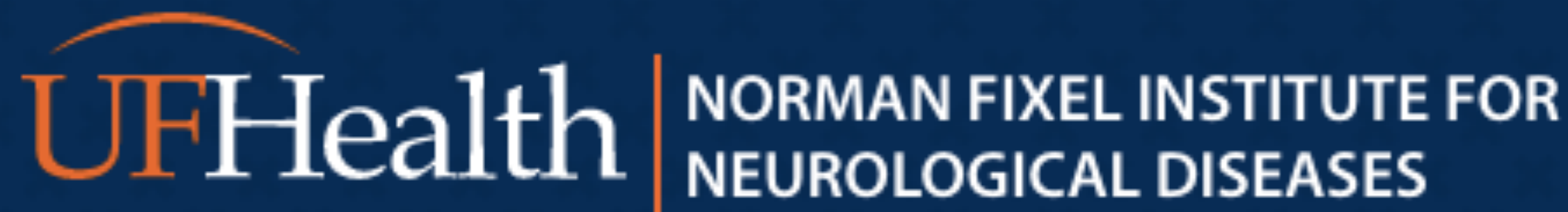


# Cognitive Subtypes in Individuals with Essential Tremor Seeking Deep Brain Stimulation

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## INTRODUCTION

- Essential tremor (ET) is the most common tremor disorder in the world, affecting ~1% of the population and ~4-5% of people aged ≥ 65.
- Individuals with ET present with subtle cognitive deficits and are at an increased risk of developing MCI/dementia.
- The cognitive profile of ET has been defined as mild frontal-executive dysfunction linked to abnormalities in the cerebello-thalamo-cortical circuit; however, prior work has found deficits in other cognitive domains as well.
- The overall goal of the current study was to determine whether cognitive subtypes would emerge in a non-demented ET cohort who were candidates for deep brain stimulation (DBS) surgery.

## AIMS

- **Aim 1:** Determine whether distinct cognitive subtypes would be present in ET patients who were DBS candidates
- **Aim 2:** Determine whether these cognitive subtypes differ in demographic and/or clinical factors

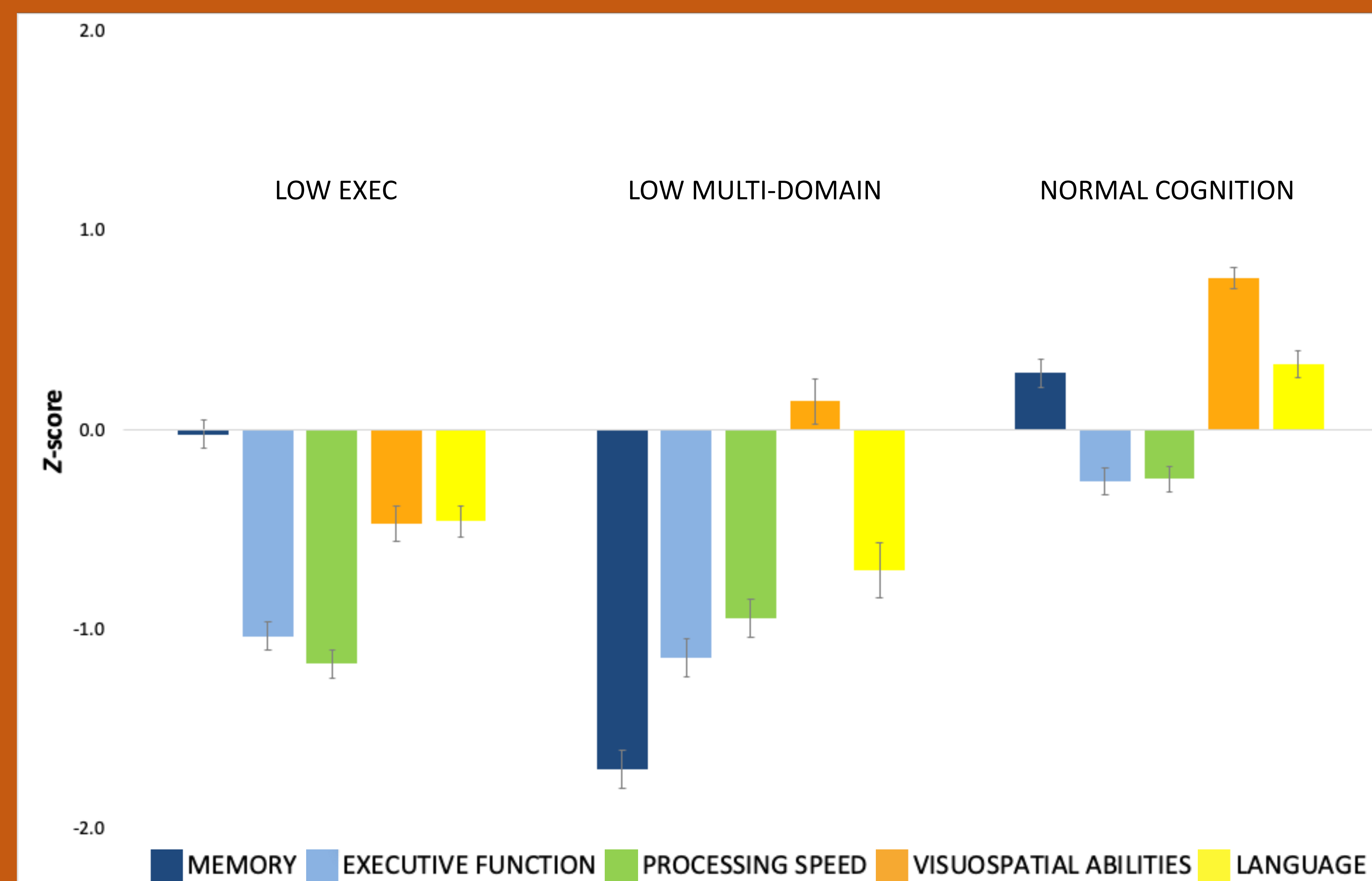
## METHODS

- Participants included a convenience sample of 201 individuals (mean age = 68.9 ± 8.9) with ET who were candidates for DBS.
- ET patients underwent a comprehensive, multi-domain neurocognitive assessment consisting of memory, executive function, processing speed, visuospatial abilities, and language measures.
- Two cluster analytic approaches (*K*-means, hierarchical) were independently conducted to classify cognitive patterns from the five domains.
- The number of clusters was selected based on clinical relevance and statistical criteria.
- Derived clusters were examined for differences in demographics, disease duration, tremor severity (Fahn-Tolosa-Marin Tremor Rating Scale), Dementia Rating Scale-2 (DRS-2) score, and mood variables (Beck Depression Inventory-II, Apathy Scale, State-Trait Anxiety Inventory) .

Three cognitive subtypes were present in a cohort of ET patients being evaluated for deep brain stimulation:

- 1) Low executive function scores
- 2) Low multi-domain scores
- 3) Normal cognition

Figure 1. Cognitive domain scores across clusters



## RESULTS

Table 1. Demographic and clinical characteristics

Category	Measure	All cases	Cluster 1	Cluster 2	Cluster 3
		<i>N</i> = 201	LOW EXEC <i>N</i> = 64	LOW MULTI-DOMAIN <i>N</i> = 41	NORMAL COGNITION <i>N</i> = 96
Demographics	Age, years	68.9 ± 8.9	68.4 ± 10.0	66.8 ± 7.7	70.2 ± 8.5
	Gender, female (%)	72 (35.8)	30 (46.9)	10 (24.4)	32 (33.3)
	Education, years	13.9 ± 2.8	13.0 ± 2.8	13.2 ± 3.0	14.8 ± 2.5
Tremor characteristics	Ethnicity, Hispanic (%)	3 (1.5)	1 (1.6)	2 (4.9)	0 (0)
	Tremor duration, years	26.3 ± 17.8	26.6 ± 17.9	25.7 ± 20.0	26.4 ± 16.9
	TRS motor	35.6 ± 11.0	37.0 ± 11.3	38.2 ± 11.3	33.8 ± 10.5
Mood	TRS total	50.0 ± 14.5	52.7 ± 15.6	52.3 ± 13.7	47.3 ± 13.8
	BDI-II	8.6 ± 7.6	9.4 ± 8.5	10.3 ± 7.9	7.2 ± 6.6
	STAI state	37.7 ± 11.5	39.2 ± 11.6	41.9 ± 11.6	35.1 ± 10.9
Cognition	STAI trait	34.9 ± 11.5	36.5 ± 12.0	38.0 ± 12.7	32.7 ± 10.2
	AS	10.9 ± 6.0	11.7 ± 6.0	12.2 ± 5.4	9.8 ± 6.1
	DRS-2	135.5 ± 4.7	133.9 ± 4.4	133.3 ± 5.4	137.4 ± 3.6

Notes: TRS=Fahn-Tolosa-Marin Tremor Rating Scale; BDI-II=Beck Depression Inventory-II; STAI=State-Trait Anxiety Inventory; AS=Apathy Scale; DRS-2=Dementia Rating Scale-2

- When comparing the three groups, the “normal cognition” group had significantly more years of education, was older, had higher overall global cognition (based on DRS-2 scores), and had lower reported state anxiety than the other groups (all *p* < .05).

## DISCUSSION

- Two of the cognitive subgroups identified were cognitively low with low scores in several domains, whereas one group had consistently average performance.
- In addition to frontal-executive deficits common to ET, one subgroup also presented with significant memory impairment, which may be better explained by other factors such as co-occurring age-related disorders.
- Future work should examine trajectories of these cognitive phenotypes in terms of post-DBS cognitive outcomes as well as potential progression dementia.

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