

Clara A. MOREAU

E-mail: clara.moreau@umontreal.ca Webpage: claramoreau9.github.io

Born Dec 9, 1991, Paris, France. Language: French (native), English (fluent)



Educational experience

- 2023 - 202X. **Postdoctoral researcher**, Imaging Genetics Center, Keck School of Medicine, USC, Advisor: Paul M. Thompson - Los Angeles, CA.
- 2021 - 2022 (2 years). **Postdoctoral researcher**, Human Genetics and Cognitive Functions unit Advisor: Thomas Bourgeron - **Pasteur Institute**, University of Paris, France.
- 2020-2021 (6 months) **Postdoctoral researcher**, Neurosciences, University of Montreal, Canada Advisor: Pierre Bellec - SIMEXP, CR-IUGM, University of Montreal.
- 2015 - 2020 (5 years) **Ph.D. in Neurosciences, University of Montreal**, Canada. Ranked as 'Exceptional thesis' Advisors: Sébastien Jacquemont (Geneticist, Sainte Justine Hospital) and Pierre Bellec (Computer Science Department, SIMEXP lab, CR-IUGM, University of Montreal) Mapping genome-wide neuropsychiatric mutation effects on functional brain connectivity: Copy number variants delineate dimensions contributing to autism and schizophrenia
- 2019 **Internship** - Imaging Genetic Center, **USC, USA** Advisor: P.M. Thompson. Skills: DTI analyses (ENIGMA consortium) - Cross-CNVs
- 2014-2015 **Research Assistant**, Medical Genetics Department, **CHUV, Switzerland** Advisor: S. Jacquemont. Skills: MRI Protocol development and Scanning, Analyses (R, Matlab), Website development for family recruitment, neuropsychological assessment.
- 2012 - 2014 **Master's degree in Cognitive Sciences** (DEC, Cogmaster) Ecole Normale Supérieure & Descartes University, Paris, France
- 2013 - 2014 **Internship** - **Neurospin Institute**, CEA, France. Advisors: Marion Noulhiane & Lucie Hertz-Pannier (UNIACT). Skills: fMRI analysis (SPM, Matlab) - Neurodevelopmental cohort.
- 2013 **Internship** - Neuroscience department, **University of Montreal**, Canada Advisor: Pr. P. Jolicoeur; Skills: MEG/EEG analyses for an auditory task.
- 2012-2013 **Internship** - Necker Children Hospital, INSERM – UMR 663 Paris, France. Advisors: Pr. M. Noulhiane. Skills: Neuropsychological assessment and data analyses - Memory & Synesthesia
- 2012 **Internship** - Centre de Recherche en Neurosciences de **Lyon**. Advisors: Pr. N. Ravel and Pr. R. Gervais, Lyon, France. Skills: Recording olfactory cells in mice and signal processing
- 2009-2012 **BSc degree in Neuropsychology**; Descartes University, Paris-V France

Invited speaker / Oral sessions

International conferences

- 07.2022 **British Association of Psychopharmacology** (London, UK)
Symposium: "Impact of genetic heterogeneity and pleiotropy in psychiatry on brain functional connectivity"
- 06.2022 **Human Brain Mapping**, (Glasgow, Scotland),
Oral session "Imaging Genetics: Mapping the Effects of Genetic and Transcriptional Variation on the Brain"
- 05.2022: **Seminar, McGill University**, CA
"Genetic heterogeneity and pleiotropy shape brain connectivity in psychiatric conditions"
- 10.2021: **European Congress Neuropsychopharmacology**, Lisboa
Symposium "The genetics of autism from risk to resilience"
- 05.2021: Les enjeux actuels en Neuroéducation
Seminaire "Que nous ont appris les dernières avancées en neuro-imagerie et génétique sur les troubles du spectre de l'autisme?"
- 04.2021: **Society of Biological Psychiatry**, virtual meeting
Symposium "Brain Alterations and Mechanisms in Carriers of Genomic Structural Variants"

- 06.2020 **Human Brain Mapping**, (virtual),
Symposium “Neuropsychiatric genetic variation shapes brain architecture by modulating gene expression”
- 06.2019 **Human Brain Mapping, Rome**
Symposium “A tough nut to crack: neurodevelopmental connectopathies.” (video online)
- 05.2019 **Society of Biological Psychiatry, Chicago**
Symposium “Large Scale Imaging Studies of Rare Copy Number variants: Brain Imaging from Enigma and Other Large-Scale International Studies” (link)
- 04.2019 **International Society for Autism Research, Montreal**
Symposium: “Human and Animal Models: Impact of High-Risk Copy Number Variants on Brain Structure, Functional Connectivity, and Sexual Development.” (link)

Local conferences

- 12.2021: Académie de Medecine
Seminaire “Troubles du neurodéveloppement sans frontière”
- 12.2021: IDA
Seminaire “Genetic heterogeneity in neurodevelopmental conditions shapes brain connectivity”
- 05.2021: Les enjeux actuels en Neuroeducation (virtual)
Lecture “Que nous ont appris les dernières avancées en neuro-imagerie et génétique sur les troubles du spectre de l'autisme?”
- 02.2021: Pasteur Institute
Lecture “Atlas of functional connectivity relationships across rare and common genetic variants, traits, and psychiatric conditions”
- 03.2020: Feindel BIC Lecture McGill University, Canada “Neuropsychiatric mutations delineate functional brain connectivity dimensions contributing to autism and schizophrenia”.
- 08.2019: Imaging Genetic Center University of South California, USA “High-risk psychiatric mutations modulate functional brain connectivity pointing to dimensions involved in autism and schizophrenia”
- 05.2016: University of Montreal, Canada
Lecture: “From the first human genome to genome editing”

First author publications

- Moreau, C.A.**, Harvey, Kumar, K., A., Huguet, G., Urchs, S., Douard, E. A., Schultz, L. M., Sharmarke, H., Jizi, K., Martin, C.-O., Younis, N., Tamer, P., Rolland, T.,... Jacquemont, S. Polygenicity shapes brain connectivity in psychiatry. accepted in *Biological Psychiatry*. <https://doi.org/10.1101/2021.05.21.21257604>
- Moreau, C.A.**, Kumar, K., Huguet, G., Urchs, S., Douard, Sharmarke, H., Jizi, K., Martin, C.-O., Younis, N., Tamer, P., Martineau, J.-L., Orban, P., Shin, D., Silva, A. I., Hall, J., van den Bree, M. B. M., ... Jacquemont, S.. Brain functional connectivity mirrors genetic pleiotropy in psychiatric conditions. *Brain* <https://doi.org/10.1093/brain/awac315>
- Moreau, C. A.**, Raznahan, A., Bellec, P., Chakravarty, M., Thompson, P. M., & Jacquemont, S. (2021). Dissecting autism and schizophrenia through neuroimaging genomics. *Brain*. <https://doi.org/10.1093/brain/awab096>
- Moreau, C. A.**, Urchs, S. G. W., Kuldeep, K., Orban, P., Schramm, C., Dumas, G., Labbe, A., Huguet, G., Douard, E., Quirion, P.-O., Lin, A., Kushan, L., Grot, S., Luck, D., Mendrek, A., Potvin, S., Stip, E., Bourgeron, T., Evans, A. C., ... Jacquemont, S. (2020). Mutations associated

with neuropsychiatric conditions delineate functional brain connectivity dimensions contributing to autism and schizophrenia.

Nature Communications, 11(1), 1–12. <https://doi.org/10.1038/s41467-020-18997-2>

Moreau, C. A., Ching, C. R., Kumar, K., Jacquemont, S., & Bearden, C. E. (2021). Structural and functional brain alterations revealed by neuroimaging in CNV carriers. *Current Opinion in Genetics & Development*, 68, 88–98. <https://doi.org/10.1016/j.gde.2021.03.002>

Moreau, C. A., Jean-Louis, M., Blair, R., Markiewicz, C. J., Turner, J. A., Calhoun, V. D., Nichols, T. E., & Pernet, C. R. (2020). The genetics-BIDS extension: Easing the search for genetic data associated with human brain imaging.

GigaScience, 9(10). <https://doi.org/10.1093/gigascience/giaa104>

Co-authored publications

Modenato C, Kumar K, **Moreau C.A.**, Martin-Brevet S, Huguet G, Schramm C, et al. Effects of eight neuropsychiatric copy number variants on human brain structure.

Transl Psychiatry 2021; 11: 399.

Ecker C., Pretzsch C.M, Bletsch A., Mann C, Schaefer T., Ambrosino S., Tillmann J, Afsheen Yousaf A., Chiocchetti A., Lombard M.V, ... **Moreau C.A.**, ... the EU-AIMS LEAP Group, Declan G. Murphy. Inter-individual differences in cortical thickness and their genomic underpinnings in autism spectrum disorder.

The American Journal of Psychiatry 2022

Modenato C, Martin-Brevet S, **Moreau CA**, Rodriguez-Herreros B, Kumar K, Draganski B, et al. Lessons learnt from neuroimaging studies of Copy Number Variants, a systematic review.

Biol Psychiatry <https://doi.org/10.1016/j.biopsych.2021.05.028>

Sønderby, I. E., van der Meer, D., **Moreau, C.**, Kaufmann, T., Walters, G. B., Ellegaard, M., Abdellaoui, A., Ames, D., Amunts, K., Andersson, M., Armstrong, N. J., Bernard, M., Blackburn, N. B., Blangero, J., Boomsma, D. I., Brodaty, H., Brouwer, R. M., Bülow, R., Bøen, R., ... ENIGMA-CNV working group. (2021). 1q21.1 distal copy number variants are associated with cerebral and cognitive alterations in humans.

Translational Psychiatry, 11(1), 182. <https://doi.org/10.1038/s41398-021-01213-0>

Douard, E., Zeribi, A., Schramm, C., Tamer, P., Loum, M. A., Nowak, S., Saci, Z., Lord, M.-P., Rodríguez-Herreros, B., Jean-Louis, M., **Moreau, C.**, Loth, E., Schumann, G., Pausova, Z., Elsabbagh, M., Almasy, L., Glahn, D. C., Bourgeron, T., Labbe, A., ... Jacquemont, S. (2021). Effect Sizes of Deletions and Duplications on Autism Risk Across the Genome. *The American Journal of Psychiatry*, 178(1), 87–98. <https://doi.org/10.1176/appi.ajp.2020.19080834>

Bannier, E., Barker, G., Borghesani, V., Broeckx, N., Clement, P., Emblem, K. E., Ghosh, S., Glerean, E., Gorgolewski, K. J., Havu, M., Halchenko, Y. O., Herholz, P., Hespel, A., Heunis, S., Hu, Y., Hu, C.-P., Huijser, D., de la Iglesia Vayá, M., Jancalek, R., **Moreau C.A.**, ... Zhu, H. (2021). The Open Brain Consent: Informing research participants and obtaining consent to share brain imaging data.

Human Brain Mapping. <https://doi.org/10.1002/hbm.25351>

Sønderby, I. E., Ching, C. R. K., Thomopoulos, S. I., van der Meer, D., Sun, D., Villalon-Reina, J. E., Agartz, I., Amunts, K., Arango, C., Armstrong, N. J., Ayesa-Arriola, R., Bakker, G., Bassett, A. S., Boomsma, D. I., Bülow, R., Butcher, N. J., Calhoun, V. D., Caspers, S., Chow, E. W. C., ... **Moreau, C.A.**, ... ENIGMA 22q11.2 Deletion Syndrome Working Group. (2021). Effects of copy number variations on brain structure and risk for psychiatric illness: Large-scale studies from the ENIGMA working groups on CNVs.

Human Brain Mapping. <https://doi.org/10.1002/hbm.25354>

Costalat, G., Godin, B., Balmain, B. N., **Moreau, C.**, Brotherton, E., Billaut, F., & Lemaitre, F.

- (2020). Autonomic regulation of the heart and arrhythmogenesis in trained breath-hold divers. *European Journal of Sport Science*, 1–19. <https://doi.org/10.1080/17461391.2020.1749313>
- Cárdenas-de-la-Parra, A., Martin-Brevet, S., **Moreau, C.**, Rodriguez-Herreros, B., Fonov, V. S., Maillard, A. M., Zürcher, N. R., 16p11.2 European Consortium, Hadjikhani, N., Beckmann, J. S., Reymond, A., Draganski, B., Jacquemont, S., & Collins, D. L. (2019). Developmental trajectories of neuroanatomical alterations associated with the 16p11.2 Copy Number Variations. *NeuroImage*, 203, 116155. <https://doi.org/10.1016/j.neuroimage.2019.116155>
- Jøneh, A. E., Douard, E., **Moreau, C.**, Van Dijck, A., Passeggeri, M., Kooy, F., Puechberty, J., Campbell, C., Sanlaville, D., Lefroy, H., Richetin, S., Pain, A., Geneviève, D., Kini, U., Le Caignec, C., Lespinasse, J., Skytte, A.-B., Isidor, B., Zweier, C., ... 15q11.2 Working Group. (2019). Estimating the effect size of the 15Q11.2 BP1-BP2 deletion and its contribution to neurodevelopmental symptoms: recommendations for practice. *Journal of Medical Genetics*. <https://doi.org/10.1136/jmedgenet-2018-105879>
- Urchs, S., Armoza, J., **Moreau, C.**, Benhajali, Y., St-Aubin, J., Orban, P., & Bellec, P. (2019). MIST: A multi-resolution parcellation of functional brain networks. *MNI Open Research*, 1(3), 3. <https://doi.org/10.12688/mniopenres.12767.2>
- van der Meer, D., Sønderby, I. E., Kaufmann, T., Walters, G. B., Abdellaoui, A., Ames, D., Amunts, K., Andersson, M., Armstrong, N. J., Bernard, M., Blackburn, N. B., Blangero, J., Boomsma, D. I., Brodaty, H., Brouwer, R. M., Bülow, R., Cahn, W., Calhoun, V. D., Caspers, S., ... **Moreau, C.**, ... Andreassen, O. A. (2019). Association of Copy Number Variation of the 15q11.2 BP1-BP2 Region With Cortical and Subcortical Morphology and Cognition. *JAMA Psychiatry*, 1–11. <https://doi.org/10.1001/jamapsychiatry.2019.3779>
- Martin-Brevet, S., Rodríguez-Herreros, B., Nielsen, J. A., **Moreau, C.**, Modenato, C., Maillard, A. M., Pain, A., Richetin, S., Jøneh, A. E., Qureshi, A. Y., Zürcher, N. R., Conus, P., 16p11.2 European Consortium, Simons Variation in Individuals Project (VIP) Consortium, Chung, W. K., Sherr, E. H., Spiro, J. E., Kherif, F., Beckmann, J. S., ... Jacquemont, S. (2018). Quantifying the Effects of 16p11.2 Copy Number Variants on Brain Structure: A Multisite Genetic-First Study. *Biological Psychiatry*. <https://doi.org/10.1016/j.biopsych.2018.02.1176>
- Sønderby, I. E., Gústafsson, Ó., Doan, N. T., Hibar, D. P., Martin-Brevet, S., Abdellaoui, A., Ames, D., Amunts, K., Andersson, M., Armstrong, N. J., Bernard, M., Blackburn, N., Blangero, J., Boomsma, D. I., Bralten, J., Brattbak, H.-R., Brodaty, H., Brouwer, R. M., Bülow, R., ... **Moreau, CA.**, ..., 16p11.2 European Consortium, for the ENIGMA-CNV working group. (2018). Dose-response of the 16p11.2 distal copy number variant on intracranial volume and basal ganglia. *Molecular Psychiatry*. <https://doi.org/10.1038/s41380-018-0118-1>

Students' supervision

- 02.2021-08.2021: Supervisor P. Bergeret and L. Tran (Master internships in Bioinformatics, University of Paris Saclay).
- 05.2021-12.2021: Supervisor L. Dry (Master internship - AgroParisTech)
- 04.2021-09.2021: Co-supervisor S. Portalier (BSc–3rd year - Genetics “Magistère”, Paris)
- 07.2020-12.2021: Co-supervisor A. Harvey (Master internship - Informatics, DIRO, UdeM)
- 06.2019-12.2021: Co-supervisor A. Proulx (Honours degree & Master internship - Psychology)
- 01.2019-07.2019: Supervisors of G. Dumais (BSc–3rd year, Neurosciences, UdeM)
- 05.2016-08.2016: Supervisors of A. Casgrain-Cyr (BSc–3rd year, Bioinformatics, UdeM)

Teaching

- 12.2021: 'Neuroimagerie dans les troubles du spectre autistique' at the R.Debré hospital (Paris, FR)
- 2021: Moderator at the OHBM educational courses
- 2018-2019-2020: Teaching Assistant, Brain Imaging Techniques (100 students, UdeM, Pr. P. Bellec)

05.2018-06.2018: Instructor at the Brainhack School 2018 (Imaging genetics, UdeM)

Reviewing

2022: PhD committee of Dominika Slušná (University of Pompeu-Fabra, Barcelona)
2021-2022: Co-editor, Frontiers in Psychiatry
2021: Agence National de la Recherche (ANR, France) (n=1)
2020: Brain (n=1)
2020: Progress in Neuropsychopharmacology & Biological Psychiatry (n=1)
2020: Molecular Autism (n=1)
2019: Neuroimage (n=3)

Awards

06.2021: Exceptional abstract of the year at the OHBM conference.
06.2020: Ph.D. ranked as an '*Exceptional thesis*', part of the '*Dean's Honor List*', and nominated for the *best thesis of the university*.

Personal grant and prices

09.2019: RBIQ Grant 15,000 \$CAD
08.2018: RBIQ Grant 5,000 \$CAD
11.2017: RBIQ Grant 3,000 \$CAD
06.2017: OHBM Travel award 500 \$USD
06.2016: OHBM Travel award 500 \$USD

Computer skills

Programming languages: R, Python, Bash, Html.
Softwares: NIAK and fMRIprep(fMRI), Freesurfer and Civet (Cortical Thickness), FSL (TBSS)

Summer school attendance and workshop

08.2017: Deep Learning - Summer school at the University of Montreal (MILA), Canada
06.2017: Workshop Brainhack - University of British Columbia, Canada
08.2016: Brain Imaging Genetics for Imagers, Summer school: Radboud University, Nijmegen
06.2016: Workshop Brainhack (fMRI) - Lausanne, Switzerland
02.2016: Workshop Brainhack (MRI) - Pasteur Institute, FR
04.2015: HackTheBrain workshop (EEG) - London, UK
08.2013: Basic and Advanced functional MRI, Summer school at McGill, Montreal, CA

Science Dissemination

05.2021: Simons Foundation Autism Research Initiative. Q&A with Sébastien Jacquemont and Clara Moreau: Why brain imaging signatures for autism are so elusive
<https://www.spectrumnews.org/opinion/qa-with-sebastien-jacquemont-and-clara-moreau-why-brain-imaging-signatures-for-autism-are-so-elusive/>
11.2020: Simons Foundation Autism Research Initiative. Gene mutations point to overlaps in brain connectivity for autism, schizophrenia.
<https://www.spectrumnews.org/news/gene-mutations-point-to-overlaps-in-brain-connectivity-for-autism-schizophrenia/>
10.2020 - Internal press release from the CHU Ste Justine Gènes, connectivité cérébrale, et maladies neuropsychiatriques
<https://recherche.chusj.org/fr/Communications/Nouvelles/2020/Genes-connectivite-cerebrale-et-maladies-neurops>
06.2016: Brain imaging workshop co-organizer (Brainhack) with P. Bellec, Lausanne, Switzerland
2016: In charge of the science dissemination for the "Brain and Development research" section at the Ste Justine Hospital, Montreal

2015-2016: Podcasts: “Psychiatric conditions” and “Inside the Brain” (Neuroimaging techniques)
 03.2014: Annual Cognitive science forum, Paris, FR Symposium (moderator) Artificial, animal, and human cognitive processes: How could we delineate Intelligence?
 11. 2014: EPFL, CH Round table Protecting Ideas, Liberating Innovation, and Open collaboration
 2014-2015: “Startup Weekend” workshops organizer and instructor for Ph.D. students (6 editions: Lausanne (EPFL), and Paris (ENS, CogInnov, and ESPCI)).
 06.2015: Open innovation “Lift Conference”, Shanghai, China

Posters presented at international conferences (first author only)

- Moreau, C. A., Kumar, K., Harvey, A., Huguet, G., Urchs, S., ... Jacquemont, S. (2021).** *Atlas of functional connectivity relationships across rare and common genetic variants, traits, and psychiatric conditions.* **OHBM 2021.** Selected to be part of "year's exceptional abstracts".
- Moreau, CA., Urchs, S., Huguet G., ...Bellec, P., Jacquemont, S. .** Functional Connectivity Analyses Suggest Shared Molecular Mechanisms Across 12 Neuropsychiatric Mutations, Autism and Schizophrenia. **SOBP 2020**
- Moreau, CA., Urchs, S., Huguet G., ...Bellec, P., Jacquemont, S. .** Brain-Wide Connectome Analyses Suggest Shared Mechanisms Across Eight High-Risk Neuropsychiatric Mutations. **INS, Denver, CO 2020**
- Moreau, CA., *, Urchs, S.*, C. Schramm, ..., Simons VIP Consortium, C. Bearden, Bellec, P., Jacquemont, S.** Gene dosage alters brain connectivity and delineates functional signatures contributing to autism and schizophrenia. **WCPG Anaheim, CA 2019**
- Moreau, CA., *, C. Schramm*, Huguet G., Urchs, S., Kumar K., Douard E., A. Evans, Labbe A., Greenwood C., Chakravarty M., Bellec, P.‡, Jacquemont, S. ‡** Estimating the commonalities of any recurrent CNVs on different anatomical and functional brain metrics. **Human Brain Mapping, Rome 2019**
- Moreau, CA., *, Urchs, S.*, C. Schramm, P.O. Quirion, A. Lin, L. Kushan, A. Evans, J.D. Lewis, Simons VIP Consortium, C. Bearden, Bellec, P.‡, Jacquemont, S. ‡** Shared functional connectivity alterations across neurodevelopmental mutations, ASD, ADHD, and schizophrenia. **Enhancing Psychiatric Genetic Testing, and Training in Europe, EnGagE, Paris 2019**
- Moreau, CA., *, Urchs, S.*, C. Schramm, P.O. Quirion, A. Lin, L. Kushan, A. Evans, J.D. Lewis, Simons VIP Consortium, C. Bearden, Bellec, P.‡, Jacquemont, S. ‡** Mirror effects of 4 neurodevelopmental CNVs on functional connectivity and implication for idiopathic autism **Sixth Biennial Conference on Brain Connectivity, Montreal 2018**
- Moreau, CA., *, Urchs, S.*, ..., A. Evans, J. D. Lewis, Bellec, P., Jacquemont, S. .** Mirror effects of 4 neurodevelopmental CNVs on functional connectivity and implication for idiopathic autism **World Congress of Psychiatric Genetics, Glasgow 2018**
- Moreau, CA., *, Urchs, S.*, ..., A. Evans, J. D. Lewis, Bellec, P., Jacquemont, S. .** Global functional over-connectivity in 16p11.2 CNV deletion carriers. **Human Brain Mapping, Singapore 2018**
- Moreau, CA., *, Urchs, S.*, Simons Variation in Individuals Project Consortium, A. Evans, J. D. Lewis, Bellec, P., Jacquemont, S. .** **Altered brain connectivity in patient with 16p11.2. World Congress of Psychiatric Genetics, Orlando 2017**
- Moreau, CA., *, Lewis JD., *, Evans A.‡, Jacquemont, S. ‡, and the Simons Variation in Individuals Project Consortium.** Altered subcortical diffusivity in 16p11.2 CNVs. **Human Brain Mapping, Vancouver 2017**
- Lewis JD.*, Moreau, CA. *, Martin-Brevet S., ..., Jacquemont, S. ‡, A. Evans‡, the 16p11.2 European Consortium, and the Simons VIP Consortium.** Thickness and contrast in 16p11.2 CNVs. **Human Brain Mapping, Vancouver 2017**