COWLEY, BENJAMIN ULTAN

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Education

2009	PhD	title: "*Player Profiling and Modelling in Computer and Video Games*", University of Ulster, Northern Ireland, United Kingdom. Supervisor: Dr. Darryl Charles.
2003	Bachelor	First class honours, topic: *Information and Communications Technology*, Trinity College Dublin, University of Dublin, Ireland

Current Positions

2017–	Visiting Researcher, Cognitive Brain Research Unit, University of Helsinki
2015–	Docent (Adjunct Professor), topic: "*High Performance Cognition*" (HPC), Faculty of Behavioural Sciences, University of Helsinki. Recommended by Profs Risto Näätänen, Elisabet Service

Previous Positions

2014→2017	Specialist Research Scientist, Finnish Institute of Occupational Health (FIOH), Helsinki
2012→2013	Postdoctoral Researcher, Cognitive Science unit, Faculty of Behavioural Sciences, University of Helsinki
2012→2012	Postdoctoral Researcher (part time), School of Business, Aalto University, Helsinki
2010→2011	Postdoctoral Researcher, School of Business, Aalto University, Helsinki
2009→2010	Postdoctoral Researcher, Center for Knowledge and Innovation Research, Helsinki School of Economics, Helsinki

Career Synopsis. My career aim is to study *the neurocognitive characteristics of high performance cognition*.

My early theoretical work on HPC was published during my PhD; subsequently my focus has been on supporting empirical topics. This choice was motivated by the philosophy that understanding higher cognition must come on foot of building an integrated picture of the *embodied, interactive context*.

My postdoctoral career illustrates my independence and productivity. My choice of positions has built relevant skills, under respected supervisors (Profs Niklas Ravaja, Christina M. Krause, Minna Huotilainen). I have also worked independently to study relevant methods, autodidactically and at international courses, on computational neuroscience, neuroimaging, and neurofeedback. With Prof Ravaja I studied psychophysiology of game players; working independently in a concurrent project, I built and led a team (six hires) to design, develop and test serious games. In my next position with Prof Krause, I aimed to improve my knowledge of experimental cognitive neuroscience, coordinating the first Finnish clinical trial of neurofeedback. I designed two laboratory protocols for testing executive functions. I worked autonomously on other project tasks: trial design and implementation; neurofeedback platform design, coordination of software development; and management of a team of up to eight researchers of varying seniority. Recommended by Prof Huotilainen, I was headhunted for an independent position to coordinate research on cognitive neuroscience in a large strategic project. I have also built a number of fruitful collaborations that complement my own expertise, with respected labs at the University of Helsinki: Prof. Maija Castrén at Faculty of Medicine; Docents Satu and Matias Palva at the Neuroscience Centre; Dr Otto Lappi at Cognitive Science.

This multidisciplinary career creates a unique opportunity for me to converge disparate lines of work and develop the integrative theory of higher cognition.

Teaching Activities

2018	Teaching scientific programming course, Cognitive Science, University of Helsinki
2017	Teaching experimental lab course, Cognitive Science, University of Helsinki
2017	Developed doctoral course "*The Psychophysiological Primer*". University of Helsinki
2013 & 2017	Developed post-graduate course "*Scientific Writing in English*". University of Helsinki
2011→2014	Developed under-graduate course "*Player-centered game design*". Metropolia University of Applied Sciences
2008→2009	Teaching assistant for: data mining, game design, programming. University of Ulster, UK

Supervision of theses [1]

2015→ 2018	Lauri Ahonen	*Doctor of Philosophy*, Faculty of Arts, University of Helsinki	*Quantifying cognition: applications for ubiquitous data*
2013→ 2017	Kristiina Juurmaa	*Masters*, Faculty of Behavioural Sciences, University of Helsinki	"*Trial-to-trial variability of EEG during a Continuous Performance Task in adults with ADHD*"
2013→ 2014	Édua Holmström	*Masters*, Faculty of Behavioural Sciences, University of Helsinki	"*Examination of the neural-regulation learning process during neurofeedback treatment for ADHD*"

1. In addition, I have supervised three Masters and one Doctoral student who did not complete. Due to years working in non-teaching institutes, I have not had opportunity to supervise undergraduate theses.

Managerial roles in research projects

Period	*Scope, #Partners*	*Role*	*Duties*
2014→2017	National, 3	Coordinator	Coordinated 12 researchers, supervised 3 RAs
2011→2013	National, 5	Coordinator, lead researcher	Built & supervised team of 8 RAs; coordinated clinical setup & software development
2010	University, 1	PI	Coordinated 6 researchers
2009→2012	EU FP7, 11	Coordinator	Supervised 2 software engineers and 3 RAs
2009→2011	EU FP7, 17	Coordinator, lead researcher	Built & managed software development team with 7 hires; supervised 2 RAs

Institutional Responsibilties & Commissions of Trust

2013, 2016, 2017	Invited Grant Reviewer: Engineering Research Council, UK; and OeNB (Austrian Central Bank) Anniversary Fund www.oenb.at/en
2013, 2016, 2017	Reviewer, Masters theses, Faculty of Behavioural Sciences, University of Helsinki
2010–	Reviewer for multiple international journals/conferences, 2-3 per year, including: SIGCHI CHI2011, Elsevier 'Computers & Education' and 'Entertainment Computing', Springer 'User Modelling and User-Adapted Interaction', IEEE 'Computer' magazine, MDPI 'Informatics', Lancet Psychiatry
2007→2008	Faculty of Computing & Engineering Postgraduate Students' Representative, University of Ulster, UK

Scientific Referees

Prof Emerita Christina M. Krause	Cognitive Science unit, PO Box 9, FI-00014 University of Helsinki, Finland. `christina.krause@helsinki.fi`
Prof Minna Huotilainen	Cognitive Brain Research Unit, PO Box 9, FI-00014 University of Helsinki, Finland. `minna.huotilainen@helsinki.fi`
Adj.Prof Kai Puolamäki	FIOH, PO Box 40, 00290 HELSINKI, Finland. `kai.puolamaki@ttl.fi`

Major Collaborations

Prof Niklas Ravaja	Psychophysiology and learning in games, School of Business, Aalto University, Helsinki. *8 joint papers*
Dr Darryl Charles	Machine learning for player modelling, School of Computer and Information Engineering, University of Ulster, UK. *7 joint papers*
Ass.Prof Giulio Jacucci	Psychophysiology of human-computer interaction, Faculty of Science, University of Helsinki. *1 joint paper*
Prof Minna Huotilainen	Neural correlates of human-computer interaction, Faculty of Education, University of Helsinki. *2 joint papers*
Adj.Prof Kai Puolamäki	Psychophysiology of collaborating knowledge workers, FIOH, Helsinki. *2 joint papers*
Adj.Profs Satu & Matias Palva	Magnetoencephalography of adult ADHD, Neuroscience Center, University of Helsinki. *study ongoing*
Prof Maija L. Castrén	Epileptic electroencephalography & attention, Faculty of Medicine, University of Helsinki. *1 joint paper*
Dr. Otto Lappi	High performance cognition and Flow in games, Cognitive Science, University of Helsinki. *study ongoing*

Invited Presentations

2017 "*Collaboration and physiology - Pair working in the wild*", Quantified Employee seminar, Helsinki

2017 "*Cognitive Perspectives on Flow in Games*", Nanyang Technological University, Singapore

2017 "*Applications of Data Mining to real-world data*", Nanyang Technological University, Singapore

2014 "*Player-Centered Game Design*", Spring symposium, Department of Media, Aalto University

2013 "*Learning and Flow, in games and psychophysiology*", at the symposium "Fostering learning through emotions, virtual reality and video-games", Swiss Center for Affective Sciences, University of Geneva, Switzerland

2013 "*Psychophysiological correlates of learning in games*", Autumn Cognitive Science symposium, Faculty of Behavioural Science, University of Helsinki

2013 "*Computational Modelling of Visual Attention*", Spring Cognitive Science symposium, Faculty of Behavioural Science, University of Helsinki

2008 "*Optimal Experience In Computer Games: Can Enjoyment be Measured?*", Research Graduate School conference, University of Ulster, UK

Fellowships

2005→ 2008 Vice-Chancellor's Research Scholarship for doctoral studies, School of Computer and Information Engineering, University of Ulster (highly competitive, value ∼70 000€)

Awards & prizes

2013 Competitive research support funding, €1500, Chancellors Grant, University of Helsinki

2012 Two awards for 'superior publications' (IF>1.5), €4000, HSE Foundation, Aalto University

2011 Competitive research support funding, €1500, HSE Foundation, Aalto University

2010 Competitive research support funding, €1500, HSE Foundation, Aalto University

2010 1^{st} European 'Best Learning Game Competition', 1^{st} Prize

2007 Competitive research support funding, GBP£500: Royal Academy of Engineering, UK

Other major scientific achievements

2016 I edited a major review and primer for application of psychophysiology in human-computer interaction, coordinating 12 contributors to produce a mini-handbook (Cowley, Filetti, *et al*, 2016).

2016 I designed and developed EEG processing software that will give researchers the tools to computationally derive optimal methods for their dataset (see Cowley, Korpela, & Torniainen, (2016,2017) and version 1.0 at https://github.com/bwrc/ctap).

2013 I conducted the first clinical trial of neurofeedback in Finland, with several valuable but as-yet unpublished outcomes. I designed two novel laboratory protocols (first described in posters (see e.g. http://dx.doi.org/10.13140/RG.2.1.5035.2886) and available at https://github.com/zenBen/Kanizsa_Prime; second with documentation forthcoming). I co-designed and coordinated development of the implementation platform (available at https://github.com/CBRUhelsinki/CENTplatform, paper forthcoming). I was responsible for six international research exchanges to bring the needed domain expertise to Finland.

2012 I produced a software module for an immersive 3D learning game, to classify emotional/cognitive states of the learner in real-time (Bedek, Cowley, *et al*, 2013; Fantato, Cowley, Ravaja, 2013).

2011 I designed and produced a web-based serious game to inspire energy efficient behaviours (Cowley, *et al*, 2011); deployed and evaluated the game in a controlled experiment to analyse efficacy of design strategies (forthcoming).

Non-degree further education, where relevant

2012, '14, '15	Matlab development training	Mathworks, Helsinki, Finland
2013	Magnetoencephalography Training program	Elekta Oy, Helsinki, Finland
2013	Baltic/Nordic neuroinformatics summer school	University of Kaunas, Lithuania
2013	Transcranial Magnetic Stimulation symposium	Aalto University, Helsinki, Finland
2012	Neurofeedback (BCIA accredited course)	Radboud U., Nijmegen, Holland
2011	fMRI introductory course	Aalto University, Helsinki, Finland
2010, '11	Computational neuroscience summer school	Max Planck Inst., Göttingen, Germany
2009	Brain imaging technology seminar	Aalto University, Helsinki, Finland
2006, 2007	Project management training	University of Ulster, United Kingdom

Membership of scientific societies

2012→ *present*	Federation of European Neuroscience Societies (FENS)
2013→2014	European Brain and Behaviour Society (EBBS)
2012→2013	International Society for Neurofeedback Research (ISNR)
2012→ *present*	Brain Research Society of Finland (BRSF)
2008→ *present*	Isaac Newton Institute for Mathematical Sciences, United Kingdom

Research Expeditions

2014 As part of a prospective program of work to study the neural correlates of attention using the tools of experimental comparative psychology, I travelled to Colombia to develop research networks. I gave a talk at the 17th Meeting of the International Society for Comparative Psychology, Bogotá; following this, I travelled to the north-west area to meet local anthropologists and lay the groundwork to begin studies with the local indigenous population, the Kogi Native Americans. The Kogi culture is relatively unchanged since pre-Colombian times, and as it is non-literate but highly information-rich, offers a unique opportunity to study the comparative relationship between culture, attention, and brain development (following the format of pioneering work by Rotenburg and colleagues in Siberia).

2012 In order to bring required knowledge of neurofeedback research to Finland, I took an intensive series of six short trips to visit leading European experts in Muenchen, Tuebingen, and Erlangen in Germany; and Nijmegen in the Netherlands.

Funding success, as PI or application co-author

Total k€	*Project title*	*Funding source*	*Period*	*Role in project*	*Role in application*
2618	Revolution of Knowledge work (Re:Know), #5159/31/2014	TEKES: Finnish Funding Agency for Innovation	2015→'17	WP Leader[1]	Co-author, with PIs
1500	Computer Enabled Neuroplasticity Treatment (CENT), #440078	TEKES: Finnish Funding Agency for Innovation	2011→'13	Lead Researcher/ coordinator[2]	Co-author, with manager Markus Kivikangas & PI Christina M Krause
25	Play Patterns And eXperience (PPAX)	Aalto University	2010→'11	PI	Main author

1. My role (leading 1 of 5 WPs) was to coordinate studies of cognitive state in HCI, including: using EEG to detect interaction of executive functions with global-local attention; using EEG to detect impact of motivation on information search; reviewing psychophysiology methods in HCI; developing methods to process EEG data; and using physiology to detect social linkage of collaborating programmers.
2. My role was to coordinate the project and design the clinical trial and all supporting experiments for the intake and outtake.

LIST OF PUBLICATIONS

28 peer-reviewed publications (+5 in press/forthcoming): 17 journal papers (15 as first author, FA); two book chapters (2 FA); eight conference proceedings (4 FA); monograph doctoral dissertation. Also eight conference posters, 11 preprints (7 FA), five software repositories, and five invited presentations. Full list of scientific works including full-texts: www.researchgate.net/profile/Benjamin_Cowley

Top five publications marked by ❄. Publications categorised according to Finnish National classification system JUFO. Open access papers marked 'oa'. Citation counts per paper by: Scopus | Google Scholar.
Total citations (excl. self-cites) >670, h-index 10 (by Google Scholar, used due to broad range of venues).

A1 – Original scientific articles.

139 | 300 ❄	**Cowley, B.**, Charles, D., Black, M., & Hickey, R. (2008). Toward an understanding of flow in video games. Computers in Entertainment, 6(2), 1–27.
10 | 14	**Cowley, B.**, Moutinho, J., Bateman, C., & Oliveira, A. (2011). Learning Principles and Interaction Design for "Green My Place": a Massively Multiplayer Serious Game. Entertainment Computing, 2(2), 10.
3 | 11	**Cowley, B.**, Heikura, T., & Ravaja, N. (2013). Learning loops - interactions between guided reflection and experience-based learning in a serious game activity. Journal of Computer Assisted Learning, 29(4), 348.
6 | 11	**Cowley, B.**, Ravaja, N., & Heikura, T. (2013). Cardiovascular physiology predicts learning effects in a serious game activity. Computers & Education, 60(1), 299–309.
2 | 8	**Cowley, B.**, Charles, D., Black, M., & Hickey, R. (2013). Real-time rule-based classification of player types in computer games. User Modeling and User-Adapted Interaction, 23(5), 489–526.
| 3	**Cowley, B.**, Kosunen, I., Lankoski, P., Kivikangas, J. M., Jarvela, S., Ekman, I., … Ravaja, N. (2014). Experience Assessment and Design in the Analysis of Gameplay. Simulation & Gaming, 45(1), 41–69.
2 | 6 oa	**Cowley, B.**, Fantato, M., Jennett, C., Ruskov, M., & Ravaja, N. (2014). Learning When Serious: Psychophysiological evaluation of a Technology-Enhanced Learning game. Journal of Educational Technology & Society, 17(1), 3–16.
| 4 oa	**Cowley, B.**, & Ravaja, N. (2014). Learning in Balance: Using Oscillatory EEG Biomarkers of Attention, Motivation and Vigilance to Interpret Game-Based Learning. Cogent Education, 1(1), 1–23.
| oa	**Cowley, B.**, Kirjanen, S., Partanen, J., & Cástren, M. L. (2016). Epileptic Electroencephalography Profile Associates with Attention Defects in Children with Fragile X Syndrome: review and case series. Frontiers in Human Neuroscience, 10(353).
| oa ❄	**Cowley, B.**, Holmström, É., Juurmaa, K., Kovarskis, L., & Krause, C. M. (2016). Computer Enabled Neuroplasticity Treatment: A Clinical Trial of a Novel Design for Neurofeedback Therapy in Adult ADHD. Frontiers in Human Neuroscience, 10(205).
| oa	Ahonen, L., **Cowley, B.**, Torniainen, J., Ukkonen, A., Vihavainen, A., & Puolamäki, K. (2016). Cognitive Collaboration Found in Cardiac Physiology: Study in Classroom Environment. PLoS One, 11(7), 89–103.
| oa ❄	**Cowley, B.**, & Lukander, K. (2016). Forest, Trees, Dynamics: Results from a Wisconsin Card Sorting Test variant Protocol for Studying Global-Local Attention and Complex Cognitive Processes. Frontiers in Psychology: Cognitive Science, 7(238).
| 5 oa ❄	**Cowley, B.**, & Charles, D. (2016). Behavlets: a Method for Practical Player Modelling using Psychology-Based Player Traits and Domain Specific Features. User Modeling and User-Adapted Interaction, 26(2), 257–306.

A1 – Original scientific articles- *cont.*.

| oa **Cowley, B.**, Korpela, J., & Torniainen, J. E. (2017). Computational Testing for Automated Preprocessing: a Matlab toolbox to enable large scale electroencephalography data processing. PeerJ Computer Science, 3:e108.

| **Cowley, B.**, Bateman, C. (2017). Green My Place: Evaluation of a Serious Social Online Game Designed to Promote Energy Efficient Behaviour Change. International Journal of Serious Games, *forthcoming*.

A2 – Review.

| 182 Kivikangas, J. M., Chanel, G., **Cowley, B.**, Ekman, I., Salminen, M., Järvelä, S., & Ravaja, N. (2011). A review on the use of psychophysiological methods in game research. Journal of Gaming and Virtual Worlds, 3(3), 181–199. http://doi.org/10.1386/jgvw.3.3.181

| 10 ❄ **Cowley, B.**, Filetti, M., Lukander, K., Torniainen, J., Henelius, A., Ahonen, L., … Jaccuci, G. (2016). The Psychophysiology Primer: a guide to methods and a broad review with a focus on human computer interaction. Foundations and Trends in HCI, 9(3–4), 151–308.

Note: this is a long-form review and has also been released as a book.

A3 – Contribution to book.

| 5 **Cowley, B.**, Bedek, M., Heikura, T., Ribiero, C., Petersen, S. A. S., Ribeiro, C., … Petersen, S. A. S. (2012). The QUARTIC Process Model to Support Serious Games Development for Contextualized Competence-Based Learning and Assessment. In M.-M. Cruz-Cunha (Ed.), Handbook of Research on Serious Games as Educational, Business and Research Tools: Design and Development (pp. 491–519). New York: IGI Global.

| **Cowley, B.** (2014). The QUARTIC Process Model for Developing Serious Games: "Green My Place" Case Study. In N. Lee (Ed.), Digital Da Vinci: Computers in the Arts and Sciences (1st ed., pp. 143–172). New York: Springer Science+Business Media.

A4 – Article in conference publication.

3 | 17 **Cowley, B.**, Charles, D., Black, M., & Hickey, R. (2006). User-System-Experience Model for User Centered Design in Computer Games. In Adaptive Hypermedia and Adaptive Web-Based Systems (Vol. 4018, pp. 419–424). Dublin: LNCS.

| 7 **Cowley, B.**, Charles, D., Black, M. M., & Hickey, R. J. (2006). Using Decision Theory for Player Analysis in Pacman. In Proceedings of the SAB Workshop on Adaptive Approaches to Optimizing Player Satisfaction (pp. 41–50). Roma, Italy.

| 3 oa **Cowley, B.**, Charles, D., Black, M. M., & Hickey, R. J. (2007). Data-Driven Decision Theory for Player Analysis in Pacman. In AAAI Workshop - Technical Report (Vol. WS-07-01, pp. 25–30). Stanford University, Stanford, Ca: AAAI Press.

1 | 5 **Cowley, B.**, Charles, D., Black, M., & Hickey, R. (2009). Analyzing player behavior in pacman using feature-driven decision theoretic predictive modeling. In Proceedings of the 5th international conference on Computational Intelligence and Games (pp. 170–177). Milano, Italy: IEEE Press.

A4 – Article in conference publication- *cont.*.

- Kivikangas, M., Ekman, I., Chanel, G., Järvelä, S., **Cowley, B.**, Salminen, M., … Ravaja, N. (2010). Review on psychophysiological methods in game research. In Proceedings of DiGRA Nordic 2010: Experiencing Games: Games, Play, and Players. Stockholm: University of Stockholm.
- Bedek, M. A., **Cowley, B.**, Seitlinger, P., Fantato, M., Kopeinik, S., Albert, D., & Ravaja, N. (2011). Assessment of the Emotional State by Psycho-physiological and Implicit Measurements. In International Conference on Multimodal Interaction. Alicante, Spain: ACM.
- Fantato, M., **Cowley, B.**, & Ravaja, N. (2013). Arousing learning: a psychophysiological classifier for real-time emotion recognition in technology enhanced learning environments. In P. Cunningham & M. Cunningham (Eds.), eChallenges e-2013 (pp. 1–8). Dublin: Intl Information Management Corp.
- Torniainen, J., **Cowley, B.**, Henelius, A., Lukander, K., & Pakarinen, S. (2015). Feasibility of an electrodermal activity ring prototype as a research tool. In 37th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (pp. 6433–6436). Milano, Italy.

B1 – Unreferred journal article (all are oa).

Cowley, B. (2015). Psychophysiology and high-performance cognition - a brief review of the literature. PeerJ Preprints, 1373(1).

Ravaja, N., **Cowley, B.**, & Torniainen, J. (2016). A short review and primer on electromyography in human computer interaction applications. arXiv, 1608.08041.

Cowley, B. U., & Charles, D. (2016). Utility of a Behavlets approach to a Decision theoretic predictive player model. arXiv, 1603.08973.

Kosunen, I., & **Cowley, B.** (2016). A short review and primer on respiration in human computer interaction applications. arXiv, 1609.03283.

Cowley, B. U., & Torniainen, J. (2016). A short review and primer on electrodermal activity in human computer interaction applications. arXiv, 1608.06986.

Cowley, B., Korpela, J., & Torniainen, J. (2016). Computational testing for automated preprocessing: a matlab toolbox for better electroencephalography data processing. PeerJ Preprints, 2140(1).

Huotilainen, M., **Cowley, B.**, & Ahonen, L. (2016). A short review and primer on event-related potentials in human computer interaction applications. arXiv, 1608.08353.

Cowley, B. U., & Charles, D. (2016). Short Literature Review for a General Player Model Based on Behavlets. arXiv, 1603.06996.

Cowley, B. U. (2016). How to advance general game playing artificial intelligence by player modelling. arXiv, 1606.00401.

Cowley, B. U., & Charles, D. (2016). Adaptive Artificial Intelligence in Games: Issues, Requirements, and a Solution through Behavlets-based General Player Modelling. ArXiv, 1607.05028.

Ahonen, L., & **Cowley, B.** (2016). A short review and primer on electroencephalography in human computer interaction applications. arXiv, 1609.00183.

Cowley, B. U. (2017). The PSICAT protocol - Primed Subjective-Illusory-Contour Attention Task for studying integrated functional cognitive basis of sustained attention. Open Science Framework, preprint(gd5p4). Retrieved from osf.io/gd5p4

G3 – Doctoral thesis (monograph).

Cowley, B. (2009). Player Profiling and Modelling in Computer and Video Games (Thesis). School of Computer and Information Engineering. University of Ulster, Coleraine.