

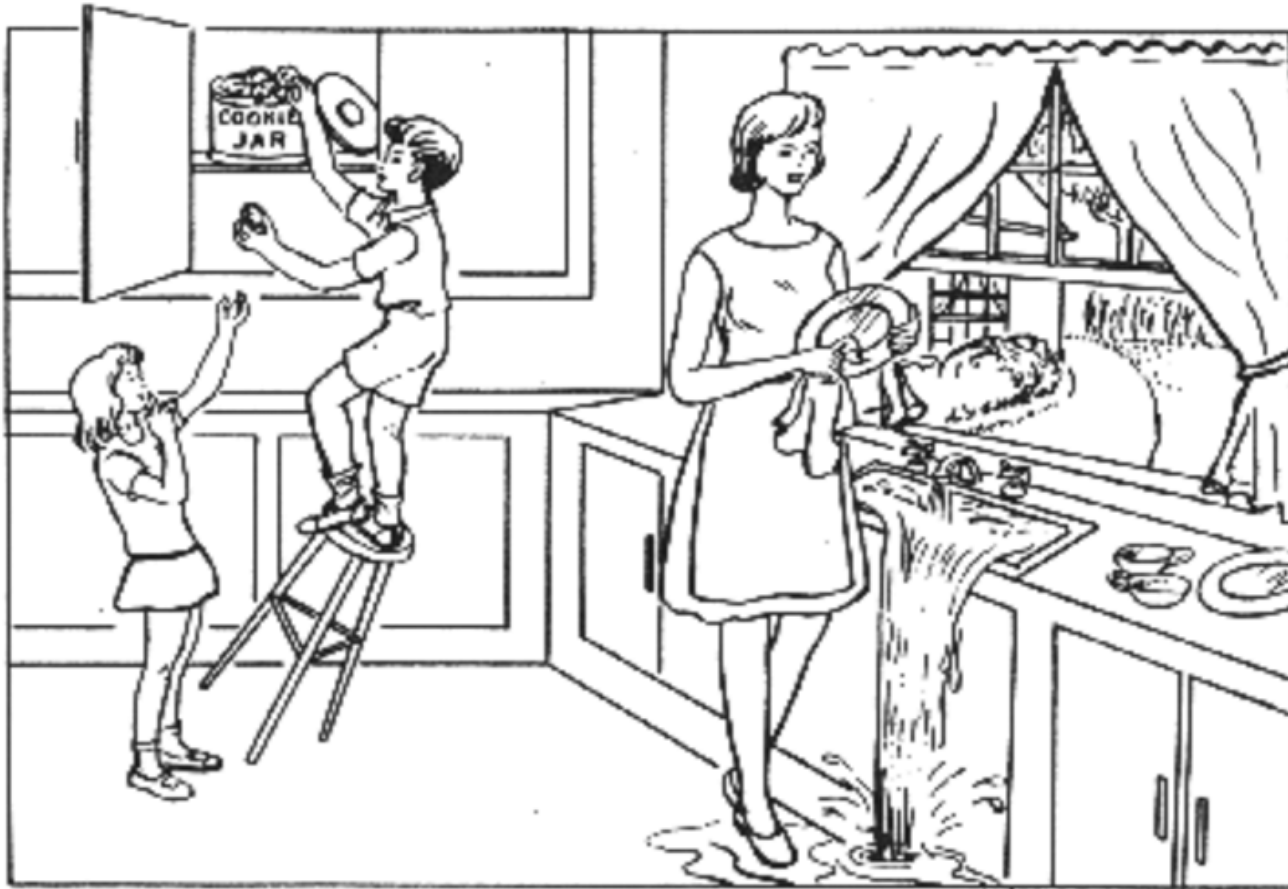
Language Profiles Differentiate Mild Cognitive Impairment and Mild Alzheimer's Disease

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The problem

- Recent advances in detection of neuropathology early in the progression of Alzheimer's disease (AD) have led to clinical trials investigating promising interventions that target its earliest effects.
- Thus, there is an urgent need for sensitive measures of its earliest symptoms, to identify candidates for these interventions and to provide metrics to assess their effectiveness.



Cookie Theft picture from the Boston Diagnostic Aphasia Examination (Goodglass & Kaplan, 1983)

Potential Measures

Connected language: spoken language that is used in a continuous sequence, as in everyday conversations (Mueller et al., 2018).

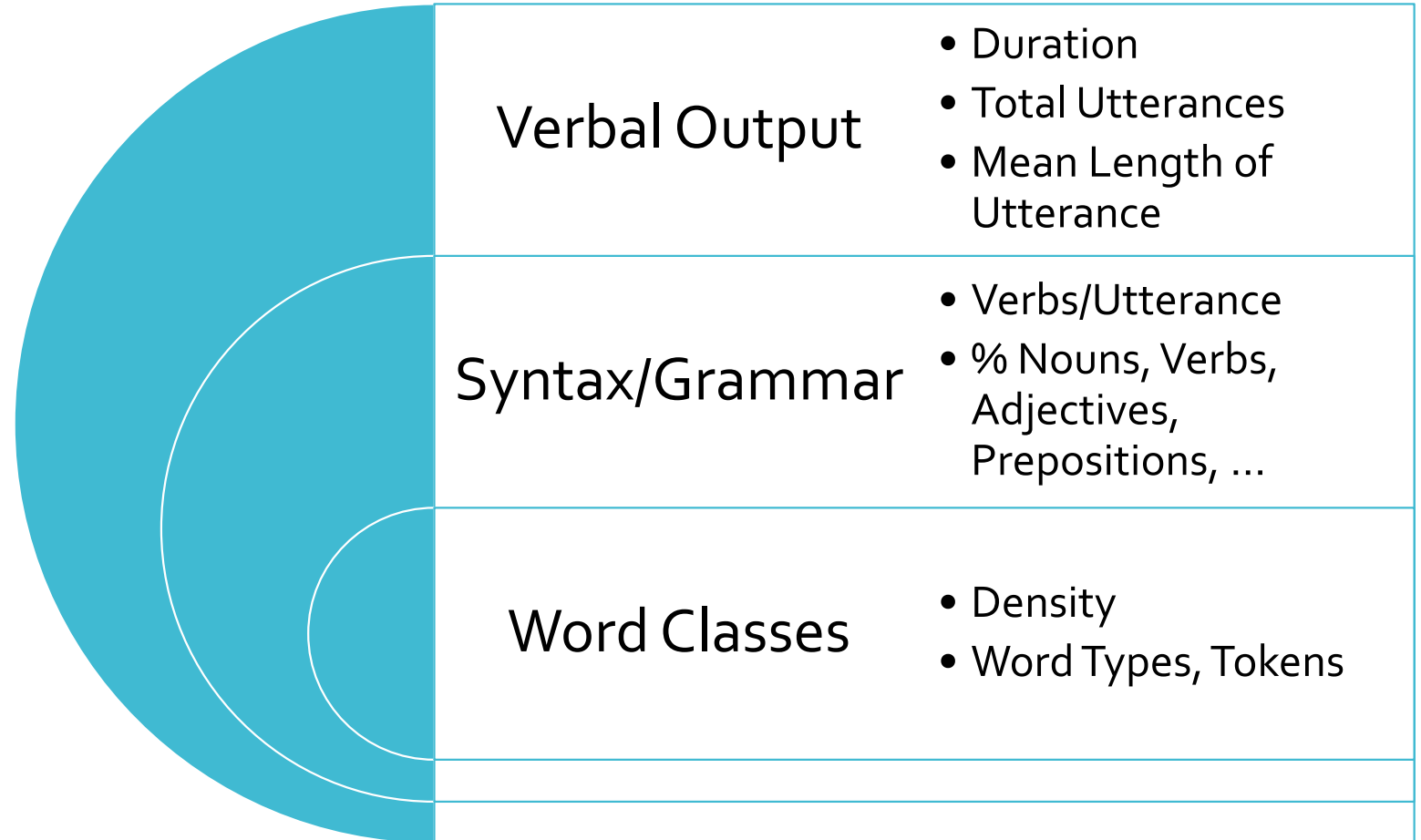
Involves use and coordination of multiple cognitive and physiological processes:

- Semantic and episodic memory
- Sustained and divided attention
- Error monitoring
- Working memory
- Syntax production

Drawbacks:

- Time
- Analysis
- Multi-factorial

Multiple Factors



Potential Measures

Verbal Fluency: One-minute generation of words in a semantic or phonemic category – i.e., animals, words beginning with 'f'

- Involves use and coordination of multiple cognitive and physiological processes:
 - Semantic memory and episodic memory
 - Search and retrieval processes (executive functions)
 - Sustained attention
 - Working memory
- Advantages:
 - Time
 - Easy scoring

Questions

Are verbal fluency and connected language assessing the same/similar processes?

How well do verbal fluency and connected language measures, along with demographic variables, predict MCI versus Probable AD?

Is that prediction better than verbal fluency alone?



Participants

	n	Age	Sex	Education	MMSE	Blessed	CDRFS	HDS
MCI	17	67 ± 8	9:8	15 ± 3*	28 ± 2*	1.2 ± 3	.47 ± .1	3.7 ± 4
Probable AD-Mild	17	72 ± 11	22:43	12 ± 4	25 ± 2	5 ± 3*	.94 ± .2*	5.8 ± 3
Probable AD-Mod	74	71 ± 8		12 ± 2	17 ± 4	7 ± 4	1 ± .4	6 ± 4

MMSE: Mini-Mental Status Examination

Blessed: Blessed Dementia Scale

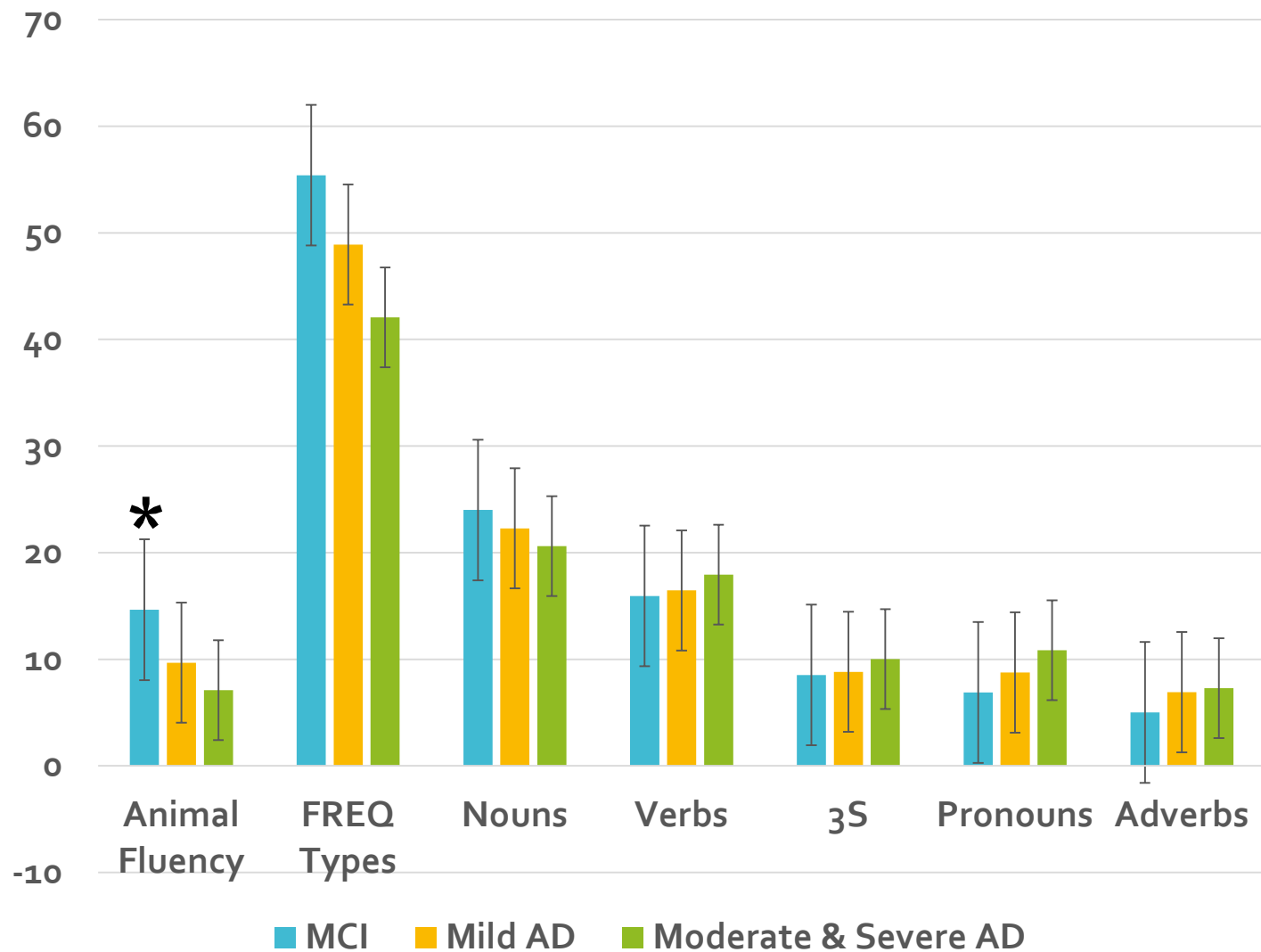
CDRFS: Clinical Dementia Rating Scale

*p<.0001

Participants' data was acquired from the DementiaBank Pittsburgh Corpus (Becker et al., 1994) of the TalkBank repository (Forbes, Fromm, & MacWhinney, 2012; MacWhinney, Fromm, Forbes, & Holland, 2011).

The MCI group had significantly more years of education than the Probable AD ($p < .0001$)

The Probable AD group scored lower on the Mini-Mental Status Exam and higher on the Blessed Dementia Scale and Clinical Dementia Rating Scale than the MCI group.



Group Differences in Language Performance

MCI and Mild AD > Moderate and Severe AD:

Verbal Fluency

Frequency of different word types

% Nouns

% Verbs

% Third person singular

% Pronouns

Language Performance

MCI

***PAR:** mother is wiping dishes but she's overflowing the sink bowl .

***PAR:** water is running on the floor .

***PAR:** outside I can't tell if it's a cloudy day or a great day but you can see some **shrubbery and [/] and bushes** .

***PAR:** < and the son > [//] and the tilting stool is about to fall .

***PAR:** taking cookies for he and his sister out of the cookie jar . [+ gram]

***PAR:** so somebody's &gon gonna [: going to] &s have some cleanup work to do .

***PAR:** and the daughter is [: of] [* s:r] course reaching her left arm and hand and elbow up to get [//] receive a cookie .

***PAR:** but he's gonna [: going to] go crashing on down the floor where the water is going, the suds water . [+ gram]

Severe AD

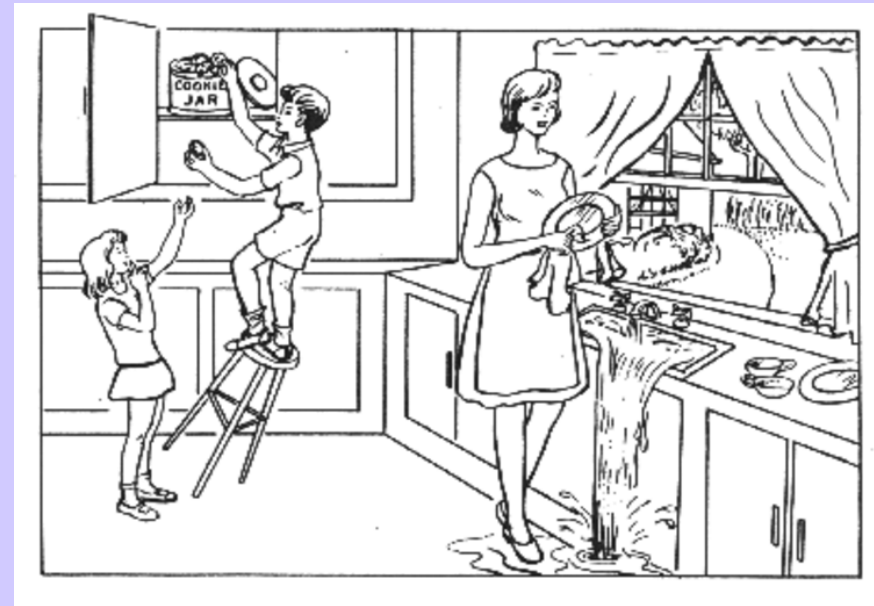
***PAR:** well she's washin(g) dishes .

***PAR:** he's climbin(g) up to get cookies .

***PAR:** he's gonna [: going to] fall .

***PAR:** and she's laughin(g) .

***PAR:** and she's spill [//] runnin(g) the water over .



Relationship VF and Connected Language

MCI

Words Per Minute, Verbs per Utterance, Education

Mild

Verbs per Utterance, Utterance Errors, Density, % Nouns, % Prepositions, % Pronouns, % Adverbs

Moderate

None

Severe

None

Results- Linear Ordinal Regression

A Linear Ordinal Regression was used to predict the affect of independent variables on the dependent variables.

Odds Ratio Estimates					
Effect	Point Estimate	95% Confidence Limits		Parameter Estimates	Sig.
Age	0.996	0.953	1.041	0.001	.967
Sex (F vs. M)	0.738	0.312	1.746	0.268	.562
Education	0.767	0.661	0.889	-0.248	.001
% Pronouns	1.183	1.052	1.330	0.147	.049
% Nouns	1.067	0.958	1.187	0.109	.095
Verbal Fluency	0.768	0.694	0.850	- 0.263	.000

Conclusion

Age, years of **education**, % **pronouns** and **nouns**, and **verbal fluency** score were most predictive of group membership.

Education is thought to increase *cognitive reserve*, which appears to slow the deterioration of cognitive processes [9].

Verbal Fluency relies on executive functioning such as word storage and retrieval that declines in disease progression [1].

Use of a higher percentage of pronouns may be indicative of impaired lexical retrieval/access with diminished semantic memory.

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