

The role of neuroimaging beyond T1-weighted MRI in the diagnosis and prediction of neuropsychiatric disorders

Esten H. Leonardsen

26.10.23



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Functional Magnetic Resonance Imaging (fMRI)



Explanation of fMRI



Functional Magnetic Resonance Imaging (fMRI)



Explanation of fMRI

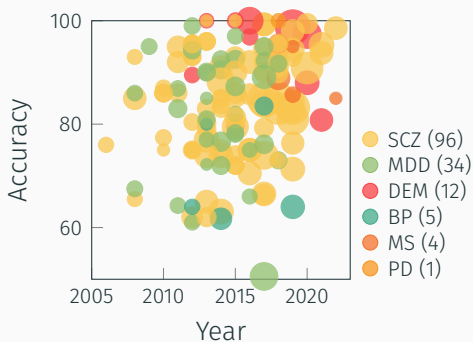
Task vs rest



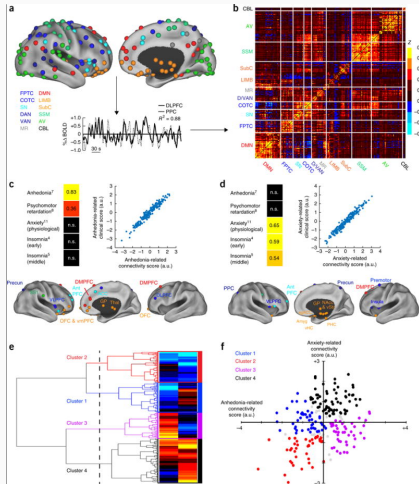
Functional Magnetic Resonance Imaging (fMRI)



Explanation of fMRI



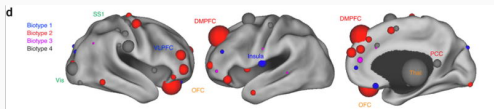
Functional Magnetic Resonance Imaging (fMRI)



Drysdale, A. T., Grosenick, L., Downar, J., Dunlop, K., Mansouri, F., Meng, Y., ... & Liston, C. (2017). Resting-state connectivity biomarkers define neurophysiological subtypes of depression. *Nature medicine*, 23(1), 28-38



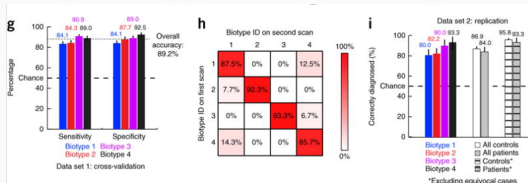
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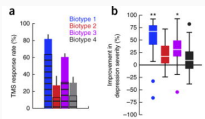
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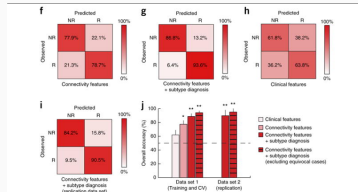
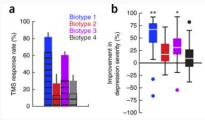
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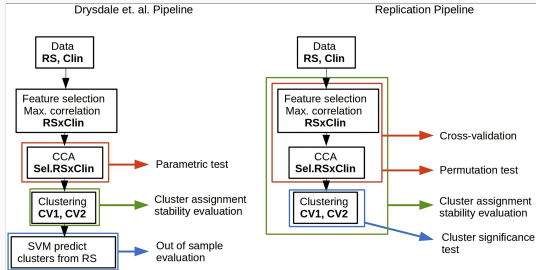
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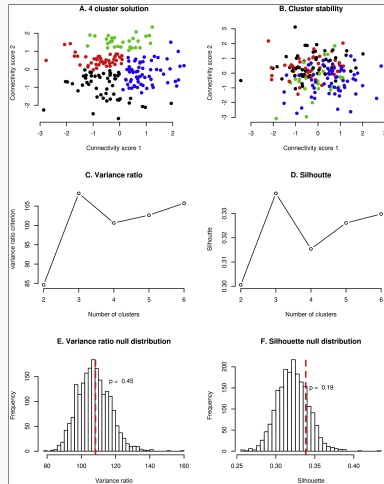
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Functional Magnetic Resonance Imaging (fMRI)

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Functional MRI

Widely used for all conditions, most prominently SCZ and MDD with varying accuracies (60-100%) and DEM (80-100%).

Used by Drysdale et al. to detect biotypes of MDD that reacted differently to treatment by transcranial magnetic stimulation.

However, Dinga et al. failed to replicate their results **WHY**.



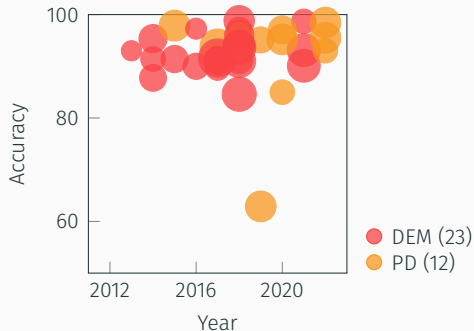
Explanation of molecular



Molecular imaging (PET/SPECT)



Explanation of molecular

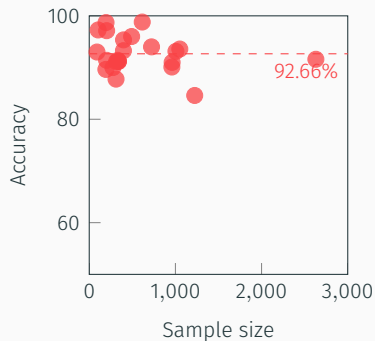




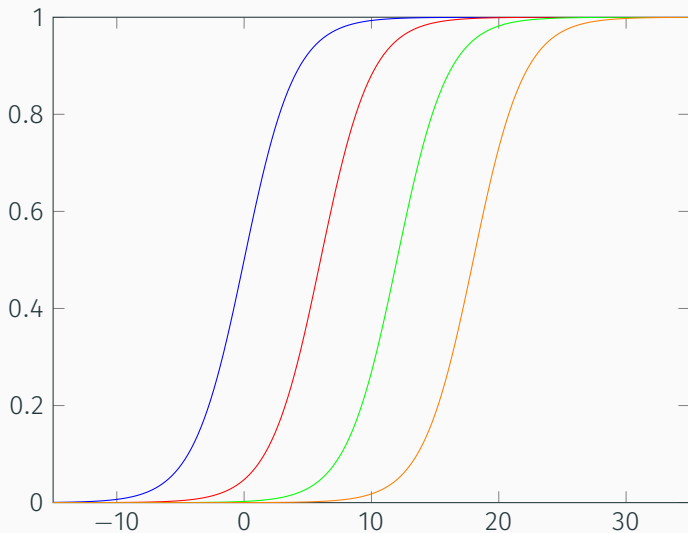
Explanation of PET



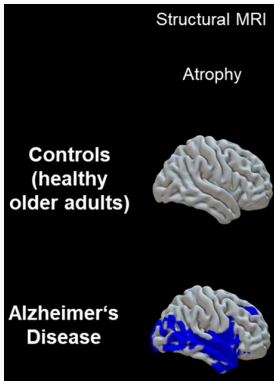
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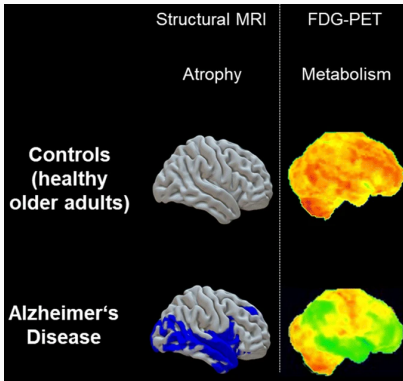
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Chételat, G., Arbizu, J., Barthel, H., Garibotto, V., Lammertsma, A. A., Law, I., ... & Drzezga, A. (2021). Finding our way through the labyrinth of dementia biomarkers. *European journal of nuclear medicine and molecular imaging*, 48, 2320-2324



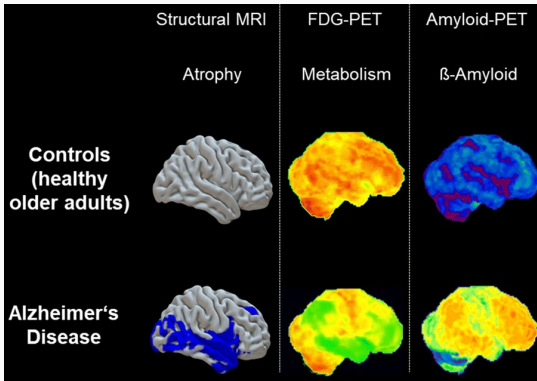
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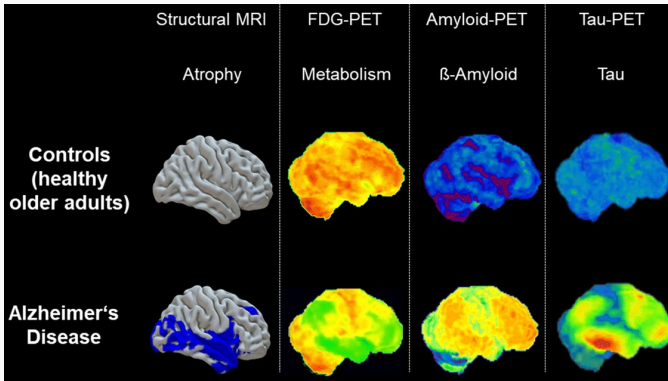
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Molecular imaging (PET/SPECT)



"It is necessary to separate syndrome (clinically identified impairment) from biology (etiology)

AD is defined by its biology with the following implications

The disease is first evident with the appearance of β -amyloid plaques, and later neocortical tau tangles, while people are asymptomatic. Pathophysiologic mechanisms involved with processing and clearance of protein fragments may be involved very early in the disease process, but these are not yet well understood.

In living people the disease is diagnosed by disease specific core biomarkers

Unimpaired individuals with abnormal biomarker testing are at risk for symptoms due to AD.

They are not at risk for a disease they already have.

Symptoms are a result of the disease process and are not necessary to diagnose AD

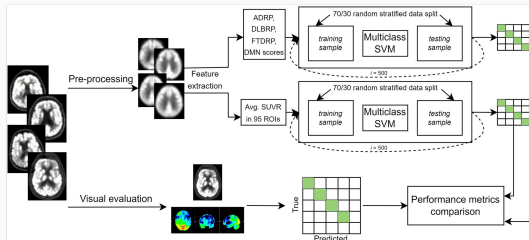
AD exists on a continuum not as discrete clinically defined entities

Clinical syndromes commonly seen with AD may also be caused by disorders other than AD and therefore clinical presentation alone is not diagnostic of AD

The same AD biology may result in different phenotypic presentations"



Molecular imaging (PET/SPECT)



Perovnik, M., Vo, A., Nguyen, N., Jamšek, J., Rus, T., Tang, C. C., ... & Eidelberg, D. (2022). Automated differential diagnosis of dementia syndromes using FDG PET and machine learning. *Frontiers in Aging Neuroscience*, 14, 1005731



Molecular imaging (PET/SPECT)



	AD	DLB	FTD	NC
AD	53	7		3
DLB	9	65	1	4
FTD		1	21	1
NC	2			39

Model predicted diagnosis (86%)

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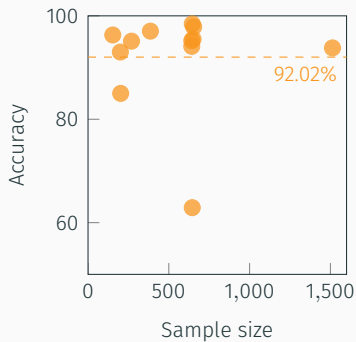
	AD	DLB	FTD	Other	NC
AD	50	4		8	1
DLB	5	54		19	1
FTD	3		16	24	
Other					
NC					41

Human predicted diagnosis (78%)

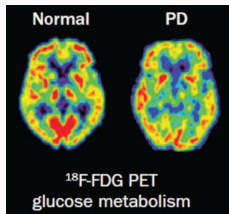
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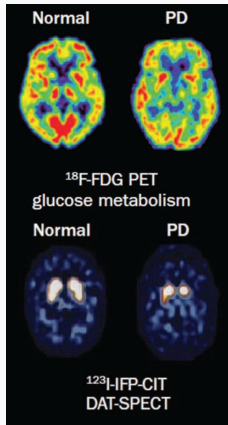
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Pagano, G., Niccolini, F., & Politis, M. (2016). Imaging in Parkinson's disease. *Clinical Medicine*, 16(4), 371



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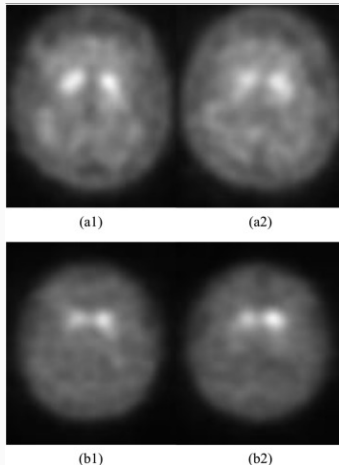
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Explanation of SPECT



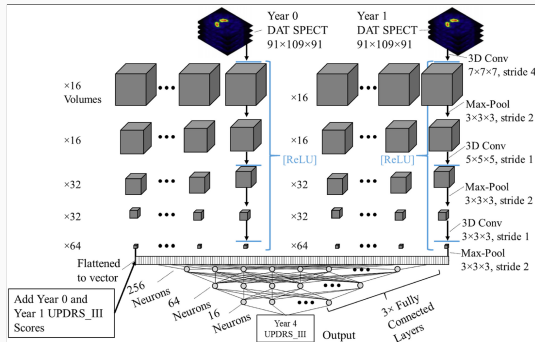
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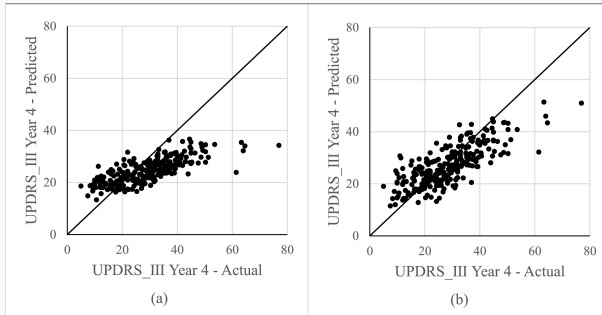
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Molecular imaging

Used in a moderate amount of studies predicting PD and DEM with good results (mean accuracy=92%).

Hello

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