Verbal Fluencies are Differentially Associated with Processing Speed in Temporal Lobe Epilepsy

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OBJECTIVE

- Category and letter fluency are often assessed as part of the neuropsychological evaluation for epilepsy surgery candidates and may have some localizing/lateralizing value (e.g., category fluency and letter fluency may reflect more involvement of language versus frontal-executive systems, respectively[1]). However, both can be impaired in temporal lobe epilepsy (TLE)[2], often alongside cognitive slowing.
- Cognitive slowing can be an early and core impairment in epilepsy.[3,4] As processing speed has been shown to predict performance on fluency tasks,[5] this may complicate interpretation of fluency measures in the pre-surgical epilepsy evaluation.
- The current study sought to better understand differential associations between processing speed and category and letter fluencies in patients with right and left TLE.

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METHODS

- Retrospective clinical data were examined for 36 adults age 17-60.
- All underwent phase 1 workup for epilepsy surgery.
- All had cryptogenic unilateral TLE (confirmed via video EEG/phase 1 workup) and left hemisphere language dominance (confirmed via Wada).
- All underwent neuropsychological evaluation including:

  WAIS-IV Coding (*processing speed*)
  Animal Naming (*category fluency*)
  FAS (*letter fluency*)
- Right TLE (n=16) and Left TLE (n=20) subgroups did not significantly differ in age, epilepsy duration, education, level of depression, or IQ.

DESCRIPTIVES N=36

Age M (SD)	37 (11.8)
Duration of epilepsy (yrs)	15.6 (11.5)
Sex	56% Female
Handedness	92% Right
Years of education M (SD)	12.6 (2.1)
WAIS-IV FSIQ M (SD)	87.2 (14.8)
BDI-II M (SD)	15.2 (10.6)
Race	64% White 31% Black

RESULTS

PARTIAL CORRELATIONS BETWEEN PROCESSING SPEED AND VERBAL FLUENCIES CONTROLLING FOR AGE AND EDUCATION

	Full Sample (n=36)	Right TLE Subgroup (n=16)	Left TLE Subgroup (n=20)
Animal Naming	0.47**	0.39	0.47*
FAS	0.28	0.30	0.35

Processing Speed: WAIS-IV Coding; * p<.05, ** p<.01

- WAIS-IV Coding was positively correlated with Animal Naming after controlling for relevant demographic variables in the full sample and in the left TLE, but not right TLE subgroup. WAIS-IV Coding was not significantly associated with FAS in any analysis.
- Post-hoc ANCOVA models controlling for age and education showed no significant differences in Coding [f(1,32)=1.06, p=.31], FAS [f(1,32)=1.14, p=.29], or Animal Naming [f(1,32)=0.99, p=.33] performance across right and left TLE groups.

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DISCUSSION

- Processing speed was significantly associated with category fluency but not letter fluency in our unilateral TLE sample, suggesting that processing speed may have more influence on semantic memory retrieval than on the executive components of verbal fluency in TLE.
- However, the relationship between processing speed and category fluency was significant only in patients with left (not right) TLE, when divided into subgroups. This selective finding further suggests that the influence of processing speed on semantic retrieval is greater in patients with seizures in the language dominant hemisphere. This can be broadly tied in with concepts of cognitive speed as reflecting structural and functional connectivity and focal epilepsy as a "network disease" (e.g., Hwang et al., 2019).[6]
- There were no significant group differences in cognitive performance in the current sample, though subgroups were small. Future research might further explore relative contribution from other factors that may influence cognitive speed and/or verbal fluencies in patients with TLE (e.g., depression, duration of epilepsy, AED type and dosing, executive functioning).
- While further research in larger samples is indicated, these preliminary findings can be considered when addressing the lateralizing/localizing value of verbal fluencies in pre-surgical assessment of epilepsy patients with slowed processing.