Syntactic constructions that Broca’s aphasics...

... perform at chance on:

- Passives:
  The boy was chased _ by the girl ...

- Object relatives:
  The boy who the girl chased _ ...

- Object clefts:
  It was the boy who the girl chased _

... do OK on:

- Actives
  The girl chased the boy.

- Subject relatives:
  The girl who _ chased the boy...

- Subject clefts:
  It was the girl who _ chased the boy...
Trace Deletion Hypothesis (Grodzinsky):

- Broca’s area supports chain formation.

  *The boy who the girl chased* ... 

- Broca’s aphasics know how to assign semantic roles to NPs when the NPs are in the “right place” (local to the verb).
- When NPs are moved, their interpretation depends on traces.
- Broca's aphasics’ syntactic representations do not have traces.
- Therefore, they apply an Agent-first strategy to moved constituents. When the subject has moved, this strategy works. But when the object has moved, the strategy yields two agents. That’s when Broca's aphasics’ guess.
  
  → result is *chance* performance in cases where arguments roles are reversed
Questions

- Is the descriptive generalization that damage to Broca’s area causes an impairment in trace interpretation correct?

- Is the TDH hypothesis the right explanation for those patients who do interpret traces at chance?
Damage to Broca’s area → impairment in trace interpretation?

- Caplan et al. 1996:
  - Compared 6 patients with purely posterior lesions to 12 patients with both anterior and posterior lesions.
  - No significant group differences in syntactic performance: Patients with posterior lesions were as impaired as those with both posterior and anterior lesions on all syntactic operations, including coindexation of traces.
**Sentence Types**

**Sentences with Full Noun Phrase**
- Two-place active: 12
- Three-place active: 11
- Conjoined: 9
- Active Conjoined Theme: 10
- Three Referential expressions: 8
- Simple Referential expression: 10

**Sentences with Pronouns or Reflexives**
- Reflexive, Simple NP subject: 8
- Pronouns, Simple NP subject: 9
- Simple Reflexive, Complex NP subj.: 11
- Simple Pronoun, Complex NP subj.: 11
- Simple Active Reflexive: 12
- Simple Active Pronoun: 12

**Sentences with Empty Noun Phrases**
- Two-place passive: 12
- Truncated Passive: 12
- Two-place Cleft Object: 9
- Three-place passive: 9
- Three-place Cleft Object: 2
- Subject Object Relative: 5
- Object Subject Relative: 7
- Object Object Relative: 7
- Subject Subject Relative: 9
- Passive Conjoined Agent: 10
- Object Control: 11
- Subject Control: 6
- NP-Inserting: 5

*Figure 1 (Caplan). Performance (number correct of 12 trials) of patients EM and LM on enactment task (for examples of sentence types, see Caplan et al. 1996)*
Questions

▪ Is the descriptive generalization that damage to Broca’s area causes an impairment in trace interpretation correct?
  □ No.

▪ Is the TDH hypothesis the right explanation for those patients who do interpret traces at chance?
Is the TDH hypothesis the right explanation for those patients who do interpret traces at chance?

- Do Broca’s aphasics represent traces? Or are they just unable to process them?
- When trace interpretation fails (for whatever reason), what do Broca’s aphasics do (such that chance performance results)?
Processing explanation of failed trace interpretation

- Successful trace interpretation requires:
  - Representing the trace.
  - Being able to reactivate the moved constituent.

  Zurif: It’s the reactivation that BAs can’t do.
  We know independently that BAs show slower than normal lexical activation.
Broca’s aphasia and crossmodal priming

**Gap-site, related**

The man liked the tailor, with the British accent, who _ claimed to know the queen.

**Gap-site, unrelated**

The man liked the tailor, with the British accent, who _ claimed to know the queen.

**Pre-gap-site, related**

The man liked the tailor, with the British accent, who _ claimed to know the queen.

**Pre-gap-site, unrelated**

The man liked the tailor, with the British accent, who _ claimed to know the queen.
Broca’s aphasia and crossmodal priming

- Normals and Wernicke’s aphasics showed priming at the gap site but not at the pregap site.
- Broca’s aphasics did not show priming at either.
- Important: No argument reversal in this example.
Is the TDH hypothesis the right explanation for those patients who do interpret traces at chance?

- Do Broca’s aphasics represent traces? Or are they just unable to process them?
  - A plausible processing explanation exists.
- When trace interpretation fails (for whatever reason), what do Broca’s aphasics do (such that chance performance results)?
Do Broca’s aphasics represent two agents?

- Chance performance results when BAs are asked to match a stimulus such as
  
  *the boy who the girl chased* …

  either to a picture where a girl chases a boy or to a picture where a boy chases a girl.

- If BA s represent this as involving two agents, would they prefer a picture where both the boy and the girl are chasing?

- Beretta & Munn (1998): NO.
Too many traces? (Hickok, 1992; Mauner et al 1993)

- VP-internal subject hypothesis.

\[
[\text{TP the girl } [\text{VP } \_ \text{ chased the boy}]]
\]

\[
[\text{the boy who } [\text{TP the girl } [\text{VP } \_ \text{ chased } \_]]]
\]
Too many traces? (Hickok, 1992; Mauner et al 1993)

- VP-internal subject hypothesis.

\[
\text{[}_{TP\text{the girl [}_{VP\_} \text{chased the boy}]\\- \text{The boy becomes the chasee because of local role-assignment. The remaining role (chaser) is given to the girl.}}\\
\text{[the boy who [}_{TP\text{the girl [}_{VP\_} \text{chased } \\text{the boy}_]\\- \text{Neither argument is local to the verb. BAs guess which one is the chaser and which one the chasee.}}}}
\]
Is the TDH hypothesis the right explanation for those patients who do interpret traces at chance?

- Do Broca’s aphasics represent traces? Or are they just unable to *process* them?
  - A plausible processing explanation exists.
- When trace interpretation fails (for whatever reason), what do Broca’s aphasics do (such that chance performance results)?
  - Evidence against the agent first strategy. Possible that two many dependencies create a confusion.
Questions

- Is the descriptive generalization that damage to Broca’s area causes an impairment in trace interpretation correct?
  - No.

- Is the TDH hypothesis the right explanation for those patients who do interpret traces at chance?
  - No.
  - Assuming that BAs have a problem representing traces not a necessary assumption.
  - Picture matching data do not support the agent first strategy.
Broca’s aphasia an syntax more widely

- Broca’s aphasia is usually described as a more general syntax problem, involving impaired morphosyntactic comprehension and use of functional morphology.
  - = “agrammaticism”
If you take a group of aphasics and test them on various tests of morphosyntax, what damage is predictive of problems?

- Dronkers et al. 1994:
  - Left anterior lobe damage, not Broca’s.
Syntax summary

- While damage to Broca’s area often correlates with impaired trace interpretation, traces can be interpreted without Broca’s area.
- The functional role of Broca’s area remains unclear.
- Overall, evidence for the involvement of left anterior temporal lobe in syntactic processing is stronger.
  - Is consistently more active for sentences than for word lists.
  - Likely generator of (E)LAN.
  - Damage to left anterior temporal lobe correlates with morphosyntactic problems.
- But recall that the left anterior temporal lobe is also activated by various semantic tasks and is the most common locus of cortical abnormality in semantic dementia.