Institution: Liverpool John Moores University
Unit of Assessment: UOA4 Psychology, Psychiatry and Neuroscience
1. Unit context and structure, research and impact strategy

1.1 Context

Research conducted within the unit is clustered around three primary topics of psychological science: biological psychology (neuroscience/psychophysiology), health psychology and cognitive psychology. In the period since REF2014, the unit has recruited strongly and selectively to build critical mass in existing areas and develop strategically important lines of research. As a direct consequence of an institutional strategy to increase the number of research-active staff in psychology, the size of our submission has increased substantially in the current exercise, from an FTE count of 9.7 in 2014 to 42.11 in the current submission. Recruitment during the current census period targeted individuals who could consolidate existing research strengths and grow new strands of research activity. This expansion in staff numbers is mirrored by a significant increase of completed postgraduate research students; from 12 in the 2014 exercise to 26 in the current submission.

With respect to the broader context of the unit within the institution, it should also be noted that the previous UOA4 submission was delivered from the School of Natural Sciences and Psychology in the Faculty of Science. Due to institutional restructuring and a recognition of critical mass in psychology-related research, the current submission originates from the newly-formed School of Psychology, which was established in September 2019 and is located within the Faculty of Health. As well as transferring to a new Faculty, it is also planned to move the physical location of the School to new accommodation in 2021.

1.2 Structure

Our strategy for the promotion of research and impact within the unit is anchored by the Research Centre in Brain and Behaviour (RCBB), which was formally conferred by the institution in 2013. The RCBB provides an organisational infrastructure to promote research excellence within the unit. The current directors of the RCBB are **Montgomery** and **Malinowski** (both Readers) who sit on an executive board alongside **Fairclough** (REF coordinator), **Poole** and **Forshaw** (both Subject Leaders).

The current structure of the RCBB consists of six research groups: Cognitive and Affective Neuroscience (10.6 FTE), Health and Wellbeing (12 FTE), Psychophysiology (6 FTE), Cognition, Education and Language (5.5 FTE), Animal Cognition (4 FTE), and Forensic and Social Psychology (4 FTE). Staff are assigned to research groups for purposes of external presentation, but we have several individuals who contribute to multiple research groups due to their specific interests. Each group hosts regular internal meetings to discuss current research and exchange information on common areas of activity, such as grant preparation, development of research facilities and networking with internal/external partners. Staff can obtain feedback through these internal meetings to improve planned studies, refine drafts of manuscripts and obtain peer review of grant applications. The RCBB also holds a series of fortnightly research seminars during semester time that are attended by all RCBB members and postgraduates, these seminars include presentations from both internal and external speakers.

One important function of the RCBB structure is to consolidate good practice with respect to research integrity. In addition to a specific research ethics panel to assess project work from undergraduate/postgraduate students, which is staffed by RCBB members, two members sit on the institutional research ethics board. A high level of involvement in research governance supports a culture within RCBB that ensures all studies are conducted according to the highest professional

standards. In addition, we have expertise within RCBB in preparing applications to external governance bodies, such as NHS Ethics and Ministry of Defence Research Ethics Committee. The RCBB also provides a monitoring function to ensure compliance with open research standards, e.g., open access publication, contribution to open data depository, and produces an annual report on research quality within the unit.

While the primary purpose of the RCBB is to promote research excellence within the School of Psychology, staff are also engaged in interdisciplinary research. **Bruno**'s work on ageing and cognitive function involves collaboration with gerontologists from external organisations. Similarly, research conducted by **Brett** and **Saini** is performed in partnership with epidemiologists in the Public Health Institute (at our institution) and University of Liverpool. **Walker** and **McGlone** have worked with neonatologists from the University of Milan to explore the role of social touch on preterm infants. **Poole** collaborates with various medical professionals, such as pain consultants, oncologists and nurses at various local NHS Trusts, e.g., Clatterbridge Hospital. **Fairclough** has co-supervised PhD students with colleagues from the School of Engineering (four students) and the School of Computer Science (two students); he is also a member of Liverpool Logistics, Offshore and Marine (LOOM) Research Unit, which is an institutional research institute dedicated to marine, offshore and transport studies. **Richter** has co-supervised PhD research on listening effort in collaboration with audiologists at Vrije Universiteit Amsterdam. The RCBB is actively engaged with the Institute for Health Research (IHR), an institutional organisation devoted to interdisciplinary research in health-related research, three staff are co-ordinators of IHR subgroups devoted to Mental Health (**Brett**, **Saini**) and Cancer (**Poole**). The research conducted by **Adams** and **Simmons** on developmental aspects of writing and mathematics has led to collaboration with colleagues from School of Education at LJMU.

1.3. Research & Impact Strategy

The REF2014 submission described a five-year plan with research excellence and the development of the research environment as core aims. Four strategic objectives were outlined, which were to: (1) increase research income and diversify sources of income, (2) increase the number of PhD completions, (3) enhance our network of collaborators from academic and non-academic organisations, and (4) strengthen research culture within the unit.

With respect to (1), the unit has obtained funding to the value of £1,393,000 during the current census period, which represents an increase of approximately 34% compared to REF2014. Due to the shifting landscape for research funding, specifically the uncertainty surrounding EU-funded research, the opportunities to diversify income sources has been limited and the unit has focused primarily on UK-based funders, specifically charities (52% of income in current period) and UKRI Councils (15% of income). The unit has successfully increased the number of PhD completions, which has more than doubled in the current review period compared to REF2014 (2). One natural consequence of increasing the critical mass of research within the unit is an expansion in our network of collaborators (3), e.g., Stanford University (**Moore**), Oxford University (**Terbeck**), Sorbonne (**Bruno**), which are detailed in Section 4 of the current document. Finally, the increased size of the RCBB has increased critical mass in our research groupings, which has enhanced research culture in the unit (4).

The REF3a document submitted in 2014 described a strategy for enhancing impact from our research based upon: (1) strengthening and extending our network of partners from industry and public sector, (2) active pursuit of priority research areas as identified by industry, government and public, (3) supporting local economy by working with SMEs, local councils and NHS Trusts, and (4) acquiring apparatus to facilitate psychological research in the field.

With respect to (1), the unit has achieved new collaboration with multinational companies in the current review period, e.g., GSK and Chanel (**McGlone**), Purdue Pharmaceutical (Moore), as well as co-funded PhD studentships with industrial partners, such as Emteq Labs (**Fairclough**) and

ECONT (**Malinowski**). We have also worked with public sector bodies at a national level, e.g., National Police Chiefs Council (**Kewley**), Department of Transport (**Fairclough**). Staff from the unit have also pursued a number of topics prioritised by government and industry (2). For example, the positive influence of meditation on mental wellbeing is of interest to private companies and public health at a national level, the work of **Malinowski** (see ICS1) achieved recognition on national television ('Trust Me, I'm a Doctor 'on BBC1 primetime 2018) and he has presented his work to the European Parliament in Brussels (March 2020). The contribution of obesity to mortality and morbidity is a topic of national importance and **Newson** was commissioned by the British Psychological Society (BPS) in 2016 to chair an Obesity Task Group, which produced a policy briefing paper in 2018 that was widely distributed across the NHS network and presented to All-Parliamentary Groups (APPG) in 2020. The role of touch for social development and social wellbeing became a topic of national discussion, even prior to the recent pandemic, which focused attention on the negative psychological effect of humans being deprived of touch. **McGlone** contributed to an APPG report seeking to better address issues related to children's mental health that highlighted the important role of touch on psychological development (published February 2019) - see ICS4 for full details.

Local partnership in the public sector (3) has been a key feature of the unit's impact strategy in the current census period. Suicide and self-harm are significant societal problems in the north-west of England and the work of **Saini** via the Suicide Impact Lab (ICS3) has been instrumental in establishing new services in Liverpool for men in suicidal crisis (James 'Place)to treat self-harming patients that was founded in 2018. The work of **Saini** and colleagues contributed to the foundation of these services by developing an evidence base, performing economic analyses, piloting services, evaluating services and establishing partnerships, e.g. Wirral Borough Council. The local economy is characterised by an active digital sector, particularly in areas related to digital health and immersive technology and the unit is actively supporting this local industry. **Fairclough** has collaborated with CGA Simulation (Liverpool) on a number of projects related to simulation funded by Department of Transport (2017-2019) and Defence and Security Technology Laboratory (DSTL) (2019-2020). He also collaborated with Onteca Ltd to help develop and evaluate an app to support mental health in children, which can be downloaded from the NHS app store. **Fairclough** has also collaborated with colleagues in the School of Computer Science to obtain funding for a Knowledge Transfer Partnership project (2019-2021) with local company Immersive Interactive – as detailed in ICS2.

The unit has invested in apparatus designed to translate our research into applications in the real-world (4), which has facilitated our ability to achieve impact. For example, investment in wearable sensors designed for psychophysiology led to consultancy work funded by AO.com in 2017 to assess emotional impact of high-definition TV (**Pawling**). Work on the contribution of touch to the development of preterm infants conducted by **McGlone** and **Walker** led to the development of an incubator device designed to create a calming effect by stimulate C-afferent fibres, this prototype was constructed and is currently being tested at Alder Hey Children's Hospital (see ICS4).

In summary, strengthening of research within the unit during the current census period is evidenced by: (i) growth in number of research-active staff as a direct result of a research-led recruitment strategy, (ii) increased research income and number of PhD completions, (iii) increased critical mass in the two primary research groups within the RCBB (Cognitive/Affective Neuroscience, Health and Wellbeing) plus formation of grouping devoted to Psychophysiology, Animal Cognition etc., and (iv) enhanced research culture (e.g., regular meetings, peer support, high standards for research governance). These improvements are supplemented by an impact strategy designed to engage with industry and contribute to public sector initiatives to tackle high-profile societal issues such as obesity, male suicide and mental wellbeing.

1.4 Future Strategy

The planned physical relocation of the School of Psychology in 2022 provides context for our future strategy on research and impact as the unit moves into the next review cycle. This strategy is based on six objectives, which are described below:

1. Improve the level of research income generated per FTE and increase level of funding obtained from UK Research Councils and UK Government sources.
2. Increase the number of completed PhD research students
3. Ensure continuity for current impact case studies while developing new ones to increase the demonstrable reach and significance of our work at a national and international level.
4. Increase the research profile of the unit at the national and international level via high-quality contributions to the research base and non-academic impact.
5. Enhance interdisciplinary collaboration within the institution by incorporating other disciplines into the structure of the RCBB, particularly from the Faculty of Health.
6. Continue a process of selective staff recruitment to consolidate existing strengths in our established research groupings and develop critical mass within nascent research groupings within the RCBB.
7. Improve and extend our research facilities, particularly with respect to neurosciences, psychophysiology and cognitive psychology, as part of our move to new accommodation

The first objective represents an implicit recognition that increased staff returns in the census exercise should lead to a proportionate increase of external research income. In addition, we recognise that income generated from UK Research Councils accounted for less than 15% of total income in the current cycle. A number of initiatives are planned to facilitate this objective, which include: (i) ensure that laboratories in new accommodation are suitably equipped to ensure that the delivery of world-class research that can offer value for money to funders, (ii) establishment of regular grant writing workshops both within and across research groupings of the RCBB, and (iii) active promotion/distribution of UK Research Council funding opportunities via the RCBB. Increased research funding would be the main engine by which the number of PG research students will be increased in the next cycle (objective 2). Cultivation of the impact case studies that currently exist to a national or international level (objective 3) will require investment in specific areas of research activity in conjunction with a strategic plan to develop evidence-based impact. Some of this investment will be derived from the institution via dedicated PhD studentships (objective 2). However, it is important for the unit to increase the number of funding applications that represent collaboration with partners from industry and the public sector, and to utilise those partnerships to expand the range of funding options available to the unit and develop impact, e.g., increase the number of industry-sponsored PhDs, research partnership with NHS Trusts and similar initiatives like KTPs. While engagement with local economy, public sector and local government is important, the unit will continue to build on current impact activity of international reach (e.g., ICS1) to extend the scope of research with potential for application at this level.

The increase of staff numbers in the current submission has already enhanced the contribution of the unit to the research base. We have presented a number of examples where staff have organised conferences at a national and international level, or contributed at an editorial level to academic publications, or played a prominent role on professional bodies during the current submission. It is expected that the contribution made to the research base by staff in the unit will be strengthened through the next census period (objective 4). The strategy will be achieved by supporting individual staff to achieve promotion during the next six years by targeting evidence of academic prestige as part of their annual Personal Development review, e.g., publication in prestigious journals, members of editorial board, special issue editorships, organisation committee for international conferences. The approach proved to be effective in the

current period and the number of Readers in the department increased from 2 in 2014 to 10 in 2021. During the next census period, we will be supporting staff to plan and achieve promotion to Professor and aim to have 5 new Professors by 2026.

Research conducted within the unit represents a broad spectrum of activities and methodologies, covering population-based studies to animal behaviour, and it remains important to fully explore collaborations with other disciplines (objective 5). The move to the Faculty of Health provides an opportunity to build closer relationships between Psychology and disciplines within that Faculty, including Nursing and Public Health. A number of those collaborations are already underway, e.g., **Brett** collaborates with Nursing staff on social prescribing, **Montgomery** and **Poole** work with Institute for Public Health on opioids. In addition, the unit will build on existing partnerships with other schools within the university, including: Engineering (**Fairclough** – maritime safety), Computer Science (**Fairclough** – mixed reality systems) and Sports Science (**Ogden** – timing perception). One strategic objective of the RCBB over this period is to expand membership of the Centre to include a greater number of researchers from other disciplines.

With respect to the sixth objective, it is important to consolidate the existing strengths of the unit and support areas of excellence where we have built critical mass. This objective will be achieved by income generation from external funding bodies and internal funding to support existing areas of research strength including, Neurosciences, Psychophysiology, Health Psychology and Cognitive Psychology. Targeted staff recruitment represents the primary mechanism for increasing critical mass in Forensic Psychology and Animal Behaviour. The unit currently has a range of dedicated research laboratories in our current accommodation, e.g. microneurography, EEG, fNIRS, neurostimulation, sensory processes, psychophysiology, eye tracking. These laboratories are supplemented by specialised apparatus, e.g. experimental pain, virtual reality, ambulatory psychophysiology.

The last census period has seen an increase in requirements on research infrastructure in line with staff recruitment and their specific needs for their research (objective seven). During the next census period, the unit will move to a new accommodation in an existing university building and the university has committed the necessary funding to ensure that existing psychology laboratory facilities can be both replicated and enhanced at the new site, i.e., creation of larger laboratories, specifically for neuroscience research, to support postgraduate teaching and research . It is also anticipated that the unit will continue to grow through the next census period through the efforts of individuals and research groups (i.e., particularly with respect to research income generation) and the new location must have capacity to both accommodate incoming staff and support their research activity.

2. People

2.1. Staffing strategy/development

Staffing is defined by our strategic objective to recruit, develop and retain leading researchers to consolidate and expand core research groups within RCBB. The focus on strengthening our established areas of research excellence whilst investing in emerging areas has underpinned our approach to recruitment and supporting staff. Our staffing strategy has resulted in a net gain of ~28 FTEs since REF 2014 and all new appointments have been made based on excellent research track records and/or future potential, e.g. **Brooks**, **Saini**, **Roberts**. Of the new staff appointed, one is a Reader and the remainder were appointed at various points on the continuous lecture/senior lecturer scale. The 42 staff submitted comprise 24 females and 18 males. The total staff group includes two professors (both male) and eleven readers (9 female) with the remainder on the continuous lecturer/senior lecturer scale; of these 10 (23%) are ECRs. Staff across all levels have contributed to the corpus of evidence presented in support of our

submission. Specifically, ECRs are authors on 26% of submitted papers which is broadly consistent with their representation in the RCBB and 51% of submitted papers are attributed to females.

In recognising challenges inherent within the relatively rapid growth of staff in the RCBB, the policies and process described below have been instrumental in managing staff development and active succession planning. Through development we have increased our senior levels to include more current Readers and we have a pipeline of applicants in development and with mentorship for promotion to Reader and Professor in future years. In the academic year 2019/20 all five Readership applicants were female reflecting the success of departmental and university initiatives and particularly our mentorship schemes.

Staff development is informed by University procedures and all members of staff are supported and nurtured via a range of policies including annual appraisal and mentorship schemes. These align with the University's principles of the Concordat to Support the Career Development of Researchers. Staff contributing to this unit are subject to the same transparent Workload Allocation Model [WAM] managed by Subject Leaders (two male, one female) who have direct line management responsibility for staff. Research-active staff receive a performance related allowance of hours for research and impact is recognised as part of the model. Individual staff performance, development goals and training needs are identified and monitored via the annual appraisal process. This process enables discussion and implementation of personalised solutions to facilitate and support achievement of tangible research outputs. This supportive environment resulted in eight internal promotions to Reader during the current REF period, two male (**Malinowski**, 2106 and **Richter**, 2018) and six females (**Walker** 2018, and **Brooks**, **Kewley**, **Newson**, **Ogden** and **Saini**, 2020). Of these, **Newson** was awarded Readership via the Social and Economic Engagement route, which again highlights the extent to which staff achieving significant impact from their research are acknowledged and rewarded. All staff are equally entitled to apply for departmental funding for training and research activities and decisions on this are informed by the appraisal process and agreed by the School Management Team.

New staff joining the unit who are mid-career or more experienced undergo a one-year induction and probationary period. They are provided with a mentor to facilitate integration into the School/University and to ensure a smooth transition of research and provision of relevant support to establish themselves at LJMU and directly link to RCBB subgroups. New staff with limited HEI experience, including ECRs undergo a three-year induction period designed to hone teaching and research skills. This period of induction includes an enhanced research allocation protection on WAM to enable them to focus on evolving their career trajectories by providing substantive dedicated research time. **Saini** provides a good example of this; since joining the unit in January 2018 she used her enhanced research time to successfully establish her research on mental health and build a small research group. This includes 2 PhD students funded via a competitive internal scheme, 1 match funded PhD student (50% funded by both LJMU and James Place) and research assistants funded through research grants (e.g. NIHR project grant). This performance was resulted in achieving the highest category of research allowance hours on the WAM which will help ensure her continued development.

Staff undergoing three year induction are also offered mentors. Mentors are typically more senior staff in the school or from a cognate discipline. They provide support in early career development and help facilitate integration of new staff into the existing research culture. To illustrate how successful these initiatives are; **Walker** was an ECR status in REF2014 and mentored by **McGlone**. **Walker** was supported by ECR seedcorn funding from the Faculty, matched by the school which enabled her to attend a neuroimaging analysis course and establish links with the Karolinska institute and funded to attend the Aurora Women's Leadership Development course. Following success as a co-applicant on previous grant applications [e.g. with **McGlone** as PI, Leverhulme project], she successfully applied for a teaching sabbatical and this

enabled her to submit funding applications as principal investigator (MRC, BIAL) and further establish her independence as a researcher. Together this support and resulting outputs were instrumental in her enabling her successful application for promotion to Reader in 2018.

The School provides Seedcorn funding to support staff in establishing research activity, e.g. travel to develop and/or consolidate collaborative working. The Faculty and University annually offer research funding to ECRs on a competitive basis. Six staff in the unit have been successful in obtaining this funding, which has resulted in the establishment of national and international collaborative partnerships and funding. For example, **Moore** was awarded ECR funding in 2014 which enabled travel to Stanford University to establish collaborative links and work on a joint pain and attention project. This led to a successful joint funding application to Purdue Pharmaceutical in 2015 ($176, 000 total, $39,000 to LJMU) to carry out further work and subsequent funding applications to extend the work are in progress. To date, findings have been presented at national and international conferences (International Association for the Study of Pain, American Pain Society, British Pain Society) one paper has been published (**Moore** et al., 2019) with more to follow. The School organises a programme of research seminars that include internal and external national and international speakers. School seminars are organised by RCBB and provide an excellent opportunity for new staff and ECRs to showcase and present work in progress and contribute to collaborative research activity. Staff in the unit have also received funding to run individual seminars or workshops on specific topics which attract internal and external participants, for example, **Brett** and **Kidd** successfully obtained funding from The MARCH Network to run a sandpit event on social prescribing (February 2020). This event attracted key stakeholders [commissioners, providers, beneficiaries] nationally and focused on engagement and evaluation in social prescribing, identifying key priorities for research and impact. Additionally, RCBB groups run their own lab and research meetings including journal clubs, protocol development, and specific sessions on new methods or apparatus which informally support staff development at all levels.

The University is committed to the Concordat to Support the Career Development of Researchers. Broader training, career guidance and staff development needs are also met at University level via a mainstream Staff Development Programme and a specific Researcher Development Programme provided by Research and Innovation Services (RIS) which includes the Award-Winning ACTivator workshops. These workshops provide bespoke training on a variety of topics such as funding, ethics, research supervision, getting published etc. To date 19 of the staff in the unit have attended 36 workshops; those most attended are a) Funding applications: Getting a yes, b) Building blocks of impact, and c) Surveying the funding landscape. Training in postgraduate research supervision is mandatory for staff engaged in supervision of PGRs , and ~60% of staff have completed this training. Additionally, staff new to PhD supervision are initially mentored by more experienced supervisors.

Aligned with the principles set out in the revised Concordat to Support the Career Development of Researchers (published in 2019), we are equally committed to improving the research environment for researchers on externally funded fixed-term contracts. We recognise and value the importance of ensuring that fixed-term researchers have the opportunity to engage with development and training activities and we are committed to promoting a positive culture where fixed term staff are encouraged to achieve their full potential. Over the period 25 researchers have been employed and the number has remained fairly consistent year on year with an average of 4 annually. As members of staff they also undergo induction and annual appraisal processes and have access to the same training and development resources as other staff. Testimony to their experience and continued development while employed in the unit, three research staff have gone on to obtain substantive permanent posts following Post Doc tenure. Boulton who left to join another HEI has since returned to LJMU as a lecturer/senior lecturer in the School of Justice studies. While, **Pawling** and **Trotter** were appointed to full posts in 2017 and 2018 respectively which further evidences our commitment to developing staff across all levels.

2.2 Research students

There are currently 27 PGR registrations in RCBB, reflecting a continued upturn in research student recruitment since 2014, and 26 PhDs awarded in current review period compared to 12 in REF2014. In addition, we have 23 trainees registered on the Professional Doctorate in Health Psychology which began recruiting in 2017, and three who have successfully completed their Professional Doctorates. PGRs and Prof Docs are members of the LJMU Doctoral Academy. The Doctoral Academy's Researcher Development Programme (RDP) supports PGRs throughout their doctoral journey. It is fully mapped to the Vitae Researcher Development Framework, and as well as helping PGRs to develop research and transferable skills, the RDP also enhances the PGR community by encouraging peer networking across faculties. Research students also become associate members of RCBB, linked to the relevant RCBB research groupings. Both the Doctoral Academy and RCBB provide a community for research students which augments their sense of belonging within the wider LJMU research community and their specific research areas via RCBB subgroups. As described below, the Doctoral Academy provides a mechanism to monitor supervision, training and development to ensure a high-quality PGR experience and timely completions.

There are a variety of ways in which PGRs are funded including; directly by the University, via matched funding from LJMU and an external organisation (e.g. James 'Place), through Industry (e.g. Glaxo Smith Kline CASE studentship), and as is the case for 2 Prof Docs, by their employer (e.g. NHS). The University has a highly competitive annual scheme for VC scholarships and four of our current PGRs are in receipt of these, while another two have successfully completed their studies. PGRs have dedicated shared office space within the Faculty, designed to promote a sense of identity and peer support. Adjacent accommodation for post-docs and research assistants enhances membership of a growing research community within the RCBB.

Research students at LJMU attend compulsory induction activities provided by the Doctoral Academy and progress of students is closely monitored by the supervisory team who report to the Faculty Research Degrees Sub-Committee (FRDC) and beyond to the University's Research Degrees Committee. The Doctoral Academy's new online system 'eDoc 'facilitates the process of monitoring training and development throughout their studies. Additionally, each school has a Post-graduate Tutor (for psychology; **McGlone**) who acts as a point of contact for current and prospective students as well as supervisors. At the end of their first year, all students are required to submit a transfer report and participate in a viva. They are examined by someone external to the supervisory team, with relevant expertise in the subject and/or methods. This process enables the progression and future viability of their research to be quality checked, and helps ensure the relevant resources and support are available to aid successful completion.

The Doctoral Academy also support annual PGR Research Days across the faculties, the Three Minute Thesis (3MT) competition, and funding to attend national and international conferences. The annual PGR Research Days in each faculty provide a forum for students in their second and third years of study to present their research. They also help plan the programme and contribute to chairing sessions, something which those involve report being beneficial to their development. For example, Mattieson states 'Participating in PGR research days has enhanced my communication and dissemination skills greatly, and has highlighted the importance of engagement and wider impact of research.' Research Days include prizes for the highest rated posters and oral presentations and six students from the unit have been awarded these prizes during the current census period (Baker, Makdani, Provazza, Slade, Sneider and Talamonti). The Faculty participates in the University wide Three Minute Thesis (3MT) competition whereby Faculty winners go forward to compete with PGRs in other Faculties and two PGRs (Mattieson and Slade) have represented the unit at the University wide competition. In terms of additional support for attending and presenting at scientific meetings, PGRs can apply to the Doctoral Academy for

funding. To date, 10 PGRs in psychology have successfully obtained this funding and presented their findings at a range of meetings, e.g. International Association for the Study of Pain, Diabetes UK.

The most recent Post Graduate Research Experience survey (PRES) that LJMU participated in (2017) highlight that for the Faculty of Science, where all PGRs in this unit were based at the time of the survey, 94% were satisfied they had regular contact with supervisors, 92% that supervisors had the skills and knowledge to support them, 91% that feedback from supervisors provided good direction for research activities and 91% were satisfied with their research skills development.

Alongside specific Doctoral Academy workshops, PGRs are required to attend, participate in, and present at departmental seminars which provide opportunities for them to further develop their skills, such as presenting their findings prior to doing so at national/international conferences. For example, Stone and Begley presented their work prior to delivering it at national and international meetings (British Psychological Society (Portsmouthh) and a European Pain Conference (EFIC, 2020) respectively). As seminars are attended by external speakers and collaborators, who contribute to questions and discussions, they enable PGRs to consolidate and enhance their networking, debating and dissemination skills. Further, PGRs are encouraged to present at the end of their first year with a focus on the work they are submitting for transfer to PhD. Together, all these activities provide excellent opportunities for PGRs to hone their skills in a competitive and supportive environment to aid their future development and potential.

2.3 Equality/Diversity

The University holds membership of the Athena Swan Charter and received the Athena Swan Bronze award in 2018. A school submission is planned for 2021. As a unit, we are monitored and follow LJMU policies on Equality and Diversity as set out in the Strategic Plan (2017-22). All staff are required to participate in training on diversity and equal opportunities annually and we adhere to LJMU policies in our recruitment processes, activities and staff development. We have a large proportion of female academics in the unit (57%) and during the period of assessment have been supported by fixed term staff when permanent members of staff have taken 12 periods of maternity leave and 3 have taken paternity leave. Staff returning from maternity or extended paternity leave have a reduced workload initially and this is adjusted to maintain proportionate time for research activities. Those returning from maternity or paternity leave on a part time basis also receive the same time pro rata in line with their research allowance in order to continue as an active researcher. All staff are managed in line with child and carer-friendly HR Policies with an emphasis on flexibility and support. Staff requests for flexible and part time working are reviewed at School, Faculty and University level and during the current REF period, 100% [8] of these requests have been approved.

It is worth noting that two of the five successful applications for promotion to Reader in 2020 were submitted by staff who have had more than one period of maternity leave during the current REF period (**Ogden** and **Newson**). All LJMU staff are entitled to apply for periods of sabbatical leave subject to School and Faculty approval. **Walker** applied during the census period and was successful, using the time to work on writing and the development of future projects. In recognising the gender imbalance across the sector, LJMU has developed a range of support for female academics seeking promotion to reader/professor and/or leadership positions, including mentorship and financial support to attend the AURORA Leadership Development programme. Four female RCBB academics have participated in the AURORA programme and been assigned a mentor staff as part of the initiative to encourage applications for promotion to Reader/Professor. Of these, **Walker**'s application to Reader was successful in 2018 and **Saini**'s application for the same was also successful. In addition, **Cazzato** who attended the AURORA training, successfully applied to become part of the LJMU cohort in the TRANSPEER International Project. This is an

Erasmus Plus funded international researcher development project (2017-20) that exposes participants to the importance of personal and career development and planning in an international context.

3. Income, infrastructure and facilities

3.1 Income

The unit was awarded over £1,393,000 of income during the current review period, an increase of 34% compared to previous census period. With respect to funding sources, approx. 16% was obtained from UK Research Councils and 48% from UK-based charities. For example, **McGlone** obtained funding from the BBSRC for a CASE award from 2014-2017, which was worth £125,250 ("Understanding the neural and behavioural mechanisms engaged during oral sensory processing"). The work of **Simmons** and colleagues ("'Understanding the influence of cognition and the home learning environment on early number skills") funded by the Nuffield Foundation from 2016 to 2018, and worth £151,609 to the university, represents one high-profile example of charitable funding obtained by the unit. A project funded by the Leverhulme Trust from 2014 to 2016 on "Investigation of the role of 5-HT in psychological responses to affective touch" obtained by **McGlone** and **Walker** is another example (£235,639), which represented important background research for ICS4. UK government bodies and UK industry accounted for approx. 13% of funding obtained by the unit, e.g., **Fairclough** was funded by the Department of Transport to work a local SME to develop driver training using virtual reality from 2017-2018 (£25,000). The unit was also funded during the current census period by EU-based organisations, which accounted for approx. 18% of total research income. The award granted to **Richter** from the Swiss National Science Foundation from 2016 to 2018 on listening effort is one example (£20,567).

With respect to patterns of income generation, the unit has substantially increased income from UKRI sources between the first and second parts of the census period, e.g., 9% of total income prior to 2017, which increased to 21% in subsequent years. Income from UK charitable bodies has fallen slightly from 59% of total income to 41%. Due to uncertainties surrounding EU funding due to Brexit, income from EU sources fell from approx. 23% to 13% of total income from the first to the second parts of the census period. However, income generation from UK government and industry increased from 8% to 16% of total income through the census period.

3.2 Infrastructure & Facilities

The infrastructure to support research in the School of Psychology is based in the Tom Reilly Building on the Byrom Street campus of the university. The psychology laboratories occupy the second floor of this building supported by two dedicated technicians. Three existing laboratories were described during the previous review exercise, dedicated to the study of: sensory processes (SomAffect Lab), EEG and functional near-infrared spectroscopy (fNIRS). The SomAffect Lab was heavily used for research funded by BBSRC and the Leverhulme Trust. Since the 2014 review the SomAffect Lab has expanded its capability with microneurography by coupling single-unit electrophysiological recordings from cutaneous sensory afferent nerves with the iontophoretic delivery of polar molecules, e.g., lignocaine, to uncouple transduction mechanisms in low threshold mechanoreceptors. New acquisitions for this lab include an ultrasound stimulator to study virtual touch with microneurography and psychophysics, and a new robotic stimulator (MultiTac) that allows the delivery of ecologically relevant touch gestures. Also, to support research on pain, the lab was recently equipped with the Somedic SenseLab and a quantitative sensory testing kit (QST), plus a bespoke fMRI-compatible, compression-pain stimulator. The work conducted in the SomAffect lab is foundational for the research impact described in ICS4. For example, the development of work on neonatal neurodevelopment led to design and construction

of a prototype NICU baby massage device, which is currently being tested at Alder Hey Children's Hospital (see ICS4 for more details).

The EEG laboratory is constructed around four distinct BioSemi systems capable of monitoring 32-128 channels within an electrically-insulated space. These facilities have been extended since the last review by the purchase of an ambulatory EEG system (LiveAmp via Brain Products) that is capable of collecting high-quality data while participants are in motion, either in the laboratory or the field (£20,000, purchased in 2017). The fNIRS laboratory has been upgraded since the previous review exercise. The fNIR200 (BIOPAC Inc.), which included four emitters in a fixed location on the forehead) has been replaced with an Oxymon system (ARTINIS Ltd.). The Oxymon (£32,000, purchased in 2015) offers a number of advantages over the fNIR200, specifically: (i) a higher number of channels, (ii) flexibility with placement of optodes covering the whole scalp, (iii) the capability of collecting optical data through hair, and (iv) the inclusion of 'short-leads 'to remove systemic influences from the signal. The fNIRS lab has supported three PhD student projects and externally-funded work from DSTL, which provided foundational research for development of ICS2. There is also an active collaboration between the School of Psychology and the Department of Engineering who have purchased an ambulatory fNIRS system, the NIRx Sport (NIRx Ltd.), and we operate an informal policy of equipment sharing. By pooling our respective apparatus, we have facilities to monitor 4-24 channels of fNIRS in both sedentary and ambulatory scenarios within the fNIRS laboratory or the ship bridge simulator.

The facilities for psychophysiological research have also been expanded during the current review period. A psychophysiology laboratory space has been established, which includes the CardioScreen 100 impedance cardiograph (Medis Ltd.) in addition to recently-purchased apparatus for psychophysiological measurement, e.g., MP36 (BIOPAC Inc.) and PowerLab (ADInstruments Ltd). This facility is complemented by an eye tracking device (Tobii X3-120 - £20,000) that permits measurement of pupil dilation. In addition, our existing suite of psychophysiological apparatus (described during the previous review exercise) have been supplemented by the purchase of BioNoMadix wireless physiology modules (BIOPAC Inc.). These wireless modules are capable of monitoring a number of signals, e.g. electrocardiogram, respiration, electromyography, skin conductance, triaxial acceleration, in an ambulatory participant either in the lab or in the field. These ambulatory sensors facilitated collaborative work with the School of Computer Science (see ICS2 for details).

Since the last REF exercise, the School have recruited staff with a specific interest in neurostimulation and a dedicated laboratory has been created to support their work. This laboratory contained a Transcranial Magnetic Stimulator (TMS), the Magstim Rapid^2 that was purchased for £25,000 in 2018. Further funding was obtained from the Royal Society (£20,000) to purchase SofTaxic Optic - neuronavigation system for TMS. The Softaxic Optic system is a sophisticated system for stereotaxic neuronavigation that complements the Rapid^2 TMS system. Research facilities available to the unit have also been extended via partnerships both within and outside the university. The ship bridge simulator is a state-of-the-art facility with a 360° field-of-view, which is located within the Department of Engineering at our institution; this facility was used to apply neuroscientific methods (e.g., fNIRS) to the study of safety-critical behaviour. The use of virtual reality (VR) to study the psychophysiology of emotion led to collaboration with the Department of Computer Science at LJMU and utilisation of the Live Lab, which is a space dedicated to the evaluation and testing of immersive technology. The Live Lab contains camera technology that is capable of tracking human posture, movement and facial expression. Research into mixed-reality systems has been conducted in an immersive space located at a local SME as part of an ongoing KTP collaboration, this space contains: 3D projections, touch sensitive surfaces, spatial audio, body tracking, Hololens etc (see ICS2 for details). The unit also has access to a number of fMRI scanners via collaboration with other institutions, such as the Liverpool Magnetic

Resonance Imaging Centre at the University of Liverpool (3T scanner) and a 7T scanner at Nottingham University.

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

Cognitive and Affective Neuroscience group

Malinowski has delivered two keynotes at international conferences, e.g., Trends In Mindfulness (Turin, 2016), Second International Conference on Mindfulness (Rome, 2016). This group have also been involved in publishing academic books, for example, **Bruno** edited "The Preservation of Memory: Theory & Practice for Clinical and Non-Clinical Populations" for Psychology Press, which was published in 2015 and **Terbeck** authored a research monograph entitled "The Social Neuroscience of Intergroup Relations" published by Springer in 2016. **Malinowki** sits on the editorial board for the journal Mindfulness (IF: 3.48) and **Terbeck** is an associate editor for Frontiers In Virtual Reality (IF: pending). **McGlone** is co-founder/President of the International Association for the Study of Affective Touch (https://iasat.org/), which host biannual international meetings. Members of this group also have active collaborations via co-supervised PhD students or research projects with institutions in the UK, e.g., University of Liverpool (**Malinowski**), Oxford University (**Terbeck**), and abroad, e.g., Stanford University (**Moore**), University of Sydney (**Malinowski**), Sorbonne (**Bruno**), University of Wisconsin (**Bruno**).

The economic contribution of the unit has been achieved via a number of industrial partnerships, ranging from multinational corporations to local SMEs. **McGlone** and **Walker** have been funded by the Leverhulme Trust (2013-2015: £235,639), BIAL Foundation (2016: £38,400, 2017-2018: £40,327) BBSRC (2013-2017: £90,880) and the Pain Relief Foundation (2014-2017: £63,618). **Malinowski** from the same research grouping has been funded by ECONT (2017-2020: £30,000) and Pain Relief Foundation (2014-2018: £59,000). **Malinowski** also serves as a scientific advisor for two companies based in Europe: Mindset Neuroeducación (Spain) and the Timeless Impact Academy (Germany). **Bruno** has also received funding from NIH (USA) as part of a large grant investigating Alzheimers Disease (£167,216 to LJMU), which commenced in June 2020.

Health and Wellbeing group

Forshaw was a Trustee of the BPS for six years (until 2018) and Chair of the Membership & Standards Board, which is responsible for membership standards and training for entry to the profession, across all 'types 'of psychologist. **Forshaw** also founded the Crisis & Pandemic Interest Group in April 2020 as a direct response to the COVID-19 situation, bringing together a team of researchers and practitioners, primarily psychologists with an interest in health. The group has expended to include members across the UK, and in Canada and Cyprus and experts in public health, education, law, supply chain management, and forensic computing. This 35-strong membership are involved in around 20 projects focused on the pandemic and, looking forward, other crisis situations. **Eames** is an executive board member of the research awards committee for the BPS in the Division of Clinical Psychology. **Brett** served as a member of the Standing Conference Scientific Committee for the Division of Health Psychology (BPS), and **Poole** and **Tarling** sit on the BPS Division of Health Psychology Training Committee. **Forshaw** has also served on the editorial board of International Journal of Health Promotion and Education and was President of the Institute of Health Promotion and Education for two years. Members of the Health and Wellbeing group also have active collaborations with institutions in the UK, e.g., University of Liverpool (**Eames**, **Sheen**, **Saini**), University of Edinburgh (**Brett**), Anna Freud Centre (**Ashworth**), and abroad, e.g., Freie Universitaet Berlin (**Eames**), Nagoya Keizai University (**Eames**).

Collectively, members of the unit regularly review papers for a broad range of journals in addition to those mentioned above, a selective list includes: British Journal of Health Psychology, British Journal of Educational Psychology, Biological Psychology, Memory & Cognition, Journal of Criminal Psychology, BMC Pregnancy & Childbirth, Neuroimage, International Psychogeriatrics, Consciousness and Cognition, Experimental Psychiatry, Nature Scientific Reports, Pain, PLoS One, Nature Neuroscience etc. Members of the unit also contribute to peer-review of funding applications for organisations, such as: Wellcome Trust, NIHR, ESRC, EPSRC, MRC, etc. and Law is a member of the ESRC Peer Review College.

With respect to funding, members of the Health and Wellbeing group have obtained funding from local NHS Trusts and community health, e.g. **Poole** (£5,000: 2020), **Newson** (£19,820: 2016-2017). **Saini** received funding from NIHR in February 2020 on a large project to investigate community outpatient psychotherapy for self-harm (£186,537). Also, **Poole** has received regular funding from the Pain Relief Foundation from 2014-2019 to the value of £16,800.

The Health and Wellbeing group have also been actively involved in practitioner-based research and supporting the work of health professionals. For example, **Poole** co-authored clinical guidelines on the management of complex regional pain syndrome, which has been downloaded 9,600 times since publication in 2018. **Newson** was commissioned by the BPS to chair a National Expert Panel that forms an Obesity Task Group. This Task Group produced a BPS document "Psychological perspectives on obesity: Addressing policy, practice and research priorities" that was published in September 2018. The document was distributed to All-Party Parliamentary groups, professional bodies (e.g., British Dietetics Association) and NHS trusts. In March 2020, **Newson** was an invited representative for the BPS to speak at a National Parliamentary Conference entitled "Addressing Obesity Stigma." **Eames** holds a position on the Mersey Care NHS Foundation Trust to direct priority areas in mental and physical health. She also consulted on the development of learning resources published to train clinical psychologists on human rights, decision-making, leadership and evaluation. **Sheen**'s research on PTSD symptoms in obstetricians and gynaecologists was published in a specialist magazine distributed by the Royal College of Obstetricians and Gynaecologists and she was invited to present her work at the Royal College of Midwives 'Learning Representatives Conference in June 2019.

Psychophysiology

Members of the Psychophysiology group also hold editorial roles for academic journals, **Richter** has served as Editor-in-Chief for the journal Motivation and Emotion since 2017 and acted as action editor for the International Journal of Psychophysiology (2015-2016). **Fairclough** served on the editorial board for IEEE Transactions on Affective Computing from 2013-2019 and is currently speciality editor for neurotechnology/systems neuroergonomics on the Frontiers In Neuroergonomics journal, which launched in September 2020. **Fairclough** also co-edited a collection "Advances in Physiological Computing" published by Springer in 2014 (over 17,000 downloads by June 2020).

The group have also been active in the organisation of international conferences, **Ogden** organised a workshop on modularity in time perception funded by the Experimental Psychology Section (50 delegates from across UK and Europe). **Fairclough** is the co-chair of the biannual Neuroadaptive Technology conference, which has been held in Berlin (2017; 100 international delegates) and Liverpool (2019: 80 international delegates). Members of the psychophysiology group also have active collaborations with institutions in the UK, e.g., Imperial College London (**Fairclough**), University College London (**Kidd**), University of Nottingham (**Richter**), and abroad, e.g., University of Queensland (**Ogden**), Vrije Universiteit Amsterdam (**Richter**), University of Toulouse (**Fairclough**).

With respect to the Psychophysiology group, **Fairclough** has worked with a number of UK-based SMEs. He is the academic supervisor on a Knowledge Transfer Partnership project (2019-

2021) funded by Innovate UK with local SME Immersive Interactive. This project is worth £175, 824K to the institution. He has also provided academic support for the work of CGA Simulation, a SME based in Liverpool, who specialise in game development and simulation. His contribution has enabled CGA Simulation to win contracts from the Department of Transport (£25,000: 2017-2018) and Defence Science & Technology Laboratory (£20,000: 2019). **Fairclough** also obtained funding from Emteq Labs Ltd., a SME based on Brighton, to co-fund a PhD studentship on wearable sensors in VR headsets (£42,000: 2017-2020); he is also a member of the scientific advisory board for Emteq Labs - see ICS2 for full details.