of research through the Research Subcommittee, which is chaired by the Director of Research (DoR; **Thompson**) who oversees research development, monitors research activity, sets guidelines, evaluates performance and reports on progress to the Executive Committee and the School. The Research Committee is also responsible for monitoring progress on the delivery of the School's research strategy. The Leads of each of the four Research and Teaching Groups sit on the Research Committee and are tasked with generating high quality science and formulating grant application targets within and across their cognate areas. The DoR also sits on the College-wide Research & Knowledge Transfer Committee, and this creates the important link to College-level guidance on policy, cross-campus initiatives and support including, for example, grant-writing seminars and mentoring support for staff at all career stages. Each of the cognate research groups runs regular internal seminars and "journal clubs" (in which recently published research papers are discussed). The research culture of the School is also strengthened by the delivery of school wide seminars involving internal and external speakers who present on work that coincides with thematically-driven research being conducted within the School, and dissemination events such as the ESRC New Dynamics of Ageing Programme (**Thompson)** and the Guarantors of Brain Symposium on "The Vestibular System: from laboratory to clinic" **(Reynolds**).

Building on the success of the University's earlier Collaborative Research Network (as noted in RAE 2008) the University established a campus-wide Institute of Advanced Studies (IAS) in 2012. The IAS grew from the notion that in order to fully exploit our own intellectual capital there was a need for more effective collaboration across and also beyond the institution. The University has made significant resources available for sustained interdisciplinary research through the IAS. To date, the School's staff have been successful in securing funding for 7 workshops, including: "Dance Medicine and Science Research"; "Trans-Disciplinary Approaches to Physical Activity Promotion in Older Adults"; "Cycling for Health and Sustainability"; and "Mild Traumatic Brain Injury". These workshops are already having an impact on research activity; for example the workshop on Sports Mega-events (**Grix**) has led to two workshops with colleagues from Brazil and the US, and the generation of additional external funding from the British Council. The workshop on dance solidified the University's role (as led by researchers in the School; **Quested, Duda, Cumming**) as a Founding Member of the new National Institute of Dance Medicine and Science.

The School's research activities are underpinned by other university-level support units and initiatives. Examples include: Research and Innovation Services who identify funding opportunities, coordinate bids and make links to industry; the Business Engagement Directorate that markets research business and develops commercial partnerships; and the Wellcome Trust Institutional Strategic Support Fund (ISSF) that provides funding for interdisciplinary collaboration in biomedical research. In addition, the University has a successful and widely recognised International Strategy; including establishing a regional presence in Brussels, India, China, Brazil and Nigeria, and the development of an institutional academic link with the University of Illinois, Urbana Champaign. The School has benefited directly from this strategy in several ways: e.g., a policy link with the Brazilian Ministry of Sport as they prepare for Rio 2014/16 (**Grix)** and the Brazilian Visiting Fellow Programme that has supported 3 visiting staff members from UNESP to spend 3 months working and preparing collaborative research projects with School staff members (**Duda, Li**).

Research Facilities. Within the School we have 2200m^2 of space comprising a wide range of state-of-the art laboratories and technical facilities to support research across the four cognate groups. Facilities include: calorimetry and metabolic kitchen, Stable isotope Mass Spectrometry Laboratory, Dual X-ray Absorptionmetry (DEXA) Laboratory, Environmental Chamber, Cerebrovascular and respiratory function Laboratories and a Gait Analysis Suite. All laboratories allow for high-standard assessments with available equipment such as Doppler ultrasound, Oxycon Pro indirect calorimeters, Ambulatory impedance cardiography, Hokanson

system/plethysmography, impedance monitors, iLAB blood analyser, whole-body linear and rotational acceleration equipment for vestibular study, electrophysiology and navigated brain stimulation equipment. We have laboratories for real-life sport/motor tasks (e.g., cycling, golf putting), display facilities for 4 x 4m life-size stimuli, space for observational studies, a focus group room, and individual testing/consultation rooms. The equipment housed within these spaces has been acquired through SRIF-2, external, or College/University equipment grant funding. We have mechanisms to ensure maximum benefit and optimal use of this extensive range of facilities including online booking, facility sharing and dedicated workshop/technical staff who can build bespoke equipment.

Researchers in the School regularly use the Birmingham University Imaging Centre (BUIC) in collaboration with colleagues from Psychology and the Medical School, which includes a 3T MRI scanner, along with a mock scanner for training researchers and participants. There are within-scanner facilities for combined EEG/fMRI, TMS and fMRI, for measuring eye and hand movements, and for high fidelity auditory stimulus delivery and binocular visual displays. We also have access to the Wellcome Trust Clinical Research Facility (WTCRF) at the Queen Elizabeth Hospital. Facilities include an outpatient area, inpatient beds, procedure and consultation rooms and day case beds for infusions, a research endoscopy suite, cardiac and vascular imaging, exercise and metabolic testing equipment, and DEXA scanning. The School also uses the WTCRF's Health Research Bus (HRB) facilitating assessments in the community. We have established links with the Cardiac Rehabilitation (CR) service based at City Hospital Birmingham, and Sandwell and West Birmingham NHS Trust (SWBH) has commenced research utilising the novel wind tunnel facility recently developed within the School of Civil Engineering. School staff have a long-term research collaboration with colleagues from the Dudley Group NHS and the Action Heart facility within the Russell Hospital, providing access to fully-equipped exercise and vascular laboratories. As part of the MRC-ARUK Centre, our mass spectrometry laboratory is twinned with the stable isotope mass spectrometry facility at the University of Nottingham, providing School staff with access to one of the most comprehensive metabolic profiling systems in the UK. Maintenance and future proofing of equipment/facilities is supported by the University policy of underwriting bids for substantial equipment from funding councils, coordination of bids to facilitate shared costs, and the School's maintenance budget. Finally, we are an active participant in the 'M5' equipment sharing initiative, between the Universities of Nottingham, Leicester, Warwick, Aston, Loughborough and Birmingham.

Standards of Research Quality and Integrity. All work conducted by staff and research students in the School is subject to mandatory external ethical review (University's STEM Ethics or NHS Committees) to ensure that it meets both local ethical criteria and those set by relevant national and international bodies. In addition, research involving the use of biological materials and field research requires a hazard and risk assessment to be completed. An important innovation is the agreement of procedures or "umbrella" ethical protocols that cover clearly-defined kinds of work (e.g., a series of variables usually assessed via validated scales) to improve efficiency.

e. Collaboration or contribution to the discipline or research base

Peer review process: During this REF census period, members of staff have served as Editor-in-Chief (*Eur J of Spt & Soc; Psych of Spt & Exer*), Associate Editor (*Biol Psych*; *Eur J of Spt Sci; Exper Phys; Int J of Psychophys; Int J of Spt & Exer Psych; J of Appl Sport Psych; J of Exper Psych: Human Percep and Perf; Intern J of Sport Psych; J of Motor Control; Publ Health Nutri; Psychophys; Scand J of Spt Med & Sci; Motiv and Emot; Eup J for Spt & Soc; Inter J of Golf Sci*) and Guest Editor (*Biol Psych; Education; Exper Physiol; Spt Educ & Soc; Inter J of Spt and Exer Psych; J Envir Public Health; Sport, Educ & Soc; Phys Educ & Sport Ped; Educ Review*). School staff also have been members of Editorial Boards (*Biochem J; Brit J of Health Psych; Clinical Science; J of Appl Sport Psych; Quest; Human Factors; Int Rev of Spt and Exer Psych; J of Aging and Phys Act; Adv in Med; J of Alzheimers Dis; Int J of Spt Pol and Politics; J of Diab & Metab; J of Exper Psych; J of Educ Psych; J of Health Dispar Res & Prac; J of Imagery Res in Spt and Phys Act; J of Spt & Exer Psychology; J of Teach in Phys Educ; Psych of Spt & Exer; Spt, Exer & Perf Psych; Spt Educ & Soc; Phys Educ & Spt Ped; The Spt Psychol; Spt & Exer Psych Rev; Frontiers Movement in Spt & Exer Sci;, Eur Phys Educ Rev; ACSM's Hlth & Fit J*).

We have reviewed grant applications for numerous funding bodies including the MRC, BBSRC,

ESRC, EPSRC, Leverhulme, Wellcome Trust, NIHR, Australian MRC, Brit Heart Found, Icelandic RF, Swiss Nat Sci Found, Brit Acad, Danish Council for Indep Res, Qatar Nat Res Fund, 'ZonMW - Netherlands, German-Israeli Foundation) and served on grant review panels [e.g., Academy of Finland (Chair), AKA-SKIDI, ESRC (College of Experts), Eur Comm FP7, EPSRC]

Contributions to the discipline: In addition to our many peer-reviewed articles staff have written 2 monographs (**Grix; Phillips**) and edited 5 books (**Armour, Phillips**); served as Founder and lead convenor of the first Network for 'Research in Sport Pedagogy' in the European Educational Research Association, international consultant in the development of Sport Science elite sport testing guidelines for the Colombian Ministry of Sport, and consultant for the British Olympic Committee.

The research excellence of members of the School has been acknowledged via a number of ***awards and honours,*** including***:*** Doctoral Honoris Causa, Norwegian School of Sport Sciences; Academician, National Association of Sport Sociology; International Fellow, American Academy of Kinesiology; Early Career Award, Amer Psychosomatic Soc; Early Career Award, Acad of Behav Med Res; Outstanding Res Contribution, British Psych Society (Div of Health Psych); New Investigator Award, Amer Physiol Soc; Assoc Fellow, British Psych Society; Research Award, International Hypoxia Conf; Fellow, European College of Sport Sciences.

Our research has been disseminated via ***keynote presentations,*** at the meetings of: the Natl Conf of British Cycling; Brit Educ Res Assoc (Annual Scholar Lecture); HEA-Hosp Leis Spt Tourism; Southwest Chapter ACSM; 4th and 5th Self-Determination Theory Conferences; Wingate Congress of Exer & Spt Sci; North Amer Soc Psych Sport & Phys Act; Assoc Applied Spt Psych (Coleman Griffith Lecture); International Assoc of Positive Psych; the Sport Psych Assocs of Brazil, France, Greece, Spain, Sweden; Intern Spt Sci Congress (Turkey); Intern Soc for Exer and Immunol; British Institute of Radiology; International Func Elec Stim Soc - UK Chapter; British Assoc Beh & Cog Psychotherapies; Eur Soc Movt Analysis for Adults & Children; Professional teacher organisations of Belgium (BVLO) and Sweden (Svebi); Colombian Olymp Comm 3rd Intern Cong on Prep for Elite Sport

We have made important ***contributions to professional associations or learned societies, via*** serving in leadership positions; e.g., Vice Pres, ACSM; Pres-Elect, Spt Psych Div, IAAP; Vice Pres, AIESEP; Chief Assessor-Elect for Spt & Exer Psych, BPS; Exec Board & Sci Board Members, ECSS; Steering Comm Members, NIDMS; Chair, Spt & Exer Psych Prog Comm, NASPSPA; Member of Sci Advisory Comm, Physiol Soc; Sci Prog Comm Member, World Congress of Active Ageing; Member of Council of Physiol Soc; Member, Hellenic Qual Assurance Agency for HE; Consultant, British OoA; Prog Comm, PNIRS; Sci Board Member, World Village of Women's Sport; Prog Comm Member of the Amer Psychosom Soc; Board Member of the World Science & Congress of Golf; Member of Prog Comm, Psychoneuroimmun Res Soc and Soc Psychophysiol Res.

Developmental disciplinary initiatives. School staff have organised a number of conferences in Birmingham, including: The Physiological Society conference on Coping with Hypoxaemia: strategies and solutions (2010); International Association for Physical Education in Higher Education conference on Sport and Exercise Pedagogy: (Re)Defining the Field (2012); a Collaborative Training Network conference on New Developments in Psychoneuroimmunology (2009).

Co-operation and collaborative arrangements for PGR training: The School contributes to and supervises students from the ESRC and BBSRC Doctoral Training Centres that were awarded to the University in 2011 and 2012, respectively. In addition, we host students as part of a Marie-Curie Training Network and, as part of the Universitas 21, we supervise a student jointly with the University of Queensland. The School also regularly hosts visiting PGR students from around the world, including those from the Universities of Padova, Valencia, Extremadura, Thessaly, Messina, Athens, Jean-Fourier - Grenoble, Delaware (USA) as well as Delft University of Technology and Autonomous University of Barcelona.