

Comparative Neuroanatomy of Object and Generative Naming Impairment in behavioral variant Frontotemporal Dementia and Primary Progressive Aphasia

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Background

- Behavioral variant frontotemporal dementia (bvFTD) is a neurodegenerative condition that presents with language, executive, and behavioral deficits^{1,2}.
- The neuroanatomical associations in object and generative naming in bvFTD has not been well characterized³
- The purpose of this study was to investigate the patterns of grey matter atrophy underlying disrupted object and generative naming in bvFTD.

Methods

- Participant is demonstrated in the table:

Participants	Number	Age (yrs)	Gender
Healthy Controls	96	51.9	47M; 49F
bvFTD	101	64.2	69M;34F
PPA	45	66.5	19M; 26F

- Participants underwent 3D T1-weighted magnetic resonance imaging and neuropsychological evaluations according to ALLFTD protocol.
- Boston Naming test, Multilingual Naming Test, and Benson Complex Figure Test were used as measures of naming and executive function performance .
- Generative naming was evaluated using the average of animal and vegetable categorical fluency tests.
- Voxel-based morphometry (VBM) analysis was used to detect regions of atrophy in bvFTD as compared to controls using a t-test.
- We used regression analyses to calculate regional grey matter volume loss associated with object naming, generative naming, and executive function in bvFTD.

Results

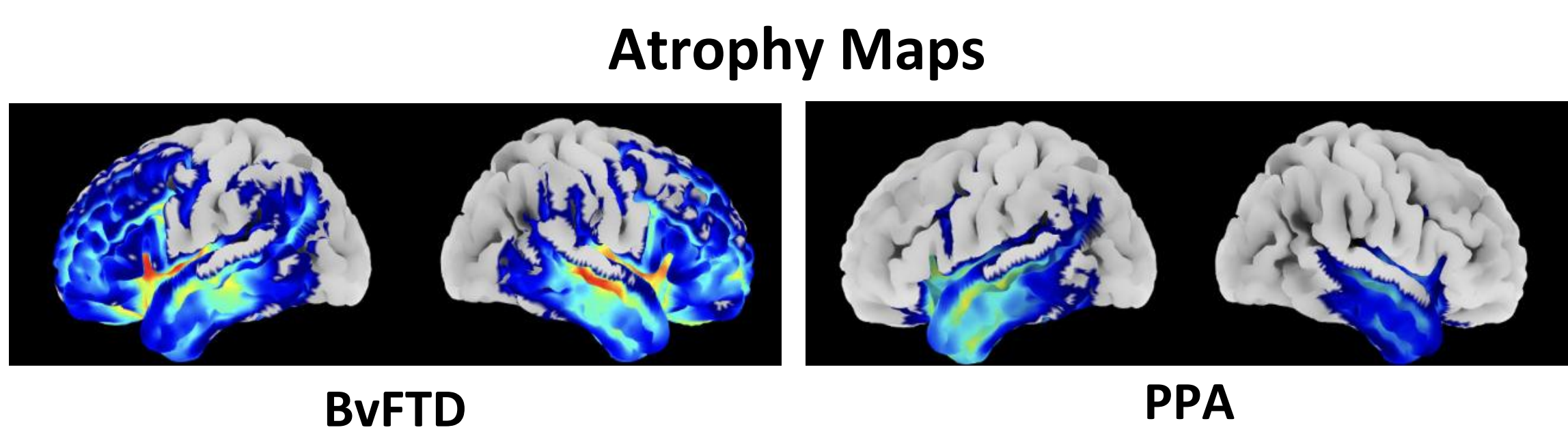


Figure 1. Atrophy Maps comparing controls to participants (p<0.001, FDRc)

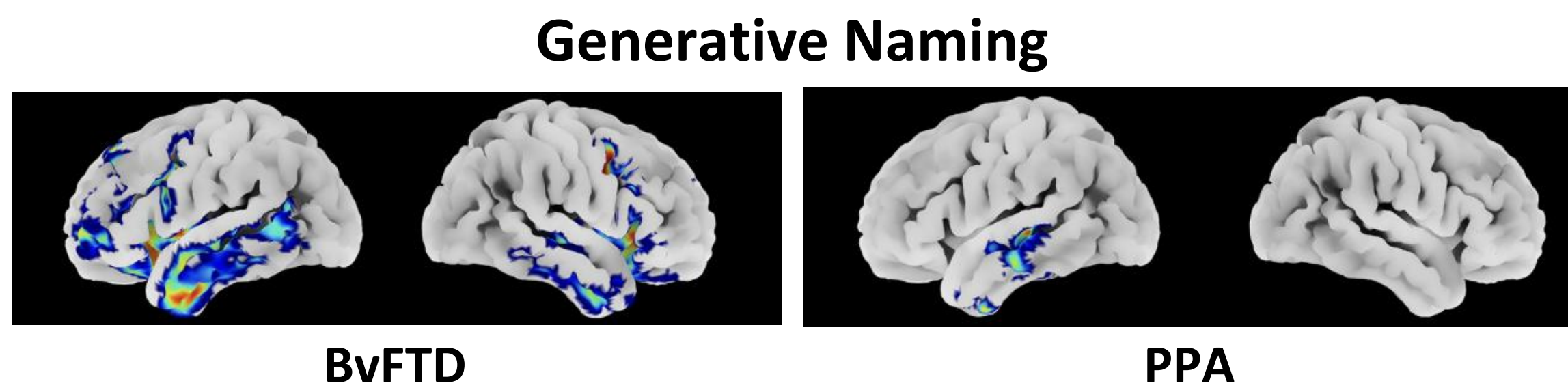


Figure 2. Correlation between Generative Naming Scores to atrophy (p<0.001, FDRc)

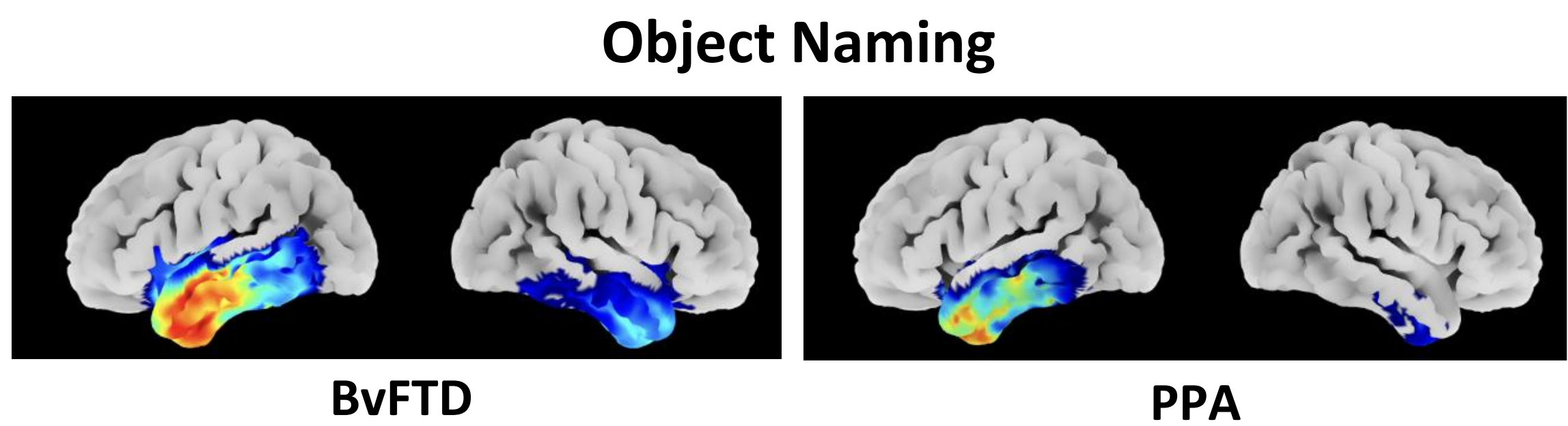


Figure 3. Correlation between Object Naming Scores to atrophy (p<0.001, FDRc)

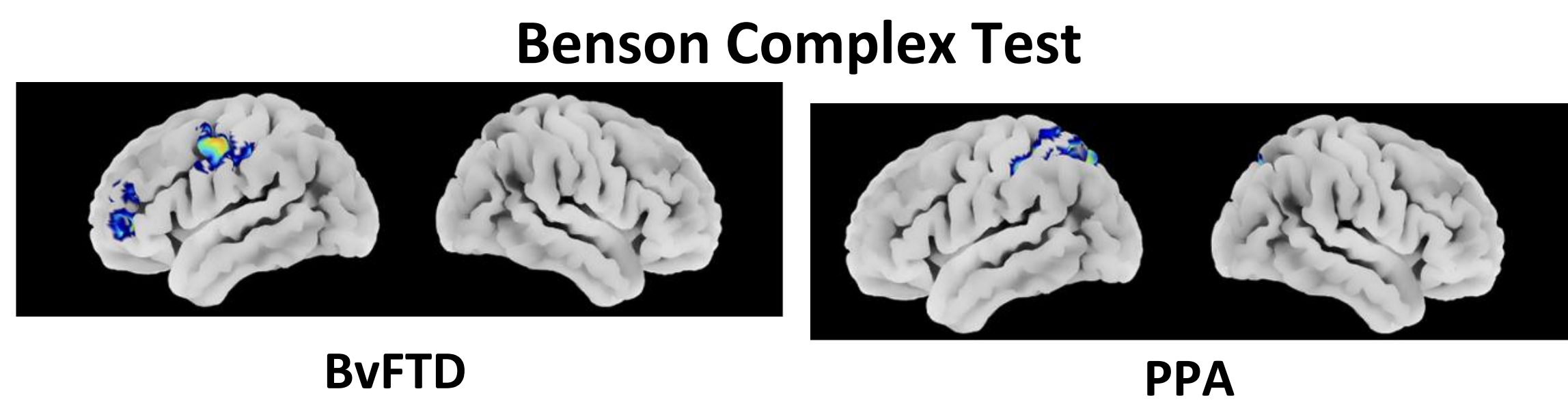


Figure 4. Correlation between Benson Complex Test Scores to atrophy (p<0.001)

- T-test indicated significant atrophy in the frontal, temporal, and parietal regions for bvFTD (Figure 1).
- Significant correlations between bilateral temporal lobe and object and generative naming for both bvFTD and PPA, with greater atrophy in left for PPA (Figure 2, 3).
- Significant correlations between impairment in generative naming and atrophy in the bilateral frontal lobe only in the bvFTD group (Figure 2).
- Lower Benson complex test scores correlated to atrophy in the parietal lobe, distinct from perisylvian language zone in both bvFTD and PPA (Figure 4).

Discussion

- Our findings indicate picture naming in both syndromes was correlated with temporal lobe cortical volume (L>R).
- Generative Naming depended on atrophy in temporal lobes for both groups but was only associated with cortical volume loss in frontal regions in bvFTD, indicating a greater association with executive failure.
- The double dissociation between atrophy patterns for naming and visual tasks points to the specificity of our findings.
- Our study provides new insight into the neural basis of anomia across FTD and PPA syndromes.

References

[1] Snowden JS, Harris JM, Saxon JA, Thompson JC, Richardson AM, Jones M, & Kobylecki C. Naming and conceptual understanding in frontotemporal dementia. *Cortex*. 2019; 120, 22–35 <https://doi.org/10.1016/j.cortex.2019.04.027>

[2] Cappa SF, Binetti G, Pezzini A, Padovani A, Rozzini L, Trabucchi M. Object and action naming in Alzheimer’s disease and frontotemporal dementia. *Neurology*. 1998 Feb;50(2):351-5. doi: 10.1212/wnl.50.2.351.

[3] Hardy CJ, Buckley AH, Downey LE, Lehmann M, Zimmerer VC, Varley RA, Crutch SJ, Rohrer JD, Warrington EK, Warren JD. The Language Profile of Behavioral Variant Frontotemporal Dementia. *J Alzheimers Dis*. 2016;50(2):359-71. doi: 10.3233/JAD-150806. PMID: 26682693; PMCID: PMC4740928.

[4] Grossman M, McMillan C, Moore P, Ding L, Glosser G, Work M, Gee J. What’s in a name: voxel-based morphometric analyses of MRI and naming difficulty in Alzheimer’s disease, frontotemporal dementia and corticobasal degeneration. *Brain*. 2004 Mar;127(Pt 3):628-49. doi: 10.1093/brain/awh075. Epub 2004 Feb 4. PMID: 14761903.