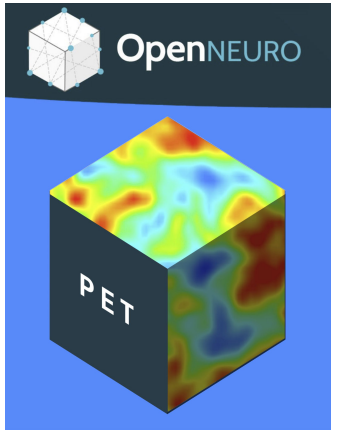
OHBM 2024

JUNE 23~27, SEOUL, KOREA

Open Access Databases in Molecular Imaging (or how to access more than 30.000 scans!)

Martin Norgaard

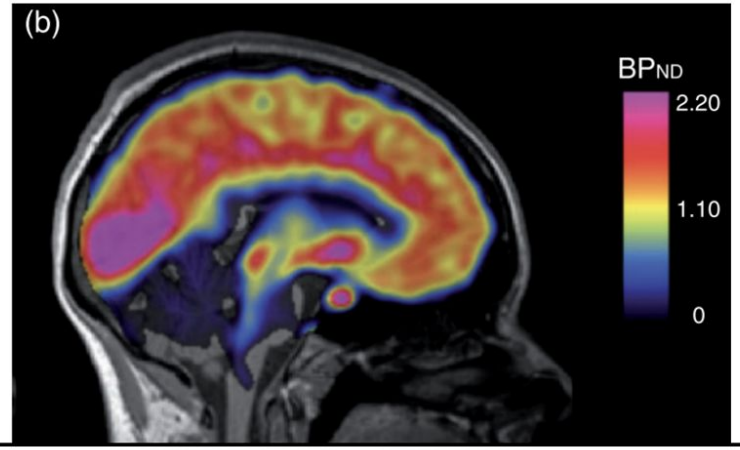
University of Copenhagen, Denmark
National Institute of Mental Health, USA

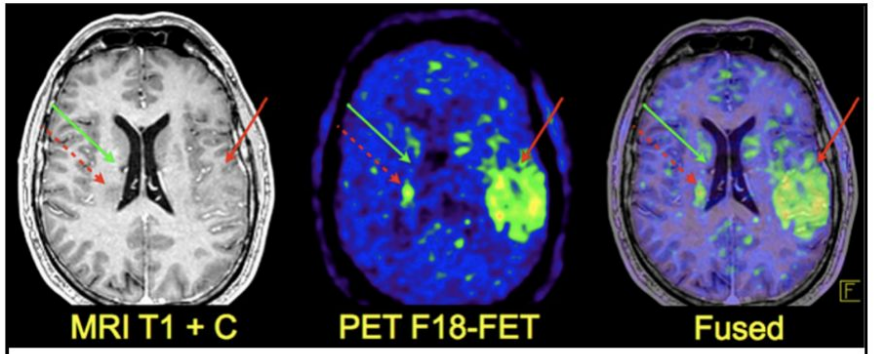


I have no disclosures

Low 5-HT$_{1B}$ receptor binding in the migraine brain: A PET study

Marie Deen[1,2,3], Hanne D Hansen[2], Anders Hougaard[1], Sofi da Cunha-Bang[2,3], Martin Nørgaard[2], Claus Svarer[2], Sune H Keller[4], Carsten Thomsen[5], Messoud Ashina[1,3,*] and Gitte M Knudsen[2,3,*]



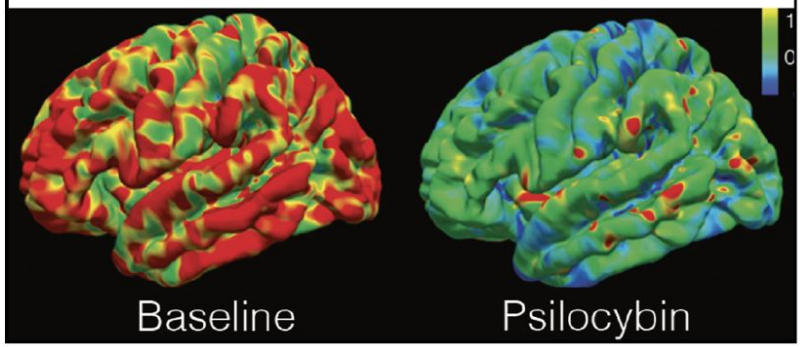


PET/MRI in cancer patients: first experiences and vision from Copenhagen

Andreas Kjær · Annika Loft · Ian Law · Anne Kiil Berthelsen · Lise Borgwardt · Johan Löfgren · Camilla Bardram Johnbeck · Adam Espe Hansen · Sune Keller · Søren Holm · Liselotte Højgaard

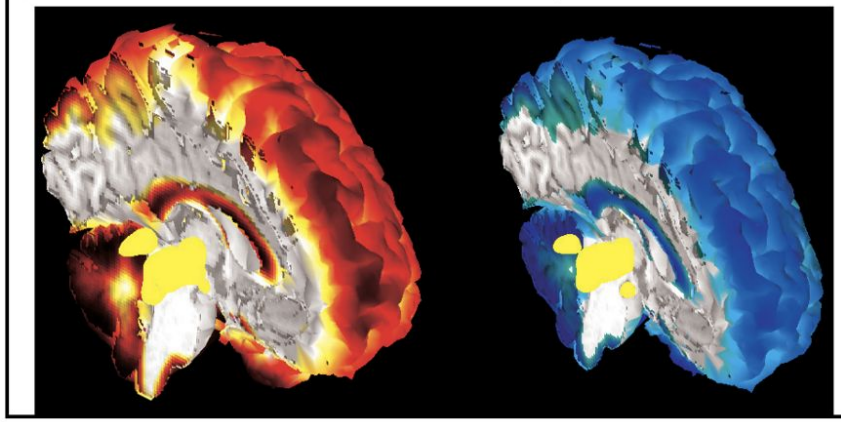
Psychedelic effects of psilocybin correlate with serotonin 2A receptor occupancy and plasma psilocin levels

Martin K. Madsen[1,2], Patrick M. Fisher[1], Daniel Burmester[1,2], Agnete Dyssegaard[1], Dea S. Stenbæk[1], Sara Kristiansen[1], Sys S. Johansen[3], Szabolz Lehel[4], Kristian Linnet[3], Claus Svarer[1], David Erritzoe[5], Brice Ozenne[1,6] and Gitte M. Knudsen[1,2]



Seasonal difference in brain serotonin transporter binding predicts symptom severity in patients with seasonal affective disorder

Brenda Mc Mahon,[1,2] Sofie B. Andersen,[1] Martin K. Madsen,[1] Liv V. Hjordt,[1,2] Ida Hageman,[3] Henrik Dam,[3] Claus Svarer,[1] Sofi da Cunha-Bang,[1,2] William Baaré,[4] Jacob Madsen,[5] Lis Hasholt,[6] Klaus Holst,[2,7] Vibe G. Frokjaer[1] and Gitte M. Knudsen[1,2]



Introduction

- Molecular imaging is expensive and causes exposure of ionizing radiation
- Many molecular imaging studies have low sample sizes
- This directly affects the quality and impact of molecular imaging studies
- The solution is data sharing and open access databases

The Shift Towards Open Science

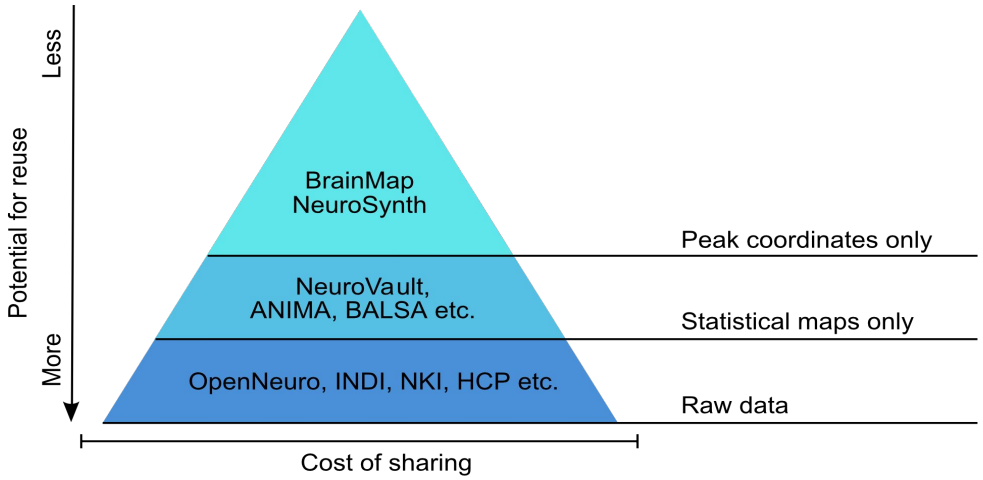
2010: The year data sharing broke in neuroimaging

Toward discovery science of human brain function

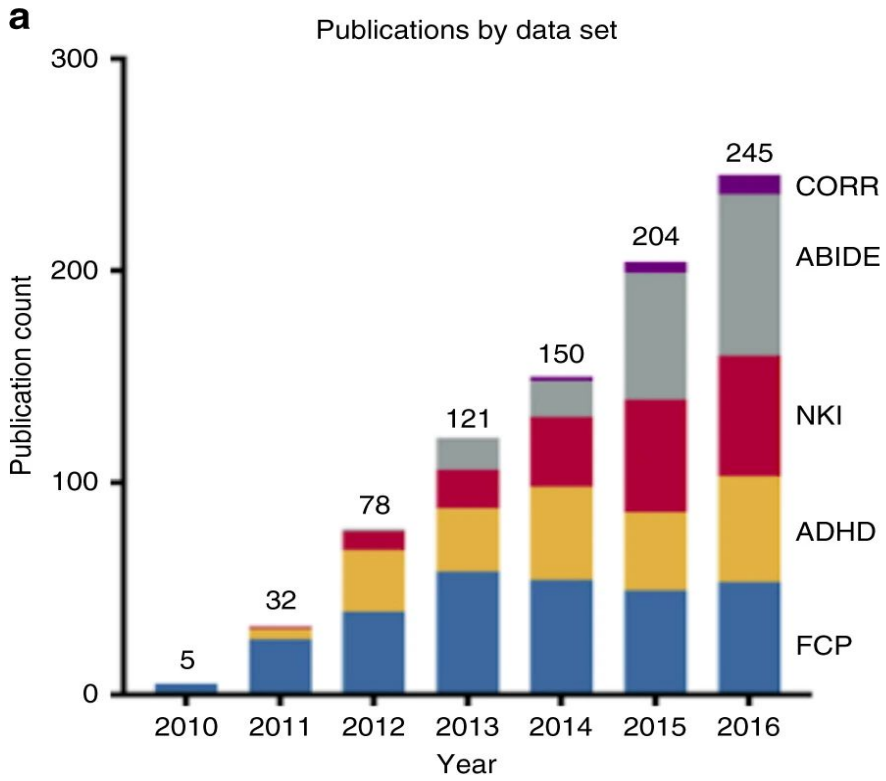
Bharat B. Biswal[a], Maarten Mennes[b], Xi-Nian Zuo[b], Suril Gohel[a], Clare Kelly[b], Steve M. Smith[c], Christian F. Beckmann[c], Jonathan S. Adelstein[b], Randy L. Buckner[d], Stan Colcombe[e], Anne-Marie Dogonowski[f], Monique Ernst[g], Damien Fair[h], Michelle Hampson[i], Matthew J. Hoptman[j], James S. Hyde[k], Vesa J. Kiviniemi[l], Rolf Kötter[m], Shi-Jiang Li[n], Ching-Po Lin[o], Mark J. Lowe[p], Clare Mackay[c], David J. Madden[q], Kristoffer H. Madsen[f], Daniel S. Margulies[r], Helen S. Mayberg[s], Katie McMahon[t], Christopher S. Monk[u], Stewart H. Mostofsky[v], Bonnie J. Nagel[w], James J. Pekar[x], Scott J. Peltier[y], Steven E. Petersen[z], Valentin Riedl[aa], Serge A. R. B. Rombouts[bb], Bart Rypma[cc], Bradley L. Schlaggar[dd], Sein Schmidt[ee], Rachael D. Seidler[ff,u], Greg J. Siegle[gg], Christian Sorg[hh], Gao-Jun Teng[ii], Juha Veijola[jj], Arno Villringer[ee,kk], Martin Walter[ll], Lihong Wang[q], Xu-Chu Weng[mm], Susan Whitfield-Gabrieli[nn], Peter Williamson[oo], Christian Windischberger[pp], Yu-Feng Zang[qq], Hong-Ying Zhang[ii], F. Xavier Castellanos[b,j], and Michael P. Milham[b,1]

- Comprehensive mapping of the functional connectome, and its subsequent exploitation to discern genetic influences and brain–behavior relationships, will require multicenter collaborative datasets. Here we initiate this endeavor by gathering R-fMRI data from 1,414 volunteers collected independently at 35 international centers. We demonstrate a universal architecture of positive and negative functional connections, as well as consistent loci of inter-individual variability. …

Data sharing is becoming the norm in neuroimaging



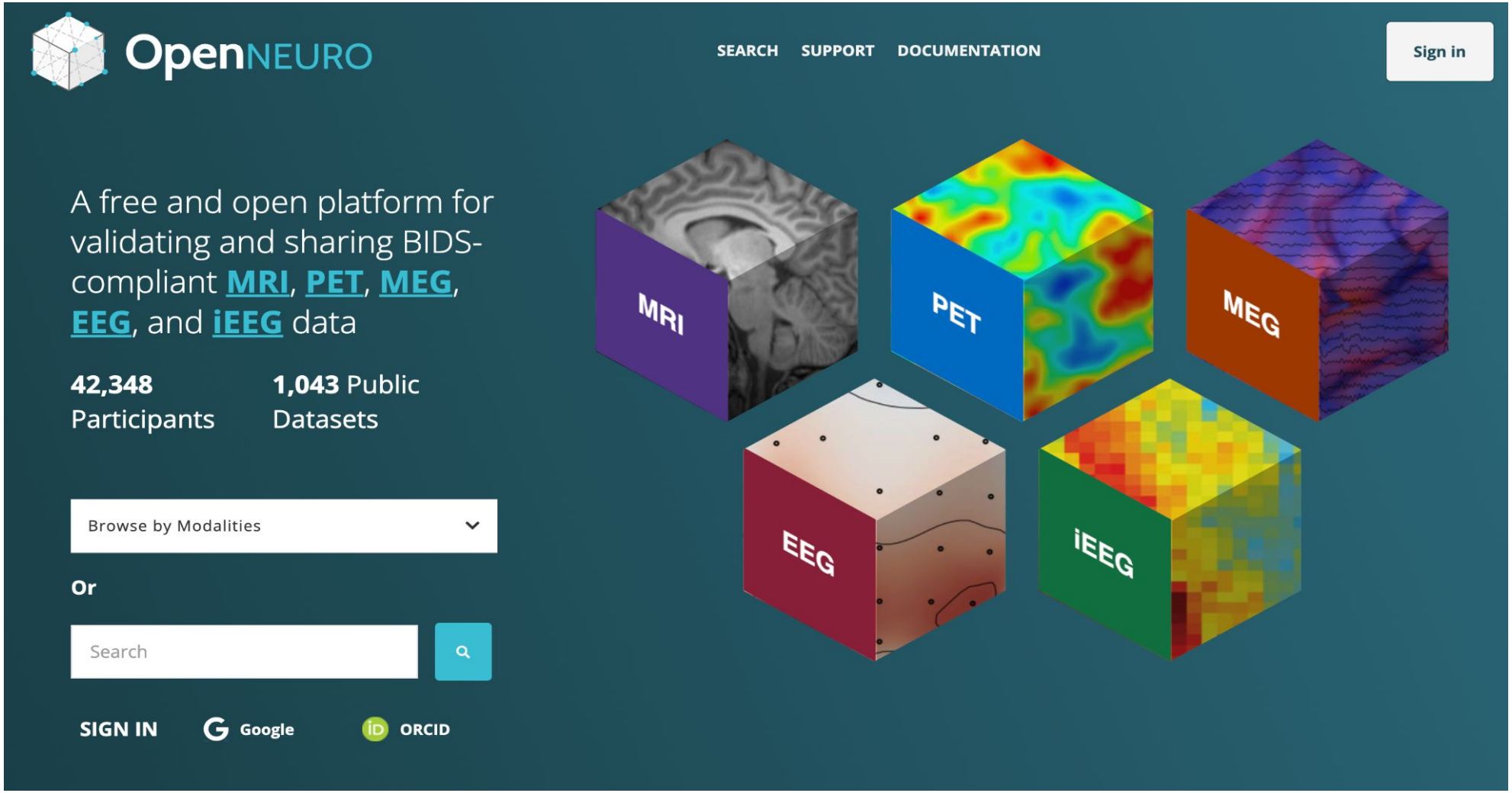
Poldrack et al., *Annual Reviews in Biomedical Data Science*, 2019



Milham et al., *Nature Communications*, 2018

Anonymous senior researcher circa 2019:
"OHBM has been taken over by the open science zealots!"

OpenNeuro: Sharing raw and processed imaging data

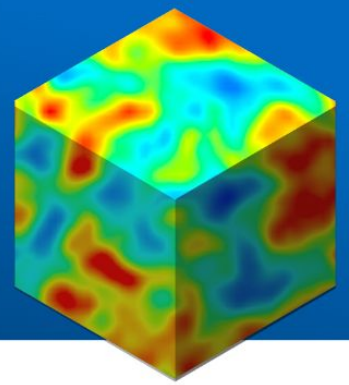


Markiewicz et al, 2021, *eLife*

OpenNeuro PET

The PET portal of OpenNeuro is supported by a collaboration between Stanford University, NIH, MGH and the Neurobiology Research Unit (NRU) at Copenhagen University Hospital through the OpenNeuroPET project. The project is funded through the BRAIN Initiative and the Novo Nordisk Foundation. Besides developing data sharing, the OpenNeuroPET project also aims at developing user friendly tools for the BIDS based data curation of PET data as well as tools for automated QC and template building.

165 Participants **17** Public Datasets



Search PET Portal

Search at the participant-level with Neurobagel

Keywords

Enter Keyword(s) to Search

All Public | Following | My Datasets | My Bookmarks

Choose Modality

Age of Participants

Number of Participants

Diagnosis

Task

Authors / PI

Sex

Publication Date

Species

Showing all available PET datasets

MODALITY:

PET ×

SORT BY: Newest

Evaluation of microglia activation related markers following a clinical course of TBS: a non-human primate study

Uploaded by:Lucero Aceves on 2024-04-17 - 27 days ago | Updated:2024-04-18 - 26 days ago

MODALITY:

PET

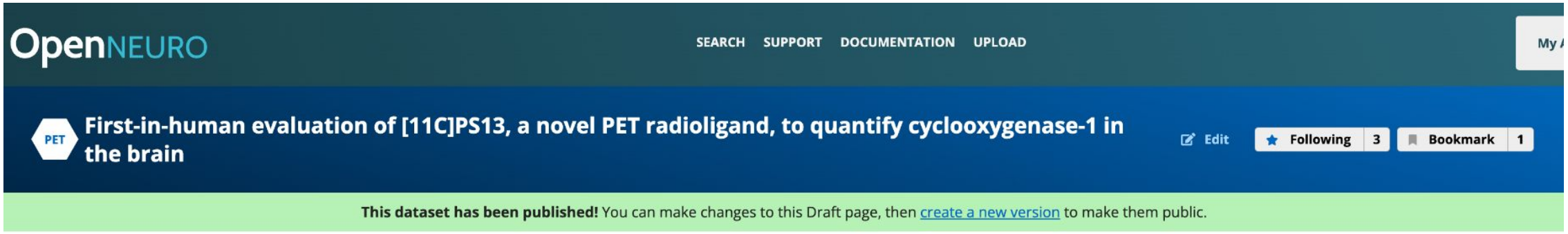
OPENNEURO ACCESSION NUMBER:**ds005093** SESSIONS:**6** PARTICIPANTS:**11** PARTICIPANTS' AGES: **N/A** SIZE:**30.93GB** FILES:**39**

Positron emission tomography (PET) quantification in healthy humans of cyclooxygenase-2 (COX-2), a potential biomarker of neuroinflammation

Uploaded by:Martin Nørgaard on 2023-12-04 - 5 months ago | Updated:2024-04-18 - 26 days ago

MODALITIES:

PET MRI


OpenNEURO
SEARCH
SUPPORT
DOCUMENTATION
UPLOAD
My A
PET
First-in-human evaluation of [11C]PS13, a novel PET radioligand, to quantify cyclooxygenase-1 in the brain
Edit
Following 3
Bookmark 1
This dataset has been published! You can make changes to this Draft page, then create a new version to make them public.
BIDS Validation
1 WARNING
Valid
Clone
Files
Share
Versioning
Download
Metadata
README
This dataset was gathered between 2017 and 2018 for as part of the "First-in-human evaluation of [11 C]PS13, a novel PET radioligand, to quantify cyclooxygenase-1 in the brain". This dataset consists of 16 subjects and their imaging data, including blood data.
For more details about the paper, authors, or dataset see the attached dataset_description.json or the participants.tsv.
Edit
First-in-human evaluation of [11C]PS13, a novel PET radioligand, to quantify cyclooxygenase-1 in the brain
Files: 207 Size: 4.83GB
+ Add Files + Add Directory
Bulk Delete (0)
CHANGES
LICENSE
README
dataset_description.json
participants.json
participants.tsv
sub-PS11
OpenNeuro Accession Number
ds004230
Authors
Min-Jeong Kim, Jae-Hoon Lee, Fernanda Juarez Anaya, Jinsoo Hong, William Miller, Sanjay Telu, Prachi Singh, Michelle Y Cortes, Katharine Henry, George L Tye, Michael P Frankland, Jose A Montero Santamaria, Jeih-San Liow, Sami S Zoghbi, Masahiro Fujita, Victor W Pike, Robert B Innis
Edit
Available Modalities
PET
MRI
Versions
Draft
Updated: 2024-03-22
Versions
Tasks
N/A
Targets
HEAD
Scanner Manufacturers
Siemens

sub-PS38

sub-PS39

sub-PS40

sub-PS42

Comments

H1 H2 H3 H4 H5 H6 Blockquote UL OL Code Block

Bold Italic Underline Monospace

Submit Comment

Sessions

2

Participants

16

Dataset DOI

doi:10.18112/openneuro.ds004230.v3.0.0

License

CC0

Acknowledgements

N/A

Edit

How to Acknowledge

Eur J Nucl Med Mol Imaging. 2020;47(13):3143-3151. doi:10.1007/s00259-020-04855-2

Edit

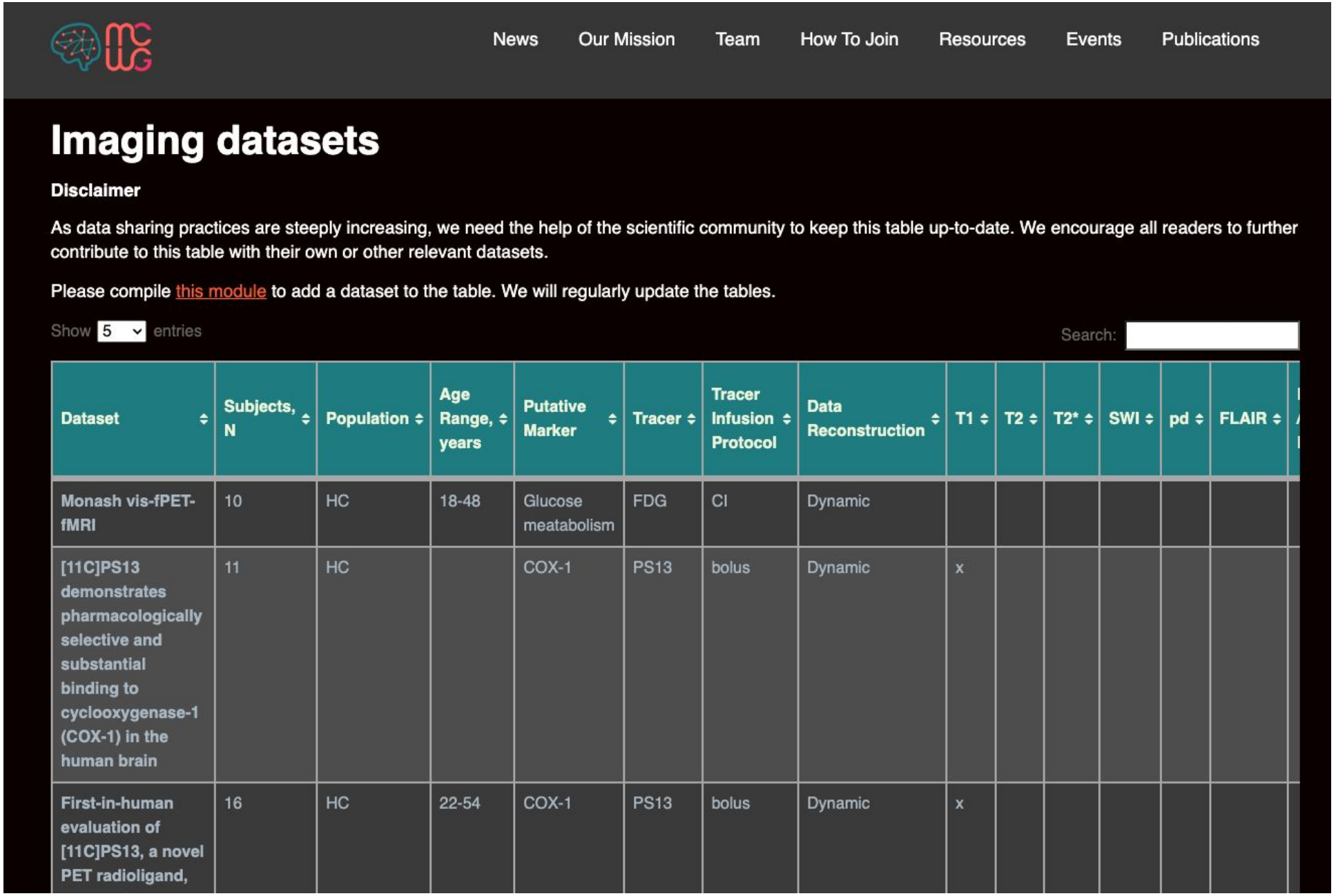
Funding

- ZIA MH002793/ImNIH/Intramural NIH HHS/United States
- ZIA MH002795/ImNIH/Intramural NIH HHS/United States

Edit

References and Links

- Kim MJ, Lee JH, Juarez Anaya F, Hong J, Miller W, Telu S, Singh P, Cortes MY, Henry K, Tye GL, Frankland MP, Montero Santamaria JA, Liow JS, Zoghbi SS, Fujita M, Pike VW, Innis RB. First-in-human evaluation of [11C]PS13, a novel PET radioligand, to quantify cyclooxygenase-1 in the brain. Eur J Nucl Med Mol Imaging. 2020 Dec;47(13):3143-3151. doi: 10.1007/s00259-020-04855-2. Epub 2020 May 12. PMID: 32399622; PMCID: PMC8261645.



News Our Mission Team How To Join Resources Events Publications

Imaging datasets

Disclaimer

As data sharing practices are steeply increasing, we need the help of the scientific community to keep this table up-to-date. We encourage all readers to further contribute to this table with their own or other relevant datasets.

Please compile this module to add a dataset to the table. We will regularly update the tables.

Show 5 entries Search:

Dataset	Subjects, N	Population	Age Range, years	Putative Marker	Tracer	Tracer Infusion Protocol	Data Reconstruction	T1	T2	T2*	SWI	pd	FLAIR
Monash vis-fPET-fMRI	10	HC	18-48	Glucose meatabolism	FDG	CI	Dynamic						
[11C]PS13 demonstrates pharmacologically selective and substantial binding to cyclooxygenase-1 (COX-1) in the human brain	11	HC		COX-1	PS13	bolus	Dynamic	x					
First-in-human evaluation of [11C]PS13, a novel PET radioligand,	16	HC	22-54	COX-1	PS13	bolus	Dynamic	x					

https://molecularconnectivity.com/resources/

Imaging datasets

Disclaimer

As data sharing practices are steeply increasing, we need the help of the scientific community to keep this table up-to-date. We encourage all readers to further contribute to this table with their own or other relevant datasets.

Please compile this module to add a dataset to the table. We will regularly update the tables.

Show 5 entries Search:

ATscan	Non-processed (recon + AC)	Processed (any step past recon + AC)	Ready for Statistical Analyses (quantified)	Data Access	Link	Additional Information
	Yes	Yes	Yes	directly accessible	https://openneuro.org/datasets/ds003382/versions/1.1.5	https://pubmed.ncbi.nlm.nih.gov/30615952/
	Yes	No	No	directly accessible	https://openneuro.org/datasets/ds004868/versions/1.0.0	
	Yes	No	No	directly accessible	https://openneuro.org/datasets/ds004230	https://pubmed.ncbi.nlm.nih.gov/32399622/

https://molecularconnectivity.com/resources/

The CIMBI database

Imaging datasets

Disclaimer

As data sharing practices are steeply increasing, we need the help of the scientific community to keep this table up-to-date. We encourage all readers to further contribute to this table with their own or other relevant datasets.

Please compile this module to add a dataset to the table. We will regularly update the tables.

Show 5 entries Search: cimbi

Dataset	Subjects, N	Population	Age Range, years	Putative Marker	Tracer	Tracer Infusion Protocol	Data Reconstruction	T1	T2	T2*	SWI	pd	FLAIR	DWI / DTI
Center for Integrated Molecular Brain Imaging (CIMBI)	906	HC, MCI, ADD, PD, Depression (MDD; Perinatal depression; Familial predisposition to major depression; Seasonal Affective Disorder), Substance abuse (MDMA	18-86	Amyloid plaques, 5HT1A receptor, 5-HT1B receptor, 5-HT2A receptor, 5-HT4 receptor, 5-HT transporter, GABA-A receptor	PiB, CUMI-101, AZ10419369, Altanserin, Cimbi-36, SB207145, DASB, Flumanezil	BI, BI+CI (Altanserin)	Partly Static/Partly Dynamic	x	x					x

https://molecularconnectivity.com/resources/

The CIMBI database

Imaging datasets

Disclaimer

As data sharing practices are steeply increasing, we need the help of the scientific community to keep this table up-to-date. We encourage all readers to further contribute to this table with their own or other relevant datasets.

Please compile this module to add a dataset to the table. We will regularly update the tables.

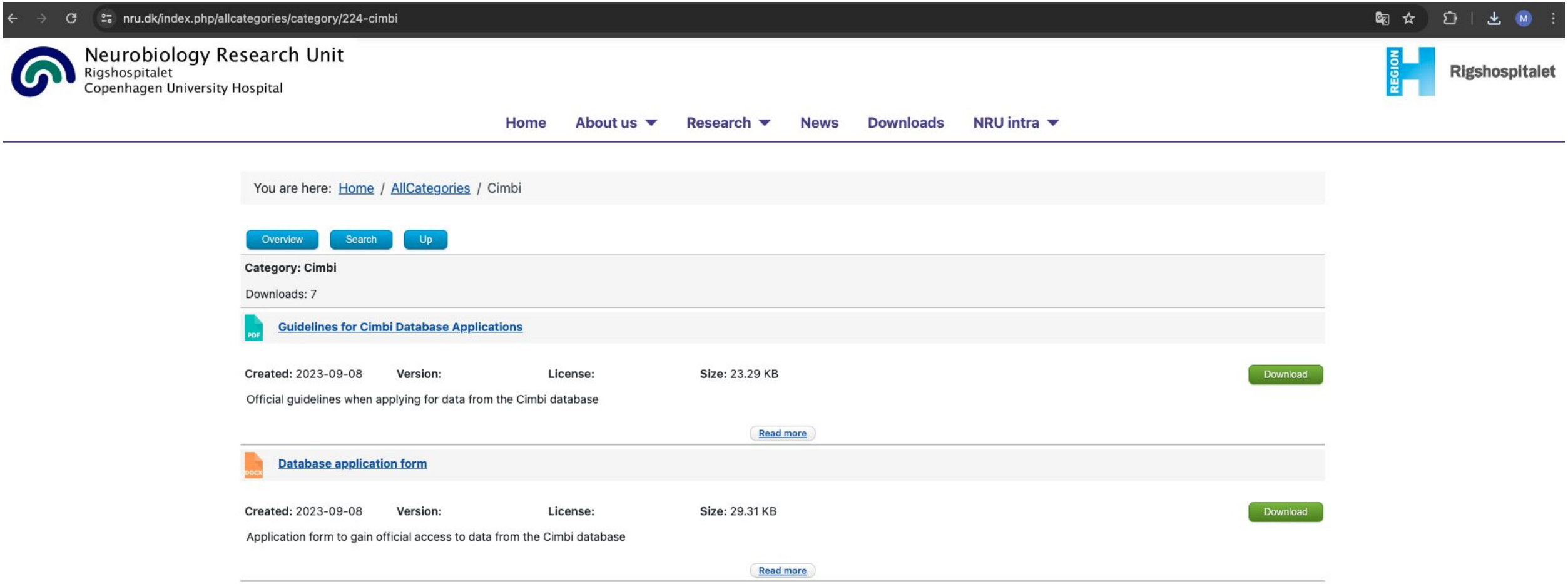
Show 5 entries

Search: cimbi

ATscan	Non-processed (recon + AC)	Processed (any step past recon + AC)	Ready for Statistical Analyses (quantified)	Data Access	Link	Additional Information
	Yes	Yes	Yes	detailed application	https://cimbi.dk/index.php/documents/category/3-cimbi-database	https://doi.org/10.1016/j.neuroimage.2015.04.025

https://molecularconnectivity.com/resources/

How to Access and Utilize These Datasets



Application for Access to Cimbi Database

Cimbi
Center for integrated molecular brain imaging

Date/Version	
1. Applicant's name	
2. Position and affiliation	
3. Address	
4. Tel **Email**	
5. Project title	
6. Short project description (Background, Aims, Hypothesis, Subjects and Methods, Data analysis)	
7. Specific request from Cimbi Database (Detailed description of subjects and variables)	
8. Proposed contribution to Cimbi Database	
9. Time schedule for project	

Practical Examples - molecular atlases

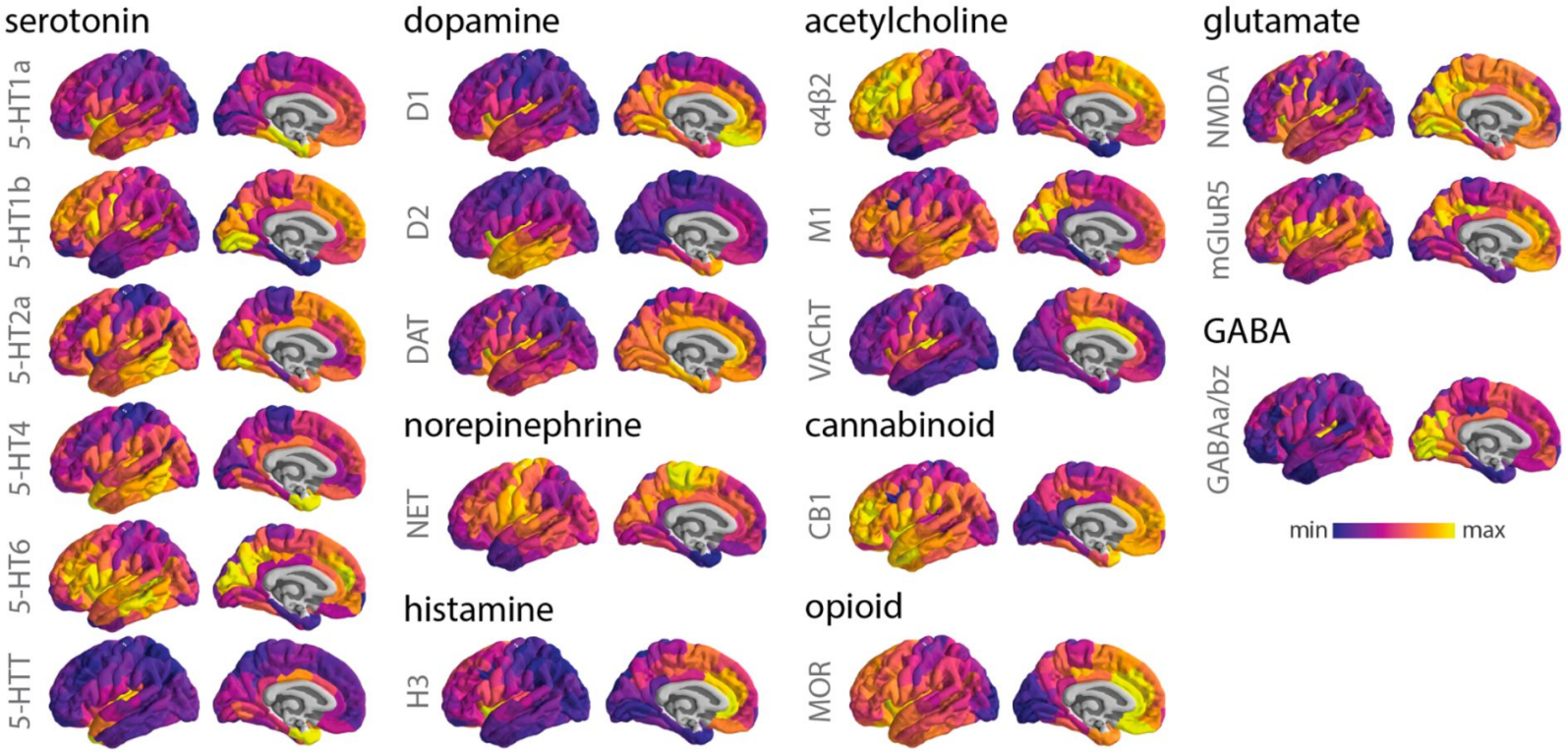


Figure 1. **PET images of neurotransmitter receptors and transporters** | PET tracer images were collated and averaged to produce mean receptor distribution maps of 19 different neurotransmitter receptors and transporters across 9 different neurotransmitter systems and a combined total of over 1 200 healthy participants.

Hansen et al. 2022, Nature Neuroscience

Conclusion

- Together, these resources include molecular imaging data from over 30.000 participants, from more than 60 datasets.
- Data for a broad range of biological targets, including perfusion, glucose metabolism, different pre- and post-synaptic neurotransmitters, amyloid and tau pathology and neuroinflammation, are currently available
- While the majority of molecular imaging data are currently not publicly available, funding bodies increasingly require data to be shared openly
- The increased availability of open data will make molecular imaging research more inclusive and also produce better research

OHBM 2024

JUNE 23~27, SEOUL, KOREA