

**Institution:** University of Aberdeen

**Unit of Assessment:** 4 (Psychology, Psychiatry and Neuroscience)

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

The University of Aberdeen has a long tradition of scholarship in psychology. It offered Scotland's first lectureship in psychology in 1896, the Anderson lectureship, held by George Stout. The legacy of this lectureship remains today in the Anderson Chair in Psychology, established in 1946 and first held by Rex Knight. Today, Psychology at Aberdeen reflects the principles of its founding members – Stout's scientific approach to psychology and Knight's championing of psychology's application to everyday problems. This aligns closely with the University's 2040 strategy to deliver **high-quality research** that is **capable of making a real difference to lives** (see REF5a).

Research in the School of Psychology falls broadly into three themes: (1) **Perception and Attention**, (2) **Cognition** and (3) **Social Cognition**. Although each staff member is assigned to a single theme, there is extensive collaboration and overlap of interests within the School. Two key strands connect the three themes: (1) *theoretical advancement* of our understanding of human experience and behaviour and (2) the *application of psychological theory* to everyday problems. We are an international group of researchers with strong collaborative links around the world and a growing culture of interdisciplinary research. We make substantial contributions to advancing theory and attract diverse funding to support our research. We engage with non-academic stakeholders through our impact activities and public engagement. Our primary aim is **to provide an inclusive, nurturing and vibrant environment to support researchers in producing world-leading psychological research and translating it into real-world impact**.

#### Strategic priorities since REF2014

In order to build on our success in REF2014 and achieve our strategic vision for the School we have focussed on five key priorities.

**1. To recruit and retain ambitious and talented researchers.** Our strategy was to recruit a balance of established leaders in their fields and talented young researchers. We initially prioritised expansion of our Cognition theme and recruited three chairs. Overseen by the School's **Equality and Diversity Team**, our recruitment is proactive and inclusive, with search committees seeking out strong international candidates for positions.

**2. To enhance the support structures available to staff.** We aim to provide an inclusive and nurturing environment to support researchers, allowing them to fulfil their potential. We developed a suite of new staff support processes, including a new staff induction programme, structures and mechanisms to support grant-writing, re-introduction of a research sabbatical scheme and family-friendly work policies and practices (see §2). We have a strong commitment to research integrity and have established a School **Research Integrity Team** to provide advice and support for open and reproducible science.

**3. To provide state of the art research facilities.** In order to support world-leading psychological research there is a need for continual investment in research facilities. We invested over GBP2.6million in research facilities, including refurbishing all office and laboratory spaces, acquiring new eye tracking systems, upgrading all existing research facilities (§3).

**4. To develop new non-academic impacts with our research.** A major strategic decision was to formalise an outward-facing identity for our impact activities – in the formation of the **Applied Psychology and Human Factors** group. With support from the University's Impact and Knowledge Exchange Team (see REF5a), internal funds have been allocated to develop the non-academic impact of our research through pump priming, supporting industrial secondment

and investment in PhD funding (§3). We have developed online training and professional development courses focused on applying our research to industrial settings.

**5. To foster interdisciplinary links.** The School has established new mechanisms to support and promote interdisciplinary research, including funding to support the development of interdisciplinary research links and to hold regular events bringing researchers from around the University together (§2). Interdisciplinary projects have been supported by University initiatives (e.g., Grants Academy workshops) and facilitated by involvement in Scotland-wide research networks (e.g., the BBSRC EastBio Doctoral Training Partnership).

### **Key achievements since REF2014**

**1. People.** We made three strategic chair appointments and appointed seven exceptional researchers as lecturers and senior lecturers. These appointments were made across all our research themes, enhancing our existing research strengths. Our new support mechanisms for staff development have helped to maintain a vibrant and active research environment, with a strong spirit of collegiality and collaboration and to support the promotion of six staff. The success of our new support processes is evident from our staff survey (§2) and our **Athena SWAN Bronze** (2015) and **Silver Awards** (2020).

**2. Research.** All research themes contribute to REF2 outputs that advance psychological theory. We have contributed **major theoretical advances** in our understanding of the self (Macrae, Sui), how people form first impressions from faces (Sutherland), the role of gesture in communication (Chu), the nature of self-regulation (Macrae), predictive processes in actions and intentions (Bach), visual crowding (Chakravarthi, Manassi) and eye movements during scene viewing (Tatler). Our network of collaborations has expanded to include **new international links** with China, Japan, Malaysia and Australia (§4). An emerging focus has been **interdisciplinary collaboration** with linguists (e.g., University of Edinburgh), engineering (e.g., Tohoku University, Japan) and computing scientists (e.g., Cambridge University; University of Alberta, Canada), linked to our strengths in language research, colour perception and social cognition (§4).

**3. Impact.** Through our recently established Applied Psychology and Human Factors group we established close relationships with industrial (aviation: Bristow, CHC Helicopters), farming (the Farm Safety Foundation), oil and gas (TRAC International) and clinical (TauRx, Novavision, NHS Grampian) stakeholders. Our research-led **online training and professional development courses** have been launched successfully and are gaining support from external bodies, such as the agriculture training provider Lantra. Enrolment in our online applied psychology courses is recognised as strategically important and supported by the Scottish Funding Council's Upskilling Fund. We have built on our long-standing contributions to impact on industry and healthcare, developing three new lines of impact : 1. the role of non-technical skills in farming safety, 2. new techniques for visual rehabilitation after stroke, and 3. training for healthcare practitioners undertaking behavioural change interventions. These case studies have benefitted from our School's impact support strategies and from University support for impact (§4). We supported staff secondment to the pharmaceutical industry (TauRx) to develop novel diagnostics for Alzheimer's disease, linked to PhD and postdoctoral funding (§3,§4).

**4. A culture of open science and research integrity.** Our Research Integrity Team has provided a focus for supporting and developing Open Science practices. In accordance with the University of Aberdeen's Open Access policy (see **REF5a**), researchers publish outputs using Green Open Access wherever possible, and datasets are usually openly available, routinely so for ESRC-funded research. Staff are involved in local and international initiatives in Open Science (e.g., the UK Reproducibility Network, the Peer Reviewers' Openness Initiative and the University Forum on Open Science), and we run 6-monthly informal workshops involving staff and research students to discuss and disseminate best practice (e.g., pre-registration, sharing research data and contributing to reproducibility initiatives). For example, Hesse played a key role in a pre-registered, multi-centre international reproducibility project designed to test the "two

visual systems” hypothesis. University procedures and training ensure best practice and awareness of the latest Concordat to Support Research Integrity. Our Psychology Research Ethics Committee has been expanded and strengthened to deal with on-going changes in the research landscape. To ensure research integrity, we follow University and funder guidelines on data management and research governance (§4).

### **Strategic priorities for the future**

To continue to enable our staff to produce **world-leading psychological research** and translate this to **real world impact**, we have five strategic priorities for the next five years.

1. **To enhance our staff research profile, through internal staff development and through recruitment.** Although we are a diverse, young and vibrant group with wide international reach, we are still a small School with a relatively junior profile: ten Lecturers, nine Senior Lecturers and six Professors. We aim to increase staffing to 30 (20% growth), with a more senior profile, including increasing the number of Professors from six to nine (24% to 30%). We will achieve this through:
  - a. our strong commitment to retaining and developing our world-class researchers, through staff support mechanisms (§2) and by providing a state-of-the-art research environment (§3). Many of our recently recruited staff are at early career stages and we will support their ambitious research programmes and progress through internal promotion (§2).
  - b. recruiting a combination of established leaders in their research fields and exceptionally promising and ambitious researchers.
  
2. **To underpin School growth with increased external research funding.** The level of funding throughout the submission period is relatively consistent. Recent appointments have added further strength and vibrancy resulting in a recent upturn in funding applications. We will grow external funding by:
  - a. continuing to strengthen the internal grant-writing support mechanisms established by the School since 2014 (§2,§3) and the rollout of more proactive pursuit of independent fellowship funding for outstanding researchers, working closely with the Grants Academy (see **REF5a**).
  - b. developing research on social perception (§3). We are building core strength in this topic, which includes our three chair appointments (Bach, Sui, Tatler), one in each of our research themes. We will invest in this area of research and pursue opportunities to build a research centre on social perception with a mission to model mechanisms of human interaction through the application of behavioural science, AI and neuroscience techniques. This will provide a focus for - mostly interdisciplinary - external research funding.
  - c. enhancing responsiveness to national and international priorities and initiatives. We will build on recent GCRF Newton funding for research on adult ageing and social cognition in the UK and Malaysia to engage with UN Sustainable Development Goals (SDGs) such as “SDG 3 Good Health and Well-being” and SDG10 “Reduced Inequality”. We will develop ongoing research that aligns with the UN goal of “decent work for all”, with current projects on improving safety, equity and respect in the workplace, including a focus on SDG 5 “Gender Equality”. These strands will be supported to develop international collaboration and build links with researchers in Official Development Assistance countries. We are building on links with industry and the third sector to address problems of relevance to the Industrial Strategy Challenge Fund “Healthy Aging” and “Robots for a Safer World” challenges, in collaboration with medical colleagues and computer scientists. We will capitalise on our strong collaborative connections across Europe to apply for the €85bn flagship Horizon Europe funds, focusing on key challenges such as (i) health and (ii) culture, creativity and inclusivity.

- 3. To expand the non-academic impact of our research.** The establishment of the Applied Psychology and Human Factors group provides a springboard for new opportunities for engaging with stakeholders (§4). We will continue to expand engagement by:
- supporting, through strategic allocation of resources, new impacts of our research including collaborations with the aviation industry on helicopter safety, with Police Scotland on CCTV surveillance and on cognitive biases in the workplace.
  - working with the Public Affairs, Stakeholder Engagement and Events Team (PASE)(see **REF5a**) to plan a series of workshops to enhance liaison with industry. This will open up new funding opportunities with industrial partners, building on current links with aviation, pharmaceuticals and healthcare providers.
  - increasing our portfolio of research-led online training modules aligned with the needs of local Small and Medium-sized Enterprises to further enhance our regional involvement. Our courses will build on our existing strengths by encompassing non-technical skills, mental health and cognitive biases in the workplace, providing a platform to educate and upskill the workforce at local and national levels. This will further enhance our links with industry and increase the impact of our research on business practice. We will also pursue the internationalisation of these modules.
- 4. To enhance our global profile through international collaboration.** Psychology in Aberdeen has an international outlook, and our submission of 25 researchers includes 11 nationalities. We have collaborative links with countries throughout Europe, Asia, Australasia and North America, including many interdisciplinary projects (§4). We will expand our global engagement by:
- building on our international collaborative networks through joint research grants, staff mobility and student exchanges. We will expand our research visitor scheme (§2) to increase international collaborations and opportunities to develop joint research bids. We will extend our staff and student exchange programme with the Aurora network of universities (Netherlands, France, Germany, Spain, Iceland, Italy and Norway) and organise joint research seminars.
  - developing our international research student training in Qatar and China. In line with Qatar government's 2030 development plan, we are investing in joint PGR initiatives at the University of Aberdeen Qatar campus. Our links to China Normal University will be strengthened by PGR exchanges focussing on Behavioural Economics.
  - establishing and hosting an annual Psychology conference in Aberdeen. We will support an open annual meeting, including invited international speakers, focusing on the key research strengths within the School. This conference will raise the School's profile globally and provide networking opportunities for staff and students to foster collaborative partnerships.
- 5. To enhance our interdisciplinary research portfolio.** The University is committed to interdisciplinarity, for which psychology is well primed to contribute extensively and impactfully. We will:
- forge new links locally to address the University 2040 strategic interdisciplinary challenges: particularly in health and wellbeing, data and AI and social inclusion.
  - capitalise on advances in computing science by expanding our collaborations in the fields of big data, AI and machine learning to address fundamental theoretical issues on key topics including social biases, scene perception and neuroimaging data in ageing.
  - capitalise on our planned investment in a research centre on social perception (see above) as a vehicle for themed interdisciplinary collaborations and funding bids.

## 2. People

### i) Staffing strategy and staff development

Over the submission period our staffing policy was (i) initially to strengthen our Cognition theme (3xECR appointments in 2014), (ii) to support existing staff development through promotion (6 promotions, 2014-2020), (iii) to consolidate the three research themes through further appointments with a focus on both theoretical strength and impact potential (4xECR appointments in 2019) and (iv) to make outstanding Chair appointments (3 appointments, 2015-2020) that further strengthen collaboration across our themes, impact strategy and succession planning.

We have a diverse, young and vibrant group of 25 Category A staff, ten of whom have been hired since 2014. All staff are on open-ended, full-time contracts. We are international in profile (comprising 11 nationalities) and outlook, and many of our staff were recruited from top tier international research centres, bringing large networks of collaborators. The majority (14) of our staff are parents, many with young children. This profile means that our staff support and development priorities centre around career development for young researchers, maximising research time and resources, supporting interaction with local stakeholders and the UK funding landscape and creating an environment that offers flexible working and family-friendly policies and practices.

To identify areas for improvement, shape strategy and monitor the effectiveness of our initiatives after REF2014, we launched an **annual staff survey** in 2015. Further monitoring and shaping of our strategy utilises focus groups with our ECRF and *ad hoc* open lunchtime meetings on specific topics (e.g., career development, open science).

### **Recruitment and support of new staff**

Our recruitment strategy is proactive and inclusive, with hiring committees seeking an internationally diverse range of applicants, and looking for strong female candidates, overseen by the School's **Equality and Diversity Team**. In 2016, we introduced **new staff induction processes**, which include a handbook covering training, development, networking opportunities, flexible working and family-friendly policies. On appointment, staff prepare a three-year probationary plan, which is reviewed annually with the Head of School. New staff are allocated senior mentors who provide impartial advice during probation. This combination of induction, training, mentoring, annual objective-setting and review supports staff as they become established members of the University. This is complemented by University-level induction information and events, providing opportunities to meet new staff from across the institution. New appointments are given reduced teaching and administration loads in their first years to allow them time to establish their research programme. They are also allocated a discretionary research budget, have access to dedicated (single occupancy) laboratory space and are given access to communal specialist laboratories. The success of induction is evident from the strong research contributions made by our recent appointments to this submission.

### **Staff support and development**

Every member of staff participates in (i) Annual Reviews with their Academic Line Manager (ALM) covering workload, development and training and (ii) annual Research Interviews with two research leaders from the School focused on appraising their research activities. Staff use these meetings to set ambitious but realistic targets on grants, papers, knowledge exchange and impact and discuss support and training needed to achieve them. The School has an internal mentoring scheme for staff and participates in the inter-disciplinary University mentoring scheme. The School appointed a Bullying and Harassment Adviser in 2017, supported by a "civility at work" guide, which is provided to all staff and students. We appointed a Mental Health and Wellbeing champion in 2017. Our School support is supplemented by the University's commitment to improving staff mental wellbeing through the provision of courses, counselling and online support. This support has been particularly important to staff during the COVID-19 pandemic.

We launched a suite of staff development programmes complementing the programmes offered centrally to all researchers, delivered primarily through the Grants Academy (see **REF5a**). We provide regular **staff development workshops** on grant writing, impact development, research integrity, open science and publication strategy (open to staff, postdoctoral researchers and PhD students). To meet our aim of encouraging **new interdisciplinary connections**, we organise a combination of “sandpit” events and offer regular targeted seminar invitations to researchers from around the University as well as encouraging participation in University initiatives (e.g., Grants Academy workshops) and Scotland-wide networks (e.g., the BBSRC EastBio DTP). In 2015, we introduced a **research sabbatical scheme**, which is competitively awarded each year by the School Management Group to support School research strategy and staff development priorities. The sabbatical scheme complies with the institutional framework for research leave, is monitored for equality on protected characteristics and includes periods of leave for impact-related activities. We provide **research-related training**, including support for MATLAB and R users, training in advanced statistics and running online experiments. Staff participate in leadership training, both internal to the University and externally (e.g., three senior staff have completed the Aurora women’s leadership training programme). All academic staff must complete a PhD supervisor training course organised by the Postgraduate Research School. Engagement with staff development is strongly encouraged in the School and discussed in Annual Reviews, with 79% of the team taking part in training from 2017-2019.

In order to support our family-oriented staff profile, in 2015, we introduced a policy that School meetings should usually occur between 10am and 4pm and avoid school holidays; 94% of staff (2019 staff survey) felt that this policy helped improve our equality culture. The School supports flexible working (e.g., staff can request not to have timetabled duties on certain days/times) and this support has been essential during the COVID-19 pandemic. Staff returning from periods of parental (or other) leave meet with their ALM to agree a phased return to duties, prioritising research activity in the initial stages. We established a **Family Support Award** scheme to support staff members with caring responsibilities to cover childcare and travel expenses so that they can attend conferences or research workshops, which provide opportunities for developing new international and interdisciplinary links (§3).

### **Early career researchers**

The School has an active **Early Career Research Forum (ECRF)**, established in 2015, which meets monthly and empowers postgraduate students and postdoctoral researchers to progress their careers. The ECRF also invites senior staff and alumni to meetings to speak on specific career development topics. To prepare postdoctoral researchers for future careers, the University offers a wide range of training and development courses. The School sponsors pedagogical training for research-only staff, including formal teaching qualifications (e.g., HEA Associate Fellowships) and provides opportunities for teaching experience, including undergraduate research project supervision. Postdoctoral researchers regularly present their research at our internal seminars, and we provide funding to support conference attendance. Close mentoring is provided for postdoctoral staff to apply for research funding, and this has resulted in successful applications, research grants (e.g., EPS) and postdoctoral fellowships (e.g., a recent award of a Leverhulme Trust Early Career Fellowship). Our postdoctoral staff contribute to the University Postdoctoral Research Committee, established in 2019 to implement the Concordat to Support the Career Development of Researchers. As a School, we are working to implement all the principles in the Concordat and have piloted a mentoring scheme pairing postdoctoral staff with early career lecturers (see **REF5a**).

### **Providing a supportive and inclusive research environment**

All staff support mechanisms are overseen by the School’s Equality and Diversity Team to ensure that provision is appropriate and accessible for all and to monitor our progress in implementing them. From 2015 to 2019, staff survey results indicate substantial improvements in the endorsement of the environment as supportive (up from 77% to 94%) and inclusive (up from 50% to 78%). According to the staff, 90% felt that the actions taken since 2015 have improved the School’s equality and diversity culture. In response to concerns about the terminology used by some researchers for gender and sexual orientation, we developed a **guide to undertaking**

**inclusive research** that sets out terminology and recommendations for collecting demographic information. This is now disseminated to all staff and students. In 2019, the School launched its own **unconscious bias training**, which has been completed by School staff, delivered around the University and will become a formal part of the School induction process.

The number of female senior lecturers has increased from three to six and female professors from one to two since 2014. These changes have come about through new appointments and internal promotions. Since 2014, six of our staff (5 females) have gained promotion within the School. We monitor female representation in all aspects of School culture. Since 2015, 57% of seminar speakers, 66% of those awarded School-funded sabbaticals, and 50% of School executive committee chairs have been female. In 2015, our School became the first at our University to achieve an **Athena SWAN Bronze Award**, and, in 2020, the first to achieve a **Silver Award**. At census, our gender balance is similar to HESA sector averages for Psychology. Recent recruitment has increased ethnic diversity within the unit of assessment which, at 14%, is higher than the sector average (10% HESA data, cost centre 104 Psychology, 2018/19). The University has recently established a Race Equality Working Group and has joined Advance HE's Race Equality Charter. We will be drawing on our experience of working on Athena SWAN to identify and challenge barriers to recruitment, progression and retention of Black, Asian and Minority Ethnic staff and students and those with other characteristics protected by the Equalities 2010 Act.

#### **Equality and Diversity and REF2021 submission**

In preparing the submission to REF2021, the unit complied fully with the institutional Code of Practice and with the commitments of the San Francisco Declaration on Research Assessment (DORA). Outputs were reviewed by at least two internal and/or external reviewers and selected strictly on the basis of quality. Choices between papers of equal grade were informed by the detailed reviewers' comments and by further independent ratings. Where appropriate, specialist external review was sought. The overall attribution profile is broadly balanced between male/female researchers.

#### **ii) Research Students**

Postgraduate students are at the heart of our research culture and productivity; ensuring their support is a priority for the School. We currently have 30 PhD students, with 39.17 FTE completing in the submission period.

#### **External studentship funding**

The School is a member of the Scottish Graduate School of Social Science, an ESRC-funded Doctoral Training Partnership (DTP). We have received studentships each year since this scheme's predecessor launched in 2011, including 12 since 2014. Many of these focus on interdisciplinary research with high-impact potential and involve collaboration and co-funding from non-academic stakeholders. We also receive PhD funding from the BBSRC EastBio DTP (five in the assessment period), a consortium of universities and research institutes across eastern Scotland that funds PhD studentships focusing on interdisciplinary and cross-institution programmes of research. Over the assessment period, our PhD students have also been funded by charities (e.g., the Leverhulme Trust, Carnegie Trust, Multiple Sclerosis Society, James S. McDonnell Foundation) and industry (e.g., BAE Systems, Maersk Drilling, TauRx Pharmaceuticals).

#### **Recruitment**

All PhD opportunities are widely advertised locally, nationally and internationally for an extended period of time to ensure a large pool of high-calibre applications. Shortlisting and interview panels all receive training to promote equality and diversity. Panels are constructed in consideration of achieving diversity and balancing School research priorities.

#### **Training and support**

The School trains researchers with broad transferable skills across a range of psychology topics, as well as specialist knowledge in techniques appropriate to their research area, to prepare them for the next step in their career. To achieve this, all research students have access to dedicated research space and facilities linked to their primary supervisor's research and to any shared resources they require. In accordance with the requirements of the University's Postgraduate Research School (PGRS), we conduct a skills audit for students within 3 months of them starting their PhD so that training needs can be identified early and appropriate training sourced. PhD students are active contributors to regular internal research-related training on topics such as statistics, online testing, meta-analysis and open science; as well as workshops on diversity and career progression. Most PhD students attend the ECRF monthly meetings, which provide research, career and social support. Additional training is provided by the University PGRS and by funders such as the UKRI DTPs (see **REF5a**).

Students are allocated second supervisors, and, where appropriate, interdisciplinary, industrial or clinical supervisors. Progress is monitored closely by the School and University. The PGRS requires 6-monthly progress reports, and the School conducts formal assessments at the end of month 9 (report and viva), and month 21 by the second supervisor and an independent assessor. All students present their work orally each year at well-attended "psycholoquia" sessions within the School. They also present and participate in seminars and attendance at School external seminars is compulsory. PhD students have a dedicated budget which provides support in presenting at national and international conferences. They have full access to computing and technical support, and, as part of their career development, are encouraged to perform a small amount of paid tutorial teaching or project supervision, for which they are fully trained. PhD students benefit from full access to and support from our inclusive and family-friendly policies (e.g., Family Support Awards), our Bullying and Harassment Adviser and our Mental Health and Wellbeing champion.

### 3. Income, infrastructure and facilities

The School is committed to providing a sustainable world-class research environment for our staff through continued procurement of external research funding, School investment in acquiring cutting edge research facilities, continued maintenance, updating and replacement of research facilities, investment in PhD studentships and continued investment in the physical work environment.

#### i) Income

**Strategy and support:** All members of staff are involved in applying for research grants. At School and University level there is robust support for preparation of research proposals. All new staff take part in intensive bootcamps on applying for research funding and impact organised by the University's Grants Academy (see **REF5a**). All staff participate in other Grants Academy and School-run events, such as University-wide "sandpits" to foster interdisciplinary research and events providing access to decision-makers from key funding bodies. We have a robust, supportive internal peer review process, encourage presentation of grant proposal ideas at internal seminars and discuss grant-writing plans and progress at annual Research Interviews. There are University and School-level funding streams to support pilot work for grant enhancement. All researchers have access to recent successful applications to relevant funding bodies to assist in preparing proposals. Our strategy has been to submit well-prepared applications that have undergone a rigorous internal review process, resulting in high quality applications matched to the funder priorities.

**Research funding portfolio:** Our research since 2014 has been supported by a wide portfolio of funders, with substantial project grants from UKRI (ESRC: Jackson, Ray, Tatler, Phillips, Martin, Hunt, Swainson; BBSRC: Andersen, Chakravarthi, Martinovic and EPSRC: Martinovic), the European Commission (Timmermans) and the Leverhulme Trust (Bach, Chu, Tatler, Sui, Hesse). We also attracted funding from charities (the Wellcome Trust, Carnegie Trust, Multiple



Sclerosis Society), learned societies and foundations (e.g., British Academy, McDonnell Foundation, Royal Society of Edinburgh), the NHS (NIHR, local endowments, NHS Education), and industry (TauRx Pharmaceuticals, Bristow, BAE Systems, Unilever, Shell, NovaVision). These awards have led directly to important publications, interdisciplinary collaborations and industrial impact. For example, the 6-year funding grant from the James S. McDonnell Foundation to Hunt (USD600K) resulted in influential publications in the fields of visual search and decision-making. Two ESRC grants to Martin (combined income: GBP457K) have facilitated interdisciplinary collaboration with evolutionary linguistics researchers at the University of Edinburgh. Funding from the Australian Research Council, ESRC and Newton Fund (combined income: GBP778K) have facilitated international collaborations between Phillips/Tatler and researchers in Australia and Malaysia to understand age effects on social cognition. The secondment of Allan to TauRx (income: GBP1.3million) has provided close links to industry and involvement in developing novel diagnostics for detecting early Alzheimer's disease.

## ii) infrastructure and facilities

We have made significant investments in expanding and updating research facilities (GBP252,000), providing funding to support research activities (GBP230,000) and supporting PhD students with full studentships, matched funding for UKRI studentships and fee waivers (GBP1.27million). The University has contributed by providing a full refurbishment of the School (GBP800,000). In addition to these financial investments, we have invested in the operational and scholarly infrastructure through launching new policies, committees and processes for supporting research staff and students.

### Research facilities

The School houses numerous specialist laboratories and multi-purpose experimental testing rooms, all equipped with high performance computers. We have a particularly strong eye-tracking suite, utilised by researchers in all research themes. This includes: five laboratory-based eye trackers (EyeLink 1000+), two of which can be connected for social communication research, and five mobile eye-tracking systems (SMI, Positive Science, Pupil Labs) to study behaviour in real-world environments with healthy and clinical populations. We have two multi-channel electroencephalography/event-related potential laboratories (1x128 channel, 1x64 channel) equipped for vision and attention research. There are two motion tracking systems: a Polhemus Liberty 6df magnetic system for high-precision reaching and grasping measurement and an Optotrak 3020 for full-body motion tracking. Instrumentation for physiological measurements includes two Portable Biometrics capture devices (for multi-participant electromyographic and kinematic recordings) and a Biopac telemetric system for assessing heart rate, blood pressure and galvanic skin response. The School houses psychophysics facilities in laboratories with highly controllable ambient lighting, including high-resolution CRT and Display++ screens, 14-bit graphics systems and high-resolution stereovision goggles. Multiple Audiofile Stimulus Processors integrated with high-precision displays are available for synchronous multi-sensory presentation.

**Investment in facilities:** Five of our ten eye-tracking systems were purchased during the submission period. We have expanded our research facilities to include: (1) a virtual reality laboratory with the latest immersive and interactive technologies to research social interaction and bridge laboratory and real-world research; (2) a high-precision tactile stimulation laboratory allowing concurrent presentation of up to eight tactile stimuli through electromagnetic stimulators; (3) a mock CCTV control room (with wall-mounted displays driven by a PC with state-of-the-art graphics), with application to real-world surveillance; and (4) high-performance computing for analysing brain imaging and face-processing data. In addition, we have upgraded displays in research seminar rooms to 74" smart touchscreens with webcasting facilities for internal and external research seminars, PGR teaching and annual PGR assessed research talks. With University IT services, we have upgraded all PCs supporting research in School laboratories, with over 180 PCs replaced.

**School refurbishment:** The University made a major strategic investment in the physical environment of the School, refurbishing the entire building in 2017, which has transformed the physical research environment. During this refurbishment, we introduced baby-changing and feeding facilities and replaced most gendered toilets with gender-neutral equivalents, all of which have enhanced the inclusivity of our physical environment. These new facilities include enhanced access for people with disabilities.

**Access to University facilities:** Research staff and students benefit from well-established collaborations involving use of the University imaging facilities, which include a Philips Achieva X-series 3T MRI scanner. The University is one of the six Scottish universities that participate in SINAPSE (Scottish Imaging Network), which provides a dynamic network and shared environment for strategic research developments in brain imaging. An important University resource is the Aberdeen Birth Cohorts (ABC) consisting of a unique, large cognitive and biomedical database of information on cohorts born in 1921 and 1936. Phillips sits on the Steering Group for ABC and was co-applicant on an ESRC/BBSRC interdisciplinary collaboration, utilising facilities at the Aberdeen Biomedical Imaging Centre and the Aberdeen Centre for Genome Enabled Biology and Medicine, to model epigenetic components of neurocognitive ageing. Researchers in Psychology also have access to high-performance computing to support mathematical modelling, brain imaging and artificial intelligence.

**Supporting impact with our facilities:** We are committed to supporting research impact through the use of our facilities. For example, our strategic investment in establishing a mock CCTV control room supports collaboration with Police Scotland on surveillance research. The School's recent investment in increasing the number and range of mobile eye-tracking systems facilitates application to real-world problems and will enhance collaboration within and outside of academia. Hunt/Irwin are using eye-tracking facilities to work with industry (Bristow) and regulators (CAA) to understand visual search in an aviation context. Our AVOT colour vision system is used to perform specialized occupational assessment by the Coastguard and Maritime Agency, Police Scotland, Civil Aviation Authorities and Scottish Fire Service.

### **Operational and scholarly infrastructure**

**Research governance:** Since 2014, the School has invested in new organisational structures, policies and procedures for supporting staff research activities (§2). We regularly review our research procedures to ensure compliance with the latest Concordat to Support Research Integrity. Our Psychology Research Ethics Committee has been expanded and strengthened to deal with on-going changes in the research landscape (e.g., compliance with GDPR, expansion of online research, devising Standard Operating Procedures for COVID-19). We have developed an inclusive research guide and established an Early Career Research Forum. To ensure research quality we (i) established a Research Integrity Team, (ii) contribute (and adhere) to University guidelines on data management and research governance and (iii) established staff support and training for Open Science. We follow American Psychological Association and International Committee of Medical Journal Editor guidelines for determining article authorship. The University provides mandatory Research Governance and Ethics training to all staff and PhD students involved in research. To ensure equitable use of all facilities and to support our highly collaborative research we have a designated member of staff who oversees each particular facility, and we have developed guidelines for fair usage of resources, which are circulated to all staff and student users and included in induction material. To ensure equitable access to facilities and amenities in the School, our Equality and Diversity Team ensures that all research facilities are housed in locations that are accessible for the researchers and participant groups that will use them and monitors the suitability of amenities in the School for researchers and participants. We monitor equal access to research training activities and support for research funding applications through our staff survey. In each staff member's annual Research Interview, we discuss any barriers that have arisen to research activity and responses influenced the development of our Family Support Award (§2).

**University support for research:** As well as the excellent programme of events from the University Grants Academy, we receive continual expert support from the University Research and Innovation team. Our Business Development Officer assists with all aspects of the research funding process: alerting researchers to funding opportunities, providing feedback on proposals and ensuring good communication with funders. The Research Finance Services team support grant costings and budget monitoring. The University Research IT team proactively advise and train staff and students on issues such as data management and security, as well as procuring computer software and hardware for research. Our impact is continually supported and enhanced through collaboration with the Impact and Knowledge Exchange Team and the Public Engagement with Research Unit.

**School-funded research and impact support since 2014:** All staff can apply to a general research fund managed by the Research Committee. This fund has a budget of GBP30,000 per annum and provides support for presenting at conferences, pump-priming for grant applications, the purchase of equipment/consumables and impact development. Current grant-holders are further awarded a discretionary research budget to support their activities. Since their launch in 2014, staff have benefitted from our investments in new research-support schemes. We have supported research leave for six staff, investing in their research activities by covering their administrative and teaching loads; and this directly led to submitted REF outputs (e.g., Cleland, Martinovic), impact development (e.g., unconscious bias training, Martin) and successful grant applications (e.g., Hunt, ESRC). We supported the secondment of Allan to industry (TauRx) by reallocating his teaching and administrative duties; this has led to close connections to industry, ongoing involvement in developing novel diagnostics for early detection of Alzheimer's disease and patent applications. We established a **visiting researcher fund** of GBP2000 per annum to bring talented ECRs from around the world for extended stays to conduct research within the School and encourage international and interdisciplinary collaboration (four successful applicants from Europe, USA and Australia). We established a **Family Support Award** to allow researchers with caring responsibilities to attend conferences, which provide networking opportunities to foster international and interdisciplinary links (eight awards totalling GBP2500). Our new (2019) **impact support fund** supported a project on mental health interventions for students (GBP2000). We have fully funded 14 undergraduate students through **research vacation scholarships** (total: GBP14,000). All ten new members of staff have been awarded **start-up funds** to support them in establishing their research activities and preparing for external funding bids and have benefited from reduced teaching and administration in their first years of employment. We are strongly committed to investing in our postgraduate community. The School supports applications to the BBSRC and ESRC DTP PhD competitions by guaranteeing the additional **matched funding** required for these awards. To maintain a strong PhD community, the School supports a minimum of two **fully funded** new PhD studentships each year. Recently these included a strategic decision to fully fund a PhD that contributes to the development of our impact case study on farming safety (REF3a) and to fully fund a PhD on equality and diversity in HE, which will inform our own equality and diversity practices in the future. In addition, we make the strategic decision to cover **fee waivers** for exceptional home and overseas students when this meets our research goals. We support PhD applications to industry and charitable funders (recent funders include BAE systems, Bristow Helicopters, TauRX, MS Society, Carnegie Trust).

**School support staff:** We have five dedicated support staff and one highly experienced Technical Resource Manager (TRM) who play an integral part in research activities. Our TRM identifies and procures research equipment for all staff and students as well as organising research laboratory bookings, providing expertise in programming (including the recent expansion of online testing) and managing our student research participation scheme. He also provides support and training to staff and students on these topics.

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

##### Contributions to the research base

**Contribution to learned societies, dissemination and conference organisation:** Martinovic is secretary of the Applied Vision Association, which supports and disseminates vision research within the UK, organises scientific meetings biannually and awards the prestigious Marr Medal. Phillips was on the organising committee of the Experimental Psychology Society (2015-18), which involves: being a trustee of the society, making funding decisions and involvement in organising the meetings of the society. She is currently on the board of the European Cognitive Aging Society, organising biennial meetings of this group. Our School has a long history of playing a prominent role in organising the annual Scottish Vision Group conference (Martinovic, Sahraie). Tatler has served on Scientific Committees for international conferences, including the European Conference on Eye Movements and Eye-Tracking Research and Applications. Bach organised the 2017 British Association of Cognitive Neuroscience conference. Our researchers have been invited to give keynote addresses at major international conferences: for example, at the European Conference on Eye Movements in Germany (Tatler); Eye-Tracking Research and Applications in the US (Tatler); Self in Action in the Netherlands (Macrae); The Future of Social Cognition in the UK (Bach, Macrae); and Cognitive Neuroscience in Germany (Andersen).

**Editorship and funding review.** During the submission period we have played a major role as Associate Editors for the *Journal of Experimental Psychology: Learning, Memory, and Cognition* (Konopka), the *Journal of Experimental Psychology: Human Perception and Performance* (Hunt), the *British Journal of Psychology* (Hesse, Macrae, Tatler), *Cognitive Neuroscience* (Sui), *Memory* (Jackson), *Applied Psycholinguistics* (Konopka), *Psychologica Belgica* (Timmermans), and the *Journal of Cognition* (Schnitzpahn). Our staff are members of the editorial boards of the *Journal of Experimental Social Psychology* (Macrae), *Psychology and Aging* (Phillips), the *Journal of Personality and Social Psychology* (Macrae), *Personality and Social Psychology Bulletin* (Macrae), *Social Cognition* (Macrae), *Social Cognitive and Affective Neuroscience* (Macrae), *Visual Cognition* (Sutherland), the *Journal of Gerontology: Psychological Sciences* (Phillips), *Gesture* (Chu) and *Frontiers in Perception Science* (Hunt, Tatler). In addition, all REF-eligible staff contribute to peer review by acting as reviewers for journals and grant bodies internationally. Our staff have sat on funding award committees for the *European Association of Social Psychology* (Macrae), the *Carnegie Trust* (Chu, Hesse, Konopka), the *BBSRC Eastbio* (Martinovic, Phillips, Sahraie) and the *ESRC SGSSS DTP* (Hunt, Jackson, Phillips, Sahraie) for awarding PhD studentships and *British Academy Visiting Fellowships* (Chu). Seven staff are members of the *ESRC peer review college* (Bach, Jackson, Martin, Martinovic, Phillips, Ray, Tatler).

**Fellowships, awards and prizes.** Members of the School have been recognised for their contributions to the discipline, for example Macrae is a Fellow of the Royal Society of Edinburgh and a Fellow of the British Academy, and Tatler was a member of the Royal Society of Edinburgh Young Academy. In 2015, Macrae was awarded the prestigious Daniel M. Wegner Theoretical Innovation Prize for contributions to social/personality psychology. In 2017, Macrae was awarded the Clifford T. Morgan Best Article Award in *Memory & Cognition* by *The Psychonomic Society*. Sutherland has also won two awards for her research contributions, winning *The Psychonomic Society's Best Article Award* in *Cognitive Research: Principles and Implications* in 2017 and the *Rank Prize Award* for the best research paper at a face perception conference. These awards recognise the world-leading calibre of research being conducted in the School of Psychology and its prominent position within the discipline.

### **Supporting collaborative research**

The School of Psychology is an outward-looking research unit, with strong international and interdisciplinary links. 16 of our 25 category A staff are non-British – representing 11 nationalities – many of whom were recruited from outside the UK, bringing with them international networks of collaborators. Our researchers engage strongly with a wide range of non-academic stakeholders through public engagement activities, established connections with industry and the public sector and providing evidence-based training for industry and the NHS. These activities are supported by the School through the annual Research Interviews (§2), strategic workload management and the School's targeted financial resource allocation (§3).

**International collaborations:** The School collaborates widely with institutions around the world, including most European countries and many countries in Asia, Australasia and North and South America. Of our 100 most-collaborated-with institutions since 2014, 74 are outside the UK. Notable international collaborators include Harvard University (42 publications), the University of Munich (35), the University of California (34), the University of Toronto (32), Radboud University Nijmegen (30) and the University of Queensland (28). Some examples of the rich international collaboration in our School are listed below:

- Andersen collaborates with European, US and Japanese partners in psychology, neuroscience and engineering to advance research in visual attention; funded by mobility and project grants.
- Sui works with international collaborators in psychiatry, neuroscience and computing science across Asia, the US and Europe to model self-processing, with a focus on the influence of depression and dementia and has developed a Knowledge Exchange partnership with the Hangzhou Jeremiah IT Company in China to develop testing and rehabilitation in dementia.
- Schnitzspahn and Phillips collaborate with partners in Europe, North America, Australasia and Asia to understand the effects of adult ageing on cognition and emotion. This includes regular international visitors to Aberdeen and has been supported by UKRI and international funders. 24 of their 31 papers on ageing in the REF period include international co-authors.

**Interdisciplinary collaborations:** Staff in Psychology have active local collaborations with researchers in the departments of Visual Arts, Linguistics, Computer Science, Engineering, Biomedical Imaging and the Rowett Institute of Nutrition, along with international collaborations in the fields of linguistics, physiology, neuroscience and computer science. These interdisciplinary projects have been facilitated by University-sponsored cross-discipline research themes and workshops and cross-UKRI funding schemes (e.g., ESRC/BBSRC epigenetics programme). We collaborate widely with NHS departments, in particular: Neurology, Neuropsychology, Geriatric Medicine and Psychiatry. Researchers from our School have led interdisciplinary Grants Academy workshops at Aberdeen University in the “Conversations on...” series, and we run “sandpit” events and research seminars with other Schools to foster collaboration. Some specific examples of our interdisciplinary work are listed below:

- There is a long history in Aberdeen of interdisciplinary research into theoretical and applied face perception (e.g., Jackson), and this continues with the recent appointment of Sutherland, who brings international collaborations with biological science, genetics and forensic science, as well as industrial partners, to develop new models of face processing.
- We have numerous local, national and international collaborations with computing science, engineering, physics and mathematics for modelling key psychological phenomena, such as social learning (Sui), perception of high-dynamic displays (Martinovic), system analysis of dyadic interaction in autism (Timmermans), human-robot interaction (Bach) and EEG/MRI data in ageing (Allan, Phillips).
- We have a vibrant language research group which is inherently interdisciplinary, including on-going collaborations with linguistics departments in the UK and Europe to explore phenomena such as bilingualism and stereotype evolution in children (Bach, Cleland, Konopka, Martin, Ray, Rommers).

### **Strategic support for stakeholder engagement**

The School delivers research that is capable of making a real difference to lives, aligning with the University’s 2040 strategy. Internal Knowledge Exchange workshops have increased stakeholder engagement and promoted evidence-based research impact assessment. Research impact is part of our staff induction programme, and impact plans are an integral part of the annual Research Interviews with all staff (§2). The School has two primary vehicles for developing and maintaining links with local stakeholders: the Applied Psychology and Human Factors group (which holds regular meetings to develop and disseminate impact and publishes a widely circulated quarterly newsletter featuring researchers and stakeholders) and the External Liaison Committee, a more formal group of stakeholders. Stakeholder engagement is supported

by (i) our School Communications Team, established in 2015 to disseminate our activities to stakeholders and the public and (ii) the School's involvement in the University's Regional Engagement Group. We have long-standing relationships with key local stakeholders who provide research placements for our students. These stakeholders include Scottish Government, companies such as Sight Science and Dekra safety consultants and third sector bodies such as the Academy of Medical Sciences. We work with the education services of local authorities to conduct research in schools, providing important support for our research activities and development of potential impact. This work is coordinated by our Research In Schools Coordinator. The School and University have strategically invested in financial support for research impact. For example, we created a new impact-support scheme in 2019 (£3) and we have made strategic allocations of PhD studentship resources to support impact projects.

**Industrial impact:** Through our Applied Psychology and Human Factors group we have well-established relationships with stakeholders within the aviation (Bristow Group, CHC Helicopters), farming (the Farm Safety Foundation), oil and gas (TRAC International) and medical device (NovaVision) industries. Using strategic workload management, we have supported staff secondment to industry (e.g., TauRx). The School receives strong support from the University's Impact and Knowledge Exchange Team, as well as financial support from the University for Impact-Support Awards on non-technical skills and visual rehabilitation. Specific examples of our industrial impact include:

- Allan has received PhD and postdoctoral funding from TauRx companies to develop novel diagnostics for detecting early Alzheimer's disease. He was seconded to the company from 2014 to 2018 and is involved in an international trial with TauRx to evaluate new EEG connectivity and cognitive data analytics, working with physicists, psychiatrists and computational modellers. This work led to patent applications, and collaborative work is ongoing to commercialise the products.
- Sahraie developed the spin-out company Sight Science in the previous REF period and this has been acquired by an international company, NovaVision. Sahraie is Chief Scientific Officer for NovaVision, involved in developing and evaluating new technologies to improve visual function for neurological patients. NovaVision was an industrial partner on a recent BBSRC studentship, including student placements in Germany and the US.
- Irwin has worked with aviation partners CHC Helicopters to develop new behavioural markers to improve safety for helicopter crews. The tools developed during this research have already been implemented as part of their training regime. An ESRC-Collaborative PhD student on this project was awarded a prize in the ESRC SGSSS research impact competition in 2020.
- Tatler has established links with the comics industry (including artists, writers and publishers), consolidated by an ESRC grant on how design principles in comics influence the way that they are read. Involvement in Comic Cons in the UK and US, together with workshops for artists and publishers, has led to ongoing partnerships with comics artists and publishers.

**Societal impact:** Our research involves close collaboration with governmental (e.g., Police Scotland, Australian Passport Office), healthcare (e.g., NHS Education; Change Exchange) and third sector partners (e.g., Age UK, Malaysia Healthy Aging), both in the UK and internationally. We host a popular annual public research event to disseminate and discuss our research with stakeholders and members of our local Participant Panel. Some examples of our societal impact include:

- Work on statistical tools for clinical assessment of mood and cognitive function by Crawford has continued since REF2014. A survey of UK and international neuropsychology professionals in 2019 showed that 83% of respondents used methods developed within our School. Respondents used Crawford's statistical methods in medico-legal assessments for civil and criminal cases. These techniques are taught to all trainee clinical neuropsychologists in the UK.
- The School works with Police Scotland on the attentional demands of CCTV surveillance (funded by the Leverhulme Trust). This resulted in Tatler advising Dundee City Council

on the design of their new CCTV control room. Future work with Police Scotland will include developing protocols for training new CCTV operators, utilising our mock CCTV surveillance operating room.

- Our involvement with stakeholders is international in orientation; for example, a recent Newton grant with Malaysia led by Phillips included Aberdeen research staff presenting to a range of Malaysian third sector groups concerned with gender equality, ageing and poverty.

**Engaging the public:** The School organises an annual public lecture, the Anderson Lecture, given by prominent researchers from around the world on topics of public interest. Our staff regularly engage with the public through talks, exhibitions, science writing and media interviews. Researchers contribute talks and demonstrations to annual scientific and cultural events, including TechFest, Explorathon, Pint of Science and May Festival, as well as year-round programmes including Café Scientifique and Pechakucha Aberdeen. We have contributed to the ESRC Festival of Social Sciences, the British Science Festival “Bring Your Own Brain” event and the Look Again visual arts festival. Researchers reach younger audiences through Café Junior, contributing talks and organised discussion events for local high school students, with a focus on inclusion for schools in more deprived and remote areas. Some specific examples of our contributions are listed below:

- The School has strong associations with the Aberdeen Science Centre, with staff organising three interactive exhibitions; contributing to the Sound Festival event, a “Brain Bee” event to engage high-school children in neuroscience; and speaking in their adult evening lecture series.
- Martin is co-organiser of Aberdeenshire Philosophy café, a popular bimonthly multidisciplinary discussion forum on research topics for the public, usually held in local libraries, but continuing in online form during the COVID-19 pandemic.
- Based on a 2017 paper on visual search decisions, Hunt wrote a piece for The Conversation which resulted in extensive international media coverage (e.g., New York Magazine, International Business Times, The Independent).
- Ray’s work on the negative social consequences of being forgotten led to international media interest (e.g., The Atlantic), public presentations to the May Festival and PechaKucha series, as well as invited presentations to local energy companies.