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The application of construction grammar to language in aphasia

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1. Acknowledgements

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- All participants in this study

2. Order of presentation

- Background
- Aims
- Method
- Results
- Discussion
- Conclusions

3. Background: Aphasia

- Aphasia is

  - an acquired communication disorder
  - due to brain damage (e.g. stroke)
  - characterized by language impairment (any modality)
  - not caused by general mental/ sensory deficits

  (e.g. Hallowell & Chapey, 2008, p.3)

- Range of impairments and severities

4. Research context

- Much linguistic research into aphasia underpinned by rule-based/ generative theory (Chomsky, 1957 onwards)
  - *Trace Deletion Hypothesis* (Grodzinsky, 1995)
  - *Treatment of Underlying Forms* (Thompson & Shapiro, 2005)
- Generative approach questioned (e.g. Tomasello, 2005)
- Emergence of other approaches
  - Construction grammar (e.g. Goldberg & Suttle, 2010)
    - Not yet applied to aphasia

5. Current study: Noun pluralisation 'errors'

- Plural produced when singular expected from the (narrative/ linguistic) context

e.g.

> *and (7.5) twelve (3.6) and stairs (1.4) and (1.3) /sk/ /skuldᵊ mɪl/ (.) shoes (1.4) fall (.) and one (.) one (2.5) one (.) shoes …*

(Case IB reported on the PATSy database, Lum, Cox, & Kilgour, 2012)

- Particularly interesting: regular plurals

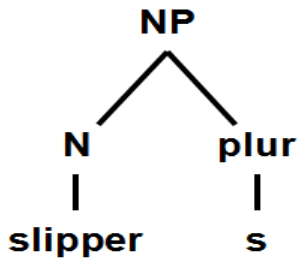
6. Why is this interesting?

- Rule-based and construction grammar accounts of noun pluralisation are **different** for regular nouns

Rule-based

e.g. 'Words-and-Rules'

(Pinker & Ullman, 2002)



mice

Regular plurals 'computed'

Irregular plurals 'stored'

X Frequency effects

✓ Frequency effects

Construction grammar

(e.g. Goldberg & Suttle, 2010)

- No distinction
- Both forms retrieved as wholes

slippers

mice

Regular plurals wholes

Irregular plurals wholes

✓ Frequency effects

✓ Frequency effects

7. Predictions/ Aims

- Such errors already point away from rule-based theory
  - Rule-based approach suggests that the singular is accessed to produce the plural

- What about frequency effects?
  - Should expect errors in both directions
    - Plural in place of singular
    - Singular in place of plural

- <u>Aims</u>

  (1) Frequency relationship

  (2) Direction of errors

8. Method

Speech samples

- Narratives: Cinderella story (3 - 13 mins each)

Participants

- 12 people with post-stroke aphasia
  - including 5 from PATSy database (Lum, et al., 2012)
- 7 male; 5 female
- Age range: [43 - 81]
- Range of aphasia severities

9. Method (continued)

Procedure

- Nouns
  - Identified in each narrative
  - Coded for 'correctness' of grammatical number
- Frequency retrieved from British National Corpus (Davies, 2004-)
  - Singular and plural of each noun
- Analysis
  - Frequency relationship
  - Direction

10. Results: Overview of errors

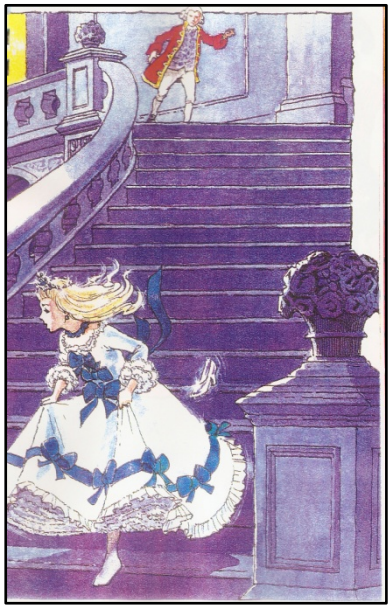
Participant	Total nouns	Errors	Potential errors
MH	95	0	0
ST	40	0	0
HB	37	0	0
DB	30	0	0
JS	33	0	1
KC	28	0	1
TD	16	1	0
BK	20	1	1
JW	56	1	1
TH	28	1	6
KP	18	3	4
IB	41	4	4

Table 1: Number of errors
(& 'potential errors')

- 2 groups
  - No errors
  - Errors
- Also 'potential errors'

11. Example of error: KP

[Video]



/œɹœⁿ/ [tut] yeah er (6.2) yes /œɹœ/ /tʃɪpəz/ /ə/ /œɹœⁿ/ (.) erm [tut] (4.3) wearing it

12. Results: Frequency

- All errors involved production of the **more frequent** form
  - Similar for potential errors (12/18)
  - (Remaining potential errors more difficult to analyse or possibly influenced by priming)

Participant	Total nouns	Errors			
		Number	Noun involved	Form used	Most frequent
TD	16	1	shoes	PLUR	PLUR (3.5 : 1)
BK	20	1	slippers	PLUR	PLUR (3.8 : 1)
JW	56	1	shoes	PLUR	PLUR (3.5 : 1)
KP	18	3	/tʃɪpəz/ [slippers]	PLUR	PLUR (3.8 : 1)
			/dʒɪpəz/ [slippers]	PLUR	PLUR (3.8 : 1)
			/ɪːpəz/ [slippers]	PLUR	PLUR (3.8 : 1)
IB	41	4	shoes	PLUR	PLUR (3.5 : 1)
			shoes	PLUR	PLUR (3.5 : 1)
			shoes	PLUR	PLUR (3.5 : 1)
			shoes	PLUR	PLUR (3.5 : 1)
TH	28	1	/s/ st-ep (1.3) /sː/son no (.) daughter	SING	SING - stepson (1 : 0) - son (5.5 : 1) - daughter (6.4 : 1) N/A - stepdaughter (0 : 0)

Table 2: Errors produced

13. Results: Direction

- Errors observed in **both directions**
  - Use of plural
  - Use of singular
- However, **few confirmed** errors using singular
  - Difficulties in identifying these
- Each participant only made errors in one direction

Participant	Total nouns	Errors			
		Number	Noun involved	Form used	Most frequent
TD	16	1	shoes	PLUR	PLUR (3.5 : 1)
BK	20	1	slippers	PLUR	PLUR (3.8 : 1)
JW	56	1	shoes	PLUR	PLUR (3.5 : 1)
KP	18	3	/tʃɪpəz/ [slippers]	PLUR	PLUR (3.8 : 1)
			/dʒɪpəz/ [slippers]	PLUR	PLUR (3.8 : 1)
			/ɪːpəz/ [slippers]	PLUR	PLUR (3.8 : 1)
IB	41	4	shoes	PLUR	PLUR (3.5 : 1)
			shoes	PLUR	PLUR (3.5 : 1)
			shoes	PLUR	PLUR (3.5 : 1)
			shoes	PLUR	PLUR (3.5 : 1)
TH	28	1	/s/ st-ep (1.3) /sː/son no (.) daughter	SING	SING - stepson (1 : 0) - son (5.5 : 1) - daughter (6.4 : 1) N/A - stepdaughter (0 : 0)

Table 2: Errors produced

14. Results: Flexibility of nouns involved

- 3 error-producing participants used the noun concerned in **one** form
- 3 error-producing participants used the noun concerned in **both** its forms:
  - The noun was used correctly as well as erroneously
  - Erroneous usage always the **first** production

Participant	Error	Both forms produced	All usages of noun	Correctness
TD	shoes	YES	Shoes Shoe	X ← √
BK	slippers	YES	slippers slipper	X ← √
JW	shoes	YES	shoes shoe shoe	X ← √ √

Table 3: All usages of nouns involved in errors in participants producing both forms

15. Discussion: Frequency

- Observed frequency relationship with errors
  - This supports a constructionist approach

- The more frequent form should be more entrenched and thus perhaps more easily retrieved
  - People with aphasia may rely more on more frequent forms
    - especially, perhaps, on the first usage:
      In those who used the noun correctly and incorrectly, the erroneous production was always the first usage

16. Discussion: Direction of errors

- Errors were observed in both directions
- Caution needed over errors using the singular
  - Only one confirmed error in this direction
  - This type of error is more difficult to judge
  - Further studies are needed
- Plural errors most problematic for rule-based approach
  - (Singular should be accessed for plural production)

17. Discussion: Direction of errors

- Could a rule-based system still be in place but the rule has become uninhibited or blocked through brain damage?
  - Possible support
    - Each participant only produced errors in one direction
  - Possible counter-arguments
    - 1 participant's potential error differed in direction to her error
    - All participants produced both regular singulars and plurals
- Overall, results again point towards a constructionist approach

18. Conclusions

- Results appear to support constructionist theory
- Limitations
  - Small-scale study
  - Limitations of using frequency levels
- Next steps
  - Why errors do not always occur when predicted by frequency
  - Other speech samples (e.g. conversation)
  - Samples from other languages
- Overall:
  - Exemplifies how construction grammar can be applied to language in aphasia
  - Key point: Potential for expansion of Cognitive Linguistics in aphasia

Thank you