

ECE KAYA

PhD · Rhythm & Synchronization · Auditory Cognition

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RESEARCH PROFILE

I am a cognitive scientist and researcher specializing in rhythm, timing and auditory perception, with interdisciplinary roots in psychology, neuroscience, linguistics, signal processing and music. My work combines behavioral methods, EEG, ECG and computational modeling to study how the body and brain synchronize to the rhythmic structure in the environment.

EDUCATION

Ph.D. in Psychology 2020 – 2024

Maastricht University, The Netherlands

Thesis: Individual differences in oscillator properties and rhythmic entrainment

Supervisors: Molly Henry · Sonja Kotz

M.A. in Cognitive Science (Psychology & Linguistics) 2015 – 2019

Bogazici University, Istanbul, Turkey

Thesis: In Search of Language-Based Factors Influencing Rhythmic Grouping

Supervisors: Esra Mungan · Pavel Logacev

B.A. in Psychology 2009 – 2014

Ege University, Izmir, Turkey

RESEARCH EXPERIENCE

Postdoctoral Researcher — Zero Noise Lab May 2024 – August 2026

Neuroscience

Ernst Strüngmann Institute (ESI) of the Max Planck Society

- Designed and built a full multimodal data acquisition laboratory from the ground up in an empty room, integrating EEG, respiration sensors, synchronized audio and video recording, and a custom triggering and synchronization system
- Managed all aspects of human data collection pipelines including ethics applications, participant recruitment, informed consent, and data protection protocols (GDPR)
- Investigated physiological rhythms and autonomic signals in the context of breathwork and wellbeing interventions
- Analysed EEG data using frequency-domain methods, neural complexity measures and connectivity analysis
- Mentoring junior researchers through study design, data collection, and analysis

Doctoral Researcher — Neural and Environmental Rhythms Group* Sep 2019 – Mar 2024

Cognitive Psychology

Max Planck Institute for Empirical Aesthetics, Frankfurt am Main

*Funded by ERC Starting Grant (BRAINSYNC-804029), awarded to M.J. Henry

- Developed novel behavioral paradigms and computational models to quantify individual differences in rhythmic entrainment
- Investigated oscillatory mechanisms of rhythm perception and production across the lifespan (aging studies)
- Built in-lab experimental protocols and data collection pipelines
- Designed and deployed online experiments using jsPsych

Project Assistant

Dec 2018 – Sep 2019

“In Search of Influences of Music and Language on Rhythm Perception”

Psychology, Linguistics

Bogazici University, Istanbul

- Conducted psychophysics experiments on culture-specific priors in rhythmic grouping
- Completed M.A. thesis on language-based factors in rhythmic grouping
- Collected data for a 15-country cross-cultural study on rhythm priors

Project Assistant

Apr 2017 – Jan 2018

“Concepts and Beliefs: From Perception to Action”

Philosophy

Bogazici University, Istanbul

- Participated in theoretical discussions on predictive processing in perception and action
- Assisted in organizing events and journal clubs for the research group

TECHNICAL SKILLS

Programming & Analysis

- MATLAB (experiment programming, neural analysis, statistics, computational modelling)
- Python (experiment programming, multimodal data analysis, signal processing, user interfaces)
- JavaScript / jsPsych / P5 (online experiment development)

Signal Processing & Engineering

- Audio signal processing and Music Information Retrieval (MIR)
- Multimodal data analysis: audio, video, behavioral time-series
- Sensor development: Arduino, Raspberry PI
- FFmpeg, mediapipe, and audiovisual tooling

Neuroscience Methods

- EEG: design, acquisition, preprocessing, analysis
- Psychophysics and behavioral experiment design
- Computational modelling of behavior, oscillatory and attentional systems

Creative & Sound Tools

- Max/MSP and P5 (real-time audio/visual programming)
- Audiovisual art
- Ableton Live, sound design

PUBLICATIONS

Kaya, E. (2024). Individual differences in oscillator properties and rhythmic entrainment. [Doctoral Thesis, Maastricht University]. <https://doi.org/10.26481/dis.20241113ek>

Jacoby, N., Polak, R., Grah, J., ..., **Kaya, E.**, ..., McDermott, J. H. (2024). Commonality and variation in mental representations of music revealed by a cross-cultural comparison of rhythm priors in 15 countries. *Nature Human Behaviour*. <https://doi.org/10.1038/s41562-023-01800-9>

Kaya, E., Kotz, S. A., & Henry, M. J. (2023). A novel method for estimating properties of attentional oscillators reveals an age-related decline in flexibility. *eLife* 12:RP90735. <https://doi.org/10.7554/eLife.90735.4>

Kaya, E., & Henry, M. J. (2024, preprint). Modeling rhythm perception and temporal adaptation: top-down influences on a gradually decaying oscillator. <https://doi.org/10.31234/osf.io/q9uvr>

Kaya, E., & Henry, M. J. (2022). Reliable estimation of internal oscillator properties from a novel, fast-paced tapping paradigm. *Scientific Reports*, 12, 20466. <https://doi.org/10.1038/s41598-022-24453-6>

Mungan, E., & **Kaya, E. (2020).** Some Time Violations Go Less Noticed: Gestalt Grouping? *Timing & Time Perception*, 8(3-4), 350–362.

SELECTED CONFERENCE PRESENTATIONS

Porter, L., **Kaya, E.**, Havenith, M. (2026, March) ECG Signatures of High-Ventilation Breathwork: Novel Methods for Assessing Cardiac Dynamics in Altered States. *13th MindBrainBody Symposium 2026, Berlin*

Kaya, E. & Henry, M. J. (2023, Oct) Individual differences in internal oscillator properties. *3rd Conference of the Timing Research Forum, Lisbon*.

Kaya, E. & Henry, M. J. (2023, Aug) Modeling rhythm perception and temporal adaptation. *Entrainment Workshop, Oslo*.

Kaya, E. & Henry, M. J. (2023, Jun) Individual differences in internal oscillator properties. *19th Rhythm Perception and Production Workshop, Nottingham*.

Kaya, E., & Henry, M. J. (2021) Individual differences in rhythmic entrainment. *ICMPC16-ESCOM11*

INVITED TALKS & WORKSHOPS

Figure 3.2.1... Publish! Data Visualization from Theory to Practice	Jul 2025
3-hour workshop · GRADE Center Brain, Goethe University Frankfurt	
Understanding Time and Rhythm through Dynamic Attending Theory	Dec 2023
Heinrich-Heine-Universität, Düsseldorf	
Estimating Properties of Internal Oscillators Underlying Rhythm Processing	Jul 2023
Lunch Talk Series · MPI for Empirical Aesthetics, Frankfurt	

TEACHING & MENTORSHIP

- **Workshop instructor:** Data visualization, scientific communication (GRADE Center Brain, Goethe University, 2025)
- **Research mentorship:** Guided a student through full study design, data collection, and analysis pipeline
- Informal postdoc-level co-supervision of ongoing studies at ESI

COMMUNITY & SERVICE

- Timing Research Forum — member of the Early Career Researcher committee
- ALS-MND Association, Izmir — member and advocate
- Freiraum Interdisciplinary Arts & Culture Collective, Frankfurt — musician, artist
- EDGE Neuroscience & Art e.V — member
- Türkiye Blues Association — member musician

LANGUAGES & OTHER

Turkish	Native
English	Full professional proficiency
German	Conversational (B1 training)

20 years of active musicianship