

Text-linguistic analysis of spontaneous speech in Alzheimer’s and Parkinson’s disease: preliminary results

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Sunday-0627

KEY TAKE AWAY:

- Text-linguistic analysis of spontaneous speech is a promising approach for identifying language alterations in neurodegenerative diseases.
- Not all spontaneous speech tasks are equally informative. Task selection can affect the detection of linguistic changes in neurodegenerative diseases.

BACKGROUND

The analysis of linguistic markers in the spontaneous speech of individuals with neurodegenerative diseases has shown promise for the diagnosis and monitoring of these conditions. For advances in this field, it is essential to identify appropriate tasks to elicit spontaneous speech and linguistic variables that are sensitive to disease-specific changes.

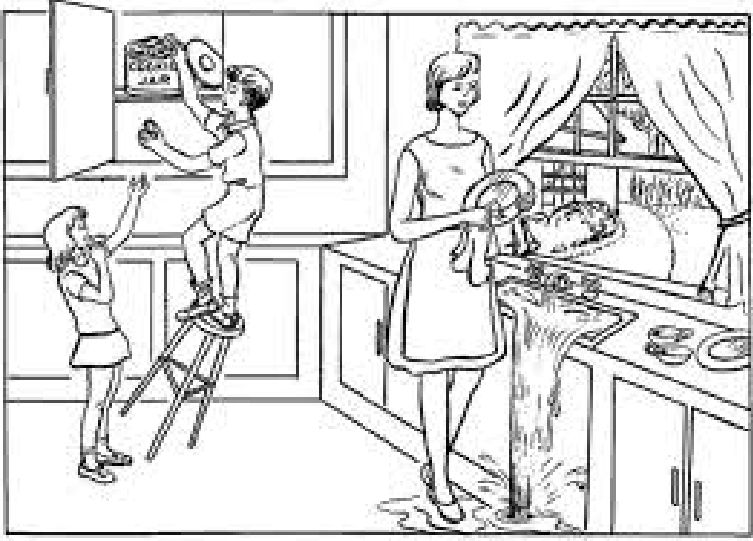
The aim of this study was to conduct a preliminary analysis of the spontaneous speech of individuals with Alzheimer’s disease dementia (AD), Parkinson’s disease (PD), and individuals without neurological disorders, using two elicitation tasks and adopting a text-linguistics perspective.

METHODS

1

Spontaneous speech was collected through two tasks:

(1) description of the Cookie Theft picture



(5) description of a happy memory



3

Analyses were conducted by two independent raters, and disagreements were resolved by consensus.



2

Narrative productions were evaluated encompassing the following aspects:

intentionality, situationality, acceptability, non-contradiction, cohesion and repetition, progression, relation.

Each aspect was scored on a Likert scale from 1 to 3,

4

Intergroup comparisons were performed using the Kruskal–Wallis and Bonferroni tests. Intragroup comparisons were conducted using the Wilcoxon test, with a significance level of 5%.

RESULTS

Linguistic variables differed significantly among the groups, with superior performance by the control group compared to the AD and PD groups in both tasks (Table 2).

Table 1 -- Description of participants

Variable	AD group (n=15)	PD group (n=25)	IwND group (n=18)	p
Age (years) - Mean±SD	73.33±8.27	68.20±8.72	58.78±10.33	0.00**
Sex (F) – n (%)	9 (60)	6 (24)	16 (88)	0.00**
Education (years) - Mean±SD	7.47±5.77	6.84±4.44	13.72±4.93	0.00**
Time since diagnosis (years) - Mean±SD	3.11±1.99	6.04±4.41	-	0.00**
MMSE - Mean±SD	18.80±4.93	24.00 (3.84)	28.28±1.99	0.00**

AD: Alzheimer’s disease; IwND: Individuals without neurological disorders; MMSE: Mini-Mental State Examination; PD: Parkinson’s disease; SD: Standard deviation *p≤0.05; *Kruskall-Wallis test; *Chi-square test.

Table 2 – Between-group comparisons of the linguistic variables

Variable	AD group (Mean and SD)	PD group (Mean and SD)	IwND group (Mean and SD)	Kruskal-Wallis test (p)	Bonferroni test (p)		
					AD X PD	PD X IwND	DA X IwND
Cookie Theft picture							
Intentionality	2.27±0.59	2.04± 0.74	3.00±0.00	<0.01*	1	<0.01*	<0.01*
Situationality	2.27±0.59	1.96± 0.68	2.89±0.32	<0.01*	0.66	<0.01*	0.01*
Acceptability	2.53±0.52	2.52± 0.59	2.94±0.24	0.01*	1	0.05*	0.02*
Cohesion and repetition	1.93±0.26	1.88± 0.44	2.33±0.59	<0.01*	1	<0.01*	0.06
Progression	2.13±0.64	1.96± 0.54	2.94±0.24	<0.01*	1	<0.01*	<0.01*
Relation	2.33±0.62	1.92±0.76	3.00±0.00	<0.01*	0.41	<0.01*	0.01*
Total	13.47± 2.72	12.28± 2.78	17.11±0.96	<0.01*	1	<0.01*	<0.01*
Description of a happy memory							
Intentionality	2.53±0.52	2.48±0.66	3.00±0.00	<0.01*	1	0.02*	<0.01*
Situationality	2.40±0.63	2.44±0.65	3.00±0.00	<0.01*	1	<0.01*	<0.01*
Acceptability	2.67±0.49	2.52±0.51	3.00±0.00	<0.01*	0.98	<0.01*	0.11*
Cohesion and repetition	1.93±0.26	1.84±0.37	2.44±0.51	<0.01*	1	<0.01*	<0.01*
Progression	2.33±0.72	2.36±0.57	2.94±0.24	<0.01*	1	<0.01*	<0.01*
Relation	2.33±0.72	2.48± 0.59	2.94±0.24	<0.01*	1	0.01*	0.02*
Total	14.20±2.98	14.16±2.32	17.28±0.67	<0.01*	1	<0.01*	<0.01*

AD: Alzheimer’s disease; IwND: Individuals without neurological disorders; PD: Parkinson’s disease; SD: Standard deviation *p≤0.05

In intragroup comparisons, significantly better performance was observed in the happy memory description task, especially in the PD group (Table 3).

Table 3 – Within-group task comparisons of the linguistic variables

AD Group	Cookie Theft picture (Mean and SD)	Description of a happy memory (Mean and SD)	Wilcoxon test (p)
Intentionality	2.27±0.59	2.53±0.52	0.05*
Situationality	2.27±0.59	2.40± 0.63	0.32
Acceptability	2.53±0.52	2.67±0.49	0.16
Cohesion and repetition	1.93± 0.26	1.93±0.26	1
Progression	2.13±0.64	2.33±0.72	0.08
Relation	2.33±0.62	2.33±0.72	1
Total	13.47±2.72	14.20±2.98	0.09
PD Group			
Intentionality	2.04±0.74	2.48± 0.65	0.05*
Situationality	1.96±0.68	2.44±0.65	0.01*
Acceptability	2.52±0.59	2.52±0.51	1
Cohesion and repetition	1.88±0.44	1.84±0.37	0.66
Progression	1.96±0.54	2.36±0.57	<0.01*
Relation	1.92±0.76	2.48±0.59	0.01*
Total	12.28±2.78	14.16±2.32	<0.01*
IwND Group			
Intentionality	3.00± 0.00	3.00±0.00	1
Situationality	2.89±0.32	3.00±0.00	0.16
Acceptability	2.94±0.24	3.00±0.00	0.32
Cohesion and repetition	2.33±0.59	2.44±0.51	0.32
Progression	2.94±0.24	2.94± 0.24	1
Relation	3.00±0.00	2.94±0.24	0.32
Total	17.11±0.96	17.28±0.67	0.53

AD: Alzheimer’s disease; IwND: Individuals without neurological disorders; PD: Parkinson’s disease; *p≤0.05

CONCLUSION

The analysis differentiated neurologically healthy individuals from those with neurodegenerative diseases. The happy memory description task elicited more efficient narratives, particularly in individuals with PD, highlighting the importance of task selection in linguistic assessment. Further studies with sociodemographically matched groups are needed to confirm these findings.