Dr. rer. nat.
Julian Q. Kosciessa

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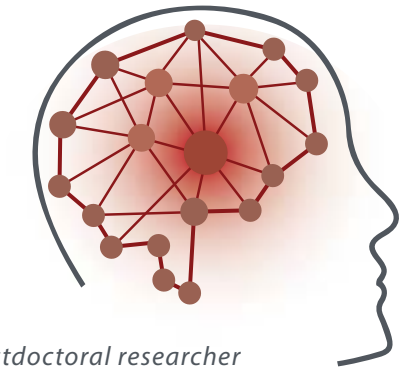


I am a postdoctoral researcher working at the intersection of cognitive, computational and systems neurosciences. My work aims to improve the characterization of neural dynamics, and clarify the functional role of neural rhythms and noise in flexible cognition. My experimental research combines neuroscientific techniques, and extends available methods via scientific software development.

Research Experience

Postdoctoral Researcher — **2022 – PRESENT**
Donders Institute for Brain, Cognition and Behaviour
Nijmegen, Netherlands

Pre-/postdoctoral Research Fellow — **2016 – 2022**
IMPRS Comp2Psych
Max Planck UCL Center for Computational Psychiatry and Aging
Berlin, Germany

Research Assistant/Intern — **2010 – 2016**
Berlin, Germany
London, UK
Singapore, Singapore

Education

Humboldt Universität zu Berlin — **2016 – 2020**
Psychology
Dr. rer. nat. (summa cum laude)

Humboldt Universität zu Berlin — **2014 – 2016**
Mind & Brain – Track Brain
M.Sc. Master of Science

Freie Universität Berlin — **2011 – 2014**
Psychology
B.Sc. Bachelor of Science

Skills

MATLAB
R
UNIX
Python
Git
Mandarin

Key Publications

Kosciessa, J. Q., Lindenberger, U., & Garrett, D. D. (2021)
Thalamocortical excitability adjustments guide human perception under uncertainty
Nature Communications

Kosciessa, J. Q., Kloosterman, N. A., & Garrett, D. D. (2020)
Standard multiscale entropy reflects neural dynamics at mismatched temporal scales: What's signal irregularity got to do with it?
PLoS Computational Biology

Kosciessa, J. Q., Grandy, T. H., Garrett, D. D., & Werkle-Bergner, M. (2020)
Single-trial characterization of neural rhythms: Potential and challenges.
NeuroImage

RESEARCH EXPERIENCE

09/2022 – PRESENT **Postdoctoral Researcher / Radboud Excellence Fellow**
Donders Institute for Brain, Cognition and Behaviour
Radboud University, Nijmegen, The Netherlands
PI: Dr. Lennart Verhagen

07/2020 – 07/2022 **Postdoctoral Researcher**
Max Planck Institute for Human Development, Berlin, Germany

10/2016 – 03/2020 **Predoctoral Research Fellow**
IMPRS COMP2PSYCH: International Max Planck Research School on Computational Methods in Psychiatry and Ageing Research
Max Planck UCL Center for Computational Psychiatry and Aging
Max Planck Institute for Human Development, Berlin, Germany
Supervisors: Prof. Dr. Ulman Lindenberger, Dr. Douglas D. Garrett

10/2015 – 03/2016 **Research Intern**
UCL Institute of Cognitive Neuroscience
PIs: Prof. Emrah Düzel & Prof. Ray Dolan
PI: Dr. Dorothea Hämmerer

03/2015 – 07/2015 **Research Intern**
Max Planck Institute for Human Development, Berlin, Germany
Center for Adaptive Rationality (ARC)
PI: Dr. Wouter van den Bos

09/2012 – 09/2013 **Research Assistant**
07/2014 – 09/2015 Max Planck Institute for Human Development, Berlin, Germany
04/2016 – 09/2016 Cognitive and neuronal dynamics of memory across the lifespan
PIs: Dr. Markus Werkle-Bergner & Dr. Yee Lee Shing

01/2014 – 05/2014 **Research Intern**
Cognitive Neuroscience Laboratory, Duke-NUS, Singapore
PI: Prof. Michael Chee
Supervisor: Dr. Irma Kurniawan

EDUCATION

10/2016 – 10/2020 **Humboldt Universität zu Berlin**
Psychology. Dr. rer. nat. (summa cum laude)

10/2014 – 09/2016 **Humboldt Universität zu Berlin**
Mind & Brain – Track Brain. M.Sc. Master of Science (GPA: 1.0)

09/2015 – 04/2016 **University College London**
Two Erasmus exchange terms. Institute of Neurology

07/2013 – 05/2014 **National University of Singapore (NUS)**
Two exchange semesters. Faculty of Arts and Social Sciences

10/2011 – 09/2014 **Freie Universität Berlin**
Psychology. B.Sc. Bachelor of Science (GPA: 1.1)

Teaching & Talks (selected)

» 2023: Invited Keynote Talk:
Signs, signals, and noise in human brain dynamics
CuttingEEG conference. Frankfurt. Germany
» 2023: Workshop: Managing your data with DataLad. CuttingEEG. Frankfurt. Germany
» 2023: Workshop: *Simulations for transcranial ultrasound stimulation.* Donders/NeuroTechEU
» 2023: Seminar: Higher order cognition and emotion. Teacher. Radboudumc
» 2023: Seminar: Psychology Research Project 3. Teacher. Radboud University
» 2023: Invited talk: *Noise as a signal of interest.* Donders Nexus meeting.
» 2022: Workshops:
Reusable data management with DataLad
Cognitive Psychology. University of Munster. Germany
Donders Institute for Cognitive Neuoimaging. Radboud University. The Netherlands
» 2022: Invited Research Talks:
Dynamic neural regimes for flexible decisions under uncertainty
- Translational Decision-Making Seminar
[Virtual: University of Minnesota/Université de Montréal]
- Biopsychology. University of Munster. Germany
- Donders Institute for Brain, Cognition and Behaviour
» 2022: Invited Symposium Talk:
Influences of arousal and cortical excitability on adaptive perceptual decision making.
International Conference of Cognitive Neuroscience. Helsinki, Finland
» 2021: Research Talk:
The role of neural dynamics in flexible perception under uncertainty.
Computational Neuroscience Symposium. Osnabrück, Germany
» 2021: Invited Research Talks:
Thalamocortical excitability adjustments guide human perception under uncertainty.
- Shine Lab, University of Sydney, Australia
- Halassa Lab, Massachusetts Institute of Technology (MIT), U.S.A.
» 2020: Invited Colloqium Talk:
Measurement and relevance of rhythmic and aperiodic human brain dynamics.
Biopsychology und Neuroergonomics Lab. Technical University. Berlin, Germany
» 2020: Invited Workshop:
Multi-scale entropy as a tool to characterize neural signal irregularity.
EEG Meeting. Max Planck Institute for Human Development. Berlin, Germany
» 2018: Invited Seminar:
Methods for the analysis of rhythmic and arrhythmic brain activity.
International Max Planck Research School on the Life Course. Berlin, Germany

Funding & Awards

» 2022: Radboud Excellence Fellowship (200.000 EUR)
» 2022: Otto Hahn Medal of the Max Planck Society (7.500 EUR)
» 2022: DAAD Conference Travel Grant: International Conference of Cognitive Neuroscience
» 2021: DGPA Brain Products Young Scientist Award 2021
» 2021: DAAD Conference Travel Grant to OHBM Meeting 2021
» 2021: Merit Abstract Award OHBM Meeting 2021
» 2018: IBRO Poster Award Interpreting BOLD 2018
» 2018: DAAD Conference Travel Grant to Interpreting BOLD 2018 (Oxford, UK)
» 2015/2016: DAAD Erasmus Stipend (University College London, UK)
» 2014: DAAD PROMOS Stipend (National University Singapore, Singapore)

Student Supervision

» 2023: MSc Martin Wimmers
  M. Sc. student in Cognitive Neuroscience, Radboud University, The Netherlands
  Towards effective thalamic deep brain ultrasound stimulation
» 2023: MSc Jesse Lam
  M. Sc. student in Cognitive Neuroscience, Radboud University, The Netherlands
  Offline transcranial ultrasonic stimulation effects on resting-state fMRI
  co-supervision with Dr. Lennart Verhagen
» 2023: BSc Lieke Hendrix
  B. Sc. student in Faculty of Science, Radboud University, The Netherlands
  Effects of arousal and valence on pupil size
» 2023: BSc Sara Mulders
  B. Sc. student in Psychology, Radboud University, The Netherlands
  How does expressed valence affect the perception of arousal in faces?
» 2023: BSc Siem van der Sluijs
  B. Sc. student in Psychology, Radboud University, The Netherlands
  Positivity and Negativity Biases of facial emotion processing
» 2021/22: MSc Claire Pleche
  M.Sc. Student in Cognitive Neuroscience, Ecole Normale Supérieure de Paris, France
  Probing the role of neural variability in flexible decision-making under uncertainty
  co-supervision with Dr. Douglas D. Garrett
» 2021: Mentor at Neuromatch Academy

Professional Activites

» Ad-hoc peer reviewer:
  PNAS
  TICS
  PLoS Biology
  NeuroImage (10x)
  Journal of Neuroscience
  Journal of Neurophysiology
  International Journal of Psychophysiology
  Brain Topography
  European Journal of Neuroscience
  Mindfulness
  PLoS One (2x)
» Associate Member of the Deutsche Gesellschaft für Psychology (DGPs)
» Member of the Organization for Human Brain Mapping (OHBM)
» Member of the International Neuroinformatics Coordinating Facility (INCF)
» Member of the International Transcranial Ultrasonic Stimulation Safety and Standards (ITRUSST)
» Co-organizer of monthly "Donders Nexus" meeting series. Radboud University.
» PostDoc representative at the Donders Centre for Cognition

PUBLICATION LIST

Journal Publications *(*corresponding author)*

1. **Kosciessa, J. Q.***, Lindenberger, U., & Garrett, D. D. (2021). Thalamocortical excitability adjustments guide human perception under uncertainty. *Nature Communications, 12(1), 2430.*

   Higher-order thalamic activation increases when contextual uncertainty ambiguates which environmental features are critical for an upcoming choice, and is associated with switches from a rhythmic to an aperiodic processing mode.

   article | data | code | task | press release

2. Kloosterman, N. A., **Kosciessa, J. Q.**, Lindenberger, U., Fahrenfort, J. J., & Garrett, D.D. (2020). Boosts in brain signal variability track liberal shifts in decision bias. *Elife, 9.*

   The magnitude of adaptive shifts from conservative to liberal decision biases under speed-accuracy emphasis is tracked by increasing signal variability in frontal cortex.

   article | data | code

3. **Kosciessa, J. Q.***, Kloosterman, N. A., & Garrett, D. D. (2020). Standard multiscale entropy reflects neural dynamics at mismatched temporal scales: What's signal irregularity got to do with it? *PLoS Computational Biology, 16(5).*

   Highlights and exemplifies biases in prior research using an information theoretic metric of signal irregularity and proposes avenues to adjudicate such issues in future applications.

   article | data | code | toolbox

4. **Kosciessa, J. Q.***, Grandy, T. H., Garrett, D. D., & Werkle-Bergner, M. (2020). Single-trial characterization of neural rhythms: Potential and challenges. *NeuroImage, 206, 116331.*

   Introduces a novel method that separates neural rhythms from background activity in magnitude, space and time, and enables specific rhythm characterization when boundary conditions are met.

   article | code | toolbox

5. Hämmerer, D., Callaghan, M. F., Hopkins, A., **Kosciessa, J.**, Betts, M., Cardenas-Blanco, A., Kanowski, M., Weiskopf, N., Dayan, P., Dolan, R. J., & Düzel, E. (2018). Locus coeruleus integrity in old age is selectively related to memories linked with salient negative events. *Proceedings of the National Academy of Sciences of the United States of America, 115, 2228-2233.*

   Quantitative imaging indicates structural reductions in brainstem locus coeruleus integrity with increasing adult age, and links related noradrenergic drive to the encoding of salient events.

   article

Monographs/Theses

6. **Kosciessa, J. Q.** (2020, Dr. rer. nat.). Measurement and relevance of rhythmic and aperiodic human brain dynamics. *Humboldt-Universität zu Berlin*.

   This dissertation highlights improvements in the ability to selectively characterize rhythmic and aperiodic fluctuations, and discusses potential generating mechanisms as well as modulatory influences to contextualize their interpretation at the latent level of human brain function.

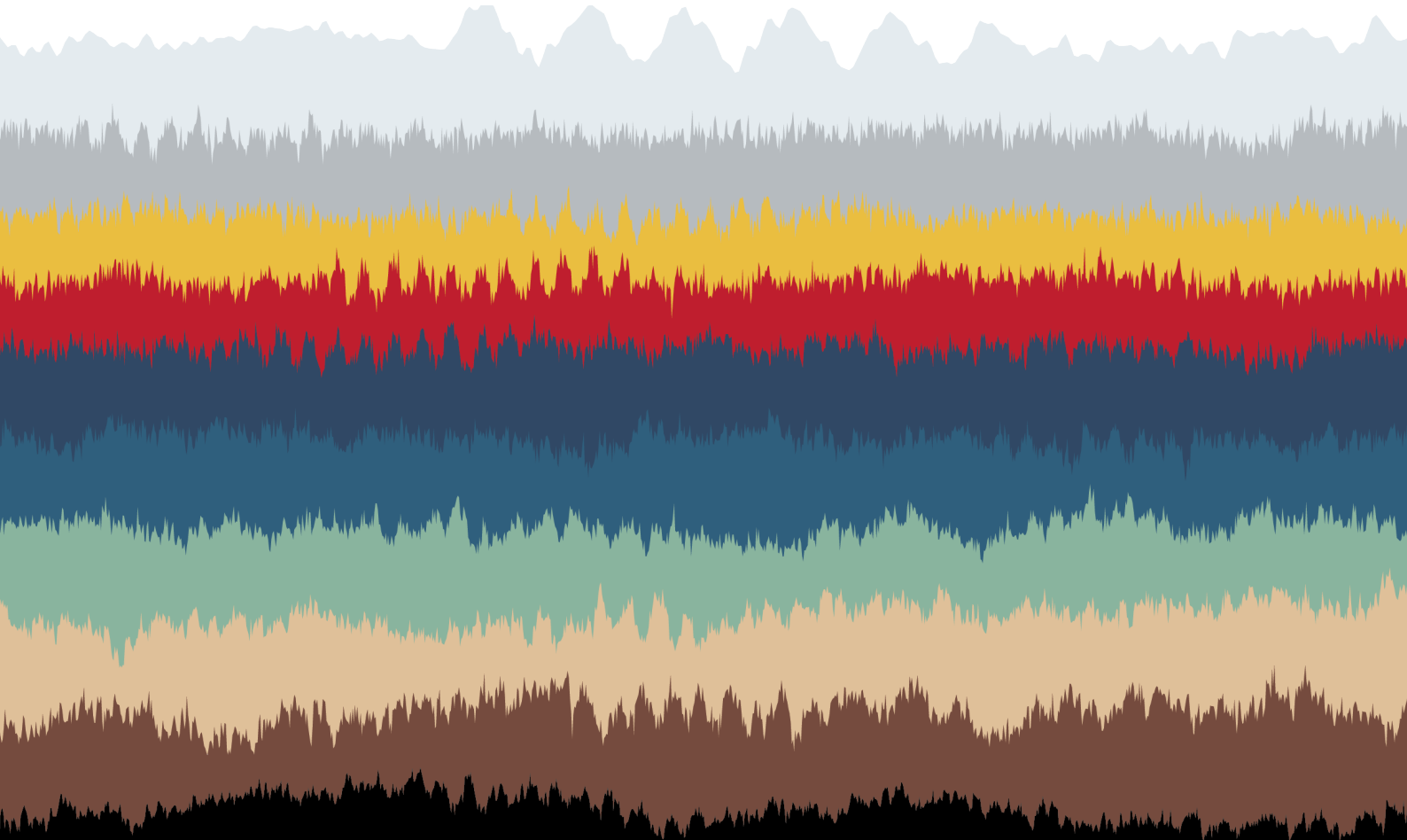
   article

7. **Kosciessa, J. Q.** (2016, M. Sc.). Effects of short-term memory load and task training on the amplitude and abundance of rhythmic neural activity. *Humboldt-Universität zu Berlin*

   Neural rhythms are dominantly characterized by their power, but this measure conflates amplitude and duration. This work separates these two parameters of human alpha rhythms and investigates how they are modulated during working memory.

8. **Kosciessa, J.** (2014, B. Sc.). The assessment of microsaccades from the rEOG. *Freie Universität Berlin*

   Microsaccades are small, high-velocity eye movements. This work explores the potential to use visual EEG channels to detect microsaccades without an eye tracker, and describes adult age differences in microsaccade characteristics.



Preprints / in preparation

9. **Kosciessa, J. Q.*** (2022). EEGmanylabs contribution.

   Preprocessing and analysis workflows for high-dimensional EEG data are highly variable. This project aims to establish the impact of analytical variability on hypothesis testing. This is a contribution to this community effort that was derived with one of my common workflows.

   preprint | code + data

10. **Kosciessa, J. Q.*,** Mayr, U., Lindenberger, U., & Garrett, D. D. (2023). Broadscale dampening of uncertainty adjustment in the aging brain. bioRxiv, 2023.2007.2014.549093. https://doi.org/10.1101/2023.07.14.549093

    With advancing adult age, behavioural deficits emerge both in selective attention and the flexible processing of multiple information streams. Here, we indicate age-related reductions in excitability modulation and behavioral flexibility using multimodal neuroimaging (EEG, fMRI, pupil tracking) of 53 healthy older adults, and 47 younger adults. The individual degree of retained thalamo-cortical uncertainty modulation supports flexible processing across the adult lifespan.

    preprint

11. Garrett, D. D., Kloosterman, N. A., Epp, S., Chopurian, V., **Kosciessa, J. Q.**, Waschke, L., Skowron, A., Shine, J. M., Perry, A., Salami, A., Rieckmann, A., Papenberg, G., Wåhlin, A., Karalija, N., Andersson, M., Riklund, K., Lövdén, M., Bäckman, L., Nyberg, L., & Lindenberger, U. (2022). Dynamic regulation of neural variability during working memory reflects dopamine, functional integration, and decision-making. bioRxiv, 2022.2005.2005.490687. https://doi.org/10.1101/2022.05.05.490687

    Linking BOLD variability increases with increasing memory load to dopamine capacity, network-level functional integration, and flexible decision processes, this study argues that the ability to dynamically regulate subcortical striato-thalamic dynamics according to momentary task demands may be a hallmark of a well-functioning brain.

    preprint