# Sentence Processing II

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### Sentence Processing II

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No head injury is too trival to ignore

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- (1) No head injury is too trival to ignore
- (2) INTERPRETATION 1: **No** head injury should be ignored no matter how trivial
- (3) INTERPRETATION 2: **All** head injuries should be ignored no matter how trivial

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- (4) No donut is too fattening to eat
- (5) INTERPRETATION 1: **No** donut should be eaten no matter how fattening
- (6) INTERPRETATION 2: **All** donuts should be eaten no matter how fattening

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So "No head injury is too trivial to ignore" actually means "All head injuries should be ignored no matter how trivial".

Lexical semantics + world knowledge  $\Rightarrow$  Wrong interpretation.

"Goodenough" theory of language comprehension (Fernanda Ferreira)

We process language in a relatively shallow way, doing just enough processing to extract a contextually-relevant meaning, but no more.

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# An example of complex language

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(7)The cat chased the mouse

(8)The mouse was chased by the cat

Which is more complex and why?

## An example of complex language

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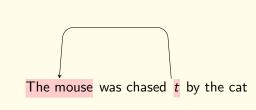
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## Difficulty with passives

- 1. Semantically non-canonical word order: the patient comes before the agent
- They are derived via syntactic movement (movement of NP the mouse from after the verb chased)

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'Canonical' = 'typical' / 'standard'

We can refer to **syntactic** and **semantic** canonicity.

In **syntactically canonical** sentences, the subject comes before the object.

(10) The teenager SUBJ likes parties OBJ

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In **semantically canonical** sentences, there is an **alignment** between the Subject and the Agent argument (and Object and Patient)

- (11) The man AG ate the donut PAT
- (12) The dog AG chased the cat PAT

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In some cases the subject may not be an Agent, but it will definitely have more agency than the object

(13) The boy  $_{AG}/_{EXP}$  smelt the rose  $_{TH}$ 

So Subject maps to the most agentive argument, while Object maps onto the least agentive argument.

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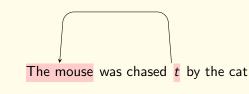
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Examples of non-canonical sentences



Syntactically canonical - subject comes before verb

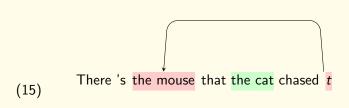
Semantically non-canonical - subject maps to least agentive argument

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Syntactically non-canonical - Object comes before Subject Semantically canonical - Subject maps to Agent argument

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For three place predicates, which is the canonical word order?

- 1. John gave her Oi a book Od (DITRANSITIVE)
- 2. John gave a book <sub>Od</sub> to her <sub>Oi</sub> (PREPOSITIONAL DATIVE)

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# For three place predicates, which is the canonical word order?

- 1. John gave her Oi a book Od (DITRANSITIVE)
- 2. John gave a book <sub>Od</sub> to her <sub>Oi</sub> (PREPOSITIONAL DATIVE)
- 3. John read a book Od [ in the park ]
- 4. John wore a blue blazer Od [ for the party ]

Prepositional dative assumed to be canonical as its basic structure (V + Od + Prepositional Phrase) is far more frequent

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Canonicity across languages

Discourse I - properties of

## 1. English is SVO (40%)

- 2. Japanese is SOV (35%)
- 3. Classical Arabic is VSO (15%)
- 4. Fijian is VOS (10%)
- 5. Xavante is OSV (<1%)
- 6. Hixkarayana is OVS (<1%)

Strong tendency for S > O (75% of world's languages) and weaker tendency for V > O(65%)

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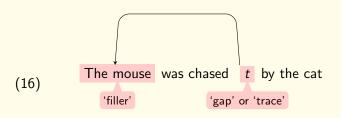
Some languages allow words to come in almost any order, e.g. Latin & Finnish.

However, even these have a preferred word order, e.g. it has been argued that the basic Latin word order is OSV.

Canonicity and movement

Discourse I - properties of MPc

Syntactically non-canonical sentences are assumed by many linguists to result from a movement process:



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Are the following sentences syntactically canonical? For non-canonical sentences specify the filler and the gap?

- 1. It was the boy that the girl pushed
- 2. The boy apparently pushed the girl into the puddle
- 3. The boy that the girl pushed was upset
- 4. The boy was pushed by the girl
- 5. The boy that pushed the girl was naughty
- 6. It was **the boy** that pushed **the girl**

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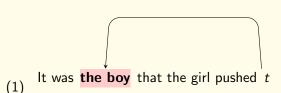
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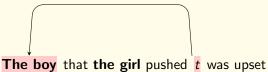
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(2) The boy apparently pushed the girl into the puddle



(3)

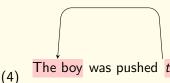
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The boy was pushed t by the girl

- (5) **The boy** that pushed **the girl** was naughty
- (6) It was the boy that pushed the girl

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Difficulty affected by movement.

Difficulty is greater when movement is longer.

Effect of difficulty is even greater in language-impaired individuals.

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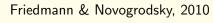
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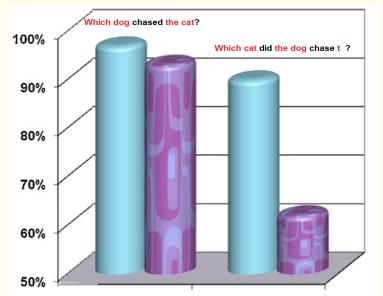
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# Position of embedding

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(17)The boy [ that pushed the girl ] was naughty

The boy pushed the girl [ that was naughty ]

## Position of embedding

```
Multiple centre-embedding is a nightmare!
```

- (19) The girl [ that the boy [ that the teacher scolded ] pushed ] hurt her knee
- (20) There's **the boy** [ that the teacher scolded \_ ] [ \_ that pushed **the girl** ] [ that \_ fell and hurt her knee ].

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How can a sentence be grammatically well-formed but almost impossible to understand?

Miller & Chomsky (1963) - separation between grammatical mechanisms and processing mechanisms.

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**LEMMA** 

Transitive Vb
Laugh + at + PERSON / THING
Laugh + about + THING



Opposite of "cry"

LEXEME

/la:f/ laugh

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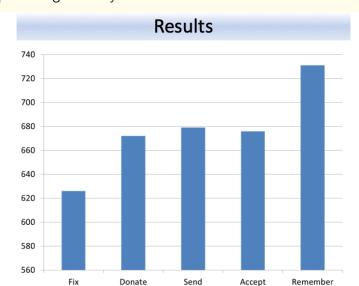
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# 1. Mary fixed the bike

- 2. Ali donated a book to the library
- 3. Ali donated a book
- 4. Angie gave Peter a book
- 5. Angie gave a book to Peter
- 6. Angie gave a book
- 7. Janet said her prayers
- 8. Janet said that she was sorry
- 9. Erica asked a question
- 10. Erica asked about the interview
- 11. Erica asked Mary a question
- 12. Erica asked whether Mary was tired
- 13. Erica asked Mary to be quiet

Shapiro et al. (1987) used a lexical decision task to test processing difficulty after the verb.



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- 1. Ali remembered the milk
- 2. Ali remembered that she had to buy the milk
- 3. Ali remembered to buy the milk
- 4. Ali remembered how to make ice milk lollies
- 5. Ali remembered his mother making him ice milk lollies
- Ali remembered when his mother used to make him ice milk lollies

complexity?

Effect of number of arguments, or subcategorisation

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## Animacy

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Because animate entities (people, animals) have volition, they make good agents.

Agents typically occur in subject position.

(21)The boy ate the sausage

## Animacy

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Because inanimate entities (e.g. objects) do not have volition, they do not make good agents.

Non-agents typically occur in object position.

(22)The boy ate **the sausage** 

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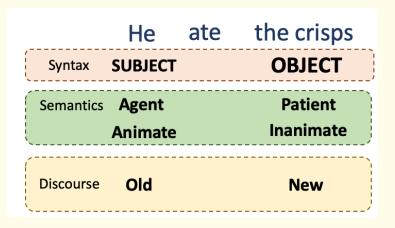
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Because of these correspondences, animacy cues can help children determine who did what to whom, e.g.

Which are easiest?

- 1. The boy that the rock squashed \_ was large
- 2. The car that the man drove was fast
- 3. **The cow** that **the pig** chased \_ was spotted

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Different argument slots also have particular discourse properties. The subject position often contains discourse-old information, e.g.

(23)I like John. **He**'s a nice guy.

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(24)Have you heard about John? He won the **lottery** 

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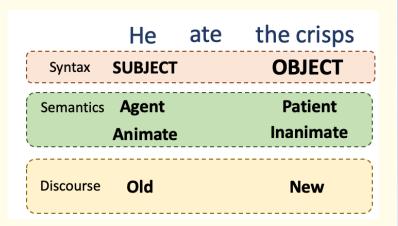
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Complex structures are a lot easier to process when subjects have typical discourse properties (i.e. they are pronominal)

(25) There's **the dog he** chased

Subject is pronominal = EASY

(26) There's **the dog the boy** chased

Subject is a full Noun Phrase = DIFFICULT

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(27)Which dog was he chasing \_?

Subject is pronominal = EASY

(28)Which dog was the boy chasing \_?

Subject is a full Noun Phrase = DIFFICULT

## Putting animacy and discourse together

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Putting animacy and discourse together

We can manipulate difficulty be combining animacy and discourse cues

(29)There's **the hammer he** dropped

Supportive animacy and discourse cues

(30)There's **the boy** that the girl chased \_

Unsupportive animacy and discourse cues

# Putting animacy and discourse together

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Animacy and discourse can actually "trump" syntactic complexity, e.g.

(31) There's **the hammer he** dropped

Noncanonical structure, but supportive animacy/discourse cues

(32) There's the girl that chased the boy

Canonical structure, but unsupportive animacy/discourse cues

Kidd et al. (2007) found that kids were actually better at repeating (31) than (32)

## Syntactic priming

- REPEAT "The car was hit by the lorry"
- Now describe the picture below
- REPEAT "The woman gave the flowers to the boy"
- Now describe the picture below

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## Syntactic priming

- REPEAT "The car was hit by the lorry"
- Now describe the picture below



- REPEAT "The woman gave the flowers to the boy"
- Now describe the picture below

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## Syntactic priming

- REPEAT "The car was hit by the lorry"
- Now describe the picture below



- REPEAT "The woman gave the flowers to the boy"
- Now describe the picture below



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We have a natural tendency to recycle the structure of preceding utterances. This is demonstrated by structural priming studies.

- 1. The participant hears a structure
- The participant describes a picture which can either be produced with the preceding structure or a different structure

Participants use preceding structures at above-chance level.

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Syntactic priming is a much studied phenomenon.

Consequence of an implicit structural learning mechanism (Peter et al. 2015).

Structural priming is widely employed in intervention (Leonard, 2011).

However, language-impaired children may be less susceptible to structural priming (Kidd, 2012)

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You can manipulate the complexity of sentences via the following:

- 1. Length of movement
- 2. Position of embedding (centre or final)
- 3. Representational properties of verbs
- 4. Animacy
- 5. Discourse properties of arguments (Noun or Pronoun)
- 6. Properties of preceding sentences (structural priming)

We can therefore create difficulty gradients. But how do we use these in clinics?

### Sentence Processing II

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## Complete the following sentences

- 1. It's a game of two \_\_\_\_\_
- 2. Her presentation was all over \_ \_ \_ \_ \_
- 3. What's a nice girl like you \_ \_ \_ \_ \_ \_
- 4. Who'd a \_ \_ \_ \_ ?

How many possibilities were there? What kind of factors influenced your completions?

### Sentence Processing II

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