

Sentence Comprehension in Aphasia: Stability of Performance

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Introduction

- Researchers studying syntactic comprehension impairments often test people with aphasia (PWA) on a single comprehension task. These investigators often assume that any observed deficits would be replicable across similar tasks.
- Dissociations in performance have been observed between sentence picture matching and enactment tasks, which both test sentence comprehension (Cupples & Ingliss, 1993). If such dissociations are common, performance on one task may not be a reliable indicator of a deficit affecting a particular syntactic structure or operation.
- The present study assessed consistency of performance in a group of PWA who were tested on the same sentence types over 5 tasks using split-half reliability and correlational analyses of accuracy data. Individual cases were also analyzed to identify the presence or absence of deficits that were stable across tasks and sentence types.

Methods

Participant Information

N=43 people with aphasia following a single LCVA

Age	Mean	60	Range	25 - 85
Education	Mean	14	Range	9 - 22

Tasks

Sentence Picture Matching (SPM) - Whole sentence and self-paced (AMW) presentations

Grammaticality Judgment (GJ) - Whole sentence and self-paced (AMW) presentations

Enactment (Object Manipulation – OM)

Stimuli

- 3 structural contrasts exemplified in 11 sentence types
- 10 exemplars of each sentence type

Active & Passives:

1. Active (A): The boy scratched the man.
2. Full Passive (PF): The boy was kissed by the girl.
3. Truncated Passive (PT): The father was hit.

Object & Subject Relatives:

4. Cleft Object (CO): It was the boy who the father dressed.
5. Cleft Subject (CS): It was the boy who kicked the uncle.
6. Subject Object (SO): The boy who the girl bit tickled the woman.
7. Subject Subject (SS): The girl who hugged the father kicked the man.

Reflexive & Full NP's

8. Reflexive Genitive (RG): The uncle of the boy dressed himself.
9. Reflexive Genitive Baseline (RGB): The mother of the girl scratched the boy.
10. Reflexive Possessive (RP): The boy's uncle hit himself.
11. Reflexive Possessive Baseline (RPB): The boy's uncle dressed the girl.

- Stimuli were digitized and auditorily presented via computer.
- Accuracy data were collected for all tasks.
- For SPM and GJ, end of sentence judgment RT's were also recorded.

Here we report accuracy data from the 5 tasks.

Results

Group Analyses

1. Is performance consistent within tasks and sentence types?

Split half reliability for tasks and sentence types within each task (Spearman-Brown)

Task	Whole Task ¹	Sentence Types in Task ²
GJ AMW	0.97	.84 (.76-.92)
GJ Whole Sent	0.98	.72 (.38-.88)
SPM AMW	0.96	.69 (.36-.87)
SPM Whole Sent	0.94	.64 (.28-.84)
OM	0.98	.79 (.32-.96)

¹ Half the sentences of each type assigned to each half

² Values given are mean (range)

2. Within tasks, is performance more consistent on the same vs. different sentence types?

Mean split half reliability within sentence types vs. mean correlation between sentence types

Measure	GJ AMW	GJ Whole	SPM AMW	SPM Whole	OM
Within sentence types	.84	.72	.69	.64	.79
Between sentence types	.62	.65	.55	.65	.69

3. For related tasks, is performance more consistent on the same vs. different sentence types?

Mean and range of correlations between same and different sentence types across tasks

		GJ		
		AMW vs. Whole	AMW vs. Whole	SPM Whole vs. OM
Within	Mean	.61	.55	.51
	Range	.48 - .74	.12 - .80	.10 - .70
Between	Mean	.51	.50	.46
	Range	.23 - .71	.07 - .83	.10 - .75

Individual Case Analyses

We examined the accuracy of each patient across all sentence types on the whole sentence presentation version of SPM and OM to identify 4 deficit types.

Criteria for Deficits:

1. Above-chance level performance on baseline (simple) sentences
2. Chance level performance on experimental (complex) sentences

For SPM, end of sentence RT data were also considered to identify speed/accuracy trade-offs (SAT).

Number of cases with each deficit type by structure

Deficit Type	Passives	Relative Clauses	Reflexives
Task-Independent, Structure-Specific	1 ^a	1 ^{a,b}	0
Task-Independent, Sentence-Specific	4 ^c	8 ^d	0
Task-Dependent, Structure-Specific	3	3	2
Task-Dependent, Sentence-Specific	7	12 ^e	4

^a Note that both of these are case 50051.

^d 2 cases with a possible SAT.

^b 1 case with a possible SAT.

^e 1 case with a possible SAT.

^c 3 cases with a possible SAT.

Examples of deficit types for sentences with relative clauses

Case	SPM				OM			
	CO	CS	SO	SS	CO	CS	SO	SS
50051	60	80	60	90	60	100	0	80
	at	above	at	above	at	above	below	above
50013	100	100	50	100	100	above	70	90
	above	above	at	above	above	above	at	above
50001	70	90	60	80	80	100	30	50
	at	above	at	above	above	above	at	at
50022	90	100	90	90	100	100	60	90
	above	above	above	above	above	above	at	above

50051 – Task Independent, Structure Specific

50013 – Task Independent, Sentence Specific

50001 – Task Dependent, Structure Specific

50022 – Task Dependent, Sentence Specific

Case 50051: An example of a task-independent, structure-specific deficit in sentence types with movement

A	SPM			A	OM		
	PF	PT	PT		PF	PT	
88.89	44.44	22.22		90	30	70	
above	at	below		above	at	at	

- Case 50051 showed deficits in passives and relative clauses in SPM and OM.

- RT's suggested a speed-accuracy trade-off for SO sentences in SPM, making that performance hard to interpret.

- 50051 performed at or below chance on sentences with reflexives and their baseline sentences. This indicates a disturbance affecting aspects of sentence comprehension that goes beyond inserting, co-indexing, and interpreting the thematic significance of traces.

Discussion

- The reliability analyses suggest that performance is affected to a similar extent on most sentence types in most patients, and that factors other than the ability to assign structure and meaning in specific sentence types are important determinants of patients' performance.

- Deficits that are stable across sentence structures and tasks are uncommon, suggesting that identification of deficits on the basis of one sentence type contrast or one task should be interpreted with caution.

- Task-independent, sentence-specific deficits are evidence for a parsing and/or interpretive failure that affects one syntactic structure. Accounting for a patient's performance on the 2nd pair is complicated.

- Poor performance on both the 2nd experimental and baseline sentences may reflect a structural specific deficit plus something else, e.g., overall reduced processing capacity.

- Good performance on both the 2nd experimental and baseline sentences requires a linguistic account. For example, a deficit for truncated but not full passives may reflect an impairment in drawing inferences regarding the implied agent.

- Task-specific, structure- or sentence-specific deficits are common, even when speed-accuracy trade-offs are taken into account. Two possible accounts are:

- Such deficits arise in the course of mapping the intermediate products of comprehension onto developing task demands.

- Such deficits arise in the course of mapping the combination of discourse and propositional meanings onto tasks.

Reference

Cupples, L. & Ingliss, A.L. (1993). When task demands induce "asyntactic" sentence comprehension: A study of sentence interpretation in aphasia. *Cognitive Neuropsychology*, 10, 201-234.

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