



Phonemic and Semantic Fluency Discrepancies: Normative Data and Differences Between MCI and AD Patients



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Background

- A neuroanatomic disassociation between phonemic and semantic word generation tasks has been reliably demonstrated, with lesions to the frontal lobes disproportionately affecting phonemic fluency and temporal lobe lesions affecting semantic fluency (Henry & Crawford, 2004a).

- In AD, pathological changes disproportionately affect temporal lobes early in the disease course. Fluency measures in AD patients mirror this pattern, with greater semantic than phonemic impairments observed even early in the disease course (Henry & Crawford, 2004b; Murphy, Rich, & Troyer, 2006).

- Despite the potential clinical utility of this discrepancy, no published data has explored the psychometric properties of this discrepancy or provided normative data for English speaking individuals in the most frequently employed fluency measures (FAS vs. Animals)

- The purpose of this paper was to evaluate the psychometric properties of phonemic/semantic discrepancies in a group of normal controls, and apply this pattern to individuals across a spectrum of AD severity.

Participants

- Data from patients and normal elderly controls were collected at the Baylor College of Medicine Alzheimer's Disease and Memory Disorders Center.

- Mild cognitive impairment (MCI) was established on the basis of a full neuropsychological evaluation and consensus regarding Peterson criteria between both neurological and neuropsychological staff.

- AD patients met NINCDS-ADRDA criteria for probable AD. MMSE scores were used to categorize AD patients into Mild (≥ 22), Moderate (15-21) and Severe (≤ 14) dementia.

Procedure

- All participants were administered both phonemic (FAS) fluency and semantic fluency (animals) measures, as part of a larger neuropsychological test battery.

- Discrepancy size was calculated as: Animals - (FAS/3)

- Normative values for all fluency measures were calculated on the basis of overlapping age ranges as outlined below.

Results

Table 1: Fluency and Discrepancy Descriptives for Normals by Age Groups

Age Range	N	Age	Animals	FAS/3	Discrepancy
61-68	36	65.6(2.5)	21.6(4.4)	15.9(5.1)	5.7(4.1)
65-72	72	69.5(1.9)	19.7(3.8)	15.0(4.5)	4.8(4.4)
69-76	84	72.2(2.2)	18.8(3.7)	14.3(4.1)	4.5(4.6)
73-80	46	75.4(1.9)	18.0(3.8)	14.0(3.8)	4.0(4.8)
77-85	24	80.8(2.8)	17.5(3.9)	14.7(3.5)	2.8(4.6)

Among Normal Controls

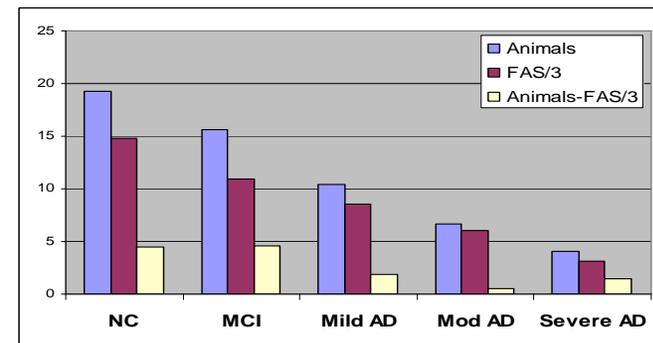
- Age was found to have a significant relationship with the fluency measures, and with the size of the fluency discrepancy ($r = -.17$, $p < .05$).

- Education, while correlated with the raw fluency measures, was not correlated with the discrepancy score.

Table 2: Fluency and Discrepancy z-scores MCI, Mild AD, Moderate AD, and Severe AD

	N	Animals z-score		FAS/3 z-score		Discrepancy z-score	
		M	SD	M	SD	M	SD
MCI	51	-0.82	0.32	-0.88	0.31	0.08	0.35
Mild AD	264	-2.21	0.16	-1.48	0.25	-0.56	0.18
Mod AD	220	-3.14	0.28	-2.15	0.12	-0.74	0.15
Sev AD	88	-4.00	0.37	-2.84	0.45	-0.85	0.59

Fluency and Discrepancy Performances Across Diagnostic Groups



One-way Anova

- Animals $F(4,766) = 209.73$ $p < .001$
- FAS / 3 $F(4,766) = 165.15$ $p < .001$
- Discrepancy $F(4,766) = 21.17$ $p < .001$

Conclusions

- The discrepancy score measuring the difference between phonemic and semantic fluency decreased with age in normals. In addition, discrepancy worsened with increased dementia severity across all age groups, except in the severe group.

- The size of the discrepancy between fluency measures does not discriminate between normal aging and MCI, but overall fluency measure performance does.

- The discrepancy normative data appears to adequately discriminate between normal aging and AD, subtly demonstrate differences in dementia severity, and may be a useful additional tool of consideration in clinical settings.