RIO group

Welcome to the RIO Newsletter!

After another fantastic RIO group meeting at the University of Roehampton last May, we return with the second edition of the Research in Imagery and Observation (RIO) group newsletter! The purpose of this newsletter is to provide updates relevant to RIO and to highlight research developments from individuals and groups within RIO.

Save the Date – 2018 RIO Group Meeting

The RIO group organisers are looking forward to seeing all group members for the 2018 RIO group meeting in Germany. This year's meeting will take place 12-13 April at Bielefeld University hosted by Cornelia Frank as local organiser. We hope to build on the success of recent meetings and it will be great to see everyone at the event!

We are excited to confirm our invited speakers for RIO 2018:

Prof. Cathy Craig (Queen's University Belfast)
Cathy Craig is a Professor of Perception and Action Psychology and Director of the state of the art Movement Innovation Lab at Queen's University Belfast. Her cutting-edge research is primarily concerned with how sensory information, picked up by the brain, is subsequently used to guide all kinds of action. We believe that Cathy's research using multi-sensory virtual environments will be of considerable interest to RIO members.

Dr. Shaun Boe (Dalhousie University)
Shaun Boe is an Associate Professor and Director of the Laboratory for Brain and Recovery Function at Dalhousie University. His research interests include central and peripheral nervous system adaptations and functional outcomes in neurorehabilitation, in addition to examining cortical contributions to balance control. We believe that Shaun's research using advanced methodological approaches to study motor imagery and learning in different populations bridges several areas of interest for RIO members.

Further details regarding abstract submission (DL: 01/03), the conference venue, and accommodation can be found on the RIO group website.

Update from Shaun Boe, Dalhousie University

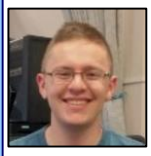
The Laboratory for Brain Recovery and Function has wrapped up a number of projects exploring the mechanisms of learning via motor imagery. Recently, we explored learning (over multiple sessions) of a complex movement through physical practice, physical practice without feedback, and motor imagery – showing that motor imagery is effective for learning the execution of a complex motor skill. We also explored how experience modulates motor imagery-related brain activation patterns, involving varsity athletes who underwent magnetoencephalography while performing motor imagery of their expert skills. Results showed that expertise impacts on the patterns of brain activation observed. This work, along with other studies examining brain networks during imagery, was presented by PhD students (Tony Ingram, Sarah Kraeutner Chris Friesen and Jack Solomon) at Human Brain Mapping (June 2017). Stay tuned for the papers reporting these findings. We are also wrapping up development of a smartphone/tablet-based application ('MiScreen') to screen for motor imagery ability, and will be rolling this out for testing in the upcoming months. If you're interested in testing the app, please contact us (s.boe@dal.ca).

Currently, the PhD students in the lab are:

Chris Friesen, who is exploring the use of neurofeedback for motor imagery performance. He is applying machine learning to brain activity to identify features that best predict motor imagery performance.

Tony Ingram, who is investigating whether or not the brain detects errors in performance during motor imagery. This work will inform on the acquisition of novel motor skills through motor imagery.

Sarah Kraeutner, who is investigating the evolution of learning through motor imagery relative to physical practice. She is comparing brain activation patterns from novice to skilled performance, between physical practice and motor imagery. This work will inform the way in which motor imagery may be best prescribed to complement performance.



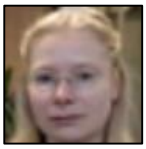
Jack Solomon, who is studying processes of inhibition during motor imagery. He is comparing electrophysiological brain activation of the preparatory phase of motor imagery vs. physical practice of a grasping task. This work will inform on the neural mechanisms underlying motor imagery.

Recent publications:

- **Boe SG, Kraeutner SN. Assessing motor imagery ability through imagery-based learning: an overview and introduction to MiScreen, a mobile app for imagery assessment. *Imagination, Cognition & Personality*, 2017 In-Press.**
- **Kraeutner SN, Gaughan TC, Eppler SN, Boe SG. Motor imagery-based implicit sequence learning depends on the formation of stimulus-response associations. *Acta Psychologica*, 2017 178: 48-55**
- **Kraeutner SN, Ingram TGJ, Boe SG. The effector independent nature of motor imagery: evidence from rTMS induced inhibition to the primary motor cortices. *Neuropsychologia*, 2017 97:1-8.**
- **Friesen CL, Bardouille T, Neyedli H, Boe S. Combined action observation and motor imagery neurofeedback for modulation of brain activity. *Front in Human Neurosci*, 2017.**

For more information on this or other projects in our lab, contact Shaun Boe (s.boe@dal.ca) or follow us on Twitter, @dalLBRF.

Update from Judith Bek, University of Manchester



The Body, Eyes and Movement (BEAM) Lab has been working towards translating our findings on action representation in Parkinson's disease through two new lines of work:

ACTION-PD: we are collaborating with RIO members Paul Holmes and Stefan Vogt, as well as Matthew Sullivan (Manchester Metropolitan University) and Trevor Crawford (Lancaster University), on a project exploring the use of combined observation and imagery (AOMI) to improve performance of everyday actions in people with Parkinson's disease. We have recently completed a preliminary study and are planning a pilot randomised controlled trial in 2018.

Dance for Parkinson's disease: we are investigating multidimensional effects of dance for people with Parkinson's (movement, communication and empathy), and the role of the action observation network in producing these effects. Following on from our workshop on action observation and imitation in Parkinson's linked to RIO 2016, we hosted a workshop on Dance for Parkinson's in April 2017. We are currently piloting measures in the lab and are excited to announce that we will be working with the English National Ballet to develop and trial a therapeutic dance programme in 2018.

Stacey Humphries completed her PhD on gesture in Parkinson's disease and is now working as a post-doctoral scholar at the University of Pennsylvania, USA.

Recent publications:

- **Bek J, Gowen E, Vogt S, Crawford T, & Poliakoff, E (2017). Action observation produces motor resonance in Parkinson's disease. *Journal of Neuropsychology.***
- **Bek J, Webb J, Gowen E, Vogt S, Crawford TJ, Sullivan, Poliakoff E (2016). Patients' views on a combined action observation and motor imagery intervention for Parkinson's disease. *Parkinson's Disease*, Article ID 7047910.**

Update from Adam Bruton, University of Roehampton

In collaboration with Prof. David Shearer (University of South Wales), I am continuing to research imagery and observation-based interventions as a means to improve performance in team settings. One of my MSc students is comparing imagery vs observation vs combined imagery and observation as a pre-performance intervention in cricket. A current BSc student is also exploring the effects of observing successful and unsuccessful performance on subsequent efficacy beliefs and decision-making in sport, an experiment that I hope to present at the RIO meeting this year.

Mr Aaron Dettner (MSc student in Clinical Psychology, University of Leiden) completed a 3-month research visit at the University of Roehampton and collected pilot data on a project investigating brain activity patterns when making confidence judgments and predicting outcomes when observing upper-body actions. Data collection is continuing in collaboration with researchers from the PsyNaps lab at the université catholique de Louvain, Belgium.

Recent publications:

- **Bruton, A. M., Mellalieu, S. D., Shearer, D. A. (2016). Observation as a method to enhance collective efficacy: An integrative review. *Psychology of Sport & Exercise*, *24*, 1-8.**
- **Shearer, D., Bruton, A., Short, S., & Roderique-Davies, G. (2018). Effects of sleep quality on imagery ability in athletic populations. *Imagination, Cognition and Personality.* Advance online publication.**

Update from Dan Eaves, Teesside University





In our Lab we continue to research motor imagery during action observation effects under two main themes: neurophysiological mechanisms, and the implications for applied practitioners. Jonathan Emerson is studying this in schizophrenia, while Matthew Scott is exploring effects across the lifespan: in older adults, children, and children with dyspraxia. Ryan Kenny focuses on AO+MI in balance, alongside his work on textured insoles, and we welcome Jack Binks as a new PhD candidate. Jack was a semi-professional footballer who studied psychology in New York. He is now testing AO+MI practice effects in sequence learning. It was a pleasure to recently collaborate both with Jennifer Cumming on the ICAP special issue, and on another project with the RIO organisers plus members of the MMU team.

Recent publications:

- Cumming, J. & Eaves, D.L. (2018). The Nature, Measurement, and Development of Imagery Ability: An Introduction to a Special Issue. *Imagination, Cognition and Personality.* Advance online publication.
- Scott, M., Taylor, S., Chesterton, P., Vogt, S. & Eaves DL (2017) Motor imagery during action observation enhances hamstring strength: an acute intervention. *Disability and Rehabilitation*. 1-9.

Update from Martin Edwards, Université catholique du Louvain





As usual, things are hectic at the Psy-NAPS Group! I am pleased to tell you that Clément Letesson (PhD 2016) is now a clinical trials project manager for a NeomaLabs, and Stéphane Grade (PhD 2016) is now a research fellow on a project that develops interactive VR training programmes. Emilie Lacroix and Marie Alsamour will submit their PhDs in early 2018, and Vincenza Montedoro will submit in late 2018 (along with another PhD, Stéphanie Dehem who never made it to RIO). The three remaining PhDs, Audrey Riga, Cédric Gaudissart and Pierre Mengal are going strong, and we hope to have new data for the next RIO meeting.

I am busy writing funds now, mainly for neuropsychology projects, but also for projects using technology. These projects involve different aspects of RIO, including some projects looking at the cognition of the robot when they observe human action. Obviously, many of these funds are aimed at trying to turn my PhDs into Research Fellows, but at the same time, I aim to expand the group. Papers go OK. Marie just had her first paper accepted (in Cortex), and coincidently, the paper was linked to the presentation in 2016 where she won the RIO prize. Clearly, this prize lead to luck in publication

The final thing to say is that Rob Hardwick (PhD 2010) is back in Europe, after working at John Hopkins University. He has a Marie Skłodowska-Curie Individual Research Fellowship based at KU Leuven (20km up the road from me). I am also pleased to say that he recently got married (to a Belgian), and they start a little family. This is all my news. I look forward to seeing everyone in Bielefeld!






Update from Cornelia Frank, Bielefeld University

In the Social Motor Learning Lab of the Neurocognition and Action - Biomechanics Group at Bielefeld University we are mainly interested in investigating the underlying motor, perceptual and cognitive adaptations that occur during the acquisition of complex motor skills. We hereby focus on different states of action such as imagery, observation, and execution, and conduct our experiments in both real world and virtual reality settings (in collaboration with the central lab facilities of the Cluster of Excellence Cognitive Interaction Technology (CITEC)).

PhD student Taeho Kim's research focuses on the development of action representation during learning by way of observation and learning by way of imagery. Recently, he published his first study in Human Neuroscience (see below). For his poster presentation on his second study, he won the best poster award at the ENYSSP (European Network of Young Specialists in Sport Psychology) Conference in Slovakia for his contribution: Kim, T., Frank, C., & Schack, T. (2017). Mental representation and cognitive training: the influence of combined training of action observation and motor imagery on the changes in perceptual-cognitive and skill performance. Presented at the 13th Conference of European Network of Young Specialists in Sport Psychology (ENYSSP), Bratislava, Slovakia. Congratulations!

PhD student Alessio d'Aquino presented ongoing work at the World Congress of Sport Psychology in Seville, Spain. His research focuses on the investigation of eye movements' similarities and differences between motor imagery and execution for interceptive tasks.

Postdoc Cornelia Frank is currently mainly working on questions related to observational learning and (verbal as well as nonverbal) feedback, using an immersive virtual reality interaction scenario (ICSPACE). This year, we published one manuscript on observational learning and organized a symposium on new tools to improve performance at the World Congress of Sport Psychology.

Recent publications:

- **Frank, C. & Schack, T. (2017). The representation of (inter)action, states of action, and learning: Three perspectives on learning by way of imagery and execution. *Frontiers in Psychology, 8*, 678**
- **Frank, C., Kim, T., & Schack, T. (accepted). Observational practice promotes action-related order-formation in long-term memory: Investigating action observation and the development of cognitive representation in complex motor action. *Journal of Motor Learning and Development.***
- **Kim, T., Frank, C., & Schack, T. (2017). A systematic investigation of the effect of action observation training and motor imagery training on the development of mental representation structure and skill performance. *Frontiers in Human Neuroscience, 11*, 499.**
- **Simonsmeier, B., Frank, C., Gubelmann, H., & Schneider, M. (accepted). The effects of motor imagery training on performance and mental representation of 7- to 15-year old gymnasts of different levels of expertise. *Sport, Exercise, and Performance Psychology.***

Update from Luca Ticini, University of Manchester

I have recently published the following paper that I believe will be of interest to members of the RIO group in collaboration with Simone Schütz-Bosbach and Florian Waszak:

- **Ticini, L., Schütz-Bosbach, S., & Waszak, F. (2018). Mirror and (absence of) counter-mirror responses to action sounds measured with TMS. *Social Cognitive and Affective Neuroscience, 1748-1757.***

Update from Aidan Moran, University College Dublin

It's been a productive year for Aidan Moran's imagery lab in UCD, with graduations, an international fellowship and publications to report.

Firstly, three members of Aidan's research team graduated between September and December 2017. Helen O'Shea's (PhD; funded by the Irish Research Council, IRC) thesis was entitled "An investigation into the neurocognitive processes underlying motor imagery". Katy Carey's (Master of Psychological Science) thesis was on "Mastery of modern dance choreography: An investigation into the relationship between expertise, motor imagery and attentional effort" and Aoife Quinn's (PhD; funded by IRC) thesis was entitled "An investigation of expert-novice differences in eye-tracking and motor imagery in equestrian athletes".

Next, Aidan was awarded a Fellowship of the Association for Psychological Science (APS) for his "sustained outstanding contributions to the advancement of psychological science" in motor imagery, concentration and the cognitive processes underlying expertise in skilled performers.

Recent publications:

- **Moran, A., Sevdalis, N., & Wallace, L. Surgical performance from a psychological perspective. In O. Braddick (Ed.), *Oxford research encyclopaedia of psychology*. New York: Oxford University Press.**
- **O'Shea, H., & Moran, A. (2017). Does motor simulation theory explain the cognitive mechanisms underlying motor imagery? A critical review. *Frontiers in Human Neuroscience*, 11: 72**
- **Toner, J., Montero, B., & Moran, A. (2016). Reflective and pre-reflective bodily awareness in skilled action. *Psychology of Consciousness: Theory, Research, and Practice*, *3*, 303-315.**
- **Moran, A., Quinn, A., Campbell, M., Rooney, B., Brady, N., & Burke, C. (2016). Using pupillometry to evaluate attentional effort in quiet eye: A preliminary investigation. *Sport, Exercise, and Performance Psychology*, 5, 365-376.**
- **O'Shea, H., & Moran, A. (2016). Chronometric and pupil-size measurements illuminate the relationship between motor execution and motor imagery in expert pianists. *Psychology of Music, 44*, 1289-1303.**

Update from Sarah Williams, University of Birmingham

Congratulations to Dr Mary Quinton of the University of Birmingham who successfully defended her PhD thesis in October. Mary's research focussed on the role of facilitative and debilitative imagery on performance, appraisals of, and responses to stress. It also examined the impact that individual characteristics such as competitive level and imagery ability have on facilitative and debilitative imagery exposure. Two of her empirical chapters have already been accepted for publication (*International Journal of Sport and Exercise Psychology* and *Psychology of Sport and Exercise*), while the other empirical chapter is currently under review. Mary was supervised by Dr Sarah Williams and Dr Jennifer Cumming. Her thesis examiners were Professor Marc Jones (Staffordshire University) and Professor David Sheffield (University of Derby). Well done Mary!

Mary's PhD publications:

- **Quinton, M. L., Cumming, J., Allsop, J., Gray, R., & Williams, S. E. (2016). Imagery meaning and content in golf: Effects on performance, anxiety, and confidence. *International Journal of Sport & Exercise Psychology*. Advanced online publication.**
- **Quinton, M. L., Cumming, J., & Williams, S. E. (2018). Investigating the mediating role of positive and negative mastery imagery ability. *Psychology of Sport & Exercise, 35*, 1-9.**

Update from David Wright, Manchester Metropolitan University






The Motor Cognition Research Group at Manchester Met continue to be active in exploring the cortical and behavioural effects of action observation and motor imagery interventions, which has produced several publications in the last year (see below). In addition, we have a number of projects in preparation or under review for publication and anticipate that data from at least three of these projects will be presented at RIO 2018.

As well as our established research exploring the cortical effects of action observation and motor imagery interventions, our ongoing research in this area is now starting to test the efficacy of these techniques in a variety of clinical populations. Specifically, data collection is currently underway exploring the efficacy of combined action observation and motor imagery interventions for improving motor performance and learning in older adults with Parkinson's disease, children with Developmental Co-ordination Disorder and upper limb prosthesis users. We hope to present the findings of these projects at future RIO events.

Recent publications:

- **Riach, M., Wright, D. J., Franklin, Z. C., & Holmes, P. S. (2018). Screen position preference offers a new direction for action observation research: Preliminary findings using TMS. *Frontiers in Human Neuroscience, 12* (26), 1-10.**
- **Wright, D. J., Wood, G., Franklin, Z. C., Marshall, B., Riach, M., & Holmes, P. S. (2018). Directing visual attention during action observation modulates corticospinal excitability. *PLoS One, 13* (1), e0190165.**
- **Holmes, P. S., & Wright, D. J. (2017). Motor cognition and neuroscience in sport psychology. *Current Opinion in Psychology, 16*, 43-47.**

RIO Notices

- **Dan Eaves and Jennifer Cumming co-edited a special issue on imagery ability in the journal 'Imagery, Cognition and Personality'. The five articles included in this issue are now available online.**

- **Call for papers for a special issue of Sport, Exercise and Performance Psychology (SEPP) on Sport and Exercise Psychophysiology - The objective of this special issue is to showcase cutting-edge psychophysiological work in the domains of sport, exercise, and performance.**

- **We would like thank all group members who contributed towards this information-packed newsletter and hope it has been an interesting read. We look forward to seeing you all in Bielefeld!**