

Sofía Fernández Lozano

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Profile

I develop and validate structural-MRI biomarkers of neurodegeneration and apply structural equation modeling to cognitive decline. My path to this work spans three countries (Mexico, Canada, and the USA) and three languages — from community psychology through clinical neuroimaging into computational neuroscience — alongside a sustained commitment to open, reproducible tools and to ethically grounded, participant-facing research with underrepresented populations.

Education

Montreal Neurological Institute & McGill University

PHD IN NEUROSCIENCES

Montréal, QC, Canada

Aug 2020 – 2026

- Project: MRI biomarkers in Alzheimer's disease.
- Candidacy completed 2022; thesis seminar completed 2025; defense scheduled for June 2026.
- Supervisor: D. Louis Collins, PhD.

Universidad Nacional Autónoma de México (UNAM) & Instituto de Neurobiología (INB)

MASTER OF SCIENCE IN NEUROBIOLOGY — GRADUATED WITH HONORS

Ciudad de México, México

Jan 2020

- Thesis: Brain connectivity in cocaine-addicted patients after repetitive transcranial magnetic stimulation treatment.
- Supervisor: Eduardo Garza-Villarreal, PhD.

Universidad Autónoma de Baja California (UABC)

LICENCIATURA (BSC) IN PSYCHOLOGY — HIGHEST HONORS

Tijuana, BC, México

Jan 2016

- Scholar Merit (first in class — equivalent to summa cum laude).
- Focus: Neuropsychology · Psychometrics.

Universidad de Salamanca

SEMESTER ABROAD

Salamanca, Spain

Jul 2014

- Training in clinical and vocational evaluations.

Research Experience

Neuroimaging & Surgical Technologies (NIST) Lab

PHD CANDIDATE

Montréal, QC, Canada

Aug. 2020 – Present

- Developing and validating MRI tools to better predict progression to Alzheimer's disease.
- Developed a Quality Control web application that significantly improved the efficiency of the lab's QC processes.

Laboratorio Nacional de Imagen por Resonancia Magnética (LANIREM)

MASTER'S STUDENT RESEARCHER

Querétaro, Qro, México

Jul. 2019 – Jan. 2020

- Continued research at the new location of the lab.
- Implemented a Machine Learning pipeline classifying cocaine-dependence from global topology metrics of fMRI (graph-theory analysis).

Laboratory of Neuroimaging, NIAAA, National Institutes of Health

VOLUNTEER RESEARCH VISITOR

Bethesda, MD, USA

Mar. – May 2019

- Trained on Functional Connectivity Density Mapping (FCDM) under Dr. Tomasi for the ADDIMEX project.
- Presented work at the joint NIAAA / NIDA intramural seminar.

Instituto Nacional de Psiquiatría "Ramón de la Fuente Muñiz" (INPRFM)

MASTER'S STUDENT RESEARCHER

Ciudad de México, México

Aug. 2017 – Jun. 2019

- Collaborated on the randomised clinical trial of rTMS in Cocaine Use Disorder under Eduardo Garza, PhD.
- rTMS administration; database management; MRI acquisition, preprocessing, and analysis.

Colegio de la Frontera Norte (COLEF)

RESEARCH INTERN

Tijuana, BC, México

Feb. – Sep. 2015

- Intern on the project: Mexican parents' attitudes toward gender equality in family roles and leadership.
- Questionnaire administration to middle-school parents and data capture.

Clinical Experience

Interpsique

PSYCHOMETRIST

Tijuana, BC, México

Jan. 2016 – Mar. 2017

- Clinical psychological evaluation: test administration, scoring, and supervised interpretation under a licensed psychologist.

Hospital de Salud Mental de Tijuana (HSMT)

PSYCHOLOGY INTERN

Tijuana, BC, México

Dec. 2014 – Mar. 2015

- 240 supervised clinical hours at the Inpatient Psychiatric Care Unit: occupational and group therapy, clinical evaluations.

Community & Advocacy

Yaaj México, A.C.

RESEARCH COORDINATOR

Ciudad de México, México

Mar. 2017 – Jul. 2019

- Coordinated a project with the United Nations Office on Drugs and Crime (UNODC) to write a guide for mental-health professionals against Sexual Orientation and Gender Identity Change Efforts: *Nada que curar*.
- Led science communication on sexual health and sex/gender diversity in youth populations.

COPRED — Council to Prevent and Eliminate Discrimination of Mexico City

CONSULTANT

Ciudad de México, México

Apr. 2017 – Jul. 2019

- Expert consultation on new policies and guidelines related to discrimination matters in Mexico City.
- Member of the Consultative Assembly that designed the selection process for the new President of the Council.

CAIPT — Integral Attention Center for Transgender People

VOLUNTEER

Tijuana, BC, México

Jan. – Jul. 2017

- Designed and implemented workshops for the transgender women community of Baja California.

Publications

ARTICLES & BOOK CHAPTER

- **Enhanced Detection of Age-Related and Cognitive Declines Using Automated Hippocampal-To-Ventricle Ratio in Alzheimer's Patients.**

FERNANDEZ-LOZANO, S., et al. · *Human Brain Mapping* 46(11) (2025). doi:10.1002/hbm.70265

Role. Designed and validated the deep-learning segmentation pipeline, conceived and executed the analyses, released the Docker image, drafted the manuscript. **Impact.** Converts a labour-intensive manual biomarker into an automated, scalable tool validated across AD and PD cohorts.

- **QRATER: a collaborative and centralized imaging quality control web-based application.**

FERNANDEZ-LOZANO, S., et al. · *Aperture Neuro* 4 (2024). doi:10.52294/001c.118616

Role. Conceived, designed, and programmed the application; led QC training and the ADNI QC effort; drafted the manuscript. **Impact.** Open-source tool adopted across multiple labs; 250K+ images processed; 2–10× faster than conventional QC.

- **Clinical and functional connectivity outcomes of 5-Hz repetitive transcranial magnetic stimulation as an add-on treatment in cocaine use disorder: a double-blind randomized controlled trial.**

Garza-Villarreal, E.A., Alcalá-Lozano, R., FERNANDEZ-LOZANO, S., et al. · *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging* 6(7), 745–757 (2021). doi:10.1016/j.bpsc.2021.01.003

Role. Co-author — administered rTMS treatments, supervised MRI acquisition and safety, performed the fMRI connectivity analyses. **Impact.** First double-blind RCT of rTMS for cocaine use disorder in a Latin-American population.

- **Gray and white matter morphology in substance use disorders: a neuroimaging systematic review and meta-analysis.**

Pando-Naude, V., Toxto, S., FERNANDEZ-LOZANO, S., et al. · *Translational Psychiatry* 11(1), 29 (2021). doi:10.1038/s41398-020-01128-2

Role. Co-author — parsed and catalogued the included studies; contributed to manuscript review. **Impact.** Systematic review and meta-analysis of gray- and white-matter morphology across substance use disorders.

- **Derechos sexuales y reproductivos; reflexiones para terapeutas (Sexual and reproductive rights; reflections for therapists).**

FERNANDEZ-LOZANO, S. · In Gómez-Lamont, M.F. & Silva-Aragón, A. (Eds.), *Terapia familiar sistémica y la comunidad LGBT+ (Systemic family therapy and the LGBT community)*. Ciudad de México: Pax & Leed (2019).

PREPRINTS

- **Hippocampal-to-ventricle ratio as a head-size-independent biomarker: sex differences and cognitive associations in 27,680 UK Biobank participants.**

FERNANDEZ-LOZANO, S. & Collins, D.L. · *bioRxiv* (2026). doi:10.64898/2026.04.13.718285

Role. Conceived the research question, derived the sex-specific normative GAMLSS references, planned and executed the analyses, drafted the manuscript. **Impact.** Establishes HVR as a head-size-independent biomarker with sex-specific norms, revealing atrophy patterns invisible to raw hippocampal volume.

- **Cardiovascular risk and hippocampal-cognitive coupling in Alzheimer's disease.**

FERNANDEZ-LOZANO, S., Villeneuve, S., Collins, D.L., et al. · *medRxiv* (2026). doi:10.64898/2026.06.01.26354601

Role. Conceived the CVR_{mimic} age-adjustment framework, built all MIMIC and LGCM mediation models, planned and executed the analyses, drafted the manuscript. **Impact.** Shows Framingham Risk Score associations with hippocampal-cognitive decline largely reflect age confounding; isolates genuine vascular effects in amyloid-negative, cognitively unimpaired individuals.

CONFERENCE PUBLICATIONS

- **The Role of Negative Space: Lateral Ventricular Expansion Is a Better Correlate of Cognition Than Hippocampal Volume.**

FERNANDEZ-LOZANO, S., et al. · *Alzheimer's & Dementia* 21(S2):e106003 (2026). AAIC, Toronto, Canada · Jul 2025. doi:10.1002/alz70856_106003

Role. Conceived the research question, planned and executed the analyses, designed the poster. **Impact.** Lateral ventricular expansion is a stronger cognitive correlate than hippocampal volume across the AD continuum.

- **Tau accumulation mediates β -amyloid effects on hippocampal atrophy and memory in early Alzheimer's disease.**

FERNANDEZ-LOZANO, S., et al. · *Alzheimer's & Dementia* 20:e092651 (2024). AAIC, Philadelphia, PA, USA · Jul 2024. doi:10.1002/alz.092651

Role. Conceived the research question, built the SEM mediation models, planned and executed the analyses, designed the poster. **Impact.** Links amyloid, tau, and hippocampal atrophy through tau-mediation in ADNI PET data.

- **Hippocampal-to-ventricle ratio (HVR) is better related to age and cognition than hippocampal volume.**
FERNANDEZ-LOZANO, S., et al. · *Alzheimer's & Dementia* (2023). *AAIC*, Amsterdam, Netherlands · Aug 2023. doi:10.1002/alz.079039
Role. Conceived the research question, planned and executed the analyses, designed the poster. **Impact.** Demonstrates HVR tracks age and cognition more closely than hippocampal volume.
- **Do we really need to normalize hippocampal volume?**
FERNANDEZ-LOZANO, S., et al. · *Alzheimer's & Dementia* (2023). *AAIC*, Amsterdam, Netherlands · Aug 2023. doi:10.1002/alz.077928
Role. Conceived the research question, planned and executed the analyses, designed the poster. **Impact.** Questions whether hippocampal volume requires head-size normalization.
- **Qrater: collaborative imaging quality control tool.**
FERNANDEZ-LOZANO, S., et al. · *Alzheimer's & Dementia* 18:e065184 (2022). *Alzheimer's Imaging Consortium*, San Diego, CA, USA · Jul 2022. doi:10.1002/alz.065184
Role. Designed and presented the poster. **Impact.** First public dissemination of Qrater to the AD imaging community.

PRESENTATIONS

Posters

- **Hippocampal-to-Ventricle Ratio Reveals Steeper Age-related Neurodegeneration in Parkinson's Disease Compared to Controls.**
AD/PD 2025, Vienna, Austria · Apr 2025.
- **Qrater: centralized web application for image quality control.**
OHBM, Glasgow, UK · Jun 2022.
- **Análisis de teoría de grafos en redes funcionales después de un tratamiento doble ciego de EMTr en pacientes adictos a cocaína** (*Graph-theory analysis on functional networks after double-blinded rTMS on cocaine-addicted patients*).
Annual Meeting of Researchers, INPRFM, Ciudad de México, México · Oct 2018.
- **Effects of rTMS on the small-worldness of crack-cocaine addicts' functional connectivity networks.**
XX Reunion of Neuroimage at CIMAT, Guanajuato, México · Oct 2018.

Oral talks

- **Hippocampal-to-Ventricle Ratio is a Viable Neurodegeneration Biomarker for Evaluating the Longitudinal Progression of Cognitive Decline in the Context of Alzheimer's Disease.**
 ON-DEMAND ORAL TALK · *AD/PD 2025*, Vienna, Austria · Apr 2025.
- **Estimulación Magnética Transcraneal: técnicas de neuromodulación como tratamiento neuropsiquiátrico** (*Transcranial Magnetic Stimulation: Neuromodulation techniques as a neuropsychiatric treatment*).
 INVITED TALK · Monthly Seminar, Baja California College of Psychologists, Tijuana, BC, México · Dec 2019.
- **Classification of cocaine dependence using topology of functional connectivity networks.**
 ORAL TALK · Neuroimage Reunion XXI, CIMAT, Guanajuato, México · Oct 2019.
- **Functional connectivity network changes after rTMS treatment in cocaine addiction.**
 INTERNAL SEMINAR · NIAAA & NIDA Intramural Seminar, NIH, Bethesda, MD, USA · May 2019.
- **Conectoma cerebral: estudiando la red más compleja de todas** (*Brain connectome: studying the most complex network system*).
 SCIENCE TALK · Brain Week, National High School 9 "Pedro de Alba", Ciudad de México, México · Nov 2018.
- **Terapias de conversión: perspectiva de la psicología y derechos humanos** (*Conversion therapy: a psychology and human-rights perspective*).
 INVITED TALK · 2nd Encounter about Sexualities and Gender, UNAM, Ciudad de México, México · Oct 2018.
- **El derecho a la identidad de infancias y adolescencias transgénero** (*The right to an identity of transgender children and adolescents*).
 CONVERSATORIUM · Supreme Justice Tribunal of Mexico City, Ciudad de México, México · Jun 2018.
- **Hablando Intersex** (*Speaking Intersex*).
 TV INTERVIEW · *Ciudad Abierta* channel, Ciudad de México, México · 2018.

Honours & Awards

FELLOWSHIPS & AWARDS

Differential Fee Waiver, McGill IPN (≈14K CAD/yr)
 IPN Entrance Award (≈6K CAD)
 UNAM Support for Mobility (≈1.3K CAD)
 CONACYT Mobility Fellowship (≈1.9K CAD)
 CONACYT Graduate Fellowship (≈19K CAD)

Montréal, QC, Canada · 2020–2023
 Montréal, QC, Canada · 2020
 Ciudad de México, México · 2019
 Ciudad de México, México · 2019
 Ciudad de México, México · 2017–2019

RECOGNITIONS

"Alfonso Caso" Medal
 EGEL-CENEVAL Excellence Award

Querétaro, México · 2020
 Guadalajara, Jal., México · 2016

Teaching & Service

Methodological Supervision — PhD Students

NEUROIMAGING & SURGICAL TECHNOLOGIES (NIST) LAB, MCGILL UNIVERSITY

Montréal, QC, Canada

2024 – Present

- Mentoring PhD students Marc-Antoine Akzam-Ouellette and Alexandra Novozhilova in Structural Equation Modeling, Confirmatory Factor Analysis, and neuroimaging analyses (model specification, technique development, interpretation).
- Trained lab members and external collaborators (P. Rosa-Neto's team at McGill; A. Eshagi's Demistify project at UCL) in MRI quality-control procedures and Qrater workflows.

Invited Workshops & Lectures

- *SEM & mediation methodology workshops* delivered for the Mahsa Dadar and Yashar Zeighami labs, McGill University (2024–2025).
- *R introductory session* for graduate students in the PSYT630 statistics course taught by Yashar Zeighami, McGill University (2024).
- *Graph Theory Analyses with R and BrainGraph* — invited graduate lecturer in Eduardo Garza-Villarreal's "Redes y Conectividad Cerebral y Neuroimagen" course, UNAM (Nov 2021).

McGill Journal of Medicine

PRODUCTION EDITOR

Montréal, QC, Canada

May 2022 – Jul. 2024

- Managed a team of production associates preparing PDF and HTML galley for online publication.

Software & Open Source

Qrater — Web-Based MRI Quality-Control Application

LEAD DEVELOPER · OPEN SOURCE (GITHUB + DOCKER HUB)

github.com/soffiafdz/Qrater

2021 – Present

- Web app + SQL backend for collaborative, remote MRI QC; 2–10× faster than traditional workflows.
- Used on 250K+ MRI images across internal and external projects — 10K ADNI scans in-house, 30K in P. Rosa-Neto's TRIAD cohort, +14K in the Demistify MS project (A. Eshagi, UCL); adopted by 19+ external users.
- Described in peer-reviewed publication (*Aperture Neuro*, 2024); +50 downloads from public release.

HVR — Automated Hippocampal-to-Ventricle Ratio Pipeline

DEEP-LEARNING SEGMENTATION · DOCKER-PACKAGED

2022 – Present

- Adapted and trained a neural network for hippocampal and ventricular segmentation; benchmarked against existing methods.
- Validated robust associations with age and cognition across AD and PD cohorts.
- Released network weights in a Docker image; published in *Human Brain Mapping* (2025); primary biomarker in an awarded CIHR grant.

Hackathon contributions

- **mriqception** — MRI quality-control toolkit; built at a hackathon during the Neurohackademy summer institute (University of Washington, 2019). github.com/elizabethbeard/mriqception
- **FANI-Pack** (Find All New ICDs Package) — ICD-9→10 conversion function for the R package `icd`; built at the Women-led BioData Science Hackathon (NCBI/NIH, 2019) during a research visit. github.com/NCBI-Hackathons/Design-of-ICD-9-to-10-...

Skills

LANGUAGES

Spanish (native) · English (fluent) · French (intermediate)

PROGRAMMING

R · Python · SQL · JavaScript · Shell · Perl

METHODS

SEM (CFA, mediation, LGCM, MIMIC) · Neuroimaging processing · Machine learning · Deep learning

TOOLS

UNIX · HPC clusters · Git & GitHub · Docker · Singularity · Podman · Flask

MARKUP

LaTeX · Typst · Markdown · HTML

Courses & Workshops

Neuromatch Academy Deep Learning 2021

NEUROMATCH

Online

Jul 2021

- Intensive 3-week course on advanced Deep Learning techniques.

Neurohackademy 2019

UNIVERSITY OF WASHINGTON

Seattle, WA, USA

Jul – Aug 2019

- Two-week intensive summer institute in neuroimaging and data science.

Bayesian Modeling of Brain Imaging Data

MICHELE GUINDANI, PHD — MEXICAN ASSOCIATION OF STATISTICS

Ciudad de México, México

Sep 2017

- Two-day introduction to Bayesian methods in fMRI analysis.

Basic Course of Applied Neuroscience

AUTONOMOUS UNIVERSITY OF BAJA CALIFORNIA

Mexicali, BC, México

Aug 2016

- Two-week neuroscience course for psychology students and recent graduates.

International Course of Neuropsychological Evaluation

JUAN-CARLOS ARANGO, PHD — SINAPSIS

Mexicali, BC, México

Oct 2015

- Neuropsychological testing in cultures and languages outside North America and Western Europe.