Marcia Bécu

Postdoctoral researcher

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How do you know where you are in space? A seemingly simple question, solved by the brain with elegant and complex mechanisms, that I try to unveil by studying behavioural and neural correlates of spatial navigation in humans, both in healthy and pathological aging.

Education

2018 **Ph.D in cognitive neuroscience**, *Sorbonne University*, Paris, France.
- Thesis: Impact of healthy aging on spatial cognition. Navigation and gaze dynamics in ecological conditions (PI: Angelo Arleo)

2013 **MSc in neuropsychology**, *University of Grenoble*, France.
- Thesis: Eye-tracking and cortical excitability as a biomarkers of the emotional response to an rTMS treatment for bipolar depression (PI: Christian Marendaz)

2010 **BSc in psychology**, *University of Lille*, France.
- Thesis: Modulation of size perception in healthy young participants (PI: Yann Coello)
- Third year achieved with Erasmus program at University of Bari, Italy

Research experience

2020-now **Postdoctoral researcher**, *DoellerLab, Kavli Institute for Systems Neuroscience*, NTNU, Trondheim, Norway.
- current research: object-vector coding in the human brain, in the context of Alzheimer's disease (K.G. Jebsen Centre for Alzheimer's Disease)
- designed a VR-based online task and analyzed fMRI data

2020-now **Guest Researcher**, *Max Planck Institute for Human cognitive and Brain science*, Leipzig, Germany.
- reviewed scientific articles for Spatial Cognition and Computation, Brain topography, Neuroscience and Biobehavioral Reviews
- chaired the Journal club of the group

2014–2019 **Ph.D candidate**, *Institute of Vision, Research chair Silversight*, Sorbonne University, Paris, France.
- contributed to the creation the SilverSight cohort (350 elderly participants)
- ensured the dissemination of results, as evidenced by oral and poster presentations
- collaborated with IP teams from Essilor International to submit EPO patent as first inventor
- mentored 10+ students

2011–2012 **Test library/ Computer instructor**, University of Lille, France.
- mentored students on computer-related tasks
- was in charge of the psychological testing library

Skills

Behaviour
eye-tracking (Eyelink, Mocaplab, Tobii VR), motion capture (Vicon), HMD (HTC vive pro, Pimax), electromyographic response (Dantec), computerized cognitive testing, visual testing

Neuroimaging and stimulation
MRI/fMRI (3/7 Tesla Siemens), transmagnetic stimulation (TMS/rTMS), mobile EEG (Brain Products)

IT	Matlab (expert), R (intermediate), Adobe Illustrator (intermediate), LaTeX (intermediate), Unity (beginner), Visual Studio (beginner), cloud computing
Statistics	GLM, analysis of variance, PCA, machine learning (binary classification, linear regression), analysis of rank
Languages	French (mother tongue), English (full working proficiency), Italian (conversationally fluent), Norwegian (beginner)

Grants & awards

2022 **Awardee of the Kavli NDI-X Speaker Series**, *To present research works at John Hopkins University.*

2022 **Honoraria from AAAS (American Association for the Advancement of Science)**, *For an invited book review in Science*, 100$.

2021 **Project grant from Helse Midt-Norge**, *Post-COVID memory function and medial temporal lobe pathology*, project collaborator, 2260K NOK.

2021 **Project grant from NTNU**, *Spatial Cognition and the Ageing Brain: a multidimensional approach to foster sustainable ageing*, project collaborator, application.

2019 **Travel grant**, awarded for a presentation at the conference "Artificial Intelligence & Health in Horizon 2020", 200€.

2018 **Honorable poster award**, at the conference "Spatial Cognition".

2017 **Best poster award**, at the conference "Neuroscience Workshop Saclay", prize 100€.

2012 **Project grant from foundation FondaMental – Institut Lilly**, *rTMS treatment in pharmacoresistant bipolar depression*, 3600€.

Press highlights

Ars Technica: "As we age, we struggle to use landmark-based navigation"

CNRS Le Journal & Le Monde : "Does our sens of direction change as we get older?"

France 5 Le magazine de la santé : "Is spatial orientation modulated by age?"

Senior actu : "Streetlab: an experimental platform to understand healthy aging"

List of contributions

Papers

Published

Bécu, *et al.* Age-related preference for geometric spatial cues during real-world navigation. *Nature Human Behaviour* **4,** 1, 88-99 (2020)

Delaux, Saint-Aubert, Ramanoël, **Bécu**, *et al.* Mobile brain/body imaging of landmark-based navigation with high-density EEG. *European Journal of Neuroscience* **54,** 8256–82 (2021)

Agathos, Ramanoël, **Bécu**, *et al.* Cognitive-motor interference in older adults navigating in a real environment. *Frontiers in Aging Neuroscience* **12,** 398 (2020)

Ramanoël, Durteste, **Bécu**, *et al.* Differential brain activity in regions linked to visuo-spatial processing during landmark-based navigation in young and healthy older adults. *Frontiers in Human Neuroscience* **14,** 440 (2020)

Sheynikhovich, **Bécu**, *et al.* Unsupervised detection of microsaccades in a high-noise regime. *Journal of Vision* **18,** 6, 1-16 (2018)

Preprints

Ramanoël, Durteste, Bizeul, Ozier-Lafontaine, **Bécu**, *et al.* Selective neural coding of object, feature, and geometry spatial cues in humans *bioRxiv* (2021)

Bécu, *et al.* Modulation of spatial cue processing across the lifespan: a geometric polarization of space restores allocentric navigation strategies in children and older adults. *bioRxiv* (2020)

In preparation

Bécu, *et al.* Age-related modulation of fixational eye movements in optic flow conditions.

Book review

Bécu & Doeller. Lost and found. *Science* **375,** 6578, 274 (2022)

Patent

Bécu, *et al.* Method for designing optical equipment based on spatial navigation strategy. (2017)

Invited talks

Bécu, Modulation of landmark and geometry spatial coding in healthy aging. *Kavli Neuroscience Discovery Institute, John Hopkins University*, Baltimore, USA (Septembre, 2022)

Bécu, Modulation of landmark and geometry spatial coding in healthy aging. *University of Magdeburg*, Germany (June, 2021)

Bécu, Modulation of landmark and geometry spatial coding in healthy aging. *Institute of Behavioural Neuroscience, University College London*, UK (March, 2021)

Bécu, Impact of healthy aging on spatial cognition. Navigation and eye movements in ecological conditions. *Max Plank Institute for Human Cognitive and Brain Sciences*, Leipzig, Germany (2020)

Conference presentations

Durteste, Ramanoël, **Bécu**, Habas, Arleo. Differential brain activity in regions linked to visuo-spatial processing during landmark-based navigation in young and heathy older adults. *Journées d'Etudes du Vieillissement (JEV)*, 20 et 21 mai, Lyon, France (2021)

Durteste, Ramanoël, **Bécu**, Habas, Arleo. Age-related differences in brain regions linked to visuo-spatial processing during landmark-based navigation. *15ème Journée Scientifique des Jeunes Chercheurs en Psychologie*, Lille, France (2020)

Bécu, Using location data to detect autonomy loss in the elderly. *Artificial Intelligence & Health in Horizon 2020*. Oslo, Norway (2019)

Ramanoël, Durteste, Bizeul, **Bécu**, *et al.* Age-related differences in the neural bases of landmark versus geometric spatial cue processing. *Symposium Vieillissement: tours, contours et perspectives*, Tours, France (2019)

Bécu *et al.* Modulation of spatial cue preference across lifespan: geometric cues enable children and older adults to successfully use allocentric navigation strategies. *International Symposium on Spatial Cognition in Aging and Neurodegeneration*, Magdeburg, Germany (2018)

Bécu, *et al.* Age-related preference for geometric cues during real-world navigation: behavioral and neuroimaging correlates. *Interdisciplinary Navigation Symposium*, Mont-Tremblant, Canada (2018)

Bécu, *et al.* Age-related preference for geometric cues during real-world navigation: behavioral and neuroimaging correlates. *Spatial Cognition Conference*, Tübingen, Germany (2018)