

GRS LX 865

Topics in Linguistics

Week 9. Sentence processing
and Linger

Human sentence processing

- When we hear a sentence, we have to assign it a structure.
- Intuition indicates that this happens incrementally, we're building the structure as the words come in.
- Language is rife with ambiguity, but we very often don't notice...

Ambiguity

- **Global ambiguity**
 - Most of my family lives in the Mpls area, but I sometimes don't feel like going home for the holidays.
 - My family likes to travel in the summer, so I'm always careful to be out of town during the summer months.
 - Visiting relatives can be tedious.
 - I sat by the bank.
 - Nothing cleans better than *Tide*.

Local ambiguity

- Because we parse things incrementally, we also face lots of **local ambiguity**.
- I saw the student...
 - ...yesterday.
 - ...leave the room yesterday.
 - ...from Turkey's mother yesterday.
 - ...from Turkey's mother leave the room yesterday.
- At the point where we hear *the student*, it could have any number of roles to play in the rest of the as-yet-unheard sentence.
 - Object, embedded subject, possessor in an object, possessor in an embedded subject.

Local ambiguity

- Generally, this isn't a problem, but sometimes...
 - While she was mending the sock fell.
 - Since Jay always jogs a mile seems light work.
 - I gave the man the report criticized a demotion.
- What these suggest is that we are processing ambiguity online and discarding a reading too early...

Mending the sock

- So what goes wrong with *While she was mending the sock fell*?
- Given the choice, and you seem to have to make a choice, you take *the sock* to be the object of *mending*, rather than guess that *the sock* might be an embedded subject.
- Because you **can** attach *the sock* to *mending*, you do.

Late Closure

- An early principle proposed to account for this is **Late Closure**, a principle followed by our parsing mechanism.
- **Late Closure**
When possible, attach incoming lexical items into the clause or phrase currently being processed (i.e., the lowest possible nonterminal node dominating the last item analyzed).

RC attachment

- The journalist interviewed the daughter of the colonel who had had the accident.
- To whom do you send flowers?
- This is ambiguous, but we have a pretty strong preference to attach the relative clause **low** (so, the flowers go to the colonel). This is as Late Closure would predict.

Late Closure

- Late Closure is usually taken to be a universal property of human sentence processing (not something English-specific).
- #John said Bill will die yesterday.
- #Juan dijo que Bill morirá ayer.

Cuetos and Mitchell (1988)

- In a now-famous study, Cuetos & Mitchell (1988) tested RC attachment in both Spanish and English:
- The journalist interviewed the daughter of the **colonel** who had had the accident.
- El periodista entrevistó a la **hija** del coronel que tuvo el accidente.
- Hmm. It's Early Closure in Spanish?

Gibson et al. (1996)

- Exploring what's behind the difference. What favors high attachment in Spanish (RCs)?
 - La **lámpara** cerca de la **pintura** de la **casa** que fue dañada en la inundación.
The **lamp** near the **painting** of the **house** that was damaged in the flood.
- "Early Closure" would predict high attachment is preferred, wouldn't have much to say about relative preferences between low and middle (or would predict middle is better than low).
- OTOH, if there's a second (stronger) factor favoring high attachment, but LC is still around, then low should be better than middle.

Testing attachment preferences

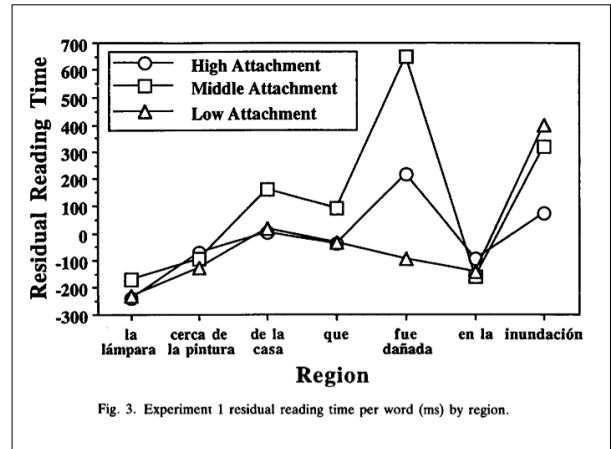
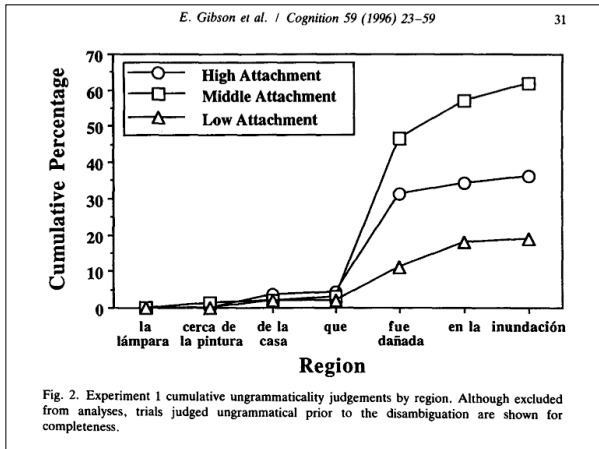
- There are a couple of ways to try to test attachment preferences.
- **Questionnaire.** Present ambiguous sentences, ask how it was understood.
 - Graham pointed to the photo beside the letter that was consulted in the lawsuit.
 - What had been consulted?
- Problem here is that these *are* ambiguous, there might be "late processing" involved here. What we want to know most is what the parser does automatically, right away...

Testing attachment preferences

- **Online.** Present *unambiguous* sentences incrementally, and look at whether people slow down more in some conditions than in others (*Reanalysis*).
 - Pat gestured toward...
 - ...the lamps near the paintings of the **house** that was damaged in the flood
 - ...the lamps near the **painting** of the houses that was damaged in the flood
 - ...the **lamp** near the paintings of the houses that was damaged in the flood
- *Advantage:* This is early processing.

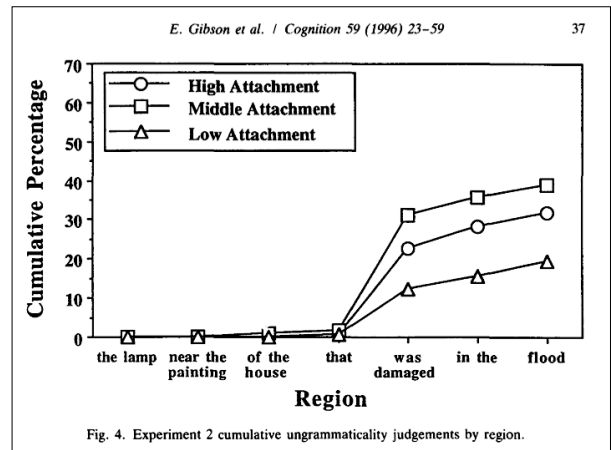
Gibson et al.'s (1996) task

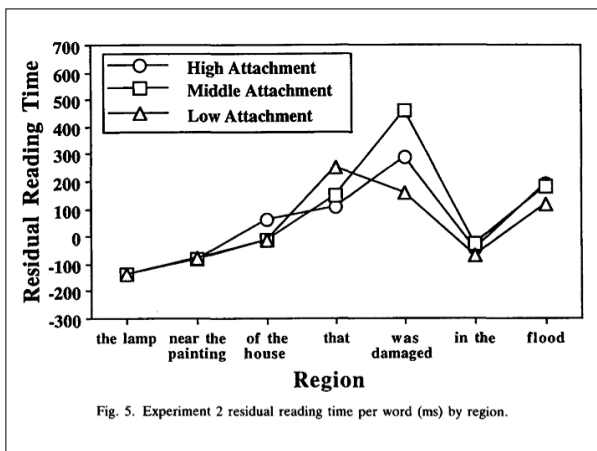
- Sentences were presented in a self-paced "moving window" display, where subjects pressed the space bar for the next word, or pressed "No" if a sentence became ungrammatical.
 - On some items (a third) the subject was asked to paraphrase the sentence (just to keep them alert).
- --- gestured -----



Two factors

- Gibson et al. (1996) conclude that there are two factors at work, one that encourages high attachment, and one that encourages low attachment. *Nothing* encourages middle attachment, so those are the hardest.
- But look—now it looks as if the Spanish speakers prefer low attachment to high attachment.
- Gibson et al. (1996) conducted essentially the same experiment in English...





Hmm.

- English looks pretty much the same as Spanish, in these three-site sentences.
 - Though we still believe Spanish prefers high attachment when it's just between two sites.
 - "High attachment" in Spanish isn't just due to "Primacy", clearly.
- Gibson et al. propose:
 - Predicate Proximity**
Attach as close as possible to the head of a predicate phrase.

Predicate Proximity

- The lamp near the painting of the house that was damaged in the flood.
- Recency (Late Closure) prefers *house*, then *painting*.
- Predicate Proximity prefers *lamp*, but that's really non-Recent in a 3-clause sentence.
- They speculate that Predicate Proximity is stronger in languages with more fluid word order.

Topics in language acquisition

- The (celebrated) difference between English and Spanish attachment preferences has opened up an interesting avenue in L2 acquisition.
 - Where will a Spanish learner of English prefer to attach?
 - Where will an English learner of Spanish prefer to attach?
 - Is there transfer of parsing principles?

German, Greek, and Spanish

- German and Greek also have a Spanish-like high attachment preference.
 - Papadopoulou & Clahsen (2003), Gross (2002), show that they nevertheless show a low attachment preference with "thematic prepositions":
 - Everyone liked the actress with the **servant** who is always smiling.
 - Everyone liked the **servant** of the actress who is always smiling.
- This might be thinkable-about as having an additional predicate lower down (re: Predicate Proximity).

L1 → L2 transfer

- Felser et al. (2003) found German → English speakers showed low attachment for *of* but showed no preference for *with*.
- That's not transfer.
 - English speakers prefer low attachment for both *of* and *with*, German speakers prefer high attachment for *of* and low attachment for *with*.
 - Greek (→English) comes out like German(→English).

Child processing

- Felser et al. (2003b) looked at this phenomenon in English speaking children and found:
- Kids break into two groups, neither group differentiating *of* and *with*.
 - The “low-span” kids generally attached low.
 - The “high-span” kids generally attached high.

Modularity

- A question that is often asked is: to what extent is the parser an independent module? What kinds of grammatical (and semantic and pragmatic) information is available immediately, as a sentence is being incrementally parsed?
- Some propose that the (first pass, automatic) parser respects only structural constraints, with semantic and pragmatic information kicking in later. Eye tracking studies and the like have suggested otherwise.

Badecker & Straub (2002)

- An interesting experiment was designed in this connection by Badecker & Straub (2002), looking at whether interpretations ruled out by grammatical constraints (Binding Theory, specifically) are discarded immediately during processing.
 - John said that Mary hurt himself. *Pr.A.
 - John said that Bill_i hurt him_i. *Pr.B.
 - He_i said that Bill_i fell. *Pr.C.

Previous results

- Badecker & Straub (1994)
 - Kenny assured Lucy... **fastest**
 - Julie assured Harry...
 - Kenny assured Harry...
 - Julie assured Lucy... **slowest**
 - ...that **he** was prepared for the new job.
- The next question is: What if the referent for *he* was ruled out by Binding Theory?

Badecker & Straub (2002)

- John thought that Bill...
- John thought that Beth...
- Jane thought that Bill...
- Jane thought that Beth...
- ...owed **him** another chance to solve the problem.
- “No candidate” was slowest in 1994. In 2002, will the last two be equivalent? Will the first two be equivalent? (Does Principle B filter out the first and third?)

Well, let's see...

- The program to play with today is **Linger**, an experiment manager (particularly useful for “moving window” experiments), written by Doug Rohde of Tedlab.
- <http://tedlab.mit.edu/~dr/Linger/>