Institution: University of Bristol

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

a. Overview

The Centre for Exercise, Nutrition and Health Sciences (ENHS) comprises all of the UoA 26 submission within the University of Bristol. The Centre has seven academic staff, all of whom are entered in REF 2014, and fourteen research staff. The Centre is housed within the School for Policy Studies in the Faculty of Social Sciences and Law. ENHS is an internationally leading centre of excellence in physical activity and nutrition research. It has distinctive strengths, with a long standing reputation for research in young people's health characterised by theoretical and methodological innovation that informs and underpins important policy impacts. Our research in young people is complemented by a focus on developing lifestyle interventions for adult patient groups such as those with newly diagnosed type 2 diabetes or moderate to severe depression. Achievements over the census period include:

- A significant upwards year on year trend in research income throughout the period (REF4b).
- Over £4.5m awarded in research grants where we are Principal Investigators and over £6m where we are Co-Investigators.
- Infrastructure grants totalling over £23m where we are Co-Investigators or scientific collaborators
- A high volume of peer reviewed publications (an average of 36 per FTE) and publication of research findings in the foremost peer reviewed journals (e.g. Lancet, JAMA, Pediatrics).
- Re-shaping of academic staff profile to create a vibrant culture of young researchers
- An increase in research staff (from 4 to 14)

b. Research strategy

Achievements since RAE 2008

Eight strategic targets were described in RAE 2008, all of which have been achieved:

1. **Strengthen ENHS with further expertise in nutrition, statistics, and Geographical Information Systems.** We have appointed two new lecturers in nutrition (Johnson, Papadaki) and research staff with expertise in advanced statistics (Griffin, McDonald-Wallis, Wood) and quantitative geography (Wheeler, Coombes).
2. **Develop socio-ecological models that integrate environmental, physiological, socio-demographic and psycho-social factors.** Through a series of conceptually related grants, we have integrated social and physical environmental factors into more established social-psychological frameworks. We achieved this by innovation in method development (*PEACH & PEAR* projects) and application of these measures/models within intervention studies manipulating the social (*Action 3:30, Bristol Girls Dance & Teamplay* projects) or physical (*iConnect & ENABLE* projects) environment. We continue to develop theory to inform interventions in high risk groups (*TREAD* (depression), *Early ACTID* (type 2 diabetes). The appointment of a new lecturer in 2012 (Sebire) has expanded our capacity to apply behavioural theories to community based interventions.
3. **Apply new research methods and designs, such as natural experiments, to study effects of the environment on lifestyle and health.** We have a strong national and international profile in applying novel research methods to study environmental influences on health. Page and Cooper are international leaders in the use of GPS combined with accelerometry to explore the spatial mobility and physical activity of children, and have been awarded five substantial grants totalling over £1.8m from the MRC, EU and World Cancer Research Fund (WCRF) as Principal Investigators to develop this methodology in the UK and Europe. Cooper is co-applicant on grants from major funding agencies (EPSRC, MRC) using this technology to evaluate two flagship natural experiments currently underway in the UK; *iConnect* (evaluating the impact of Sustrans Connect2 interventions) and *ENABLE* (exploring the impact on physical activity of re-housing residents from deprived communities to the Olympic athletes village).
4. **Continue to be at the forefront of development of measurement technology**. We continue to exploit developments in technology to measure human behaviour. Cooper is a

co-applicant on *SPHERE* (Sensor Platform for HEalthcare in a Residential Environment; EPSRC; £12 million), an interdisciplinary research centre where we will explore remote sensing of sedentary and eating behaviours within the home. Johnson has been awarded £5,000 to pump prime a programme of work to utilise smart phone technology to accurately measure dietary intake.

5. **Build on existing relationships with Funding Councils and government agencies and increase funded studentships and fellowships.** We have strengthened our visibility with funders by being active members of grant panels for NIHR (Haase, Jago), WCRF (Cooper), the Irish Health Research Board (Page) and members of expert colleges for the MRC, ESRC and NIHR (Cooper, Haase, Jago, Page). We have also secured eight competitive studentships from the British Heart Foundation, Decipher (a UKCRC centre of excellence), NIHR, the NIHR Bristol Biomedical Research Unit in Nutrition, Diet and Lifestyle (BRU) and primary care (Department of Health). We are leading the Health & Wellbeing pathway of the ESRC-funded South West Doctoral Training Centre (SWDTC) (Haase).
6. **Increase our grant success.** We have shown a significant upwards year on year trend in research income from ~£208,000 in 2008/09 to ~£788,000 in 2012/13. See section d for further details.
7. **Engage physical activity and eating behaviour research more closely with critical global agendas such as sustainability**. We are internationally recognised for our work on active travel, which is central to the sustainability agenda since shifts to active travel will reduce car use and carbon emissions. As examples, we are working with transport colleagues in the *iConnect* project to evaluate the carbon impact of active travel and have contributed to a published a review of evidence to support integrated health impact assessment with the international Transportation, Air pollution and Physical ActivitieS (TAPAS) project (Environment International 37, 2011).
8. **Increase international engagement.** We have research collaborations with many prominent international groups (see section e for details). More broadly, we have engaged with international societies (e.g. Jago is on the Executive Committee of the International Society for Behavioural Nutrition and Physical Activity), and have examined PhDs internationally (Australia, Denmark, Norway and Portugal).

Aims for next 5 years 2014-2019

Aligned with the MRC framework for the development of complex interventions, we have three priority research areas:

1) Aetiology of chronic lifestyle disease

We will extend our work to understand the role of diet, physical activity and sedentary behaviour in the development of chronic diseases. Specifically, Johnson will build on previous work to examine how dietary patterns are associated with cardiovascular disease risk in Epic-Heart and other large cohort studies. Cooper & Page are working with clinicians within the BRU to examine how physical activity and sedentary behaviour are associated with the development and management of type 2 diabetes. Jago will also explore how change in physical activity and obesity is associated with cardio-metabolic health among children and adolescents. These early stage projects will guide the work in themes two and three by identifying key behaviours to target in complex interventions.

2) Understanding physical activity, nutrition and sedentary behaviour

Our work examining the influence of the environment on physical activity in children will be extended to include adult populations by investigating the environmental factors associated with prolonged sedentary time in clinical populations (type 2 diabetes, childhood obesity). We will explore innovations in assessment of physical activity and nutrition, taking advantage of new technology to identify the best opportunities for intervention in these populations. We will also continue to build on our body of work examining the social environment and how friendship groups, and specifically social networks, influence young people's physical activity, eating and sedentary behaviour. This work will involve the development of statistical techniques to understand behaviours and how theories of behaviour change operate in complex social networks and environments. We will also further build on our international reputation for leadership in research on physical activity related parenting to examine how parenting practices are associated with

physical activity, screen-viewing and nutrition among pre-school children and how these relationships change as children age.

3) Development and evaluation of complex interventions

We will extend our existing large projects to develop, implement and evaluate complex interventions that focus on changing physical activity, nutrition or sedentary behaviours to improve health. Specifically, we will use the BRU infrastructure to design interventions that focus on improving dietary habits, increasing physical activity and reducing sedentary time among adults with type 2 diabetes. We will consolidate the knowledge drawn from current projects to develop integrated physical activity and nutrition based parenting interventions to be delivered in the community and via NHS based primary care. We will continue to develop our body of school-based work including full-scale trial evaluations of an after-school dance programme for secondary school aged girls and a teaching assistant led intervention for primary school children. We will extend our intervention work in adults by conducting nutrition intervention studies in work-place settings and examine the effect of web-based applications on dietary behaviour change.

We intend to achieve these objectives by building on our current successes to secure further funding from NIHR, research councils (BBSRC, ESRC, EPSRC, and MRC), government departments (e.g. DoH), the European Union and medical charities such as British Heart Foundation and Diabetes UK. This research programme will be underpinned by greater involvement of patients and the public in all aspects of these studies through developed PPI strategies, and the potential impact of these studies on beneficiaries will be central to our planning, as described in REF3a. To implement these aims, we will work with a new institute, PolicyBristol, established by the University to enhance the influence and impact of our policy-relevant research.

c. People

i. Staffing strategy and staff development

Academic staff

Over the current REF cycle we have experienced changes to the staff profile with the number of academic staff decreasing from 8.6 to 7 FTE. Staff have retired (Fox), moved to other institutions (Thompson, Hillsdon), or left academia (Baic, Davis). Building on the research success of ENHS has been identified as a priority area within the University and we have received significant support at School, Faculty and University level to recruit high calibre replacements. Our strategy has been to use this opportunity to reshape the academic profile of the centre by recruiting young staff with demonstrably high potential to be future research leaders, and focussing the efforts of senior colleagues on supporting their development through mentorship. We have appointed new lecturers with expertise in nutritional interventions (Papadaki), nutritional epidemiology (Johnson) and psychology of behaviour change (Sebire). To accelerate our research in nutrition, we are currently recruiting a new senior lecturer to extend leadership in this discipline. A central component of our future strategy is that these colleagues will play a major role in our success over the forthcoming years by securing grant income, developing their own research teams, and conducting academically rigorous work with measurable impact on scholarship and society.

During the current REF cycle the contribution of staff members has been recognised by a series of promotions. Cooper was promoted to Reader (2008) and then Professor of Physical Activity & Public Health (2011), Jago to Reader (2010) and then Professor of Paediatric Physical Activity & Public Health (2012) and Page was promoted to Reader in Physical Activity & Public Health in 2011. At the time of submission we have structure consisting of two professors, one reader, one senior lecturer (Haase) and three lecturers (Johnson, Papadaki and Sebire). The range of experience and skills enables us to provide opportunities for career development of all staff including mentoring for junior staff and development of leadership roles for senior staff.

Research staff

Success in gaining research funding has allowed us to increase both the number (from 4 in 2008 to 14 in 2013) and the level of experience of research staff, with the team now including 5 post-doctoral researchers. This has increased both the volume and quality of our outputs. In addition, major capacity building successes such as the BRU have effectively increased our staffing base,

providing access to staff expert in statistics, qualitative research, systematic reviews, health economics, database management and research administrative support. For example, BRU core support staff are building the database and providing analytical support for 3-year follow up of *Early-ACTID*.

In the current REF cycle, seven research staff have secured funded PhD studentships and fourteen have secured more senior research/academic posts. We have further facilitated the progression of early career researchers within the Centre; Sebire began his employment as a research assistant in 2010 and secured a lectureship in 2012, Edwards started as a Fieldworker in 2011, being promoted to Research Assistant and subsequently Research Associate in 2013.

Ensuring vitality and sustainability

We have created a highly supportive and vibrant research environment in which all staff are supported to realise their potential and to develop skills to enhance their careers. We are proud of the positive and supportive *esprit de corps* within the Centre which is generated through a number of routes:

- We protect research time for academic staff through a system which allows concentration of teaching in short blocks, two days per week (minimum) free of teaching or administrative duties, and an allocation of five protected research weeks by the School.
- We have a bi-weekly seminar programme where all research staff and PGR students present their work in a supportive environment.
- We share knowledge across projects through research skills workshops in which team members with particular expertise provide training to all other staff members.
- We have a process of internal review of grant applications in development where all colleagues are encouraged to contribute feedback.
- We celebrate success in publication and grant winning.
- We have monthly meetings to discuss progress with ongoing projects and share problems and achievements.
- We provide time for staff to develop their career via advanced training (e.g. Jago NIHR Career Development Fellowship and NIHR/Ashridge Business School Leadership course).
- We encourage a productive work life balance in addition to fulfilling statutory requirements for supporting maternity leave. We support part-time and/or home-working for research staff with caring responsibilities and periods of maternity/paternity leave. (e.g. Haase workload was reduced on return from maternity leave to re-establish her research profile).
- We provide £500 annually from the Centre budget to each academic to support research development activities, and £750 annually from the Faculty travel fund.
- We mentor and support staff in their research development via an annual review of each individual's plans for research, publication, grant applications, engagement and impact. Progress against these plans is aided by termly discussion of individual research and teaching plans. In addition, early career staff are allocated additional mentors to support their personal development. This is in keeping with the formal 'Concordat to support the career development of researchers' which is subject to monitoring by the UoB.

ii. Research students

We develop students with an in-depth knowledge of their topic and the broader context within which their research is placed. This is underpinned by high quality training in research methodology provided by the University, which allows for tailoring of specific training needs for each student. We have a developing profile of postgraduate research (PGR) students. Registered PhD student FTE by year are:

Academic year	**Student FTE**
08/09	0.5
09/10	2.0
10/11	2.41
11/12	3.95
12/13	5.07
Total	**13.94**

Research students are located physically within our Centre, and all are provided with a desk, computer and storage space. They are typically supervised by Centre members, but with some instances of co-supervision with other Departments and Schools. Each student and supervisors complete annual reports to the Graduate Dean documenting progression. The research students interact regularly with academic and research staff as part of our team, and attend and contribute to our research seminar series. PGR students are also integrated into the wider life of the Centre and School. PGR representatives are invited to attend Centre and School meetings and all PGRs are invited to attend new appointment presentations. PGR's are encouraged to seek teaching experience whilst studying, most often acting as lecturers in their specialist area on our MSc programme. This provides valuable teaching experience, with unit co-ordinators providing support and peer review to ensure quality control and feedback. The majority of PGR students continue in academia once they have been awarded their PhDs. Destinations include Bristol (Brockman), Bath (Withall) and Exeter (Griew) Universities. A new development since RAE 2008 is the ESRC-funded South West Doctoral Training Centre (SWDTC) which coordinates doctoral provision, including ESRC studentships, across its three institutions – Bath, Bristol and Exeter. The SWDTC provides the overarching structure for all postgraduate students, a main feature of which is a focus on high quality research training to generate future research leaders. Within the SWDTC, the Health and Well-Being pathway was developed and led by members of the Centre (Thompson/Haase).

d. Income, infrastructure and facilities

Income

We have a significant upwards year on year trend in research income (totalling £2.8 million) as a result of research grants totalling over £4.5m where we are Principal Investigators and over £6m where we are Co-Investigators, since RAE 2008. In addition, we have been successful in major strategic capacity building awards exceeding £23million; the £4.5 million NIHR funded BRU (Cooper; co-applicant & theme lead. Note: the BRU is located within the Faculty of Medicine and Dentistry, and does not appear in the UoA26 REF4), the £2.5 million NIHR School of Public Health (Cooper, Jago; co-investigators), the £5 million UKCRC Decipher Centre of Excellence (Cooper, Jago, Page; scientific collaborators) and the £12 million EPSRC *SPHERE* project.

Grant income strategies

We use a number of strategies to secure funding:

1) Maintain diversity of funding sources

We have increased the range of funding sources for our research since RAE2008 across all funding sectors (UK Government, International Government, UK council and UK charity). This allows us to strengthen our track record with existing funders as well as take advantage of new funding streams. This diversity also allows us to support a range of different types of projects from early stage feasibility studies and methods development to major trials and cohort studies.

2) Balance our research portfolio

We have had consistent success since RAE2008 in the proportion of grants where members of ENHS are PIs. This strong funding platform has enabled us to develop specialist skills to support interdisciplinary work outside the Centre, where we contribute as co-investigators to other research bids both nationally and internationally. We are involved in major capacity building initiatives in public health playing key roles in the NIHR funded BRU and School of Public Health and the UKCRC Decipher Centre of Excellence. Our success in leading grants and contributing to large collaborative grants increases the impact and longer term sustainability of research in the Centre.

3). Establish flagship areas of excellence

By obtaining successive grants and long term funding we have been able to build on areas of strength since RAE2008 and achieve international excellence at the cutting edge of physical activity research in three areas. We are international leaders in the combined use of accelerometry and GPS to explore environmental influences on physical activity in children (*PEACH, PEAR, iFamily*), are leaders in describing friends and family influences on physical activity and the application of social network analytical methods to physical activity data (*3Ps, TEAMPLAY, PROACTIV, iFamily*) and have developed the physical interventions for the management of chronic

disease in two major randomised controlled trials (*Early ACTID, TREAD*).

4). Build expertise & support sustainability

We have adopted a sequential strategy to securing research funding, which has allowed staff in the centre to develop a track record and increase their research potential. For example, Cooper & Page have a track record of funding over 12 years from small grants to major MRC funding to support the research that underpins our impact case studies. Similarly, Jago developed ideas within a small internal UoB grant which led to BHF funding. Ideas were further developed during his NIHR fellowship and led to funding for a feasibility study of a school based dance intervention and subsequently a full trial funded by NIHR. This systematic development of research potential and track record enables us to develop the career potential of more junior researchers as well as increase the profile of more established researchers.

Infrastructure

The University's Research and Enterprise Development (RED) group consists of >80 staff working with academics and researchers to sustain and grow research activities. This includes identifying funding opportunities, advising on development of research proposals, and co-ordinating large collaborative bids. The University's Elisabeth Blackwell Institute provides strategic funds to develop new research opportunities, particularly in those subjects which cross traditional subject boundaries. For example, Haase has recently been awarded funding to develop a workshop to explore approaches to physical activity in pregnancy. Similarly Bristol's Institute of Advanced Studies funds meetings, and research fellowships for visiting academics to come to Bristol, which are used to enrich the research environment and to develop new research opportunities. The University offers a very active staff development programme, which provides support and training for all levels of academics. Courses range from grant writing, and managing a small research group, to advanced management and leadership programmes. The Public Relations Office assists staff in promoting their work through assisting with press releases, offering guidelines for interviews and running training courses on working with the media. Additionally, the University's Centre for Public Engagement and PolicyBristol provide help and support in developing "pathways to impact" proposals and ensuring research is communicated to a wide audience. At Faculty level, the Faculty Strategic Research Initiatives Scheme supports pilot projects, provides seedcorn funding, and supports conferences, workshops and stakeholder events. The Faculty has a dedicated finance team who provide pre-award support for grant applications and post-award support for grant administration.

ENHS is closely linked with the Bristol BRU which substantially enhances our research infrastructure through the provision of central research support staff, and provision of seedcorn funding for nutrition related studies. For example, Johnson has been awarded £5000 to review the latest technology based nutrition assessment methods.

Facilities

During the assessment period ENHS has been relocated to a newly refurbished building at the heart of the University Precinct. This building provides accommodation for full time staff, research staff and PGR students, as well as high-quality seminar and meeting rooms and equipment preparation rooms in one building. Academic staff either have their own office or share (maximum 2 people) large office spaces. All members of the Centre, including PGR students, have allocated desks and PCs and have access to a wide range of online resources. An important element of the research culture is the various shared spaces where staff and research students can interact informally, both within ENHS and in the wider School for Policy Studies (e.g. a common room and numerous kitchen areas), and there is a regular daily coffee break. These allow for greater collegiality and communication. The newly refurbished Arts and Social Sciences library has an extensive, multi-disciplinary subject collection, long opening hours, hundreds of study spaces, four Group Study Rooms, Group Multimedia Viewing facilities, a designated Postgraduate Study Room and access to PCs, printers and photocopiers, with laptop connection sockets available in each study space. Print and online guides are also available on Remote Access, detailing the ways in which users can access electronic library resources off–campus. A wireless network (including Eduroam) operates across the entire University, and all seminar rooms and lecture theatres have

internet-linked computers that run presentation software, with high-quality data projection and audio systems. Staff have access to e-conference facilities within the University.

e. Collaboration or contribution to the discipline or research base

We have a strong history of national and international collaboration. Nationally, we collaborate with colleagues from a wide range of academic disciplines including epidemiology, medicine, geography, transport and psychology to create the multi-disciplinary teams required for the success of our research. We are also active in many international collaborations. For example, Cooper and Page have collaborated with colleagues in six European countries in the European Youth Heart Study since 1999 to date, and are currently collaborating with European colleagues from eight countries in *iFamily*. Jago collaborates extensively with colleagues in the USA, Haase with colleagues in New Zealand and the USA, and Papadaki and Johnson have active collaborations in nutrition with large EU consortia (*DiOGenes, HELENA, PROGREENS* and *EPIC-Heart*). These partnerships have led to major international publications, increase ENHS competitiveness for continued international funding and inform policy and practice internationally. Research within ENHS is marked by innovation in measurement, and we have made a major contribution to the discipline in the use of accelerometers to explore at the temporal pattern of physical activity, in integrating accelerometer and GPS data to investigate environmental influences on physical activity, and in the establishment of a major database of children's objective physical activity data (*ICAD*) which is available to researchers worldwide. This innovation continues, with Sebire having developed a novel instrument (the Goal Content for Exercise Questionnaire) which is being used by researchers in the USA, Europe and Canada and is being translated in to several languages.

To complement our strong academic collaborations we have extended our partnerships with public and third sector agencies who are actively involved in our research grants, dissemination and public engagement activities and as agents of our impact. We have been instrumental in fostering inter-agency working at the local level at Bristol City Council. Examples include links at policy and practice level between education and health (*Action 3.30* curriculum development) and young people's services, sustainability and health (*PEAR*). This inter-agency working has been identified as a strong example for health impact assessment and is being used as a model for national initiatives for community based physical activity promotion (Play England/DH national campaign (Page)). We have also collaborated with a range of other national organisations (YMCA, National Childbirth Trust) to support evaluation of practice and dissemination to hard to reach groups.

We have played pivotal roles in developing National physical activity guidance such as the Chief Medical Officers national guidelines for physical activity (Start Active, Stay Active 2011; Fox, Jago) and the British Association of Sport and Exercise Sciences consensus statement on physical activity and health 2010 (Cooper), EU physical activity recommendations (Page) and the National Institute for Clinical Health and Excellence guidance on promoting physical activity, active play and sport for pre-school and school-age children and young people (Cooper). We have senior roles on funding panels, edit major journals (International Journal of Behavioural Nutrition and Physical Activity, Journal of Applied Sport Psychology, Psychology of Sport and Exercise, American Journal of Health Behaviour) and provide leadership to the field by serving as independent members of study steering committees (Watch-IT (Cooper), Cambridge Guided Busway (Cooper), Families For Health (Jago), HelP (Jago)).

In summary, ENHS is a thriving Centre committed to the generation of high-quality, innovative and impactful research through the achievement of clear strategic objectives. The identification of the Centre as a priority area within the Faculty recognises our success in securing external funding, our involvement in major health research initiatives and our potential to make further leading contributions to the field of physical activity and nutrition.