Cris Rossi

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Current position

Postdoctoral Fellow, Neuroscience 2022 – present
Kennedy Krieger Institute, Johns Hopkins University, Baltimore, MD, USA
Advisor: Dr. Amy J. Bastian
Topic: perception of self-generated movement

- how it shapes generalization of learning across environments
- applications to neurorehabilitation
- development of an open-source VR platform to promote ecologically valid movement research

Education

Ph.D., Biomedical Engineering (Neuroengineering) 2016 – 2022
Johns Hopkins University, Baltimore, MD, USA
Advisor: Dr. Amy J. Bastian
Dissertation: "Mechanisms of motor and perceptual learning in locomotor adaptation"
Topic: neural mechanisms of movement and motor learning:

- interplay with perceptual and cognitive processes
- development in childhood and effects of aging
- formulation of a computational model for perceptuomotor learning in walking

M.Eng., Biomedical Engineering, 1st Class Honours 2022 – 2015
Imperial College London, London, UK
Integrated Bachelor's/Master's (Neuroscience focus)
Advisors: Dr. Etienne Burdet, Dr Holger Krapp, Dr Dominic Southgate
Topic: neural control for locomotion and assistive technologies for sensorimotor impairments

Funding and awards

Predoctoral Fellowship, American Heart Association. 2020 – 2021
Role: principal investigator.
Amount: $62,032.

Trainee Professional Development Award, Society for Neuroscience. 2019
Role: student presenter.
Amount: $1,000.

Inventions

MovementVR (movementVR.github.io)
Role: lead creator and developer
Description: an open-source platform for creating behavioral experiments in immersive Virtual Reality, quickly and without coding. It includes:

- a ready-to-use VR app with a naturalistic task
- integrated hand tracking for lifelike object interaction and motion capture
- GUI-based tools for customizing experiments and processing recorded data.

Status: prototype complete; licensing discussions in progress

Manuscripts

Rossi C. Age-specific generalization in walking adaptation: the role of training speed. *Journal of Neurophysiology 2025 May 27. doi: 10.1152/jn.00225.2025*.

Rossi C, Varghese R, Bastian AJ. MovementVR: An open-source tool for the study of motor control and learning in virtual reality. *arXiv preprint 2025 Apr 30; arXiv:2504.21696*.

Varghese R, **Rossi C,** Malone LA, Bastian AJ. Adaptive learning of a naturalistic bimanual task in virtual reality. *bioRxiv preprint 2025 May 1; bioRxiv:2025.05.01.651653*.

Rossi C, Leech KA, Roemmich RT, Bastian AJ. Automatic learning mechanisms for flexible human locomotion. *eLife 2024; 13:RP101671*.

Rossi C, Roemmich RT, Bastian AJ. Understanding mechanisms of generalization following locomotor adaptation. *npj Science of Learning 2024 Jul 23;9(1):48*.

Rossi C, Roemmich RT, Schweighofer N, Bastian AJ, Leech KA. Younger and late middle-aged adults exhibit different patterns of cognitive-motor interference during locomotor adaptation, with no disruption of savings. *Frontiers in Aging Neuroscience 2021 Nov 26;13:729284*.

Stenum J, **Rossi C**, Roemmich RT. Two-dimensional video-based analysis of human gait using pose estimation. *PLoS Computational Biology 2021 Apr 23;17(4):e1008935*.

Rossi C, Bastian AJ, Therrien AS. Mechanisms of proprioceptive realignment in human motor learning. *Current Opinion in Physiology 2021 Feb 13; 20:186-197*.

Rossi C*, Chau CW* [*Co-First Authors], Leech KA, Statton MA, Gonzalez AJ, Bastian AJ. The capacity to learn new motor and perceptual calibrations develops concurrently in childhood. *Scientific Reports 2019 Jun 27; 9(1):9322*.

Conference and extramural presentations

Oral Presentations

Rossi C, Leech KA, Haith AM, Bastian AJ. "Mechanisms of perceptual and motor changes with locomotor adaptation". Panel "Beyond a visuo-centric view: The crucial role of proprioception in

sensorimotor learning" with Miall C, Block H, Tsay J. Society for the Neural Control of Movement Annual Meeting, July 2022, Dublin, Ireland.

Stenum J**, Rossi C**, Roemmich RT. "Two-dimensional video-based analysis of human gait using pose estimation". Symposium on Advances in markerless tracking used for human movement analysis, February 2021, online.

Rossi C, Cherry-Allen KM, Bastian AJ. "Effect of somatosensory impairments on the rehabilitation of walking function post-stroke". Dynamic Walking Annual Meeting, May 2020, online.

Rossi C, Bastian AJ. "Adaptive training of gait and proprioception: what persists during natural over ground walking?". Young Researcher Conference, October 2019, University of Maryland College Park, MD.

Rossi C, Leech KA, Bastian AJ. "Exploring post-stroke perceptual deficits in gait". Young Researcher Conference, April 2019, Drexel University, Philadelphia, PA.

Rossi C, Leech KA, Bastian AJ. "Motor learning also changes perception". Baltimore Brain Series, September 2018, National Institute on Drug Abuse, Baltimore, MD.

Poster Presentations

Rossi C, Varghese R, Bastian AJ. "Reaching beyond the lab: virtual reality platform to study adaptation in real-world conditions". Society for Neuroscience Annual Meeting, November 2023, Washington, D.C.

Rossi C, Roemmich RT, Bastian AJ. "Why does locomotor adaptation generalize only partially to overground walking?". Society for Neuroscience Annual Meeting, November 2022, San Diego, CA.

Rossi C, Hill NM, Keller J, Spears I, Leech KA, Bastian AJ. "Somatosensory biases, sensitivity, and adaptability during post stroke walking". Society for Neuroscience Annual Meeting, November 2021, online.

Rossi C, Leech KA, Bastian AJ. "Proprioceptive sensitivity, biases and adaptability during post-stroke walking". American Society of Neurorehabilitation Annual Meeting, October 2019, Chicago, IL.

Rossi C, Bastian AJ. "Transfer of the perceptual and motor components of treadmill learning to natural walking". Society for Neuroscience Annual Meeting, October 2019, Chicago, IL.

Leech KA, **Rossi C**, Bastian AJ. "A Walk to Remember: people learn and store new locomotor memories despite increased cognitive loading". Society for Neuroscience Annual Meeting, October 2019, Chicago, IL.

Rossi C, Leech KA, Bastian AJ. "Recalibrating the perception of how our legs move with walking adaptation". Young Researcher Conference, September 2018, University of Maryland College Park, MD.

Rossi C, Leech KA, Bastian AJ. "Dissecting changes in perception following locomotor adaptation". Progress in Clinical Motor Control Annual Meeting, July 2018, Penn State, PA.

Rossi C, Leech KA, Bastian AJ. "Dissecting changes in perception following locomotor adaptation". Society for the Neural Control of Movement Annual Meeting, May 2018, Santa Fe, NM.

Intramural presentations at Johns Hopkins University

Oral Presentations

Rossi C, Leech KA, Bastian AJ. "Dissecting changes in movement perception following locomotor adaptation". Dept of Biomedical Engineering Seminar Series, February 2018.

Rossi C, Leech KA, Bastian AJ. "Dissecting changes in movement perception following locomotor adaptation". Sensorimotor Research Day, December 2017.

Poster Presentations

Rossi C, Bastian AJ. "Transfer of the perceptual and motor components of treadmill learning to natural walking". Physical Medicine and Rehabilitation Research and Clinical Expo, December 2019.

Rossi C, Leech KA, Bastian AJ. "Kinesthetic sensitivity, biases and adaptability during post-stroke walking". Johns Hopkins Research Symposium on Engineering in Healthcare, November 2019.

Rossi C, Leech KA, Bastian AJ. "Perceptual and motor asymmetries in stroke survivors". School of Medicine Student Research Rounds, May 2019.

Rossi C, Leech KA, Bastian AJ. "Deficits of movement and perception in post-stroke gait". Graduate Student Association Poster Session, May 2019.

Rossi C, Leech KA, Bastian AJ. "Exploring post-stroke perceptual deficits in gait". Women in STEM Symposium, April 2019.

Rossi C, Leech KA, Bastian AJ. "How do we change movement and perception with locomotor adaptation?". Physical Medicine and Rehabilitation Research and Clinical Expo, November 2018.

Rossi C, Leech KA, Bastian AJ. "Perception and movement change differently with locomotor adaptation". School of Medicine Student Research Rounds, June 2018.

Teaching experience and training

Instructor, developed and taught curriculum (Johns Hopkins University)

Bridging the Gap Between Engineering and Medicine: Rehabilitation of Stroke, Parkinson and Other Neurologic Disorders 2020 – 2022
Intersession. Taught 3 times, each section had 11-13 students & 13-18 contact hours.

Engineering rehabilitation of motor, neurologic and psychiatric disorders 2019 – 2021
HEART program. Taught 5 times, each section had 8-11 students & 13 contact hours.

Biomedical Engineering: Rehabilitation and Devices 2019
Discover Hopkins program. Taught twice, each section had 11-14 students & 45 contact hours.

Miracles of Modern Medicine, lecture on Neuroengineering, movement and stroke July 2018
Discover Hopkins program. 20 students & 5 contact hours.

Instructor, taught curriculum (Johns Hopkins University)

Biomedical Engineering Innovation 2020 – 2021
Taught twice, each section had 25-31 students & 40 contact hours.

Teaching assistant (Johns Hopkins University)

Foundations of Human Anatomy 2019
12 students & 12 contact hours.

Teaching training and certificates

Johns Hopkins Teaching Academy Certificate 2018 – 2021
Teach First Training at Imperial College London 2014 – 2015

Mentorship experience

(Role: research mentor to junior trainees in Dr. Bastian's lab, Johns Hopkins University)

Doctoral students

Nick Castle 2023 – present
Brittney Tiffault 2021

Undergraduate students

Alexander Jean-Luc Tinana 2022 – 2023
Ian Spears 2021
Valeria Suarez 2020
Lauren Fink 2019 – 2020

High school students

Jordany Gonzalez 2021 – 2022

Volunteering and outreach

Youth Mentorship & Education

P-TECH, High School mentor 2018 – 2020
Thread, High School mentor 2018 – 2020
Dunbar High School, Baltimore, USA
Relationship-based mentoring to foster belonging and academic self-belief across societal divides.

Pimlico Connection, Science Club Leader 2015
Ashburnham Primary School, London, UK

Imperial College School Plus, Coding Club Instructor 2014 – 2015
Bishop Challoner Sixth Form, London, UK

Science Outreach Events (selected)

Women in STEM, Panelist 2019
Johns Hopkins University, Baltimore, USA
Invited speaker on panel discussing gender in science

Girl Scout Roller Coaster Day, team leader 2018
Baltimore Brain Connect, event organizer and science demo leader 2018
Baltimore Brain Fest, science demo leader 2017
Hopkins Robotics Cup, team leader 2017
Johns Hopkins University, Baltimore, USA

Professional activities

Journal reviewer

PLOS One
Journal of Neurophysiology
npj Science of Learning
Child Development

Professional membership

Society for Neuroscience. 2017 – 2023
Society for the Neural Control of Movement. 2017 – 2022
American Heart Association. 2019 – 2021
American Society of Neurorehabilitation. 2019

Professional training

Neuromatch Academy: computational neuroscience summer school 2020

Technical skills

Experimental platforms and testing

Human participants testing: children, younger and older adults, participants with stroke

Marker- and video-based motion capture: classic laboratory marker systems (Vicon, Optotrak), pose estimation from videos and images (OpenPose), tracking with VR headsets built-in cameras

Virtual reality experiments: development of VR apps (Unity, C#) with articulated hand models for lifelike interaction with virtual objects (for headsets like Meta Quest 2).

Split-belt treadmill experiments: controlled with custom scripts (Python, MATLAB, D-Flow/Lua).

Assessment of motor, sensory-perceptual, and cognitive processes

Clinical evaluations: motor (Fugl-Meyer, walking tests), sensory (Semmes-Weinstein monofilaments for cutaneous sensation, proprioception and kinesthesia joint-level discrimination tests), cognitive (Montreal Cognitive Assessment, tests of hemineglect)

Psychophysics and perceptual assessment: measurement of perceptual thresholds and sensitivity using classic psychophysical methods – method of limits, adjustment, and constant stimuli – and adaptive methods based on Bayesian estimation – QUEST, Ψ method.

Interplay between processes and learning: experimental design to evaluate relationships between motor, perceptual and cognitive processes, and induce changes in these processes with adaptive learning and dual-tasking.

Statistical and computational methods

Coding expertise: data analysis (MATLAB, Python, R), VR app development (C#, Unity), website development (HTML, JavaScript, CSS), hardware interfacing (C++).

Statistical methods: classical parametric and non-parametric tests; bootstrapping for hypothesis testing; fixed, random, and mixed-effects models; Bayesian methods; linear, logistic, nonlinear regression; machine learning techniques

Computational modelling: model fitting and development of new computational models for motor and perceptual time series data in human learning

Communication

Languages: English (fluent), Italian (native), German (basic), French (just starting)

Transferable: Comedy Improv performer (Baltimore Improv Group, Highwire Improv).