

Institution: Abertay University
Unit of Assessment: 4 Psychology, Psychiatry and Neuroscience
<p>1. Unit context and structure, research and impact strategy</p> <p>Abertay University has grown its reputation since REF2014, being twice named the top modern university in Scotland (2017 & 2019; <i>Guardian Good University Guide, Times & Sunday Times Good University Guide</i>). Psychology has played a prominent role in this improvement, particularly in terms of research intensity and productivity. For example, annual <i>Complete University Guide</i> data show a 30-place improvement in our median rank since the last REF period, with our average annual rating for research quality improving by 41% from 1.7 in the last assessment period to 2.4 in 2014-2020.</p> <p>Abertay's research strategy is to produce high-quality research and knowledge exchange aligned with international, national and local priorities, and to deliver real impact for society (see REF5a). The university's research during the assessment period was organised across four themes: 'Society', 'Security', 'Creative Industries' and 'Environment'. Of these themes, UoA4 staff have contributed significantly to Society, Security and Creative Industries, including the provision of three Theme Leaders across the assessment period. Our research has benefitted from several Theme-led internal postgraduate studentships awarded to Psychology students; for example, the internal 'RLINCS' scheme has awarded seven fully-funded PhD studentships (including two in collaboration with the Northwood Trust) to UoA4 since the start of the assessment period, an important investment for a small department. By bringing together discipline-specific research under the remit of Theme-led, competitive internal funding schemes, Abertay has funded the growth of both our postgraduate student base and associated staff research outputs, contributing to a research environment that has continuously improved across the assessment period.</p> <p>All Abertay UoA4 staff are members of the Division of Psychology and Forensic Sciences in the School of Applied Sciences, which was formed in 2019 by merging previously separate Psychology and Forensic Science departments. We are a relatively small unit, which has achieved significant growth in the level of research activity across the current assessment period. Compared to the REF2014 submission, UoA4 staff have increased the number of research outputs published in peer-reviewed journals by 37%, and these have improved in quality as well as quantity (e.g., the number of outputs included in high impact (IF>3) journals has increased by 230%). Our external research income has also risen significantly, with the associated spend rising from just under £50k in 2013/14 to over £130k in 2019/20. Notably, we have improved our track record of prestigious UKRI funding, which has increased from 8.7% of external research funding spent in 2013/14 to 22.3% in 2019/20, including projects led by Abertay PIs. As outlined below, this progress has allowed us to both meet the strategic objectives set out in the last assessment period, and articulate achievable, sustainable goals for future research and impact.</p> <p><u>Strategic Aims for Research and Impact</u></p> <p><i>Achievement of strategic objectives during assessment period (2014-2020)</i></p> <p>The research aim and strategic objectives set out in REF2014 have shaped our academic staff appointments, priorities, and research collaborations during the assessment period. These were:</p> <p>Aim: To produce excellent quality applied psychological research and become one of the leading Scottish Psychology departments engaged in translational research within five years.</p> <p>The aim specifically related to the generation of research with impact. To meet this aim, we have increased the level of applied research activity by appointing staff working on translational projects (e.g., Woolnough: missing persons; Gawrylowicz: witness reliability) and ensuring that staff have sufficient time to exploit the translational elements of projects. As a result of this</p>

translational emphasis, we have attracted significant research funding for applied research projects, including:

- 'Self-referencing in the classroom': ESRC-funded education project (£484,383), exploring the effectiveness of self-referencing in children's learning (S. Cunningham, P-I)
- 'Communicative behaviour in a defence and security context': Ministry of Defence's *Defence and Security Accelerator* (DASA) project (£99,573) exploring the detection of nonverbal communication indicators in security contexts (Kempe, P-I)
- 'Societal and political engagement of young people in environmental issues': European Commission Horizon 2020 project (£177,650) to promote e-participation by young people in environmental decision-making (Scott-Brown, C-I)
- Exploring community experiences of serious organised crime in Scotland': Scottish Government funded project (£134,393), in support of Scotland's Organised Crime Strategy (Woolnough, C-I)
- 'Art de la Scene': Practice-based research on interactive knowledge funded by Carasso Foundation (€127,550), with Fabrique Autonomes des Acteurs (Jola, C-I)

Psychology staff have also supervised several high-impact translational postgraduate projects, supported by external funding bodies including the Alzheimer's Society (Woolnough), Scottish Institute for Policing Research (Woolnough), and The Leverhulme Trust (C Cunningham, S Cunningham). The outcomes of this research have been published in international applied psychology journals (e.g., *Psychology, Crime and Law*; *Psychopharmacology*).

By investing in new staff and postgraduate projects with an applied approach, we have met our goal of becoming one of the best modern Psychology departments in Scotland for translational research, as illustrated by national prizes won for our applied work with impact (e.g., Woolnough: C-I on 2015 *ESRC Impact Prize* winning project: *Outstanding Impact in Society*; Taylor: 2016 winner of *SIPR Student Award for best research*).

Both of our REF2021 impact case studies have emerged directly from this translational research aim. Woolnough (ICS1) was appointed from the Grampian Police Force as part of this strategy, bringing her wealth of expertise and data on missing persons to an academic setting, and developing impact from the outset of commencing her post. S Cunningham (ICS2) initiated a line of applied education research as a direct result of being set strategic objectives to build impact from her theoretical work, leading to new outputs, funding, and a unique school outreach programme. Our translational aim has therefore had a measurable effect on impact.

Strategic objectives: To increase research outputs in the key areas of security and vision science, evolutionary psychology, cognition and language.

Psychology staff have significantly increased their overall research performance across the assessment period, with improved vitality in key areas. We have significantly increased both the quantity and quality of outputs since 2014; the number of publications in international peer-reviewed journals (indexed in JCR) has increased by 37% across the assessment period from 81 to 111, and the average impact factor of the journals in which we publish has increased from 2.46 to 2.76 (SNIP increase 1.37 to 1.45). Notably, since the last assessment period the quantity of papers published in journals with an impact factor above 3 has risen by 230% (from 13 to 43), and in journals with an impact factor above 4 by 180% (from 5 to 14), demonstrating significant improvements in research output quality.

Research output improvements are demonstrable within our specified strategic areas:

Security and vision science: we have made new appointments in security and vision science (Woolnough, Gawrylowicz, Sharman), supporting both applied research (e.g., missing persons research, intoxicated witness reliability) and theoretical science (e.g., camouflage, depth perception). Staff working in this area have produced 37 outputs across the assessment period in journals with a mean IF of 2.55, including *PNAS*, *Scientific Reports*, *Functional Ecology*, *Psychopharmacology*, *PLoS One*, *Psychology and Aging*, and *Royal Society Open Science*.

As well as the translational funding in security described above (>£230k), our theoretical work in security and vision science has been awarded external funding including **BBSRC** (Lovell, P-I: £8,294; C-I: £314,325), **AHRC** (Scott-Brown, C-I, £60,471), and the **Leverhulme Trust** (Scott-Brown, C-I, £144,477).

The reach of this research is supported by international links with industry and practice. Woolnough has worked with police forces in the UK, Canada and Sweden to improve practice and serves as Associate Director of the national Scottish Institute for Policing Research, while Scott-Brown collaborates with industrial and charitable partners (Hymans, Norman Fraser Design Trust, Munepene) who support knowledge exchange and provide financial support for PGR students and research assistants.

Evolutionary psychology, cognition and language: existing strengths have been augmented by the appointments of Kirk and Wakeford (language), Jola (motor cognition and expertise) and Wood (cultural evolution) since 2014. Seventy-two outputs have been authored by academic staff in this area, including papers in *Psychological Science*, *Leadership Quarterly*, *NeuroImage*, *Journal of Neuroscience*, *Evolution and Human Behavior*, *PLoS One*, *Child Development*, *Cortex*, and *Cognition*.

As well as the funding for translational projects in this area listed above (>£500k), external funding for this research includes awards from the **Leverhulme Trust** (C Cunningham, P-I, £122,584; S Cunningham, P-I, £106,336; Kempe, P-I, £151,059), **ESRC** (S Cunningham, C-I, £294,894), and the **Carnegie Trust** (Kirk, P-I, £14,659; Watkins, P-I, £6,990).

Our research in this area has garnered an international reputation and interest. Jola has been invited to work with international performance organisations (e.g., FAA, France; Laban, Switzerland; ICKAmsterdam). Kempe was sponsored for a Visiting Research Fellowship by the Max Planck Institute of Psycholinguistics, Nijmegen (2016). Work on dialect (Kirk, Kempe) was featured on BBC Timeline (TV) and BBC Social Media feeds, where it amassed over 2 million views, on radio throughout the UK and Europe (e.g., Slovenia) and on national news media.

In addition to achieving our research aims during the assessment period, we have significantly enhanced the vitality of our research environment to provide sustainable support for staff, particularly ECRs. We established a '**Researcher Forum**' in 2018 to provide an opportunity for staff and postgraduate research students (PGRS) to meet monthly during term-time for research practice discussions. Topics have included emerging research practices and analysis (e.g., Psychological Science Accelerator; Bayesian approaches) and ways to improve current practice (e.g., increasing outreach and impact). The Researcher Forum has also provided a platform for peer review and discussion, for example to review funding application drafts and practice research talks. Over the three years in which it has run, the Researcher Forum has expanded to more than 30 members.

One aim of the Researcher Forum has been to increase staff engagement in **open science practices**. We hosted a forum on pre-registration, increasing the proportion of current UoA staff with projects pre-registered (e.g., on OSF) to >65%. We raised awareness of open-access data repositories, such that recent submissions by 60% of UoA staff have included links to open data and/or analyses. Further, our staff have now published papers with fully pre-registered Introduction & Method sections (e.g., Watkins, *Scientific Reports*, *Frontiers in Psychology*; Kempe, *Journal of Experimental Psychology: General*).

Psychology staff organise weekly **Research Seminars** during term-time, in which internal and external academics deliver research talks followed by informal discussion and networking. As of 2020, Watkins extended this seminar series to a wider audience of students and staff from across the life sciences and behavioural/social sciences, with psychology seminars well represented among a broad range of topics. Commitment to this event continued even during the 2020 lockdown when staff have had high competing demands on their time, with a median of 30 attendees per seminar. Watkins also initiated the *Michael Lamb Lecture*, a new Abertay

public lecture series named after one of our honorary graduates. The inaugural event (~180 tickets sold), postponed from March 2020 due to COVID, took place in April 2021.

Future Strategic Aims and Goals (2020-2025)

Success in our previous areas of strategic priority (i.e., Security and vision science, Evolutionary psychology, Cognition and language) has led to growth in staff numbers and expertise in these areas, to the extent that they have now been re-organised into three more cohesive collaborative research groups that will commence formally at the start of the next REF period:

- **Policing, security and forensic science:** Security has formed its own research group, with a more focused remit facilitating collaboration between forensic psychology staff and forensic science colleagues who joined the Division.
- **Cognition and vision science:** Vision Science has merged with Cognition and Language to form a research group that takes advantage of common methodologies and theoretical approaches.
- **Development, learning, and evolution:** Evolutionary psychology has combined with cultural evolution and developmental psychology (an emerging strength in the department) to form a research group, combining ontogenetic and phylogenetic approaches.

Each of the groups includes both translational and theoretical research projects and has an explicit aim of increasing collaborative outputs and impacts, as well as supporting colleagues' research development. The continuity between previous areas of research priority and the current research groups means that we can continue to build on our existing strengths, providing a sustainable base of expertise. Future strategic aims are organised around our three research groups, with each group asked to conduct collaborative research projects (with associated funding applications and outputs), provide collegial support, especially for ECRs and PGRS, and encourage undergraduate students who may gain valuable experience by supporting activity (e.g., through the research volunteer scheme). All psychology staff are included in at least one of the three research groups, with multiple memberships possible to encourage as much collaboration and sharing of ideas as possible (a fission-fusion model). Being a small Division (17 psychology staff, 15 of whom are Category A), we have a sustainable culture of forming productive bonds within and across research groups, and have a history of working collaboratively (e.g., joint investigators on large ESRC grant, joint authorship of papers in *Scientific Reports*, *Frontiers* and *Cognition*, joint organisers of *North Sea Laterality* meeting). We also encourage inter-disciplinary research and have productive collaborations with colleagues in other Abertay divisions (see Section 4).

Our strategy is also aligned with the university's new Research and Knowledge Exchange Strategy (2020-2025) (see REF5a). For example, our policing and developmental research areas are closely aligned with institutional strategic investment in 'Security, Equality & Social Justice', and 'Health and Care Across the Lifespan', and our research groups align with institutional priorities to support excellence in research on 'Learning and Pedagogy', 'Social identity and human behaviour', and 'Experimentation and systems modelling'. This alignment ensures a sustainable base for internal support and collaboration across disciplines during the next REF period. Abertay have made a strategic commitment over the next five years to invest in and support c.15 fully funded PhD studentships, funded PhD studentships for newly appointed academic staff (subject to the approval of a research plan that is aligned with the RKE strategy objectives), Abertay Futures Scholarships, Pump Priming awards, and Open Access Publication awards.

Within our Division, we are continuing to improve the vitality of our environment by implementing a number of research-specific strategic objectives:

- **Build staff research capacity by adopting a strategy of block teaching and sabbaticals.** This is being supported by university-wide commitments: all staff have been invited to nominate modules for block teaching to free up more concentrated time for research across the year, and to apply for research sabbaticals with specified aims and outcomes (see Section 2).

- **Increase funding application success by improving internal review processes and the availability of exemplar applications.** We now have a centrally-held repository of successful funding applications that can be accessed by all staff. We have introduced peer-review workshops as part of the Researcher Forum, and instigated a rigorous process of pre-submission internal review by a group of experienced UoA4 staff for all psychology applications, as well as having access to university-wide peer review for inter-disciplinary applications. These processes have increased funding application success (see Section 3) and are particularly useful for ECRs.
- **Support ongoing research expansion by investment in resources.** In 2020, we have invested in licenced online testing software to support research undertaken during lockdown, namely *Gorilla* and *Pavlovia* experimental software platforms, and *Qualtrics* survey tools (we are currently hosting weekly collaborative meetings to share developing experience in using these platforms). We have also purchased a mobile eye-tracker (ESRC-funded) that will support multiple projects. These developments are aligned with our institution's new digital strategy.
- **Grow capacity for research participant recruitment** by developing our participant pool and investing in testing spaces. A business case for a cross-disciplinary participant pool has been submitted by Watkins and Elliott (Head of Researcher Development) to grow capacity in the next review period. We have invested in SONA technology to facilitate undergraduate participation in research, improving the student experience as well as significantly increasing internal recruitment. We also aim to increase our capacity for large-group testing, preparing a business case to develop a larger suite of testing cubicles on site for the simultaneous testing of 40-50 participants.

As demonstrated, we have clear, sustainable plans to continue developing the vitality of our research environment. We take feedback from staff on how effective these plans are, for example with dedicated sessions to discuss this at annual divisional Away Days. Indeed, some of the plans detailed above were derived from a focused Away Day discussion, demonstrating a commitment to implement ideas that benefit our research environment. We are focused on delivering translational impact, successful funding applications, and high-quality outputs, while being supported by a collegiate environment that promotes dedicated research time.

2. People

Staffing Strategy and Development

A total of 15 psychology staff are returned in the current UoA4, an increase of nearly 90% since REF2014 ($N=8$). This reflects an increasing research focus within our unit, and a growing ability to attract high-quality researchers and funding. The team of psychology academic staff currently comprises a healthy balance of experience, with two professors, eight senior lecturers (Grade 9) and seven lecturers (Grades 7 and 8), of whom 15 are Category A eligible staff (all on permanent contracts), and ten have been internally promoted at least once in the current assessment period. This reflects Abertay's real commitment to developing staff careers; for example, unlike many institutions Abertay held 2020 promotion rounds despite the COVID pandemic, with four UoA4 psychology staff being promoted. The university's commitment to investing in staff is further evidenced by a Gold award from Healthy Working Lives.

Investment in new academic staff across the assessment period has been driven by a strategic plan for improving existing research strengths (i.e., in the named research groups). Permanent academic appointments include Wood (Development, Learning and Evolution), Jola, Kirk, Sharman and Wakeford (Cognition and Vision Science), and Gawrylowicz and Woolnough (Policing, Security and Forensic Science). Of the lecturers appointed, four were ECRs and three established researchers, again providing a balance of experienced and developing staff. Investment from external funding bodies has also enabled us to appoint 17 new research staff across the research groups during the assessment period.

Staff development

Consistent with the *Concordat to Support the Career Development of Researchers* (CSCDR), of which we are a signatory, line managers are committed to staff well-being and all psychology staff have twice-yearly *Developmental Discussions* with the Head of Division. These formal discussions are designed to appraise both short-term research objectives and long-term plans, discuss training and development needs, and review any well-being or workload issues. Some training and development needs are met within the institution, which provides workshops and courses on topics such as *R* and advanced statistics, GDPR, data management, and ethical conduct, to ensure research is conducted according to appropriate frameworks and standards. In addition to the UKRI Open Access Block Grant, the university is committed to supporting open access publication, funding fees for UoA4 staff in journals including *Scientific Reports*, *PLoS One*, *iPerception*, and *Frontiers*. We have a Research Development Officer who is available to all researchers for individual statistical advice as well as training workshops. In addition, our Head of Researcher Development provides regular training and one-to-one support on academic writing, grant and fellowship applications, and research plans. As well as development sessions, we host briefings on the RKE funding landscape including specific funding schemes (e.g., KTPs, DASA, Innovate UK).

We are a signatory to the Knowledge Exchange Concordat and have a psychology staff member serving as the university's Academic Enterprise Leader (Scott-Brown). Driving the university's policy in this area, we have also had three members sit on the Research Knowledge and Exchange Committee (S Cunningham, Kempe, Scott-Brown).

Staff training and development needs that cannot be met internally have been provided by funding external training, either by bringing external speakers to Abertay (e.g., developing research impact (Fast Track Impact series); Advance HE Leadership workshops for researchers; Transparent and Reproducible Science training) or funding participation in events at other institutions (e.g., eye tracker training delivered in London; participation in national Aurora leadership programme).

ECRs and other new appointees are given additional support in the form of a reduced teaching load in their first year to allow them time to establish their research lab. There is a probation period of two years for academic staff to ensure regular objective setting and discussion with line managers. Depending on experience and qualifications, ECRs may also be required to complete the university's Postgraduate Certificate in Academic Practice (PGCAP). This qualification has a research focus as well as developing teaching skills, including modules such as 'Developing Academic Practice' and 'The Effective Research Academic', covering the supervision of postgraduate students, the research funding landscape, project management, developing a research niche, and internal research procedures (e.g., ethics, data management). All staff who are inexperienced in postgraduate supervision are required to complete an online Epigeum course on supervision skills before being mentored through their first PGR student supervision. Once staff are established, additional research time can be provided through a formal sabbatical scheme where research leave is possible for 6- to 12-month periods. In addition, Psychology staff have sabbatical time built into their calendar as standard, with teaching breaks of four to twelve weeks during term-time provided each year to all staff with responsibility for research.

Within Psychology, all new staff are offered mentoring by a more experienced colleague. UoA4 staff are also actively involved in the TRAMS mentoring scheme, with for example five mentors/mentees participating in 2020. This scheme runs in partnership with six universities including Abertay, St Andrews, Dundee and Trinity College, Dublin, matching academic staff at external institutions to provide objective support for career development.

An important environmental improvement during the current assessment period is that staff research has been supported by consistent internal funding. The RLINCS scheme that provides PhD studentships (details below) also awards 'pump priming' research funding to support new projects and help ECRs develop a track record of independent research. Pump priming funds have supported the initial development of materials used to underpin larger projects (e.g., £1.4k

awarded to Watkins in 2014/15 led to outputs Watkins, *Perception*, 2017 and Watkins & Leitch, *Archives of Sexual Behavior*, 2020).

Internal funding has also been provided to support career development and dissemination through conference attendance. Across the assessment period, internal funding has facilitated participation in national meetings (e.g., EPS and Cognitive/Developmental sections of *BPS*) and international conferences in Europe and the US (e.g., *ICPS*; *International North Sea Laterality Meeting*; *Psychology and Law*; *ECVP*; *ECEM*; *International Primate Society*; *Vision Sciences Society*).

Training and Supervision of PGRS

Psychology PGRS are a significant component of our departmental research culture, and to the university more broadly as they are based in Abertay's Graduate School. During the REF assessment period, we awarded 7 PhD degrees (REF4a), 1 MPhil, and 12.5 MbR degrees (i.e., 12 supervised within the cognate area of psychology plus one jointly supervised with another UoA). We have a further 8.5 continuing PhD students (plus a further 2 who have secured PhD studentships in 2020 but will enrol after the assessment period) and 5 continuing MbR/MPhil students. This constitutes a healthy and sustainable PGRS community for a group of just 15 Category A staff.

Funding for Abertay postgraduate students has been secured from external organisations (Leverhulme Trust; Northwood Trust, Scottish National Blood Transfusion Service, Scottish Prison Service) as well as RLINCS studentships, co-funded studentships and fee waivers. We have co-supervised students at several external institutions including York University, Canada, and the University of Queensland, Australia (S Cunningham); University of Dundee and University of Edinburgh (Woolnough); Glasgow Caledonian University and London South Bank University (Gawrylowicz); and Bangor University (Jola).

Supporting their career development, PGRS are co-authors on more than 20 published papers in the current assessment period and have presented or co-authored more than 50 conference presentations and posters. Our postgraduate students have achieved excellent success after graduation, going on to lectureships (Kirk, Abertay; Taylor, UHI) and research positions (e.g., at Kings College London, Plymouth, Reading), as well as relevant employment outside of academia (e.g., Senior Mental Health Practitioner for Scottish Association for Mental Health; Psychology Practitioner for NHS Grampian).

All PGRS are based in Abertay's vibrant pan-university Graduate School, an important resource that allows students in our relatively small department access to training and a large peer group from other disciplines. As well as providing physical resources (allocated desk in an open-plan office, social area, IT equipment), the Graduate School creates a structured system to support progress:

- **Progress panels:** students complete an annual progress report and presentation to an independent internal panel (and their supervisor), where they discuss the project and supervision experience. This provides an annual check-up on student progress and opportunity to address any issues, and gives the student the opportunity to practice addressing questions about their research decisions in preparation for their viva.
- **Personal development planning:** Students track meetings, achievements, and goals in *PebblePad*. They enter personal development achievements against planned training needs into our ADEPT system (structured around the Vitae Researcher Development Framework), which must be submitted for approval one month before their PhD thesis submission. This ensures that students are systematically focused on developing appropriate fundamental skills and foundational knowledge to support progress, and that they can articulate the research, experience and wider achievements attained throughout their PG training. PGRS can also register for part of the PGCAP qualification, which supports their development of teaching and wider academic skills.

- **Annual Graduate School conference:** All PGRs are required to present their research to peers, supervisors and academic staff from across the university. This helps the students to develop presentation skills and confidence in a formal professional context.
- **Training:** Skills-based seminars and workshops (a programme of over 100 annual opportunities) are held during term-time to meet individual training needs, including research methods, statistics (SPSS and R), qualitative analysis, public engagement and outreach training, academic writing, funding applications and business development. Placement opportunities in industry, charities or government are also available and have been undertaken by Psychology PGRs, including funded placements in the Scottish Executive (Kirk) and Hymans Robertson LLP (Crowe).
- **Access to professional research support** from our Researcher Development Officer (statistician) and Head of Researcher Development (for guidance and support with academic practices such as developing outputs and funding applications).
- **Funding opportunities:** students can apply to a dedicated fund for conference attendance and researcher training support.

Additionally, the Scottish Graduate School of Social Science (SGSSS) provides all our PGRs with access to support (e.g., advanced and specialist statistical training) and opportunities (e.g., internships). SGSSS is a Doctoral Training Partnership commissioned by ESRC and the Scottish Funding Council that provides all social sciences PGRs in the member universities, including Abertay, with high quality training experiences and resources.

We also support the development of research experience in our undergraduate and taught PG students, funding specialist research training (e.g., SR training in London, 2018) and supporting them toward publication of their dissertation research (e.g., Seiryte & Rusconi, 2015, *Personality and Individual Differences*; Harvey et al., 2015, *Frontiers in Human Neuroscience*; Egan et al., 2016, *Scientific Reports*; James et al., 2018, *Perception*; Korbmacher & Wright, 2020, *Psychology Teaching Review*). We run a Research Volunteer Scheme that has allowed 135 psychology students to obtain research experience (e.g., experimental design, data collection and analysis) during the assessment period. Students who participate in the scheme receive recognition on their Higher Education Achievement Record (HEAR). We have also secured 12 competitive undergraduate/pre-PhD vacation scholarships (e.g., from the BPS and Carnegie Trust) to allow our students to be employed as research assistants over the summer vacation.

Supporting and Promoting Equality and Diversity

Promoting research opportunity across all staff has been a focus of the Psychology Division during the current assessment period, particularly in terms of gender equality. All Grade 10 staff (both professors and the Head of Division) are female, and while the gender proportion of academic staff has not changed significantly since the last assessment period (2013/14: 72% female; 2019/20: 71% female), there has been excellent progress in ensuring the research responsibilities and opportunities are more evenly distributed across the genders. In the last REF assessment, just 40% of submitted staff were female, compared to 73% in the current submission. Further, female UoA4 staff are authors on 75% of the papers included in the current submission, a proportion that closely aligns with the Division's staff gender mix. These data suggest that male and female academic staff have similar research performance and opportunities.

Support is also given for training in gender awareness, and opportunity for gender-equal work flexibility. Two female UoA4 staff were funded to attend an Equate Scotland workshop as part of the Aurora programme and Women in Cognitive Science events. There is also support for flexible working, maternity, and paternity leave. The overall number of male and female academic Psychology staff on part-time contracts has not changed between 2013/14 and 2019/20 (1 M, 3 F), but individual contracts have been adjusted on request (e.g., female academics being granted a return to full-time work following a reduction in caring responsibilities). Staff who have taken maternity leave are given reduced teaching loads on their return to work, to allow increased time to resume research activities. Flexible working is fully

supported, with a new Digital Strategy launched in 2020 to empower staff to deliver in a way that works best for them.

All proposed university policies undergo Equality Impact Assessments, and Psychology staff are well-represented on committees that ensure equality and diversity are promoted. Three UoA4 staff act as Lead Voices for university-wide equality and diversity groups (specifically, Pregnancy and Maternity, Gender, and LGBT+). UoA4 staff also serve as representatives on the University and College Union and Staff Engagement Advisory Team committees which have, for example, ensured that staff with caring or health responsibilities are supported during COVID restrictions. All staff in the Division have undergone mandatory unconscious bias training to combat the influence of social category membership cues on decision-making, consistent with CSCDR commitments. Abertay's commitment to equality and diversity is evidenced by awards in national schemes including Athena Swan (Bronze Award) and the Race Equality Charter Mark (Bronze Award), which we are the only Scottish university to hold.

3. Income, infrastructure and facilities

Income

Our unit has spent £811,523 of external research income during the period 01/08/13 - 31/07/20, with annual external funding spend increasing more than 2.5-fold between 2013/14 and 2019/20. This reflects a strong and sustained improvement in securing external research funding across the REF assessment period, with mean associated spend increasing from £62,908 p.a. in the first half of the period (2013/14–2015/16) to £155,700 p.a. in the second half (2016/17-2019/20).

As well as total spend (REF4b), the distribution of sources of research income shows important developments in research vitality across the assessment period, particularly within the strategic areas detailed in Section 1. There has been a notable improvement in our HESA Category 1 awards, including **UKRI** funding for research led by Abertay academics as Principal Investigator (e.g., ESRC award of £484,383 to S Cunningham as PI and McLean as C-I, 2020), as well as co-investigator funding (e.g., ESRC award of £294,894 with S Cunningham as C-I; AHRC award of £60,471 with Scott-Brown as C-I). Research income spend in Category 1 represented 22.3% of external research spending in 2019/20, compared to just 8.7% at the start of the assessment period (2013/14). Since 2015/16 we have also had success with **EU funding** (Categories 8-11; e.g., Horizon 2020 award of £177,650, Scott-Brown, C-I), spending an average of £18,555 per annum from this source since 2015/16 compared to a baseline of zero in 2013/14 and 2014/15. We have had consistent success in securing funding from **UK-based charities** across the REF period (Categories 2 & 3; mean spend £70,031 per annum), including three awards of >£100k each from the Leverhulme Trust to P-Is C Cunningham, S Cunningham and Kempe respectively. However, this source now represents a smaller proportion of external research income spent (22.7% in 2019/20, compared to 45.9% in 2013/14) as the total research income has been augmented by more prestigious funding. This shift in source demonstrates an increase in ambition, reputation, and experience within UoA4 staff, some of whom were ECRs at the beginning of the assessment period and have progressed from smaller charitable funding awards to major UKRI grants. It also reflects the strategic focus on supporting research funding submissions, with access to a new central repository of previously successful applications, a robust University internal peer review process, and draft application review sessions organised as part of the Researcher Forum, as well as dedicated research time allocated to staff in workload models,

The increase in external research funding awarded has contributed to the employment of 17 new funded Postdoctoral Research Fellows and Research Assistants during the current period, contributing to a growing and vibrant research community. It has also supported investment in impact activities, with Leverhulme Trust, ESRC and Royal Society funding underpinning outreach activity in schools, and Scottish Government funding supporting impact on policing.

Internally, the Division has invested >£63,000 in staff research development, equipment, and training during the current assessment period (median £8,800 p/a), primarily for conference attendance (45%) and research equipment (42%).

Infrastructure and facilities

The University's **Research Enterprise and Innovation Services (REIS)** offer advice and support on research related matters, including IP, contract management, costing, reviewing and approving applications for external funding and processing grants awarded. Graduate School resources (e.g., Researcher Development staff, training seminars) are available to all staff, and are used regularly. These university-wide points of contact provide excellent pooled expertise to support staff research.

Within UoA4, our staff have a diverse portfolio of expertise including eye movement recording and analyses, psychometrics, analysis of vocal parameters, systematic observation of primate behaviour, experimental procedures involving alcohol administration, participatory co-design, and translational research. Our Division has access to twelve dedicated staff research labs and a suite of eleven experimental cubicles, a seminar suite, specialised crime scene simulation areas, microscopy suite and a range of analytical laboratories. Our labs are equipped with high-end PCs with appropriate licensed software (e.g., E-Prime, FaceReader, Genemapper, Gorilla, N-Vivo, Observer XT, Psychopy, Qualtrics, SPSS, Superlab). Our research hardware includes an anechoic chamber, wall mounted remote controlled CCTV cameras, EEG with Paradigm, tCDS machine, SMI Eye View X HED Mobile Eye-Tracker and BeGaze analysis software, SR Research Eye Link II Eye Movement Recorder, equipment to measure galvanic skin response, BioHarness Telemetry System with LabChart, CUDA modelling PC, two Pupil Invisible mobile eye movement recorders, and Fujitsu CRT and Sony Trinitron monitors. Staff can also access our test library resources which include standardized tests of aptitude and IQ (e.g., Raven's Matrices; WAIS and WISC, Wechsler Individual Achievement Test), executive function (e.g., TEA; TEA-Ch, CNRep), mental health (Beck Depression Inventory), and vision (Ishihara Colour Test, TNO Stereo Test, Pelli Robson Acuity Chart).

Our staff also have access to university-wide resources. The Division used the HIVE laboratory for research (a large, dedicated space with 7m widescreen projection and extensive VR facilities), generating collaborations with programmers through SME's (e.g., *Pocket Sized Hands*) and outputs (the first paper to demonstrate edge-enhanced camouflage at such a wide scale, Egan et al., 2016 *Scientific Reports*), and cross disciplinary collaborations with programmers. This centre was replaced with a new Emergent Technology Centre in 2019, which the Division can access. The Division has also invested in its own VR equipment (e.g., Oculus Quest 2) and has expanded its floor space with an additional three dedicated laboratories with full blackout facilities for VR research. Our biomechanics and human movement facility allow high-quality video-capture and full kinematic analysis, which enables collaboration with colleagues in the Division of Sport and Exercise Sciences. Our staff and students also have access to dedicated private interview rooms and recording equipment for qualitative research and the development of interviewing and counselling skills, as well as a photography rig and image manipulation software, serial response box, and VR headsets for immersive experiments. We also have ongoing partnerships with external facilities for research including local zoos for observation of primate behaviour (Camperdown Park; Edinburgh Zoo; Gibbon Conservation Centre, Los Angeles), performance organisations, sports coaching, local charitable bodies and Abertay's Tayside Centre for Counselling. The university is investing in a new digital strategy for teaching and research, and this has helped our ability to fund new software to facilitate online research (e.g., Gorilla, Qualtrics). Restructuring within our School also affords us access to wet laboratories for physiological and biochemical testing moving forward.

Our infrastructure and facilities have developed significantly since the previous assessment period. Through the RLINCS scheme, staff can access starter funding for projects that would not normally attract a funding stream (e.g., a single low-cost experiment that would merit publication if successful), pump priming for new and existing researchers with track record, and funding for open access costs. Supporting our previous strategic goal in developing a reputation for

translational research, the institution has invested significantly in 'Bell Street Ventures', a business starter project supporting and developing academic enterprise among staff and students. This has facilitated start-ups among recent graduates in both the third sector (e.g., Du Plooy's café designed to provide work opportunities for individuals with learning disabilities), and commercial enterprises (e.g., Crowe's start-up company *Muckle Studios* emerged directly from her thesis work on eye tracking, supervised by Scott-Brown).

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

Academic collaboration and contribution to the research base

Internal collaborations

Staff within our unit of assessment collaborate internally within our research groups but also across disciplines. In particular, UoA4 staff have strong links with Abertay colleagues in Computer games and Cybersecurity (joint funded projects, installations and PhD supervision), Health sciences (joint PhD supervision and external funding), and Law and Sociology (joint PhD supervision).

External collaborations

We collaborate with approximately 90 different academic institutions and stakeholders, in over fifteen countries across five continents (Pure data). Academic collaborations include UKRI-funded research projects with other British universities (Aberdeen, Dundee, Edinburgh, Bristol). International collaborations have led to multiple joint outputs, including:

- C Cunningham: University of Southern Illinois (D'Agostino & Cunningham, 2015, *American Journal of Primatology*).
- S Cunningham: University of Queensland (Sparks et al., 2016, *Cognition*); University of Victoria, Canada (Turk et al., 2015, *Learning and Instruction*).
- Jola: INSERM-VEA Cognitive Neuroimaging Unit & CNRS, France (Bachrach et al., 2016, *NeuroImage*); University of Zurich (Grabherr et al., 2015, *NeuroRehabilitation*),
- Kempe: University of Sevilla & Griffiths University, Australia (Benítez-Burraco & Kempe, 2018, *Frontiers in Psychology*; Langley et al., 2020, *Evolutionary Anthropology*); City University of New York (Brooks et al., 2016, *Language Learning*); University of Lille (Kempe et al., 2015, *Cognition*).
- Kirk: Aix-Marseille University, France (Kirk et al., *Cognition*, 2018).
- Lovell: Hainan Normal University, China (Bu et al., 2020, *Global Economy and Conservation*), Universities of New York and Adelaide (Brulez et al., 2016, *Ecology and Evolution*).
- McLean: Universitat de Barcelona, Spain (Ivanova et al., *Language, Cognition and Neuroscience*, 2017).
- Scott-Brown: Griffith University, Australia (Stainer et al., *iPerception*, 2017), University of Málaga, Spain, and University of Agder, Norway (Carrillo et al., *Computers in Human Behavior*, 2017).
- Watkins: collaboration of researchers from seven countries in four continents (Watkins et al., 2019, *Scientific Reports*); Shenzhen University, China (Han et al., 2020, *Hormones and Behaviour*).
- Wakeford: Education University of Hong Kong (Smith et al., 2020 *Computers in Human Behavior*).
- Wood: National Center for Chimpanzee Care, Bastrop Texas (Davis et al., *Journal of Comparative Psychology*, 2019); Lincoln Park Zoo, Chicago (Watson et al., 2018, *Animal Cognition*).
- Woolnough: Universidad Autónoma de Madrid, Spain (García-Barceló et al., 2020 *Journal of Investigative Psychology and Offender Profiling*).

Non-academic external partnerships

Partnerships with industry have been developed by Academic Enterprise Leader Scott-Brown, leading to industry and charity funded projects (with *Hymans Robertson LLP*, *Munepene*, *Norman Fraser Design Trust*), projects designed to foster collaboration with regions of the EU (EU Interreg: i2i, iAge, InfoCare), and multi-site EU/Erasmus collaborations (FG4AG). Non-academic collaborations also include national and international police forces (Woolnough), local authority schools and education training providers (S Cunningham, Kempe), primate zoos in the USA and UK (C Cunningham, Wood), and international theatre and dance organisations (Jola).

These partnerships have been used to develop impact in the wider community, as detailed in both UoA4 impact case studies. For example, through workshops provided by SSERC, S Cunningham's educational research was shared with over 120 teachers in 2020. Woolnough's collaborations with police services have resulted in her research underpinning the Scottish Police Force's Missing Person Strategy (2015-18) and her behaviour profiling guidance is used by all UK police forces, police in Australia and Canada, and the international search and rescue community. Impact partnerships have also led to practitioners enhancing our research environment, for example becoming PhD students (Slokan, Scottish Prison Service) or visiting researchers (Scott, retired teacher; Steptoe, Forensic Psychologist).

Major prizes, indicators of esteem, and positions of influence

Our staff are regularly engaged with a diverse range of professional bodies, creating access to a wide network of contacts (e.g., *American Psychology-Law Society*; *Applied Vision Association*; *Association of Computing Machinery*; *Association of Psychological Science*; *British Society for Individual Differences*; *Cognitive Science Society*; *Cultural Evolution Society*; *European Society for Cognitive Psychology*; *Experimental Psychology Society*; *Human Behavior and Evolution Society*; *International Society for Human Ethology*; *Primate Society of Great Britain*; *Psychonomic Society*; *Polskie Towarzystwo Nauk o Człowieku i Ewolucji*; *Society for Evidence Based Policing*; *Vision Science Society*).

Psychology staff have been awarded numerous fellowships, prizes and elected memberships of professional bodies of influence during the assessment period:

- **Ig Nobel Prize for Economics** (Watkins, Sept 2020), with associated online presentation in lieu of ceremony at Harvard University, and an invited talk at MIT. (It is notable that we are one of only two non-Russell group UK universities to be awarded this prize, which garners significant international publicity.)
- **Associate Director** of the Evidence and Investigation Network, and **Executive Committee and Governance Board member** for the Scottish Institute of Policing Research (Woolnough).
- **Fellow of the International Academy of Investigative Psychology** (Woolnough).
- **Board Member** of the Applied Vision Association (Lovell).
- **Member of the Scientific Committee** of the International Conference on Cognitive Science, Russia (Kempe).
- **Elected officer** of the Association for the Heads of Psychology (C Cunningham).
- **Elected Committee Member** of the Developmental Section Committee of the BPS (S Cunningham).
- **Advisory board member** of the Scottish Graduate School for the Social Sciences (ESRC Doctoral Training Partnership, Kempe).

Other indicators of esteem include invitations to give external presentations and chair external events, including:

- **Keynote speakers:** *European Human Behaviour and Evolution Association Meeting*, Krakow (Wood, 2020), *National Missing Persons Conference*, Sydney (Woolnough, 2017), *InnArbeid Konferanse*, Norway (Scott-Brown, 2019), *Contact Festival Dartington*, Malta (Jola).

- **Public Lectures:** Leverhulme Annual May Festival lecture (Cunningham), Café Science (Cunningham, Kempe, Lovell, McLean, Wood), Bilingualism Matters Edinburgh Annual Event/HMS Unicorn (Kirk).
- **Invited speakers:** Research seminars at universities in the UK (Aberdeen, Bath, Edinburgh, Essex, Leicester, Middlesex, Queen Margaret, Queens, St Andrews, Warwick) and Europe (Liège, MPI Nijmegen, Palma de Mallorca). Invited talks at the Royal Society of Biology, Scotland, International Documentation of Contemporary Dance Education, University of Bielefeld, Germany (Jola), Scottish Crucible Lab (Scott-Brown), Freiburg Institute for Advanced Studies (Kempe). Invited symposium for the BPS Cognitive Section (Scott-Brown).
- **Session chairs** at international conferences:
 - Cunningham: *International Convention of Psychological Science*, Paris (2019)
 - Kempe: *Annual Conference, Psychonomic Society*, (2016)
 - McLean, *International Convention of Psychological Science*, Vienna (2017)
 - Scott-Brown: *European Conference on Visual Perception*, Belgrade, Serbia (2014)
 - Sharman: *Scottish Vision Group*, Skye (2019)
 - Watkins: *Human Behaviour and Evolution Association*, Natal, Brazil (2014); *Polskie Towarzystwo Nauk o Człowieku i Ewolucji*, Prague (2019)
 - Wood: *Culture Conference*, Stirling (2020).
 - Woolnough: SIPR International Policing Conference, Edinburgh (2015); *International Conference on Missing Children and Adults* (Dundee, 2017; Liverpool, 2019)
 - Wright: *North Sea Laterality Meeting*, Dundee (2018)

Professional service and participation in peer-review

Staff contributions in this area during the assessment period include:

- **Editorial Board Membership:** *Scientific Reports* (Sharman, Watkins); *PLoS One* (Kempe); *Frontiers* (Kempe); *Humanities and Social Sciences Communications* (Wood); *Language Development Research* (Kempe, founding Action Editor of Open Access journal); *Animal Behaviour* (C Cunningham); *Laterality* (Wright, Consulting Editor); *Encyclopedia of Evolutionary Psychological Science* (Watkins, Section Editor); *Encyclopedia of Language Development* (Kempe, Co-editor).
- **Editor for special issue:** ‘Emergentist Approaches to Language’ / ‘Self-domestication and Human Evolution’ (Kempe, *Frontiers*), ‘Self-processing biases in cognition’ (Cunningham, *Quarterly Journal of Experimental Psychology*), ‘The Psychological and Physiological Benefits of the Arts’ / ‘Performance in Theatre and Everyday Life’ (Jola, *Frontiers*).
- **Reviewing:** invited reviewers for funding bodies (Alexander von Humboldt-Stiftung Foundation, BeIPD-COFUND, Carnegie Trust, Czech Science Foundation, ESRC, ERC, German Research Foundation, Leverhulme Trust, National Science Foundation, SIPR) and international journals (e.g., *Current Biology*; *Cognition*; *JPSP*; *JEP: General/LMC/HPP*; *QJEP*; *Archives of Sexual Behaviour*; *Journal of Experimental Child Psychology*).

External research examination

UoA4 staff have served as thesis examiners at UK universities (Bangor, Birmingham, Bristol, Brunel, University of East Anglia, Lancaster, Liverpool, London Metropolitan, Nottingham Trent, Portsmouth, St Andrews, York) and international institutions (Australian Catholic University; MPI Nijmegen; University of British Columbia, Canada). Scott-Brown is also REF Reviewer at the University of Sunderland.

Contribution to the economy and wider society

Consistent with Abertay’s strategic plan, we conduct translational research that is embedded within the wider community, as evidenced by our research connections with local schools, public, and charitable organizations. We contribute to events designed to widen HE awareness and access to disadvantaged school pupils (*Dundee Science in Schools week*, *Growth Mindset* events with Leisure and Culture Dundee). We also contribute to local public engagement events, including Café Science, TEDx Abertay, Dundee Rotary Club and Dundee Science Festivals, as well as other public talks (e.g., Jola, student-organized lecture for BPS; Kirk, ‘Bilingualism Matters’ at Edinburgh University). This has engaged the wider community with our research; for

example, Watkins' public lecture (*'Take me out? The science of love, sex, and attraction'*) has been viewed over 14.5k times on our institution's YouTube channel.

UoA4 staff have raised the profile of our institution locally and internationally by chairing their own successful conferences (Woolnough: **Third International Conference on Missing Children and Adults** - 150 delegates from 16 countries; Wright: **North Sea Laterality Meeting 2018**). These contributed to the local economy and generated over £22,000 income for the Division.

Finally, we have substantially raised our profile via wider dissemination of our published work. During the current assessment period, our peer-reviewed papers have generated over 240 news articles (Altmetric statistics) in international outlets, including the *BBC*, *The Atlantic*, *The Australian*, *Hindustan Times*, *The Financial Times*, *The Daily Mail*, *The Huffington Post* (Canada), and *The New York Post*, as well as in media sections of *Science*, *New Scientist*, *British Medical Journal*, and *Nature*. Our work has also attracted attention from local and national television and radio (e.g., *BBC Radio Scotland*; *BBC Radio Kent*; *America in the Morning*; *Video Games in Citizen Science*; *Radio Berlin-Brandenburg*; *Radio Austria*), including a video on our dialect research viewed by more than 2 million people (Kirk: BBC Scotland News, <https://www.facebook.com/bbcscotlandnews/videos/1752880221402855/>). This latter viral video is an example of international outreach garnered from institutional investment in a locally focused project led by a former Abertay student who is now a permanent member of staff. Some of our peer-reviewed papers have also generated significant impact for the scientific journals in which they were published (Altmetric data: James et al., 2018: all-time #2 output for *Perception*; Fruhen et al., 2015: all-time #40 output for *Leadership Quarterly*; Watkins et al., 2019: all-time top 100 for *Scientific Reports*; Hardie & Wright, 2014: more views than 99% of all articles in *Frontiers in Psychology*). We have also published 28 academic book chapters during the assessment period (Pure data), and published articles for a general audience in outlets including *Raw Story*, *Spektrum* (Germany), *TeachPrimary*, *The Learning Scientists*, and *The Conversation*. We have influenced policy (La Rooy et al., 2015 *Journal of Criminal Research Policy and Practice*), and contributed to panels or provided consultancy for a diverse range of local and international user groups (e.g., Scott-Brown: talks for 'gamification' for *XpoNorth*, 2017 and the *V&A Design for Business Advisory Group*, 2016; Jola: consultancy for 'This is your brain on art', *Washington Post*, September 2017 and advocacy for the importance of dance in physical activity at the Scottish Parliament).