



Mattia Rosso, PhD

Personal Mobile- +45 91888984

Email- mattia.rosso@clin.au.dk

D.O.B: 23/05/1992

BIOGRAPHY

I obtained my Master's degree in Body and Mind Sciences at University of Turin (IT), where I spent one year as research assistant among MANIBUS Lab under the supervision of prof. Francesca Garbarini. During that period of hands-on experience with EEG setup, montage and data processing, I got familiar with behavioral and event-related potentials (ERPs) paradigms for investigating multi-sensory integration, motor control, body and space representation. My main research interest is interaction with music approached from the perspective of psychology and neurosciences, which brought me at IPEM Institute for Systematic Musicology to start a PhD in December 2018.

My work is focused on human rhythmic behavior, and develops along two lines of research. On the one hand, I investigate the behavioral and neural dynamics underlying interpersonal coordination. On the other hand, I develop methods for investigating neural entrainment during synchronization with environmental rhythms. The methods of my research mainly consist of a combination of behavioral and electroencefalography (EEG) analyses from interactive experimental scenarios, with a core focus on multimodal signal processing and design of novel experimental paradigms. My experimental work started with the design of an interactive paradigm for dyadic rhythmic interactions. In my first study, I focused on modality-specific dynamics of spontaneous entrainment, showing how the relevance of kinematics information conveyed via visual coupling shapes the interaction in very consistent manner across dyads. Ongoing extensions of this paradigm include sonification strategies to convey kinematic information via the auditory channel, and manipulation of visuo-spatial perspective via 'body-swapping'.

My training in more advanced neuroscientific methodologies began in 2019 under the supervision of Dr. O.A. Heggli and Professor P. Vuust from the Center for Music in the Brain in Århus (DK), where I spent one month for my first research stay abroad in 2019 and two months for a second stay in 2021. The proposal of the second stay was awarded an FWO Mobility Grant for long research stays abroad. To this date, the collaboration led to a joint publication on a high-impact neuroscientific journal, and a solid ongoing collaboration which is meant to result in further scientific output and extend beyond the duration of my PhD project. Delving into these techniques lead me to collaborating with Lousin Moumdjian from Ghent and Hasselt Universities (BE), investigating auditory-motor coupling in neuropathological populations such as persons with multiple sclerosis and cerebellar ataxia, and Marc Vidal Badia from Ghent (BE) and Granada (SP) Universities on mathematical modelling of intra- and inter-brain dynamics. Such collaborations led me to expand my research in the domains of neurorehabilitation and mathematics, respectively. In the case of L. Moumdjian, I am actively involved as collaborator in her personal FWO postdoc mandate in quality of EEG data analyst and consultant (2022-2025). This resulted in joint publications, ongoing submission to neuroscientific and neurorehabilitation journals, and a series of papers which I will co-author. Furthermore, it established a connection with the lab of Professor B. Morillon at Aix-Marseille University in Marseille (FR), where I had the opportunity to visit and consolidate my knowledge of advanced analysis methods based on cross-frequency of brain activity and rhythmic behaviors (finger-tapping and walking).

In 2019, I was awarded a BOF scholarship for the project 'Human rhythmic interactions in healthy and clinical populations', to extend my investigation to normal and pathological ageing, with the goal of building a fundamental knowledge of the sensorimotor deficit in Alzheimer Disease (AD) and address interventions to improve coordinative and communicative functions in such population. The project is being currently carried out under the co-supervision of Professor Séverine Samson and in the framework of a co-tutelle with the PSITEC research group in Lille (FR). The final outcome of the agreement will consist of the award of a joint-PhD in Art Science and Psychology, foreseen in September 2023. The two disciplines converge in the investigation of the fundamental behavioral and neural

dynamics underlying perception and production of rhythm in humans, with a special focus on adaptive behavior to ever-changing environments and interpersonal coordination. The title of the resulting thesis dissertation is “*Human rhythmic interactions. Coordination dynamics and informational coupling*”.

During my PhD, I was able to independently carry out and publish a large number of empirical studies, and gathered solid international experience. In a period of 4 years, with the precious collaboration of my team and my broader European network, my work led to a total of 9 peer-reviewed scientific publications in high-impact scientific journals, frequent contributions to international and intercontinental scientific conferences, a number of articles and book chapters in preparation, the consolidation of a tight European network involving top-notch research centers in neuroscience and psychology, and a clearly outlined research program for years to come.

In October 2023, I embarked on my postdoc project in collaboration with IPEM at Ghent University (BE) and the Center for Music in the Brain at Århus University (DK), extending my research from dyadic to group interactions and advancing neuroimaging analysis methods in the domain of rhythm perception and production. In the daily practice, I am keeping up my never-ending study of neural signal processing, developing and publishing novel analysis techniques. The know-how acquired so far allows me to implement experiments in autonomy within and beyond the facilities offered by IPEM (ASIL Art Science and Interaction Lab), including portable solutions to export the experimental settings among the facilities offered by our international partners.

EXPERTISE

- Degrees:
 - PhD in Psychology (University of Lille - FR) - *September 2023*
 - PhD in Art Sciences (Ghent University - BE) - *September 2023*
 - Master’s degree in “Body and Mind Sciences” (University of Turin - IT): 110/110 summa cum laude - *July 2018*
 - Bachelor in “Psychological science and techniques” (University of Turin - IT): 110/110 - *September 2015*
- Computing skills:
 - Matlab (advanced)
 - Arduino (intermediate)
 - RStudio (beginner-to-intermediate)
 - Python (beginner-to-intermediate)
- Research:
 - Intracranial electroencephalography (iEEG) (intermediate-advanced): processing, data analysis, network estimation via multivariate source separation
 - Magnetoencephalography (MEG) (intermediate-advanced): setup, data acquisition, processing, source reconstruction, co-registration with MRI, network estimation via multivariate source separation
 - Electroencephalography (EEG) (advanced): implementation and synchronization for multimodal recordings, processing, multivariate analysis methods (GED, PCA, ICA), cross-frequency coupling (FM, AM), brain-behavior coupling, hyperscanning methods (intra- and inter-brain)
 - Signal processing (intermediate-advanced): filter design, multivariate source separation, dimensionality reduction
 - Complexity methods (intermediate-advanced): phase-space embedding, (joint/cross) recurrence quantification analysis (RQA)
 - Movement data processing and analysis (finger-tapping, gait, motion capture)
 - Synchronization analysis methods
 - Dyadic and group interaction
 - Experimental design
- Languages:
 - Italian (native speaker)
 - English (C1-C2)
 - Spanish (C2)
 - Dutch (B2)
 - French (B1)

RESEARCH STAYS ABROAD

Center for Eudaimonia and Human Flourishing Linacre College, University of Oxford (England, UK) Prof. Dr. Morten L Kringelbach, Prof. Dr. Leonardo Bonetti	6 Jul – 12 Jul 2024
Center for Music in the Brain Aarhus University (DK) Prof. Dr. Peter Vuust, Prof. Dr. Peter Keller, Prof. Dr. Leonardo Bonetti	1 Mar – 1 Jul 2024
Center for Music in the Brain Aarhus University (DK) Prof. Dr. Peter Vuust, Prof. Dr. Peter Keller	2-16 Dec 2023
Laboratoire PSITEC (Psychologie : Interactions, Temps, Emotions, Cognition) Université de Lille (FR) Prof. Séverine Samson	1 Dec 2022 – 1 May 2023
Institut national de la santé et de la recherche médicale (INSERM) Aix Marseille Université (FR) Prof. Dr. Morillon Benjamin	14 – 20 Feb 2022
Center for Music in the Brain Aarhus University (DK) Prof. Dr. Peter Vuust, Dr. Ole Adrian Heggli	1 Sep – 1 Nov 2021
Center for Music in the Brain Aarhus University (DK) Prof. Dr. Peter Vuust, Dr. Ole Adrian Heggli	29 Oct – 29 Nov 2019

AWARDED GRANTS

Total amount awarded to date: 144.280 EUR

Fonds Wetenschappelijk Onderzoek (FWO) international mobility grant
Personal grant for a 2-months research stay at Aarhus University (DK)
1st April - 1st June 2024
Amount: 3.432 EUR

'Meet the Jury' grant (Ghent University)
for organization of Synposium 2023 at Ghent University
September 2023
Amount: 1.200 EUR

Fonds Wetenschappelijk Onderzoek (FWO) international mobility grant
for oral presentation at ICMPC-17 (August, 2023 – Tokyo, JP)
Amount: 1.582 EUR

ICMPC&SEMPRE travel award
for oral presentation at ICMPC-17 (August, 2023 – Tokyo, JP)

Amount: 350 EUR

Fonds Wetenschappelijk Onderzoek (FWO) international mobility grant
Personal grant for a 2-months research stay at Aarhus University (DK)
1st September - 1st November 2021
Amount: 2.838 EUR

Bijzonder Onderzoeksfonds (BOF)
Personal PhD mandate (4 years)
'Human rhythmic interactions. Coordination dynamics and informational coupling.'
October 2019 – October 2023
Amount: 134.880 EUR (120.000 for personal salary, plus 14.880 bench fees)

SCIENTIFIC OUTPUT

International A1 peer-reviewed publications

Total of 10 articles; 6 as first author; 4 as second author, H-index 6.

Rosso, M., Gener, C. N., Moens, B., Maes, P. J., & Leman, M. (2024). Perceptual coupling in human dyads: kinematics does not affect interpersonal synchronization. *Heliyon*.
[Impact Factor 4.0. Q1 Multidisciplinary].

Vanbilsen, N., Kotz, S. A., **Rosso, M.**, Leman, M., Triccas, L. T., Feys, P., & Moumdjian, L. (2023). Auditory attention measured by EEG in neurological populations: systematic review of literature and meta-analysis. *Scientific Reports*, 13(1), 21064.
[Impact Factor 4.997. Q1 Multidisciplinary (11/120)].

Rosso, M., van Kerrebroeck, B., Maes, P. J., & Leman, M. (2023). Embodied perspective-taking enhances interpersonal synchronization: A body-swap study. *iScience*, 26(11).
[Impact Factor 6.1. Q1 Multidisciplinary].

Rosso, M., Moens, B., Leman, M., & Moumdjian, L. (2023). Neural entrainment underpins sensorimotor synchronization to dynamic rhythmic stimuli. *NeuroImage*, 120226
[Impact Factor 5.7. Q1 Neuroimaging (2/14), Q1 Cognitive Neuroscience (5/96)].

Rosso, M., Heggli, O. A., Maes, P. J., Vuust, P., & Leman, M. (2022). Mutual beta power modulation in dyadic entrainment. *NeuroImage*, 257, 119326.
[Impact Factor 5.7. Q1 Neuroimaging (2/14), Q1 Cognitive Neuroscience (5/96)].

Rosso, M., Maes, P. J., & Leman, M. (2021). Modality-specific attractor dynamics in dyadic entrainment. *Scientific Reports*, 11(1), 1-13.
[Impact Factor 4.997. Q1 Multidisciplinary (11/120)].

Rosso, M., Leman, M., & Moumdjian, L. (2021). Neural entrainment meets behavior: the stability index as a neural outcome measure of auditory-motor coupling. *Frontiers in Human Neuroscience*, 15.
[Impact Factor 3.473. Q2 Behavioral neuroscience (29/79)].

Vidal, M., **Rosso, M.**, & Aguilera, A. M. (2021). Bi-Smoothed Functional Independent Component Analysis for EEG Artifact Removal. *Mathematics*, 9(11), 1243.
[Impact Factor 2.884. Q1 Mathematics (75/378)].

Dell'Anna, A., **Rosso, M.**, Bruno, V., Garbarini, F., Leman, M., & Berti, A. (2021). Does musical interaction in a jazz duet modulate peripersonal space?. *Psychological Research*, 85(5), 2107-2118.

[Impact Factor 2.956. Q1 Arts and Humanities (43/306), Q2 Experimental and Cognitive Psychology (44/148)].

Van Kerrebroeck, B., **Rosso, M.**, & Maes, P. J. (2020). Linking embodied coordination dynamics and subjective experiences in musical interactions: a renewed methodological paradigm. *DOCUMENTA*, 38(1), 38-60.

A2 peer-reviewed publications

Total of 1 article; 1 as co-author.

Moumdjian, L., **Rosso, M.**, Moens, B., De Weerd, N., Leman, M., & Feys, P. (2022). A case-study of a person with multiple sclerosis and cerebellar ataxia synchronizing finger-taps and foot-steps to music and metronomes. *Neuroimmunology Reports*, 2, 100101.

B1 edited publications (Book chapters)

Total of 1 book chapter; 1 as co-author.

Maes, P. J., van Kerrebroeck, B., **Rosso, M.**, Marouda, I., & Leman, M. Extended reality (XR) in embodied musical art and science. In *The Routledge Handbook of Embodied Cognition* (pp. 143-155). *Routledge*.

Pre-prints

Total of 2 pre-prints; 1 as first author, 1 as last author.

Rosso, M., Fernandez-Rubio, G., Keller, P., Brattico, E., Vuust, P., Kringelbach, M. L., & Bonetti, L. (2024). FREQUENCY-resolved brain Network Estimation via Source Separation (FREQ-NESS). *bioRxiv*, 2024-08.

Bonetti, L., Fernandez-Rubio, G., Andersen, M. H., Malvaso, C., Carlomagno, F., Testa, C., ... & **Rosso, M.** (2024). BROADband brain Network Estimation via Source Separation (BROAD-NESS). *bioRxiv*, 2024-10.

DISSEMINATION

Scientific conferences (as organizer)

SYNCPOLIUM 2023. Current perspectives on the modelling of rhythmic interactions, September 20th-21st 2023 – Ghent (BE)

Invited keynote speakers: Prof. *Peter Keller* (Aarhus University, DK), Prof. *Peter Vuust* (Aarhus University, DK), Prof. *Marc Leman* (Ghent University, BE), Prof. *Pieter-Jan Maes* (Ghent University, BE), Prof. *Sylvie Nozaradan* (BE), Prof. *Benjamin Morillon* (FR), Prof. *Sonja Kotz* (Maastricht University, NL), Prof. *Séverine Samson* (Lille, FR), and Dr. *Lise Hobeika* (Lille, FR).

Amount of registrations: 129 (hybrid format).

Scientific conferences (as presenter)

Neuromusic VIII, June 13th-16th 2024 – Helsinki (FI)

Rosso M., Keller, P., Van Kerrebroeck, B., Maes, P., Leman M., Vuust, P. “Distinct neural mechanisms underpinning interpersonal synchronization: evidence from a body-swap study in EEG hyperscanning.”

(Poster presentation)

Timing Research Forum, October 4th – 6th 2023 – Lisbon (PT)

Rajendran, V., Sierra, F., Criscuolo, A., **Rosso, M.** “Rhythmic synchronization in and out of the brain, from single interval estimations to interpersonal interaction. A cross-species and translational perspective.”
(Symposium)

ICMPC17 – APSCOM7, Augustus 24th-28th 2023 – Tokyo (JP)

Rosso, M., Maes, P., Leman, M. “Dyadic rhythmic interactions. Coordination dynamics and informational coupling”.
(Oral presentation)

Sysmus, September 7th-9th 2022 – Ghent (BE)

Rosso, M., Leman, M., Moumdjian, L. “Event-related frequency adjustment. A methodology for investigating neural entrainment”.
(Oral presentation)

Rhythm production and perception workshop, June 22-25th 2021 – Oslo (NO)

Rosso, M., Leman, M., Moumdjian, L. “Neural entrainment meets behaviour: the Stability Index as a neural outcome measure of auditory-motor coupling”.
(Oral presentation)

Neuromusic VII, June 18th-21th 2021 – Aarhus (DK)

Rosso M., Heggli O.A., Maes P.J., Vuust P., Leman M. “Drifting metronomes. Cooperation and competition in dyadic entrainment”.
(Poster presentation)

ANT Neuromeeeting, January 15th-18th 2020 – Beaune (FR)

Rosso M. “Interactive settings for interactive brains”.
(Poster presentation)

Scientific conferences (as contributor)

Neuromusic VIII, June 13th-16th 2024 – Helsinki (FI)

Baliviera E., **Rosso M.**, Moens B., Leman M., Feys P., Moumdjian L. “Spared neural and behavioral adaptation following changes in rhythm in patients with cerebellar impairments.”
(Poster presentation)

MOBI 2024 (Mobile Brain/Body Imaging Conference), June 2nd-5th 2024 – Piran (SI)

Moumdjian L., Morillon B., **Rosso M.**, Moens B., Leman M., Feys P. “To Sync or not to Sync: Understanding the variation of synchronization consistency when walking to beats in patients with cerebellar impairment compared to healthy controls.”
(Poster presentation)

Seminars and invited talks

“Frequency-resolved brain network estimation via source separation (FREQ-NESS)” – *Center for Music in the Brain, Aarhus University (DK) - November 25th 2024*

“Social cognition in coupled systems: in-group and out-group dynamics in interpersonal synchronization” – *Center for Music in the Brain, Aarhus University (DK) - December 11th 2023*

“Event-related frequency adjustment (ERFA): a methodology for investigating neural entrainment” - *Timing Research Forum (virtual journal club) November 29th 2023 (online)*

“Dyadic rhythmic interactions. Coordination dynamics and informational structures.” In *‘Rhythm, synchronization, social interactions’ seminar - PSITEC lab, University of Lille (FR) – April 3rd 2023*

“Human rhythmic interactions and their dynamics” – *BAND Lab, University of Maastricht (NL) - November 7th 2022*

“Human rhythmic interactions and their dynamics” - *Department of Psychology, University of Turin (IT) - October 14th 2022*

TEACHING

- Lectures
 - ‘Music psychology’ at Ghent University (Prof. Marc Leman): ay 2019/20 – 2020/21 – 2021/22
- Internships: training and supervision
 - Master’s student Jan de Tremerie (Jan 2021 – Apr 2021)
 - Master’s student and lab assistant Canan Nuran Gener (Apr 2020 – Apr 2021) – University of Padova (IT), Department of Psychology
- Master’s thesis supervisions
 - ‘Human musicality and the roots of empathy: neural basis, evolution and integration.’
Canan Nuran Gener
University of Padova (IT) - Gent University (BE)
Defended in April 2022
- Workshops
 - “Interactive settings for interacting brains. Dual-EEG approaches in music research”.
Sysmus, September 7-9th 2022 – Ghent (BE)

SPECIALIZED EDUCATION

- Doctoral Training Program – Ghent (BE)
Ghent University Doctoral Schools - aa.yy. 2019-2023
- “Linear algebra for neuroscientists”
Radboud summer school – Nijmegen (NL), 14-19/08/2022
Lecturer: Mike x Cohen
- FLAMES Summer School 2020
 - Module 06: Generalized linear models
 - Module 12: Time series analysis
- “Getting started with High-Performance Computing 2018-2019” (part 2)
Ghent University Doctoral Schools - 3-5/06/2019
Transferrable skills training (Research and Valorization cluster)

- “Sound & Listening on the edge of Music, Performance, Film and New Media”
Ghent University Doctoral Schools – 20-24/05/2019
Specialist course by the Faculty of Arts, Humanities and Laws
- UDEMY:
 - “A deep understanding of deep learning”
 - “PCA & multivariate signal processing, applied to neural data”
 - “Complete linear algebra: theory and implementation in code”
 - “Master the Fourier transform and its applications”
 - “Master statistics & machine learning: intuition, math, code”
 - “Signal processing problems, solved in MATLAB and in Python”
 - “MATLAB onramp 2021: coding, concepts, confidence, and style”
 - “Master MATLAB through Guided Problem Solving”
 - “Master Python programming by solving scientific projects”
 - “Complete neural signal processing and analysis: Zero to hero”
- IPEM Think Tanks
Weekly lab meetings: 2018-2023
- Attended conferences and seminars
 - “Neuro-sense & sense-ability. Sensing and data processing technology for the brain” - KU Leuven (BE) – 1-2/4/2019
 - UBL CONNEX: “The neuroscience of musical entrainment: insights from EEG frequency-tagging” – Sylvie Nozaradan. Université Libre de Bruxelles (BE), 12/12/2018

PUBLIC APPEARANCES

- ‘Universiteit van Vlanderen’ – featured in “Can music help with physical rehabilitation?” by L. Moumdjian.
- ‘Rode Neuzen’ - VTM (Vlaamse televisie maatschappij) on 4/12/202