Eighteenth Conference on Typology and Grammar for Young Scholars
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In search of experimental syntax

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Outline

- By way of introduction
- Building better models
  - No experiments needed
  - Experiments helping theory
  - Theory helping experiments
- Where to from here?


Marc Bloch
Apologie pour l'histoire
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Apologie pour la syntaxe expérimentale

Syntax is syntax is syntax…

- Syntax (aka theoretical syntax): model of the necessary and sufficient features, principles, and processes which determine the structure of sentences in natural language
- Experimental syntax: a set of approaches for collecting replicable data in service of theoretical syntax

Data

- Main source of data for theoretical syntax: acceptability judgments and replicable naturally-occurring data
- Question for experimental syntax: to what extent can linguists trust the acceptability judgments reported in the literature?

Reasons to look for new tools and data

- Graded judgments
- The novelty bias: New toys and data
- Replicability (and its crisis)

Graded judgments

Idealization

- Typical assumption: the primary dichotomy between good (grammatical, well-formed, acceptable) and bad (ungrammatical, ill-formed, unacceptable)
  - The Happy Family Assumption: All the good segments are alike
  - The Unhappy Family Assumption: graded distinctions among the bad

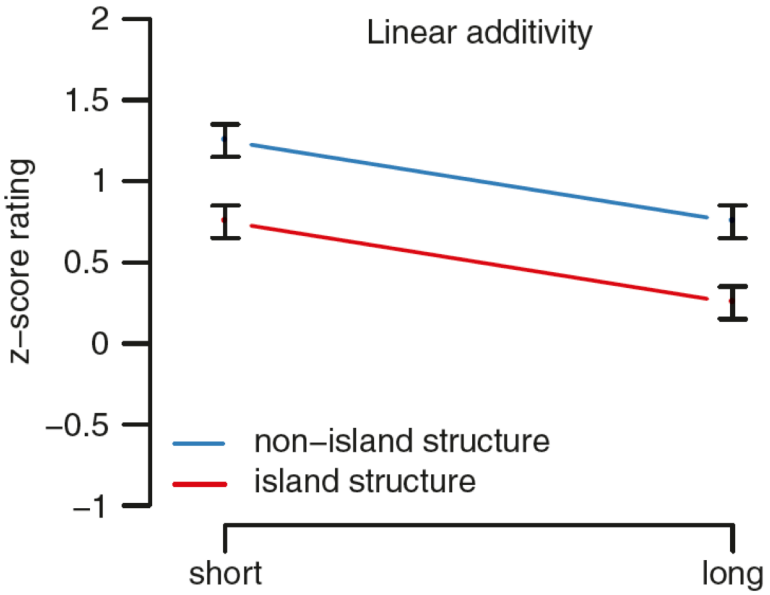
Facts on the ground

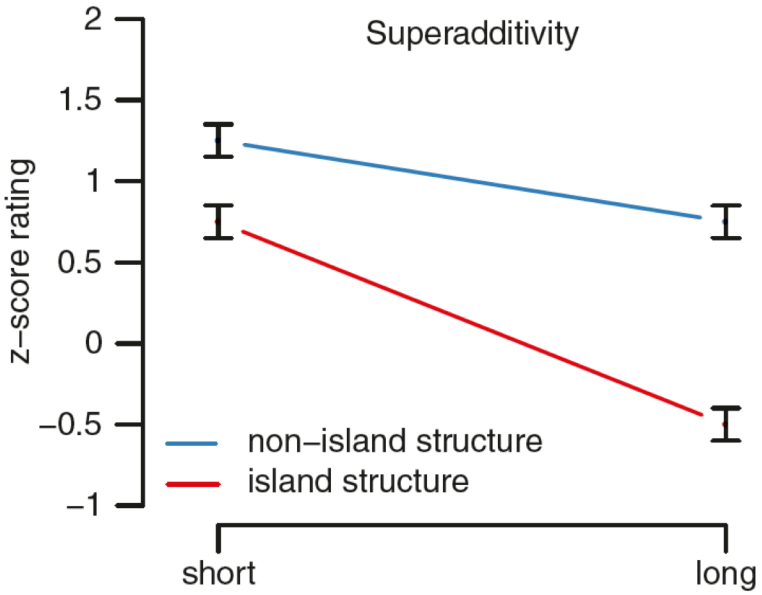
- Speakers vary in their acceptance/rejection of most segments that are of any complexity
  - Variation is determined by language experience (e.g., as measured by education) and other factors, some linguistic, some extralinguistic
  - shared linguistic abilities operate on a graded continuum scale found for cognitive abilities of a more general sort
- We must be cautious in extrapolating from gradient results to the nature of grammar

Experimental syntax to the rescue

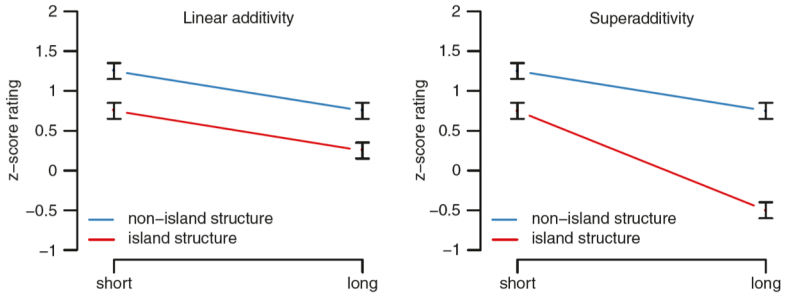
- Grammaticality can be evaluated in relative terms:
  - Segments relative to one another
  - Speakers compared to themselves and then across pools
  - Factorial design (Sprouse and co-authors)

Factorial effects





Factorial effects



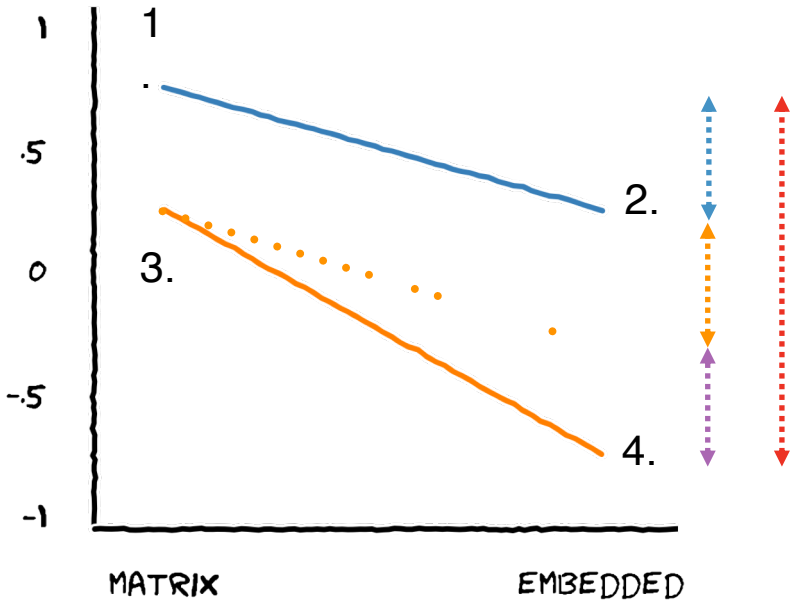
- if the critical effect can be captured by the sum of reductionist components, then the reductionist theory is likely true
- if a superadditive effect is observed, the results are ambiguous:
  - there is an additional constraint causing the superadditive effect
  - the two reductionist components interact in a complex way to yield a superadditve effect

Factorial logic

structure cost

1. Who __ thinks that Jack stole the necklace?
2. What do you think that Jack stole __?
3. Who __ wonders whether Jack stole the necklace?
4. * What do you wonder whether Jack stole __?

dependency cost



	process effect 1	(1-2)
	process effect 2	(1-3)
+	something else	+ X
	island effect	(1-4)

If these two factors sum super-additively, then something else must be at work. This could be a grammatical constraint; or it could be something else.

Reasons to look for new tools and data

- Graded judgments ✓
- The novelty bias: New toys and data
- Replicability (and its crisis)

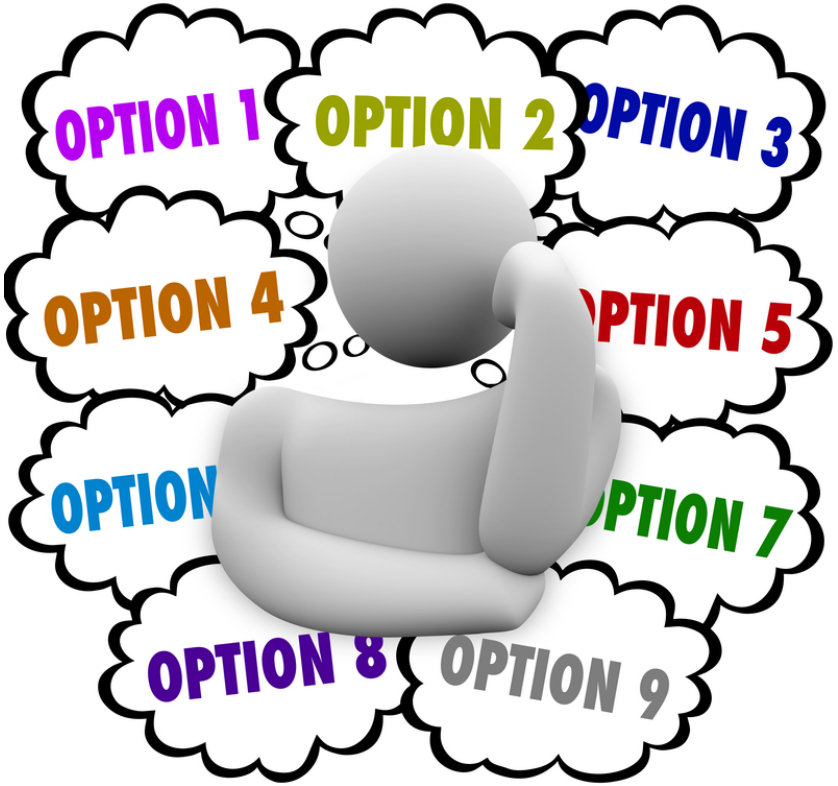
The Novelty Bias: New Toys

Armchair linguistics

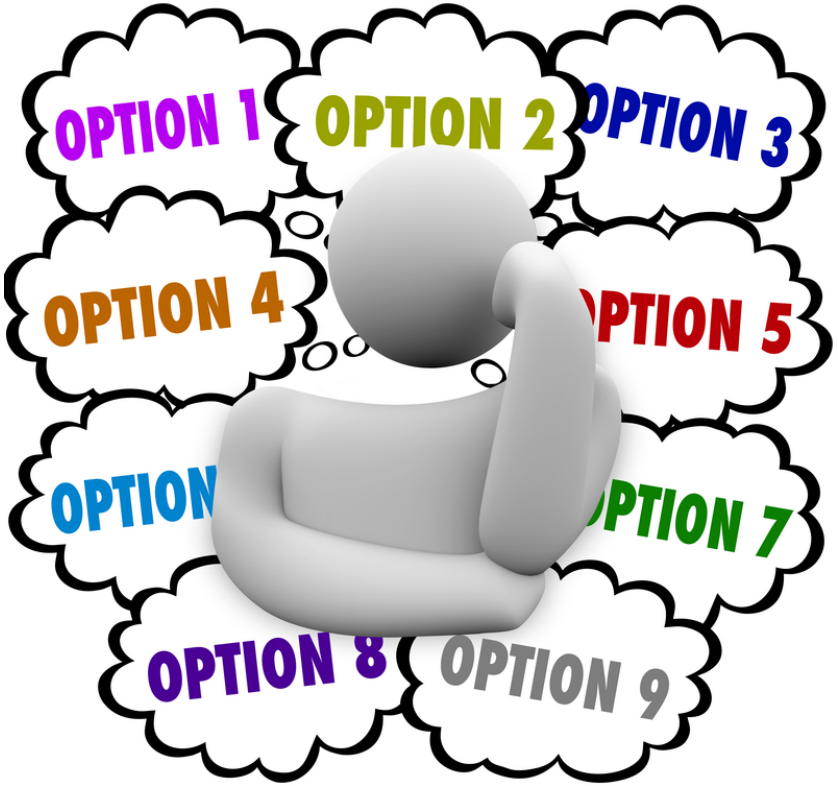
Armchair linguistics does not have a good name in some linguistics circles. A caricature of the armchair linguist is something like this. He sits in a deep soft comfortable armchair, with his eyes closed and his hands clasped behind his head. Once in a while he opens his eyes, sits up abruptly shouting, "Wow, what a neat fact!", grabs his pencil, and writes something down. Then he paces around for a few hours in the excitement of having come still closer to knowing what language is really like. (There isn't anybody exactly like this, but there are some approximations.)

(Fillmore 1991)

Armchair linguists



Armchair linguists



What they really do

What people think they do

Burn your armchairs!
Charge your gadgets!

- We have grown up:
  - Big data
  - Corpora
  - Behavioral experiments
  - Neuroimaging
- We are now all experimentalists!

Experimental linguists

Neuroimaging in the field

Attraction:

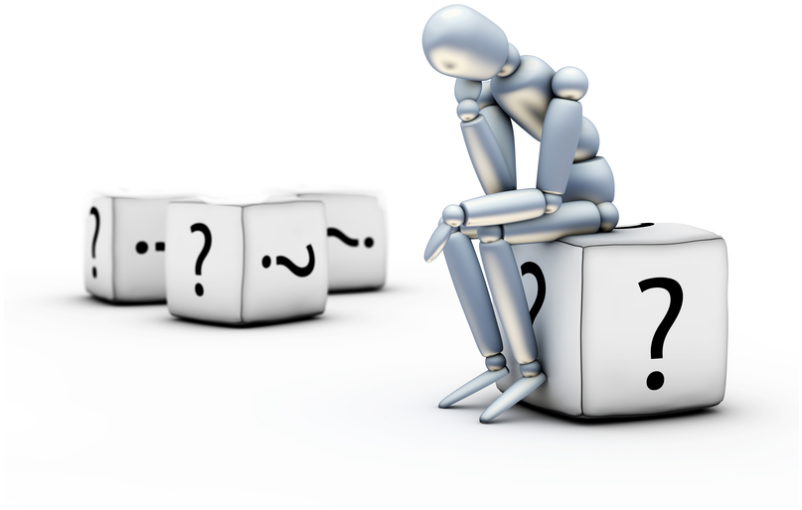
- New toys (including portable EEG machines)
- Interesting results beyond the familiar languages

Experimental linguists

What we think they do

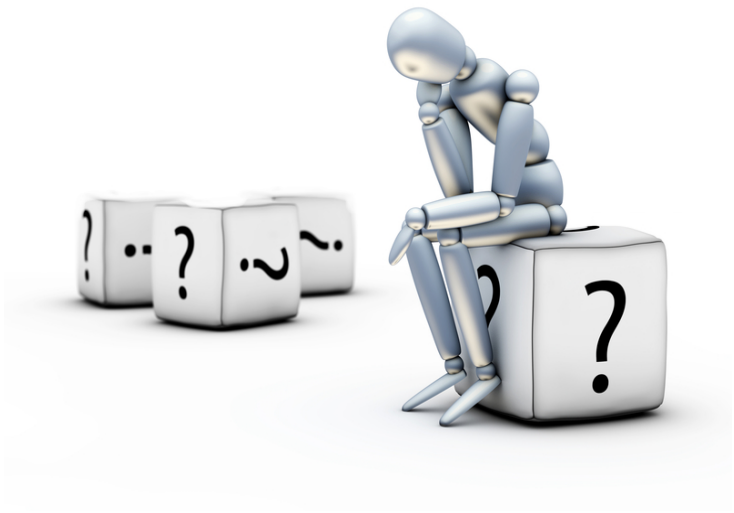
What they really do

An overlooked step



- Before embarking on an experiment, we should all do what Fillmore's armchair linguist does well

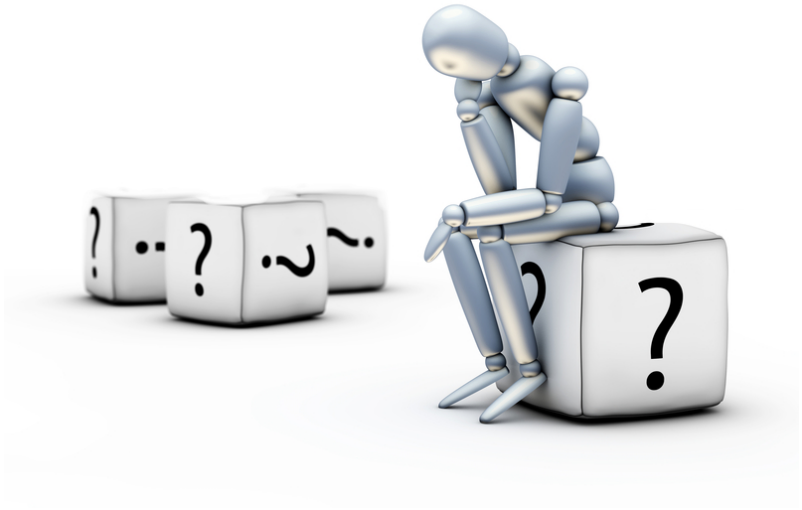
An overlooked step



- Before embarking on an experiment, we should all do what Fillmore's armchair linguist does well

- Armchair linguistics is cheap but it offers a significant gain

An overlooked step



Before embarking on an experiment, we should all do what Fillmore's armchair linguist does well

Armchair linguistics is cheap but it offers a significant gain

Only after you have thought hard about the various issues, are you ready to run an experiment

Syntax is syntax is syntax…

- Theoretical syntax: model of the necessary and sufficient features, principles, and processes which determine the structure of sentences in natural language
- Experimental syntax: a set of methods and approaches to data collection which allow us to build better models

The Novelty Bias: New Data

Sources of new data: Pros

- New languages—with more rigorous descriptions
- New languages: Updates to existing linguistic models

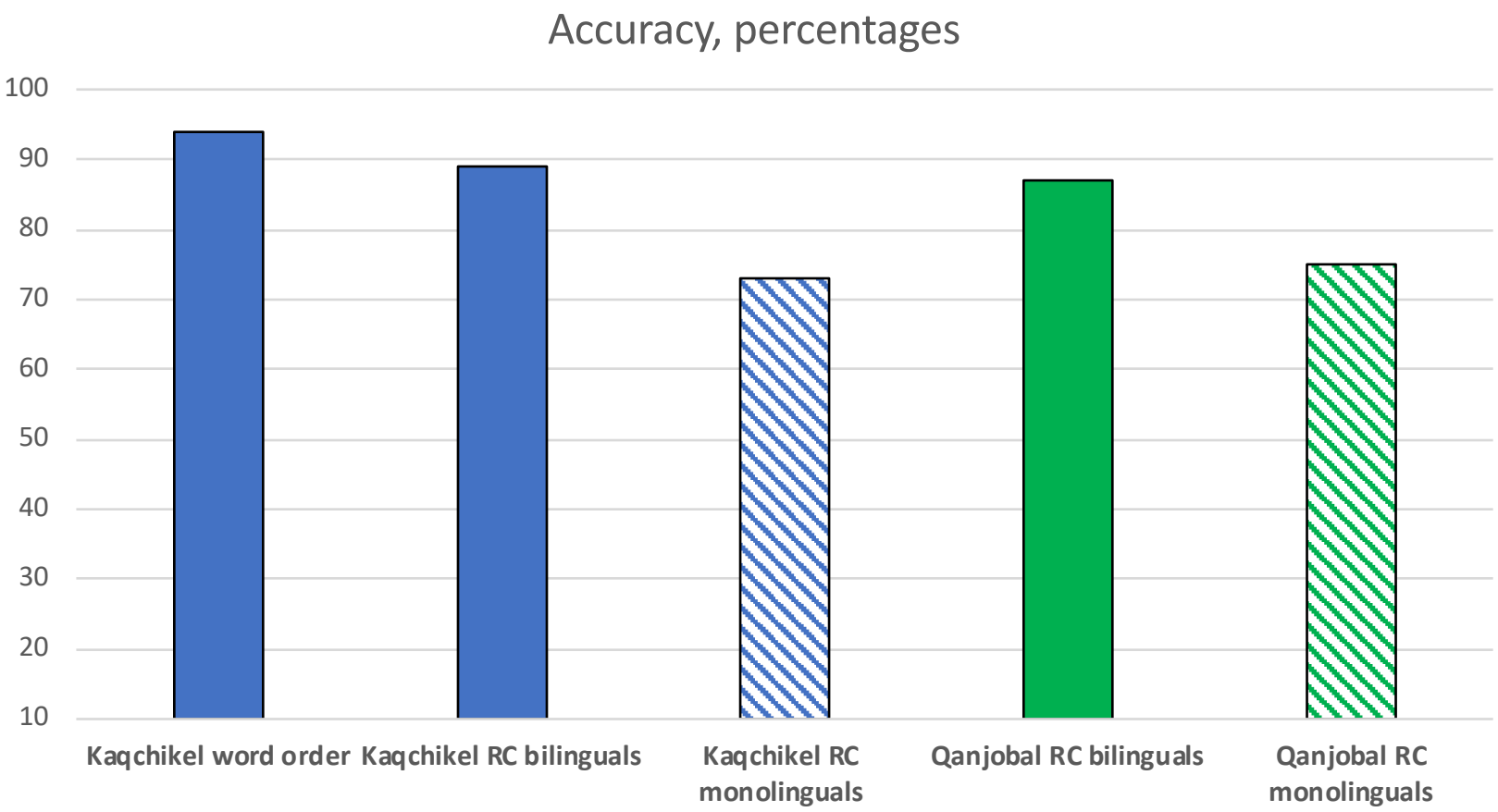
Sources of new data: Cons

- New populations of speakers come with additional confounds
  - Bilingualism
  - Attrition
  - Educational level differences

Picture matching

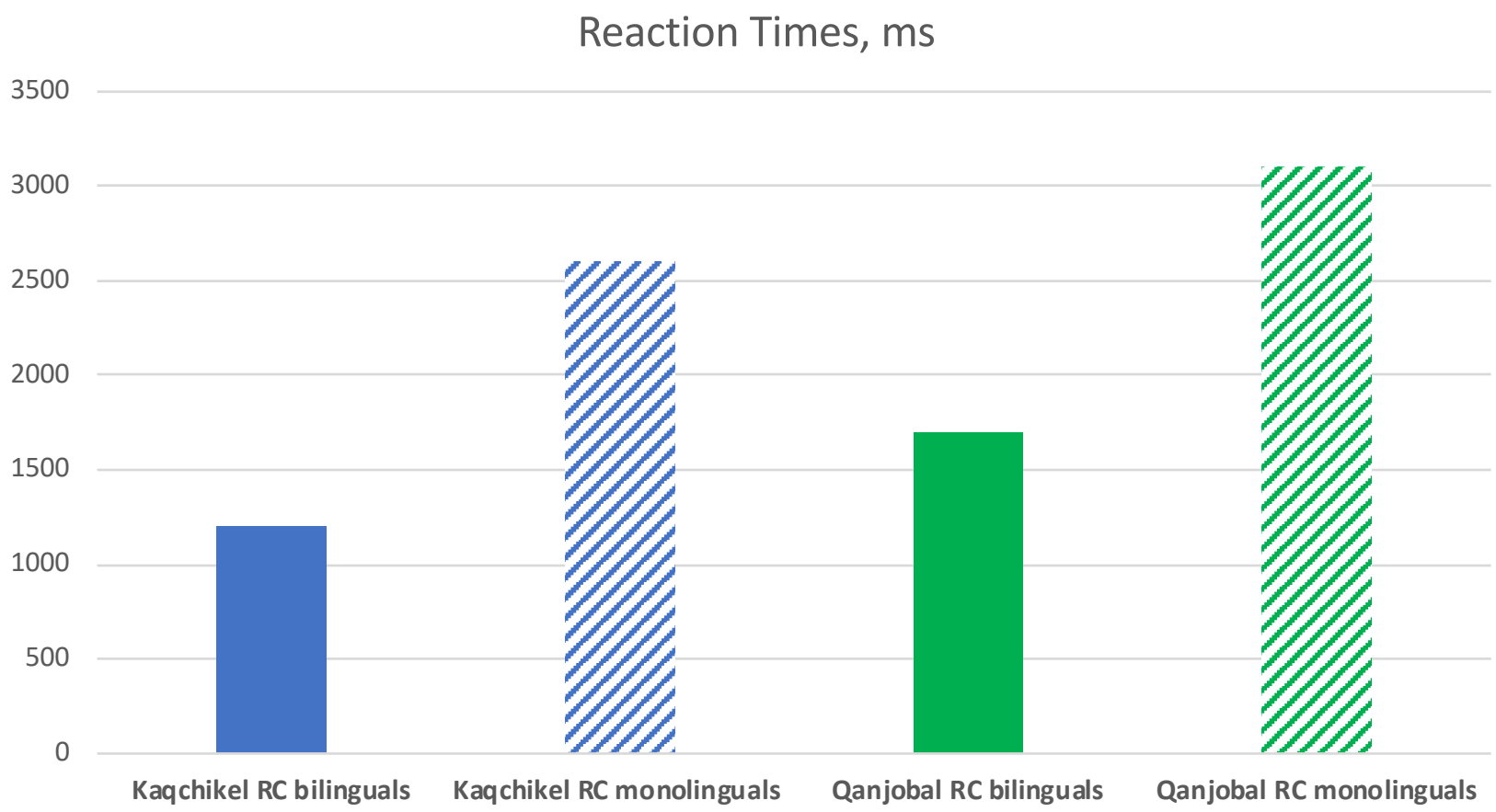
The girl is following the woman

Accuracy on picture matching task: Mayan languages



Yasunaga et al. (2015); Clemens et al. (2015)

Reaction times on picture matching task: Mayan



Reasons to look for new data

- Graded judgments ✓
- The novelty bias: New toys & data ✓
- Replicability (and its crisis)

Replicability (Crisis)

Replicate and reproduce

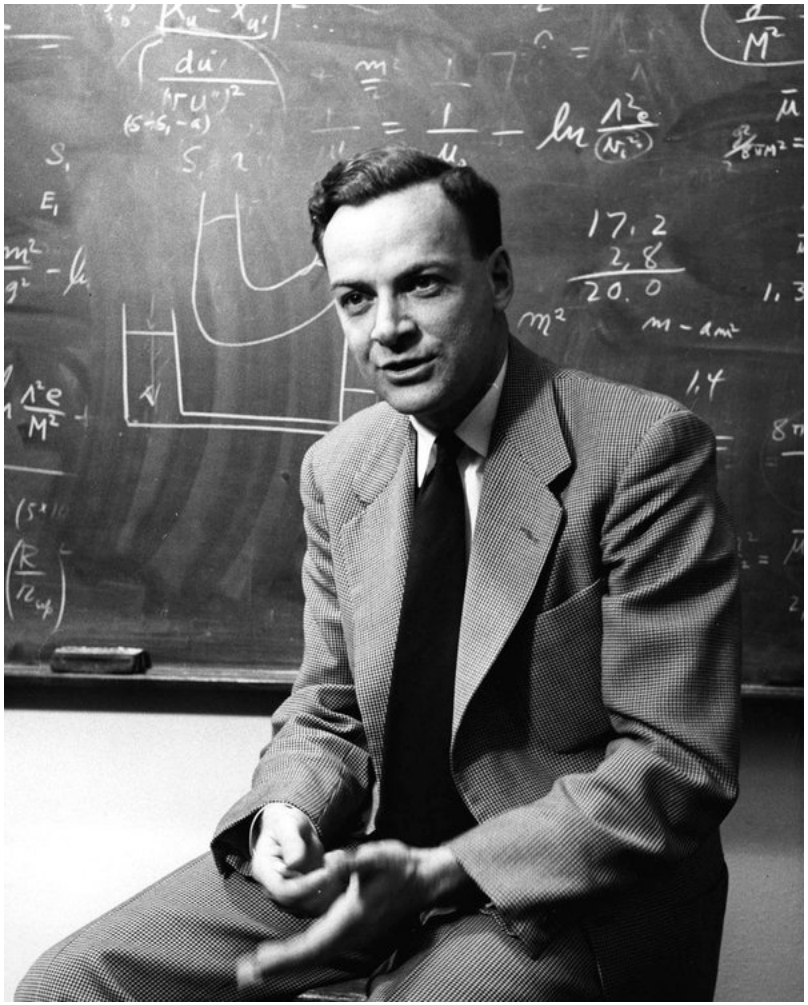
- access to the original data for independent analysis
  - (re-)analysis of Piraha texts (Everett vs the World)
- new data, which can then ostensibly be analyzed for either confirmation or disconfirmation of previous results

What can go wrong?

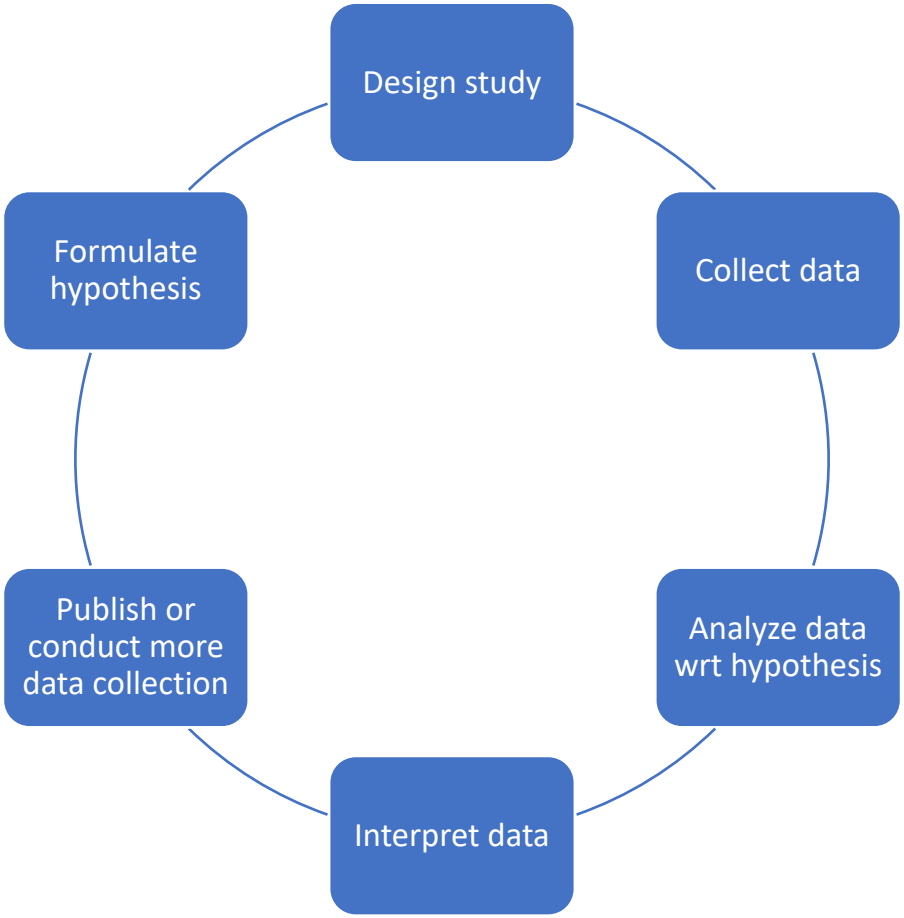
- Normal human error
- Small sample (too few data points; too few speakers)
- Different conditions of research
- Publication bias by journals
- Researcher's bias
  - Verification rather than falsification
  - Skipping links in the research cycle

Researcher's bias: Falsify not verify

"The first principle is that you must not fool yourself and you are the easiest person to fool."

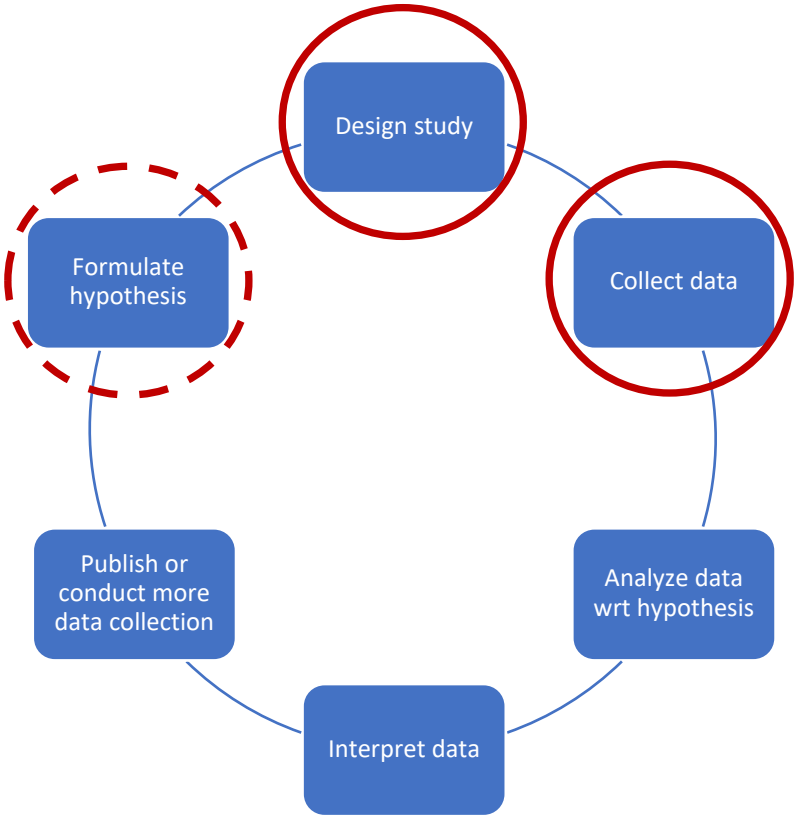


Researcher's bias: Research cycle links overlooked



The appeal of experimental syntax

- Holding the hypotheses constant
- Increasing sample size
- Relying on existing designs
- Relying on established data collection techniques



Outline

- Apologie pour la syntaxe expérimentale ✓
- Building better models
  - No experiments needed
  - Experiments helping theory
  - Theory helping experiments

Building better models

Between syntax and experimental approaches

- When no experiments are needed
- When experiments can help theory
- When theory can help experiments

When no experiments are needed

Experiments are not called for

- Case-by-Agree model (Chomsky 2000, 2001): case is licensed by functional heads, tied to the locus of agreement
  - designated syntactic heads probe for a goal in their c-command domain, in order to provide a value to their unvalued features
  - Case is the result of feature valuation, together with agreement
  - NOM assigned under Agree with finite T, GEN assigned under Agree with D, ACC assigned under Agree with v/Voice

Hill Mari (Pleshak 2020, 2021)

- Participial clauses can have subject in NOM or GEN
- Agreement on the participial predicate is possible regardless of the case borne by the subject

GEN SUBJECT – OPTIONAL AGREEMENT ON THE PARTICIPIAL PREDICATE

tən'-ən	ro-mə̑ /	ro-m-et	püšängə-m …
2SG-GEN	cut-PTCP.PASS	cut-PTCP.PASS-POSS.2SG	tree-ACC

NOM SUBJECT – OPTIONAL AGREEMENT ON THE PARTICIPIAL PREDICATE

tən'	ro-mə̑ /ro-m-et		püšängə-m …
2SG[NOM]	cut-PTCP.PASS	cut-PTCP.PASS-POSS.2SG	tree-ACC

'the tree cut by you'

Hill Mari (Pleshak 2020, 2021)

- Participial clauses can have subject in NOM or GEN
- Agreement on the participial predicate is possible regardless of the case borne by the subject
- The same agreement pattern, with agreement showing up on the same head, can result in two different case forms of the subject

Hill Mari (Pleshak 2020, 2021)

- Participial clauses can have subject in NOM or GEN
- Agreement on the participial predicate is possible regardless of the case borne by the subject
- The same agreement pattern, with agreement showing up on the same head, can result in two different case forms of the subject
- Case cannot be assigned under Agree

Experiments are not called for

- Case-by-Agree model is falsified
- Next steps:
  - Alternative models of case licensing: Configurational model, any other models?
  - Data in other languages that replicate the Hill Mari pattern of dissociation between case and agreement

Experiments at the service of theory

Two examples

- That-trace effect
- Agreement and concord

That-trace effect

- Some languages ban extraction from subject position in subordinate clauses over an overt complementizer.

(1) That-trace effect

a. %Кого ты думаешь, Маша позовет __?
b. %Кто ты думаешь, __ позовет Машу?
c. %Кого ты думаешь, что Маша позовет __?
d. *Кто ты думаешь, что __ позовет Машу?

The puzzle

Some languages ban extraction from subject position in subordinate clauses over an overt complementizer. English does (as do French or Wolof).

(1) *That-trace* effect
- a. ✓ Who do you think that Sue met __?
- b. ✓ Who do you think Sue met __?
- c. * Who do you think that __ met Sue?
- d. ✓ Who do you think __ met Sue?

Other languages do not. Spanish allows such extraction, for instance (as do Italian and Catalan).

(2) Spanish extraction over obligatory *que*
- a. ✓ ¿A quién crees **que** conoció Susana __?
- b. * ¿A quién crees conoció Susana __?
- c. ✓ ¿Quién crees **que** __ conoció a Susana?
- d. * ¿Quién crees __ conoció a Susana?

These facts have been the subject of intensive research yet remain basically a mystery (cf. Pesetsky 2017 for an overview)

Spanish vs English

- Under a view of syntax which attributes cross-linguistic variation to the features of lexical items (Chomsky 1995), variation can be traced to different feature specifications on the relevant functional heads.
- Indeed, theories of that-trace often focus on properties of C or T (e.g., Rizzi & Shlonsky 2007; Pesetsky & Torrego 2001)
- Difference between English and Spanish complementizers → nature of C
- Difference in available subject positions → nature of T and the EPP

Different accounts of that-trace effect

- Anti-locality
- Criterial freezing
- Prosodic alignment
- T-to-C raising

Comparing the accounts

Account	Basic claim	Spanish is different because…
Anti-Locality (Douglas 2017; Erlewine 2016, 2020)	Movement from Spec-TP to Spec-CP is too short; extraction from Spec-TP thus universally barred.	it does not have the EPP; Spanish allows extraction from post-verbal position, so movement is not too short.
Criterial Freezing (Rizzi 2006, 2015; Rizzi & Shlonsky 2007)	Positions with interpretive properties (like subjects) are frozen; extraction from Spec-TP thus universally barred.	Null expletive fills the subject position in Spanish, so subject can be extracted from lower position.
Prosodic Alignment (Kandybowicz 2006, 2009; McFadden & Sundaresan 2018; Sato & Dobashi 2016)	Empty Spec-TP cannot align with left edge of intonational phrase (or cannot form phrase with C) so syntax/prosody matching fails; extraction from Spec-TP thus universally barred.	V-to-T movement means V is highest head in intonational phrase and therefore at left edge, which is thus not empty.
T-to-C (Pesetsky & Torrego 2001)	T raised to C surfaces as that; extracting a subject is more economical and blocks T raising, so *that-t.	Spanish C is a true complementizer, not an instance of T in C.

Code-switching

- Two or more languages in a single sentence
- Rule-governed like all natural language phenomena

(1) The children *abrazaron* *un ornitorrinco*.
hug.PAST.3.PL a platypus
'The children hugged a platypus.'

(2) * They *abrazaron* *un* *ornitorrinco*.
hug.PAST.3.PL a platypus
'They hugged a platypus.'

Predictions for English-Spanish code switching (Hoot & Ebert 2021)

Account	Basic claim	Predictions for CS
Anti-Locality (Douglas 2017; Erlewine 2016, 2020)	Movement from Spec-TP to Spec-CP is too short; extraction from Spec-TP thus universally barred.	Extraction only from post-verbal position in CS, so whatever determines subject position determines extraction in CS
Criterial Freezing (Rizzi 2006, 2015; Rizzi & Shlonsky 2007)	Positions with interpretive properties (like subjects) are frozen; extraction from Spec-TP thus universally barred.	Null expletives permit extraction, so whatever determines null subject availability determines extraction in CS
Prosodic Alignment (Kandybowicz 2006, 2009; McFadden & Sundaresan 2018; Sato & Dobashi 2016)	Empty Spec-TP cannot align with left edge of intonational phrase (or cannot form phrase with C) so syntax/prosody matching fails; extraction from Spec-TP thus universally barred.	Assuming V-to-T is a property of T, language of T determines CS behavior
T-to-C (Pesetsky & Torrego 2001)	T raised to C surfaces as that; extracting a subject is more economical and blocks T raising, so *that-t.	Language of C determines CS behavior

Acceptability Judgment Task (Hoot & Ebert 2021)

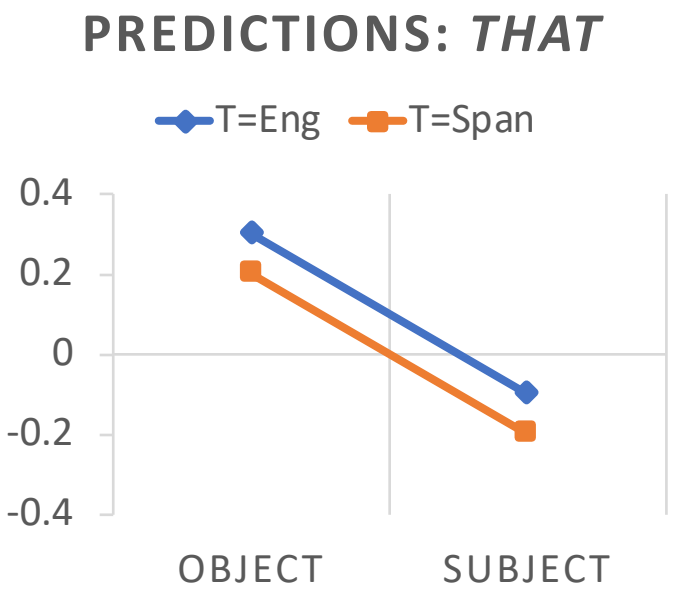
- 2x2x2 factorial design:
  - Realization of C: that, que
  - Language of T: English, Spanish
  - Wh-argument extracted: object, subject

Conditions (Hoot & Ebert 2021)

Condition	C	T	Wh	Example
1. TEO	That	EN	O	*Qué asumieron los maestros* **that** the child had read before the test?
2. TSO	That	SP	O	What did the teachers assume **that** *el niño había leído antes del examen*?
3. TES	That	EN	S	*Quién asumieron los maestros* **that** had read the text before the test?
4. TSS	That	SP	S	Who did the teachers assume **that** *había leído el texto antes del examen*?
5. QEO	Que	EN	O	*Qué asumieron los maestros* ***que*** the child had read before the test*?*
6. QSO	Que	SP	O	What did the teachers assume ***que*** *el niño había leído antes del examen*?
7. QES	Que	EN	S	*Quién asumieron los maestros* ***que*** had read the text before the test*?*
8. QSS	Que	SP	S	Who did the teachers assume ***que*** *había leído el texto antes del examen*?

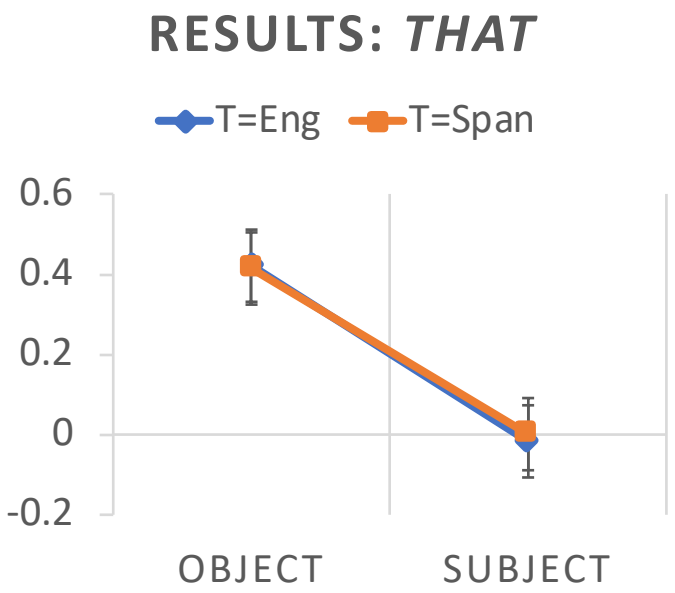
Extraction over *that*: Predictions

Cond	C	T	Wh	Example
✓TEO	That	EN	O	*Qué asumieron los maestros* **that** the child had read before the test?
✓TSO	That	SP	O	What did the teachers assume **that** *el niño había leído antes del examen*?
*TES	That	EN	S	*Quién asumieron los maestros* **that** had read the text before the test?
*TSS	That	SP	S	Who did the teachers assume **that** *había leído el texto antes del examen*?



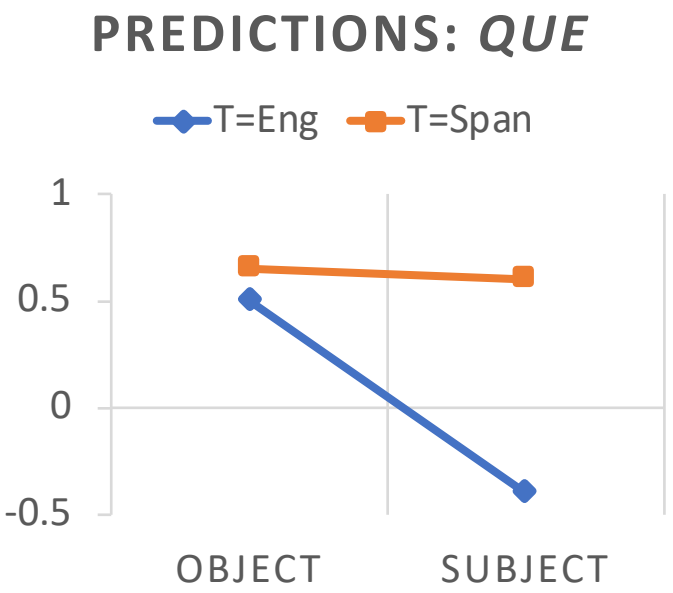
Extraction over *that*: Results

Cond	C	T	Wh	Example	Z
✓TEO	That	EN	O	*Qué asumieron los maestros* **that** the child had read before the test?	0.421
✓TSO	That	SP	O	What did the teachers assume **that** *el niño había leído antes del examen*?	0.414
*TES	That	EN	S	*Quién asumieron los maestros* **that** had read the text before the test?	-0.017
*TSS	That	SP	S	Who did the teachers assume **that** *había leído el texto antes del examen*?	0.001



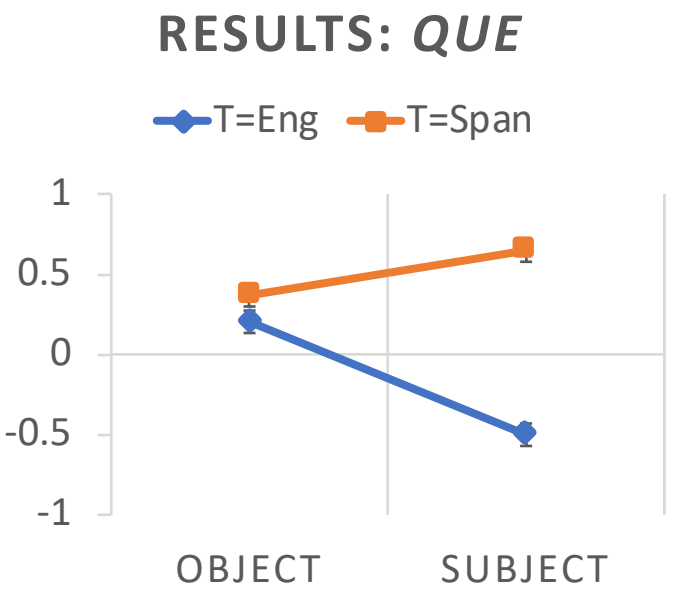
Extraction over *que*: Predictions

Cond	C	T	Wh	Example
✓QEO	Que	EN	O	*Qué asumieron los maestros **que*** the child had read before the test?
✓QSO	Que	SP	O	What did the teachers assume ***que*** *el niño había leído antes del examen*?
*QES	Que	EN	S	*Quién asumieron los maestros **que*** had read the text before the test?
✓QSS	Que	SP	S	Who did the teachers assume **que** *había leído el texto antes del examen*?



Extraction over *que*: Results

Cond	C	T	Wh	Example	Z
✓QEO	Que	EN	O	*Qué asumieron los maestros **que*** the child had read before the test?	0.203
✓QSO	Que	SP	O	What did the teachers assume ***que*** *el niño había leído antes del examen*?	0.368
*QES	Que	EN	S	*Quién asumieron los maestros **que*** had read the text before the test?	-0.501
✓QSS	Que	SP	S	Who did the teachers assume **que** *había leído el texto antes del examen*?	0.647



Summary of findings

- Extraction over *that*: extraction of subjects is always worse
  - Spanish T alone does not help with subject extraction
- Extraction over *que*: subject extraction is acceptable only in one case
  - Spanish C alone does not license subject extraction

Assessing the existing accounts

Account	Basic claim	Account supported?
Anti-Locality (Douglas 2017; Erlewine 2016, 2020)	Movement from Spec-TP to Spec-CP is too short; extraction from Spec-TP thus universally barred.	Yes. Experimental work suggests C and T together permit post-verbal subjects
Criterial Freezing (Rizzi 2006, 2015; Rizzi & Shlonsky 2007)	Positions with interpretive properties (like subjects) are frozen; extraction from Spec-TP thus universally barred.	Yes. Experimental work suggests C and T together permit null subjects
Prosodic Alignment (Kandybowicz 2006, 2009; McFadden & Sundaresan 2018; Sato & Dobashi 2016)	Empty Spec-TP cannot align with left edge of intonational phrase (or cannot form phrase with C) so syntax/prosody matching fails; extraction from Spec-TP thus impossible.	No. T alone does not obviate the that-trace effect
T-to-C (Pesetsky & Torrego 2001)	T raised to C surfaces as that; extracting a subject is more economical and blocks T raising, so *that-t.	No. C alone does not obviate the that-trace effect.

That-trace effect: Fewer analytical options

- Code-switching experiments rule out at least two accounts:
  - ~~Prosodic alignment~~
  - ~~T-to-C raising~~
  - Anti-locality
  - Criterial freezing
- Next: choosing between anti-locality and criterial freezing
  - This choice does not necessarily have to rely on experimental work

Agreement and concord

- Basic generalization: the phi-features [GENDER], [NUMBER] present on a noun are matched by the "agreeing" adjective, participle, determiner, verb
- [GENDER] and [NUMBER] equally found on different lexical categories: determiners, finite verbs, adjectives (and other modifiers)
  - [PERSON] is found only on predicates/verbs

Gender agreement on adjectives and determiners

- French
  un/le vieux carnet une/la vieille lettre
  un/le carnet overt un/la letter ouverte
- German
  der kleine Käse die kleine Karte das kleine Auge
  ein kleiner Käse eine kleine Karte ein kleines Auge

Gender/number agreement on verbs and adjectives

- Russian
  залаяла болонка
  залаяла доберман
  залаяли доберман и болонка

  добродушная болонка
  добродушный доберман
  добродушные доберман и болонка

Different syntax: Agreement vs concord

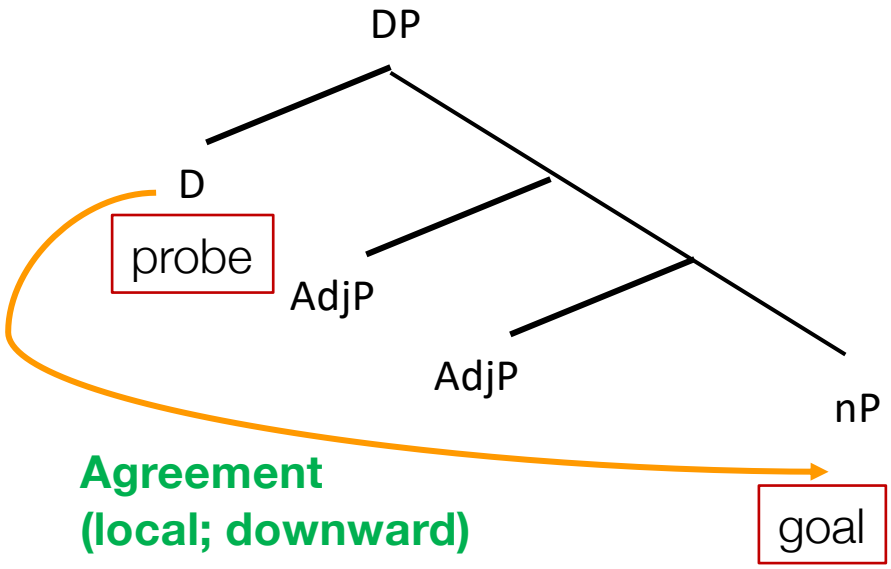
It is possible that the matching of gender and number features on heads (C, D, v) vs. modifiers (A) is subject to different syntactic mechanisms (Chomsky 2001, Chung 2013, Norris 2014, 2018)

Analyses of agreement and concord

	Same mechanism underlying subject-verb agreement and adjective-head-noun agreement	Subject-verb agreement is agreement proper, nominal agreement is concord
ADJ is in spec,F	Bonet et al. (2015), Cinque (1994), Carstens (2000), Boskovic (2001), a.o.	—
ADJ is adjunct	Baier (2015); Baker (2008); Carstens (2016); Kramer (2009); Toosarvandani & van Urk (2013), a.o.	Norris (2014, 2018), Polinsky (2016), Giusti (2008), a.o.

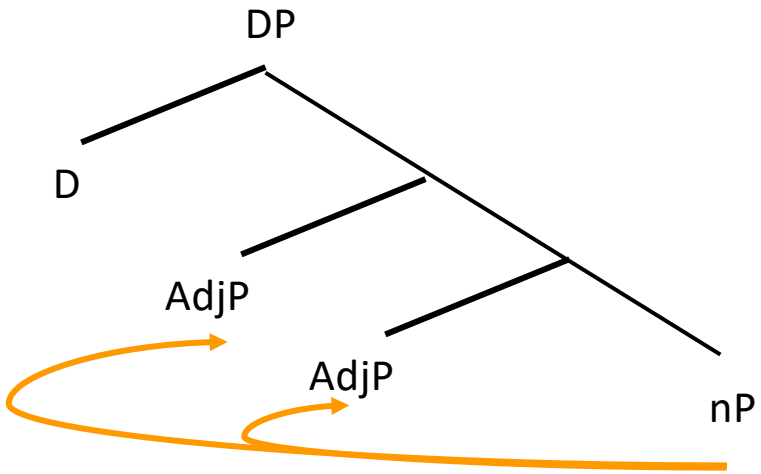
Different syntax: Agreement vs concord

Agreement:
A probe-goal relation between a head and the nP bearing the features [GENDER], [NUMBER]



Different syntax: Agreement vs concord

Concord: percolation of phi-features in the nominal domain



Concord
(direction irrelevant, less local)

Agreement as a two-step operation

- Agreement is composed of AGREE-LINK and AGREE-COPY
    - AGREE-LINK connects the probe and the goal (part of narrow syntax)
    - AGREE-COPY reproduces the feature value of the goal on the probe (may be at PF or still in syntax)

(Arregi & Nevins 2012; Benmamoun et al. 2009; Bhatt & Walkow 2013; Franck et al. 2006, 2008; Giusti 2008; Smith 2018; Lyskawa 2021)

Concord as a single-step operation

Assumptions:

- Concord is a relation between the head and an externally-merged specifier
- relevant ϕ-features are represented throughout the DP, spreading upwards
  (Giusti 2008; Norris 2014, 2018; Polinsky 2016)
- elements acquire and express the relevant ϕ-features post-syntactically (Norris 2014)

Experimental evidence?

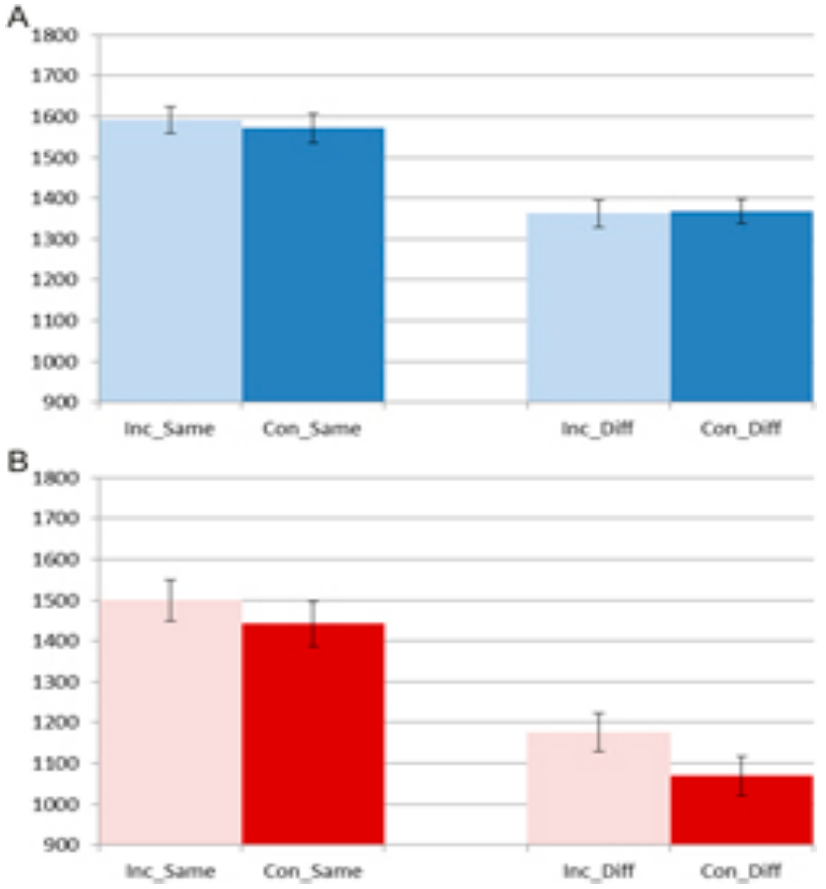
- German determiners and adjectives
- Russian verbs and adjectives

German

Hopp & Lemmerth (2018); Lemmerth & Hopp (2019): German speakers use gender information on DET and on ADJ to facilitate lexical retrieval

German recurrent agreement: ADJ > DET in comprehension

- German L1 speakers (children and adults) use both agreement on DET and agreement on ADJ predictively in comprehension
- but the adjective (B) is processed faster than determiner (A), hence ADJ has a stronger facilitative effect



Hopp & Lemmerth (2018: Fig 3) German monolinguals, adults, at the onset of DET (A) and ADJ (B)

Confound in the German data?

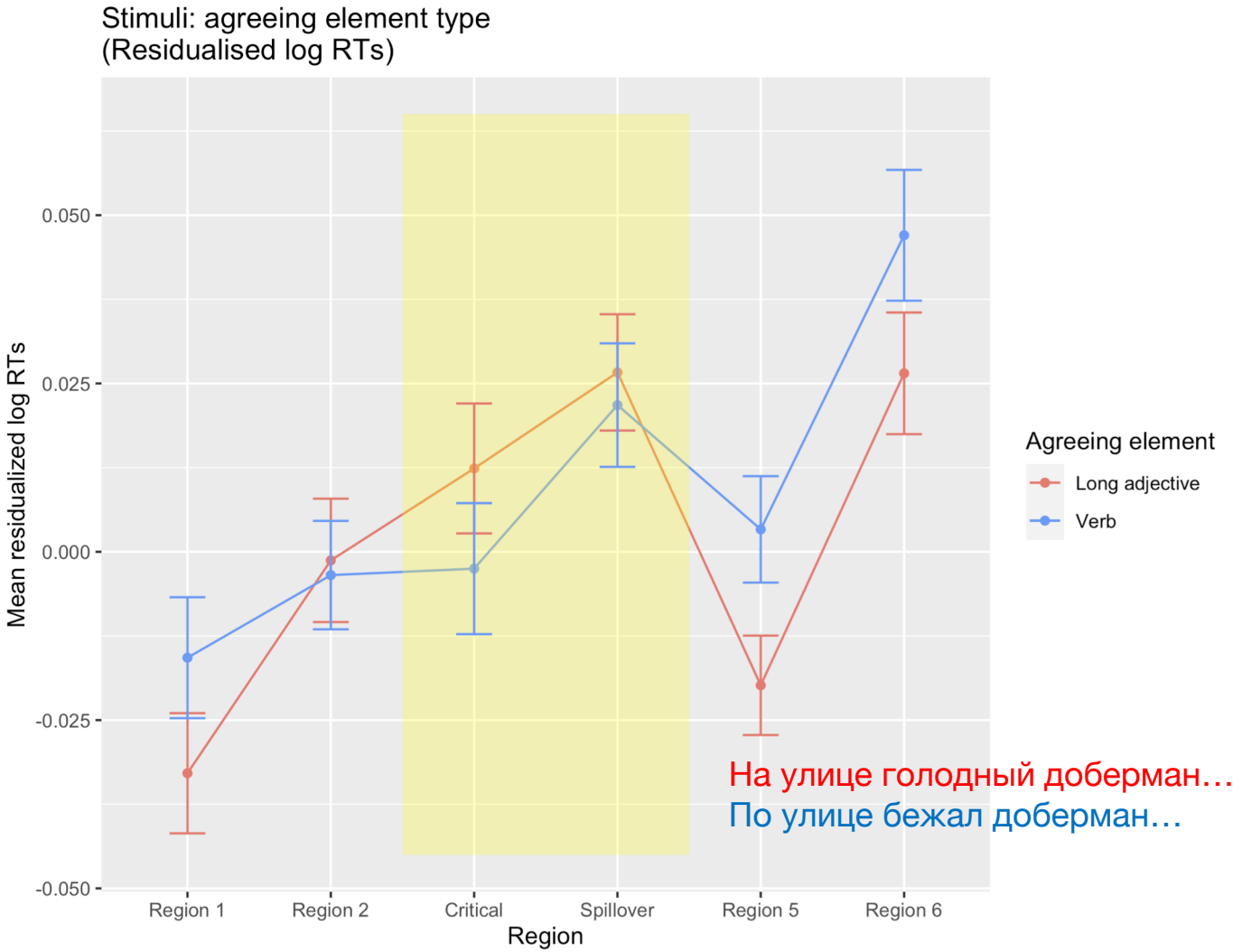
- Determiners are a closed class, adjectives are an open class, and the difference in effects may be due to the higher informativity of the adjective

Russian: Verbs and attributive adjectives, both open classes

Self-paced reading, only MASC and FEM in the singular

R1	R2 (agreeing form)	R3 (critical word)	R4 (spillover)	R5-8
PP/Adv	Verb/adjective	Noun	XP	…
На улице	голодный	доберман	безобразно	лает на всех прохожих
По улице	бежал	доберман	необычной	расцветки и без ошейника

Russian results: Grammatical condition



Agreement vs concord? Possibly

- If these results are on the right track, experiments offer weak support for the conception that subject-verb agreement and agreement in the noun phrase follow from different underlying mechanisms

Analyses of agreement and concord

Same mechanism underlying subject-verb agreement and adjective-head-noun agreement	Subject-verb agreement is agreement proper, nominal agreement is concord
Baier (2015); Baker (2008); Carstens (2016); Kramer (2009); Toosarvandani & van Urk (2013), a.o.	Norris (2014, 2018), Polinsky (2016), Giusti (2008), a.o.

Agreement vs concord? Possibly

- If these results are on the right track, experiments offer weak support for the conception that subject-verb agreement and agreement in the noun phrase follow from different underlying mechanisms

- What's next? Eye-tracking studies, as they may offer a more sensitive measure of behavioral results

Theory at the service of experimentation

A famous observation

- Subject and object relative clauses are different in processing

Subject Relative Clause: The reporter who/that
[__ attacked the senator] admitted the error

Object Relative Clause: The reporter who/that
[the senator attacked __] admitted the error

A famous observation

- Object relative clauses are harder to process than subject relative clauses

Harder to process = less accuracy on comprehension questions, **slower RTs, neuroimaging differences…**

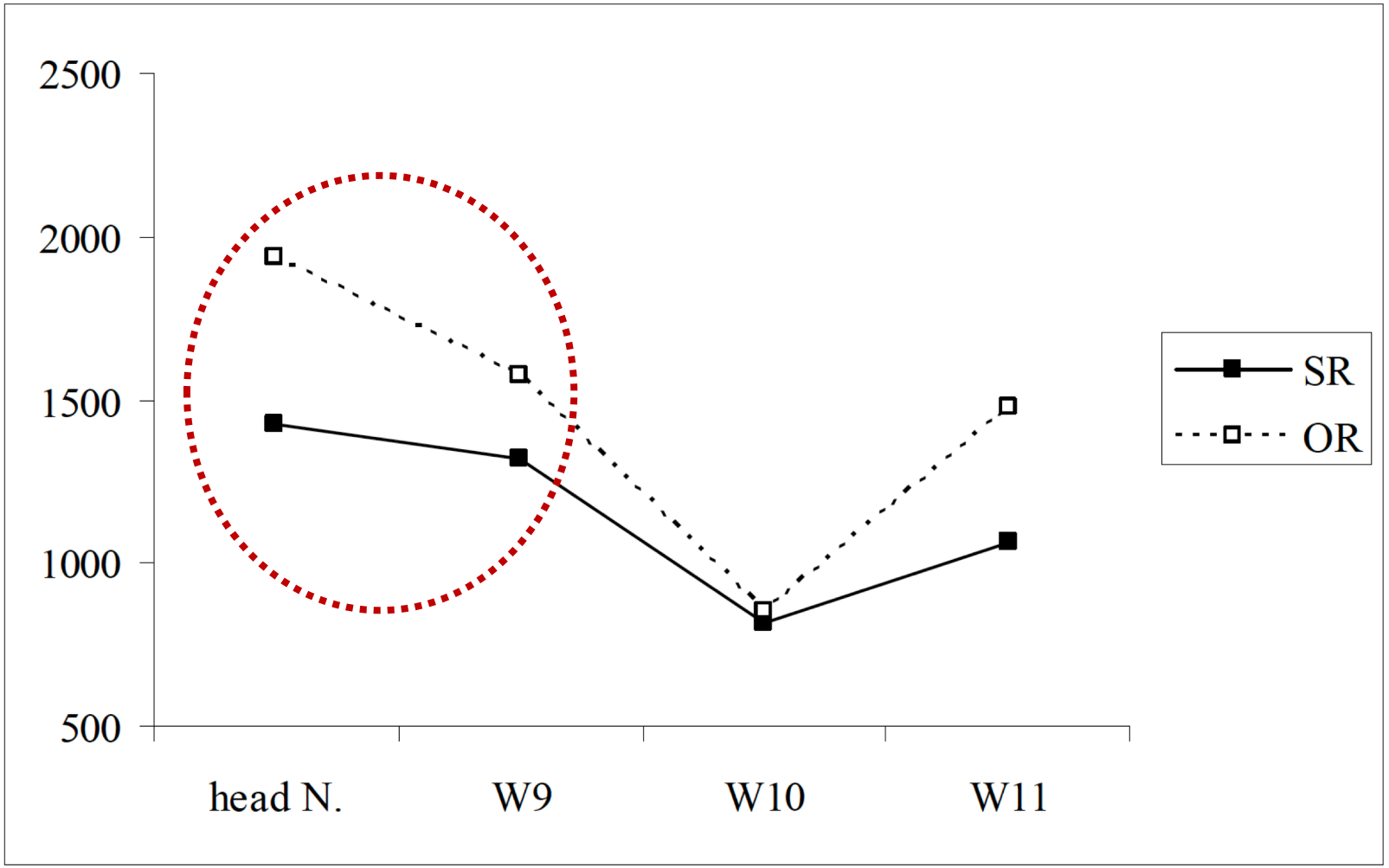
SRC: The reporter who/that [__ attacked the senator] admitted the error

ORC: The reporter who/that [the senator attacked __] admitted the error

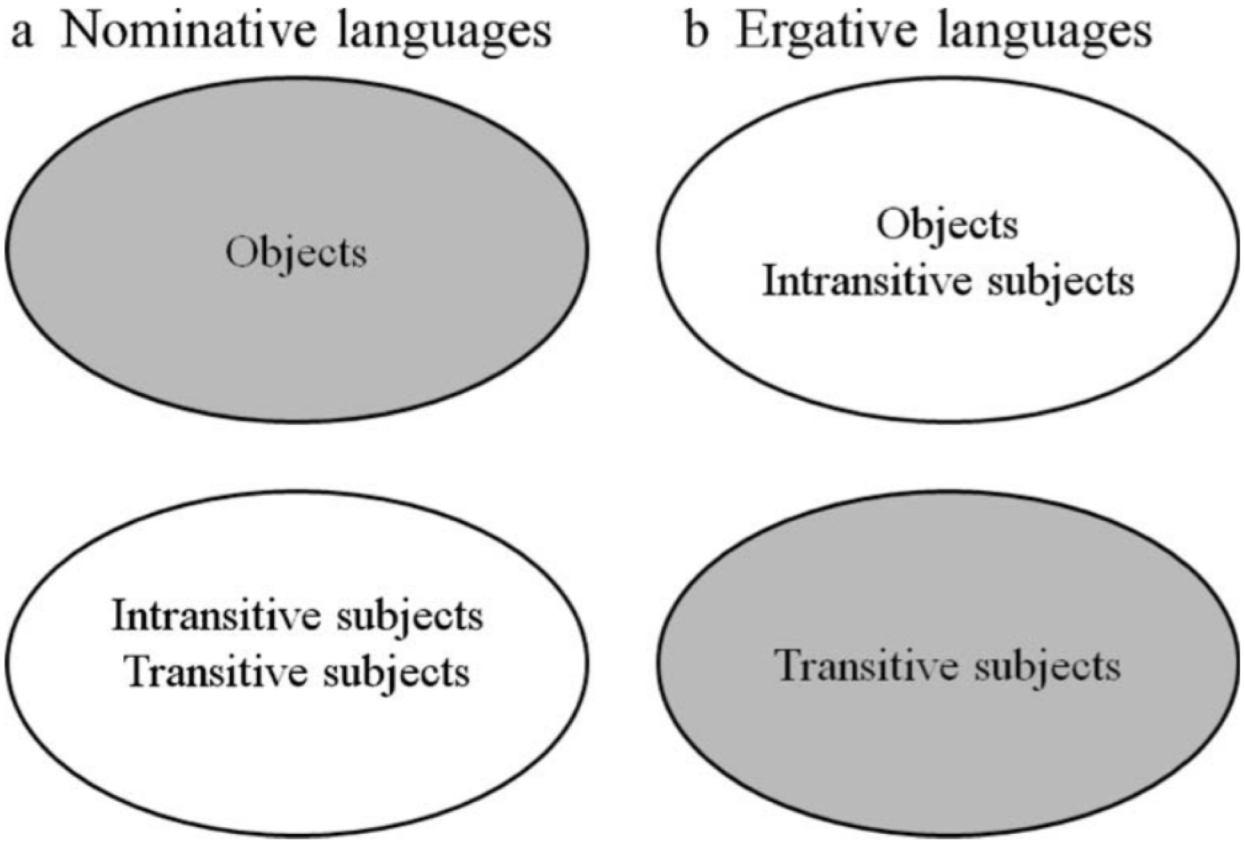
Subject vs Object relative clauses

- SRCs impose less of a processing load than ORCs
  - Replicated in languages with different word orders (VO and OV languages)
  - Replicated in accusative and ergative languages

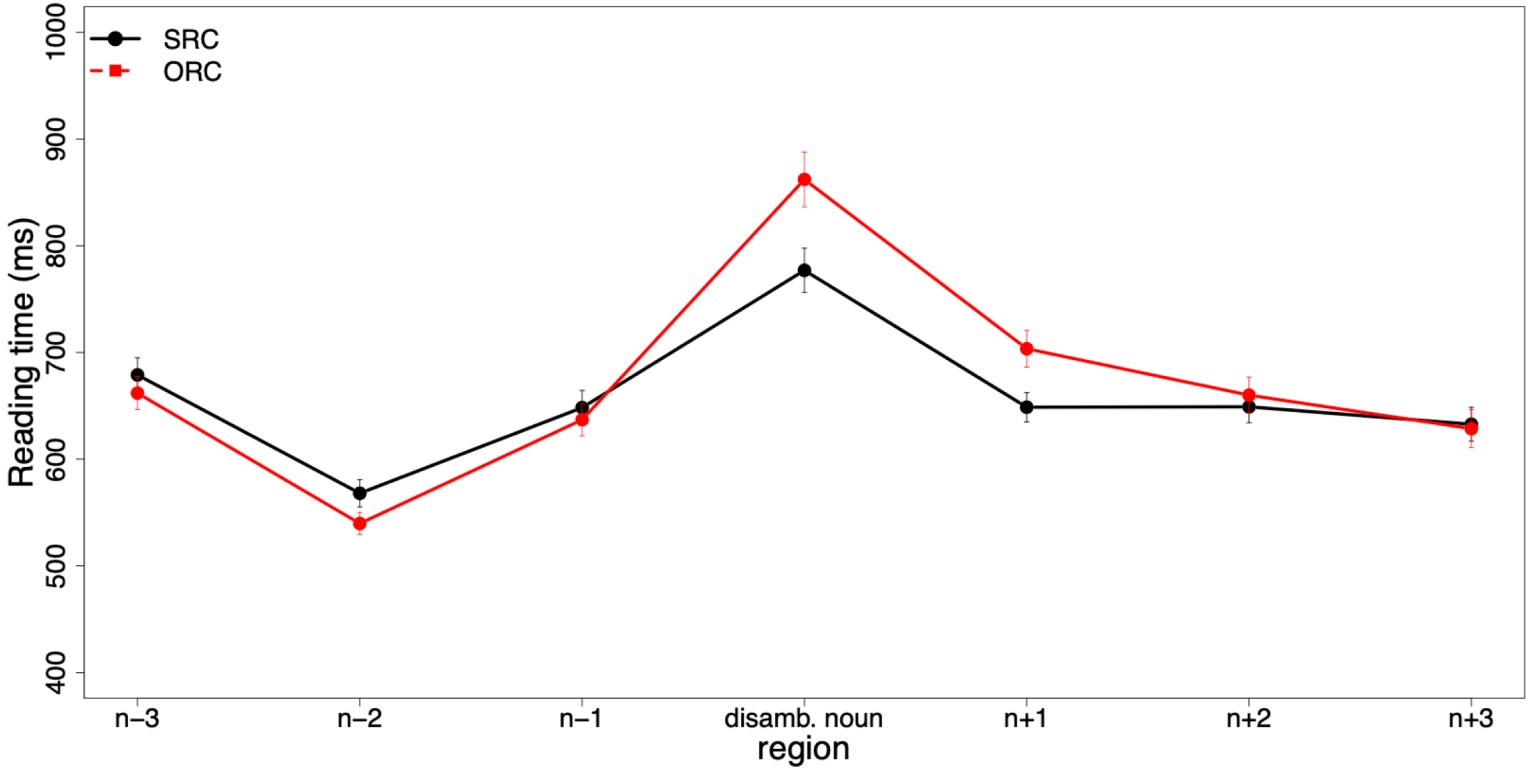
Subject vs Object relative clauses in Korean (head-final; prenominal RCs)



Ergative languages



Georgian RCs in self-paced reading



(Lau et al. in press; Foley 2020)

Why are ORCs more difficult?

And why should we care about the answer?

- The SRC/ORC contrast serves as key data for the understanding of parsing as shaped by
  - general memory architecture
  - linguistic structure
  - Interpretive connections between language units
- The right explanation may still tell us something important about the parser and the interpretive system

Why are ORCs more difficult?

- Frequency explanation
- Thematic role differences
- Syntactic (structural) difference
- Integration in parsing

Why are ORCs more difficult?

- Frequency explanation?
  - SRCs are more frequent in input than ORCs, so comprehenders predict them

- Not really:
  - English has 31.2% SRCs (based on transitive clauses) and 37.5% ORCs (averaged over several corpora; Gordon & Hendrick 2005)
  - Similar distribution in other languages

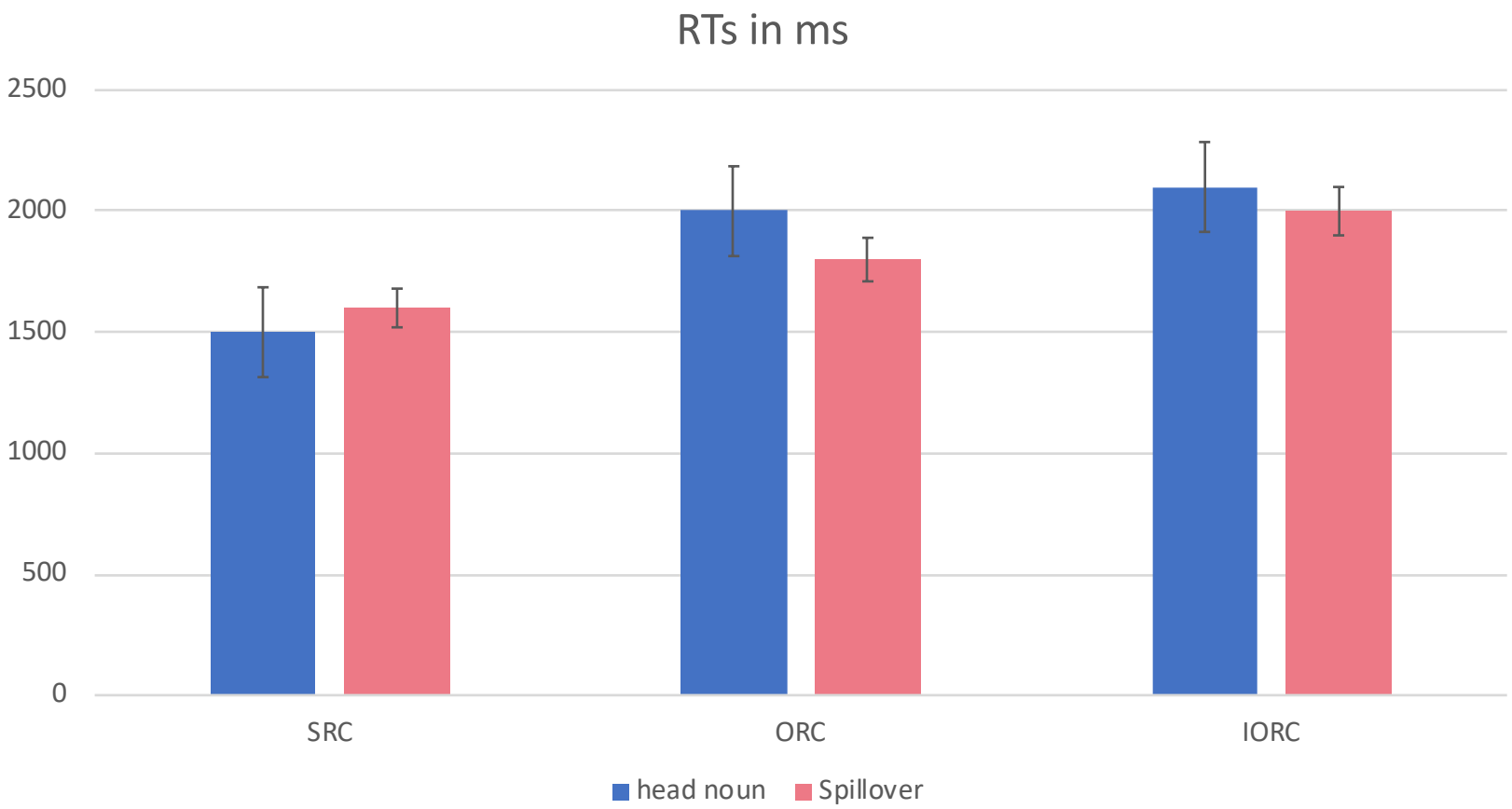
Why are ORCs more difficult?

- Thematic role effects:
  - there is a memory cost for the assigning a thematic role to a noun phrase
  - thematic-role assignment for patient/object is more tightly connected to the verb than it is for agent/subject (cf. Dowty 1991)
- Prediction: all other factors being equal, RCs based on external arguments should be processed faster/easier

Korean RCs

R1	**R2**	**R3…**	**Predicate**	**Head noun…**	**RC type**
In the morning	Headmaster-ACC	with parents	greet-ADN	teacher…	Subject RC
‘the teacher who greeted the headmaster together with the parents in the morning’					
In the morning	teacher-NOM	with parents	salute-ADN	headmaster…	Object RC
‘the headmaster whom the teacher saluted together with the parents in the morning’					
In the morning	headmaster-NOM	teacher-ACC	Introduce-ADN	parents…	Indirect Object RC
‘the parents to whom the headmaster introduced the teacher in the morning’					

Korean RCs: Reading times at head noun and spillover region



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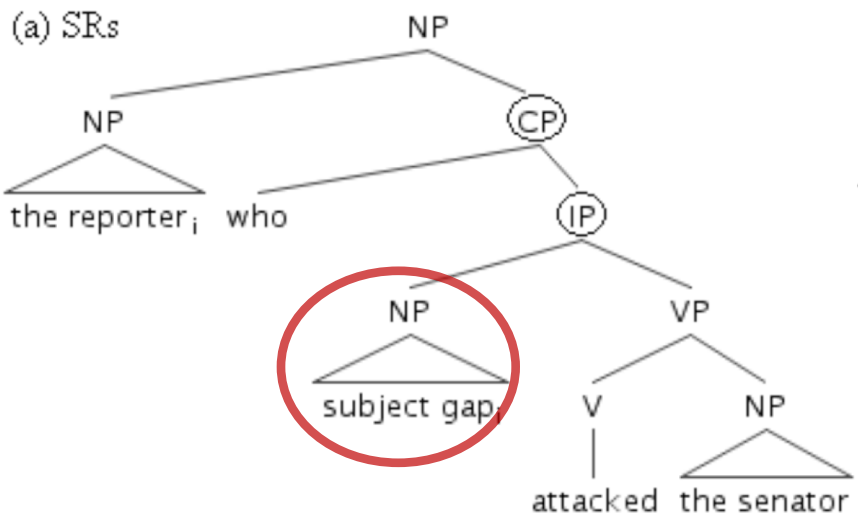
- Prediction: all other factors being equal, RCs based on external arguments should be processed faster/easier—not confirmed

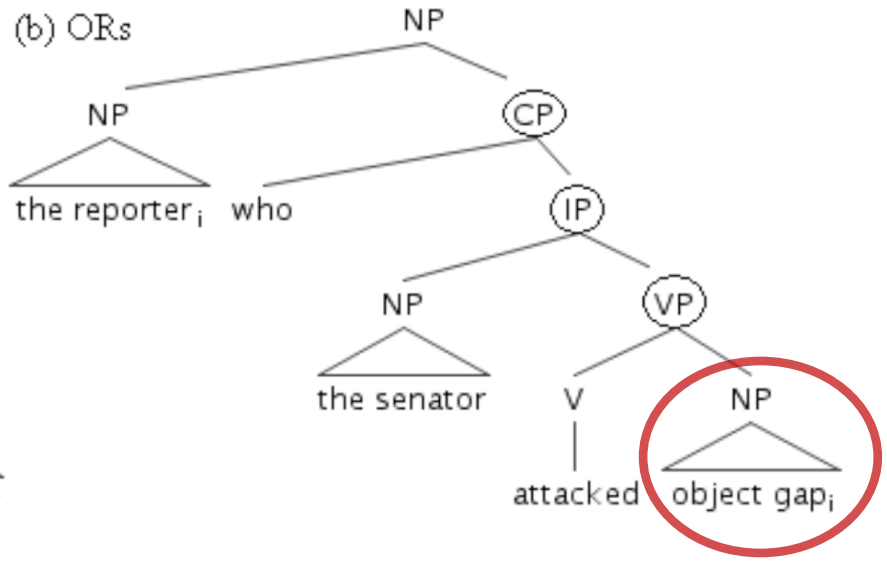
Why are ORCs more difficult?

- ~~Frequency explanation~~
- ~~Thematic role differences~~
- Syntactic (structural) difference
- Retrieval and integration

Why are ORCs more difficult?

- Structural (representational) explanation?
  - Representations with greater structural distance between dependent elements are dispreferred





Correlatives

[какая машина ему подойдет], такую он и купит

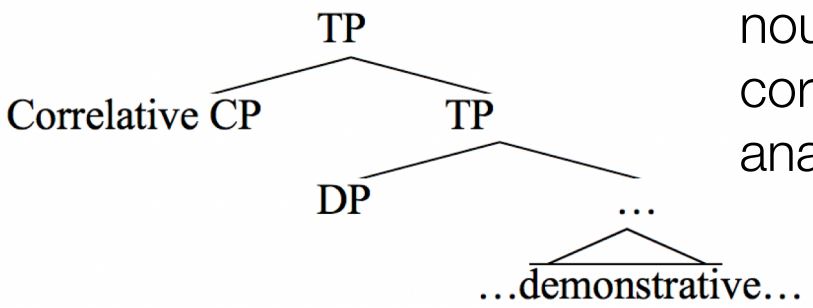
[какую машину он заметит], такую и начинает хвалить (cf. Mitrenina 2018)

Correlatives

[*какая машина ему подойдет*], *такую он и купит*

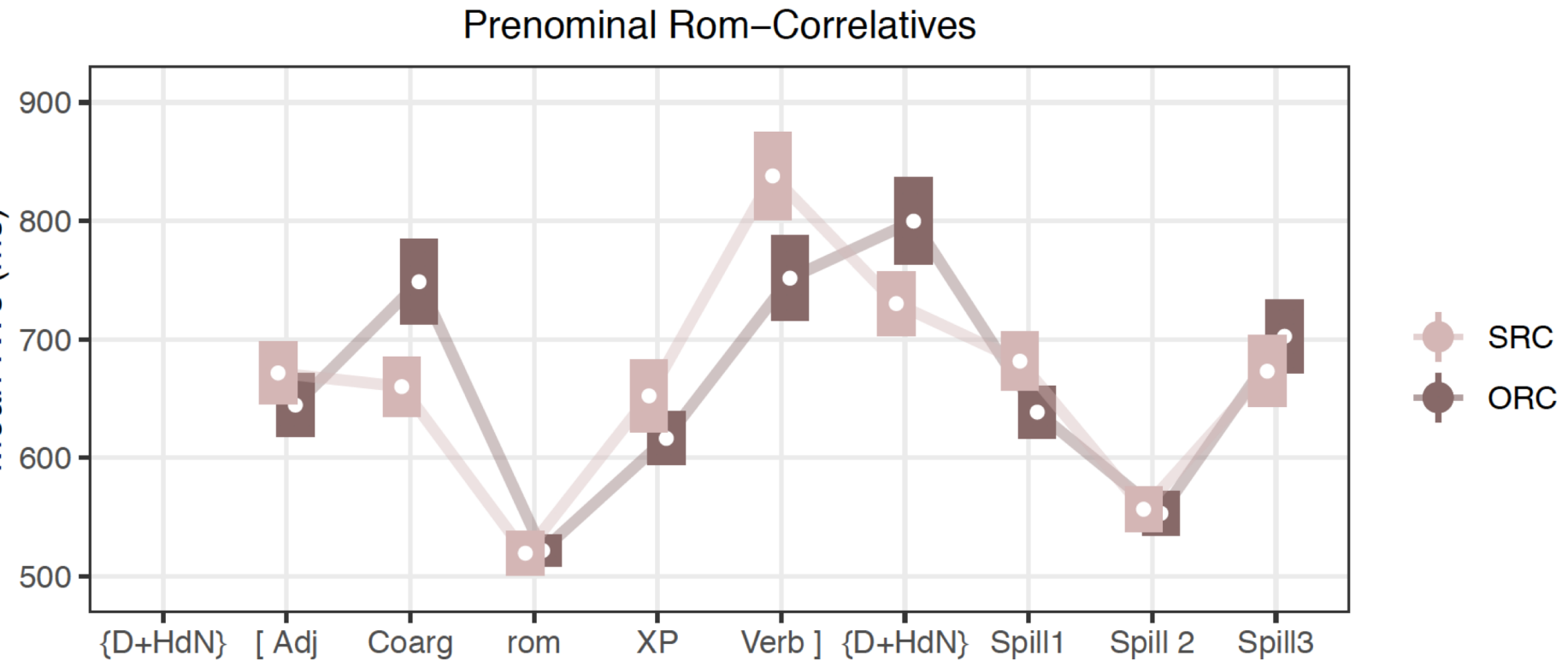
[*какую машину он заметит*], *такую и начинает расхваливать*

(cf. Mitrenina 2021)



The relation between the noun in the correlative CP and the correlate in the main clause is strictly anaphoric

Georgian correlatives, RTs in ms (Foley 2020: 117)



Georgian correlatives (Foley 2020)

- Same contrast between subject and object correlatives as between subject and object relative clauses

- Structural distance may be implicated but in an indirect, more mediated way

Why are ORCs more difficult?

- Flow and order of information given the overall structure
  - more material held in costly working memory in ORCs
  - more retrieval interference in ORCs

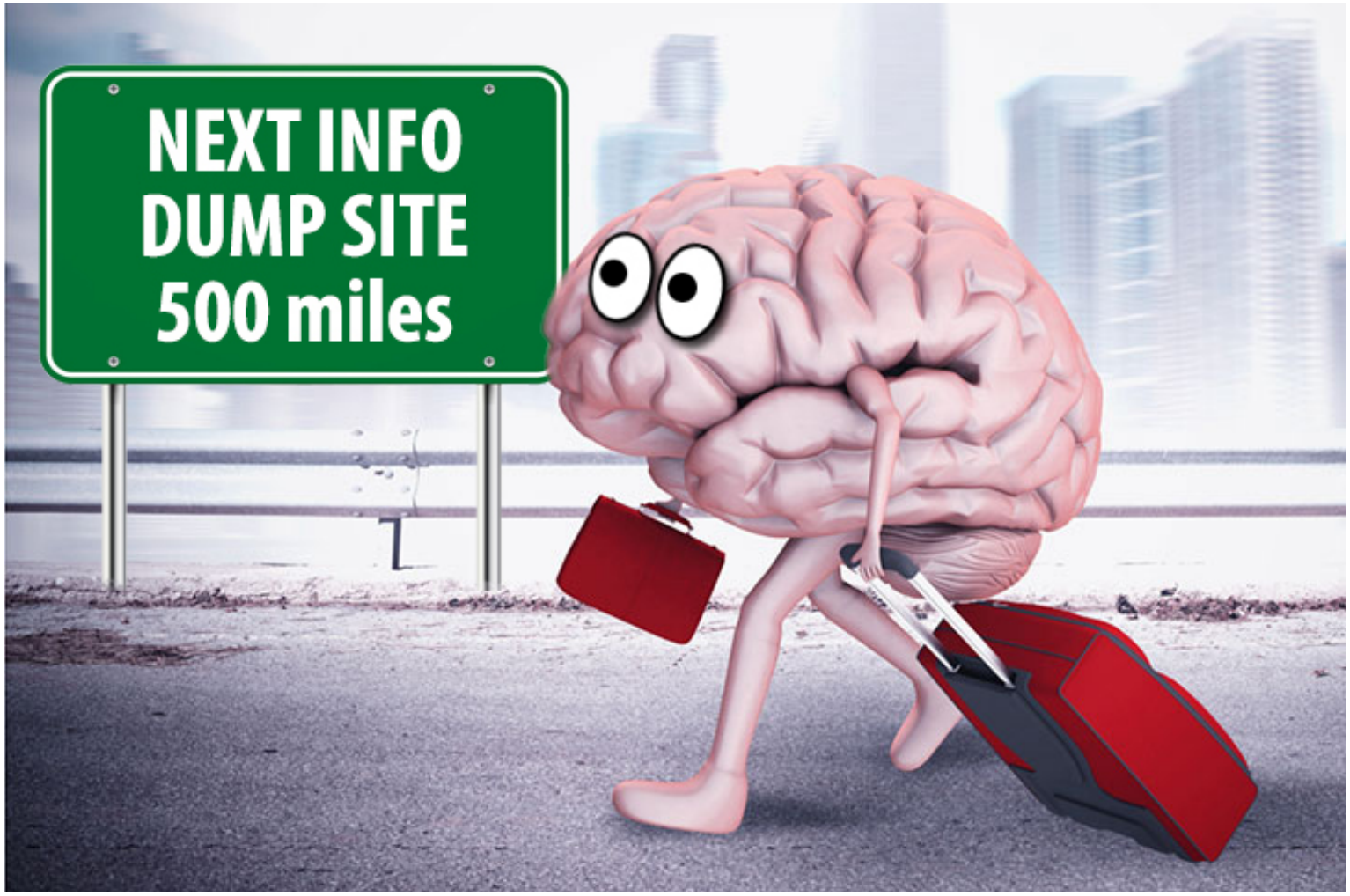
Working memory and relative clauses

SRC: the reporter who [harshly ___ attacked the senator]

ORC: the reporter [who the senator harshly attacked __]

Processing subject extraction is associated with a memory cost of two local open dependencies: at the point of the head noun (*the reporter*) and at the point of the relative pronoun *who*

Processing object extraction is associated with a memory cost of two local open dependencies: the head noun (*the reporter*), the relative pronoun *who,* and *the senator*
(Gibson 1991, 1998)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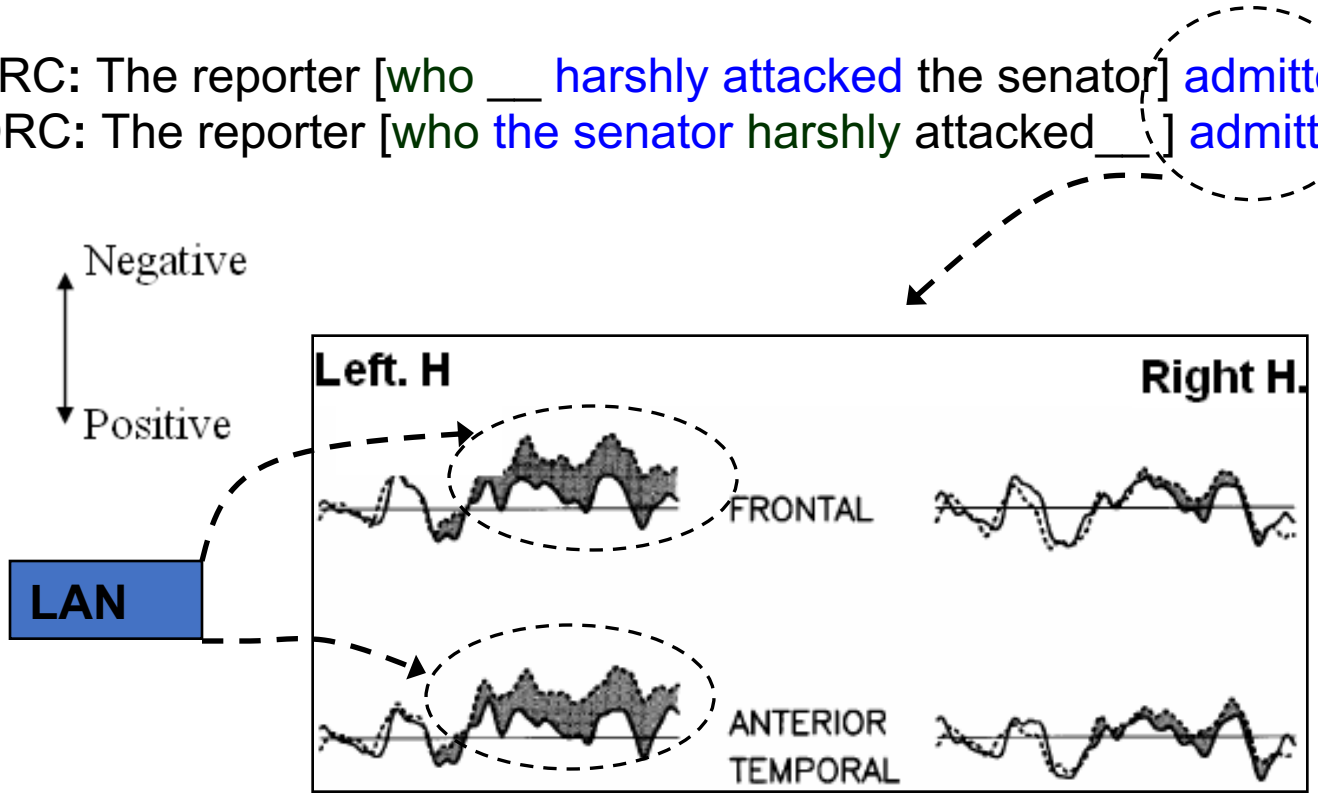
Can we find evidence for WM effects in RC?

- Anterior negativity: Consistent effect observed with ORCs across different languages in electrophysiological studies (ERPs)

English: Left Anterior Negativity (LAN) to OR
(King & Kutas 1995)

SRC: The reporter [who __ harshly attacked the senator] admitted the error.
ORC: The reporter [who the senator harshly attacked__] admitted the error.



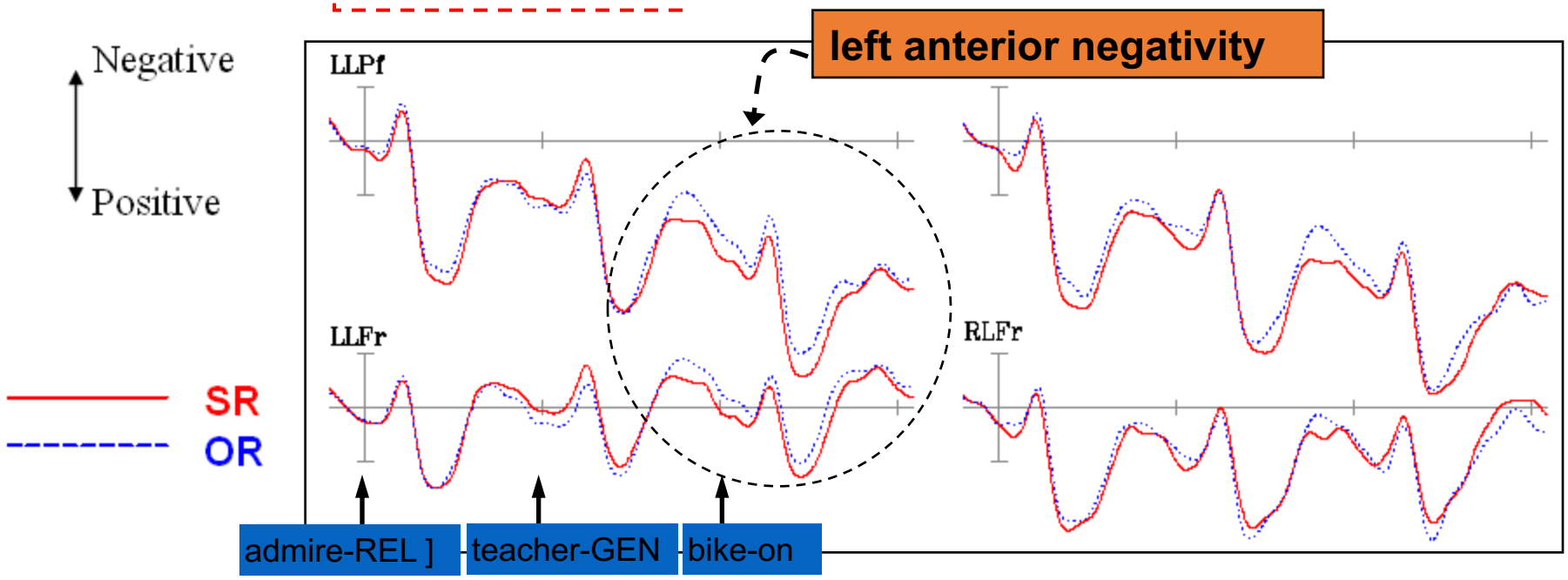
- **(L)AN to filler-gap association in ORs**

Korean RCs: LAN at head noun
(timelocked to V-REL)

교생의 자전거

SR: 'A leaf fell on the apprentice-teacher's bike who secretly admired the preschool teacher.'

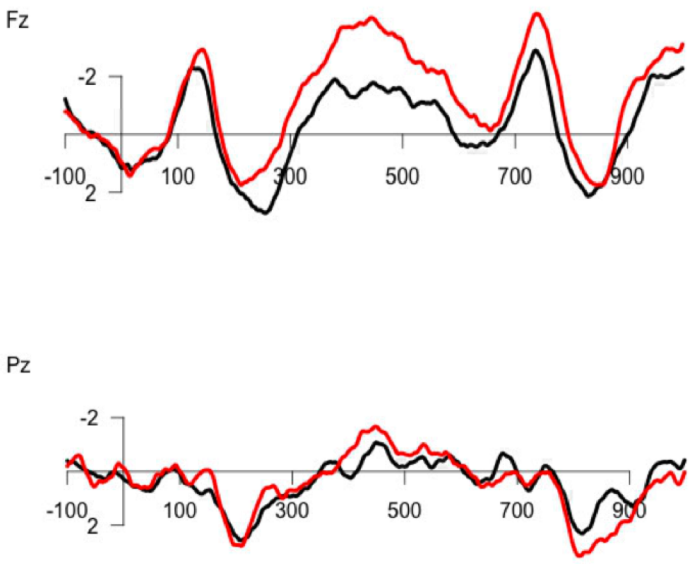
OR: 'A leaf fell on the apprentice-teacher's bike who the preschool teacher secretly admired.'



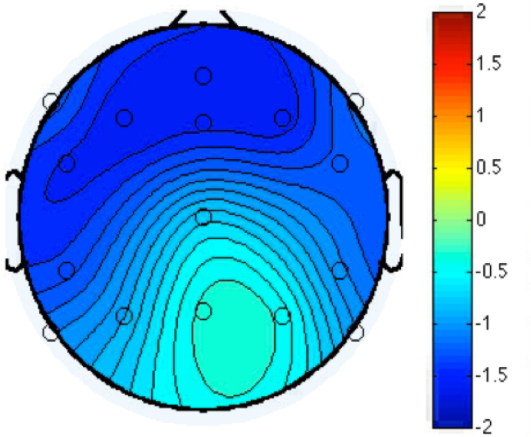
- **Head Noun (NP-GEN): (L)AN to OR as in English RCs**
- **filler-gap or gap-filler association in ORs → LAN effect**

(see also Ueno and Garnsey 2007 for same effects in Japanese)

Georgian RCs: The LAN is back



ORC - SRC
250-650ms



- Results: large anterior negativity for disambiguation to ORCs (Lau et al., in press)

Object relative clauses and neural response

- Object RCs consistently evoke (left) anterior negativity (LAN) in event-related brain potential (ERP) experiments
  - What can LAN teach us about object relative clauses?
  - What can we learn about LAN from object relative clauses?

Other instances of anterior negativity (simplified)

- LAN (between filler & gap, at gap)
  - English ORs (King & Kutas, 1995)
  - English wh-questions (Kluender & Kutas, 1993; Phillips et al., 2005)
  - German wh-questions (Fiebach et al., 2001, 2002; Felser et al., 2003)
  - Japanese O-scrambling (Ueno 2003)
  - English passive (Kluender, in prep.)
  - Garden path sentences

English: Left Anterior Negativity (LAN) to OR
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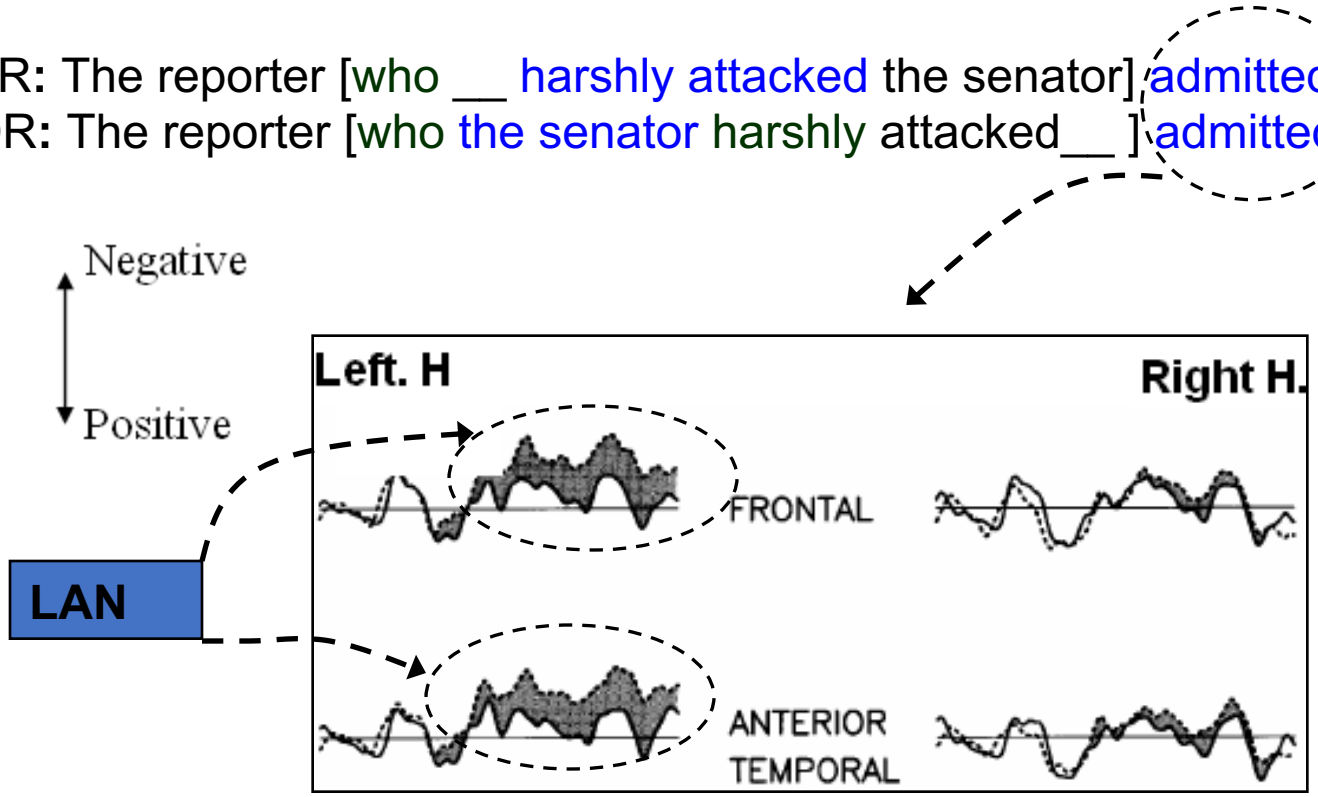
SR: The reporter [who __ harshly attacked the senator] admitted the error.
OR: The reporter [who the senator harshly attacked__] admitted the error.



- **(L)AN to filler-gap association in ORs**

LAN for Filler-Gap Dependencies in English Wh-Questions

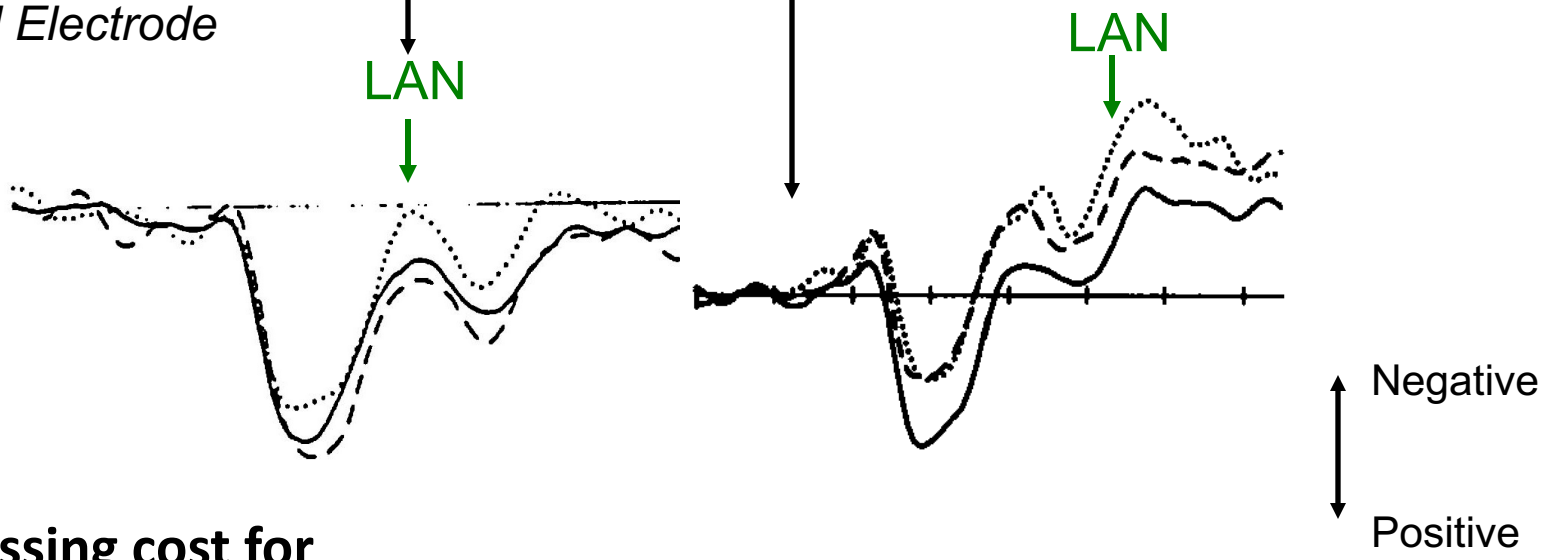
(Kluender and Kutas 1993)

a. Do you wonder [if they caught him at it by accident]?

b. Do you wonder [who they caught __ at it by accident]?

FILLER GAP

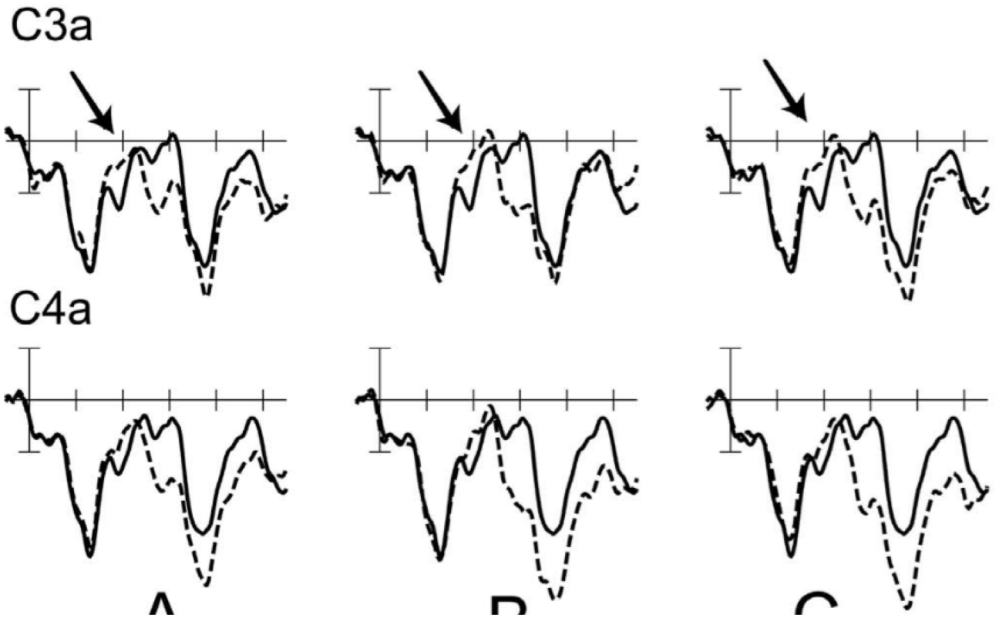
Left Anterior Temporal Electrode

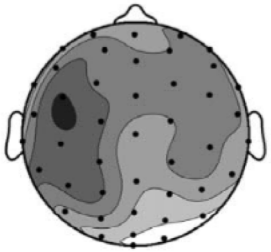


→Processing cost for

- **holding the filler *who* in verbal working memory**
- **back associating the gap with preceding filler**

LAN for garden paths





(6) a. The man is painting the house and the garage is already finished.
b. The man is painting the house but the garage is already finished.

(Kaan & Swaab 2003)

What does anterior negativity index?

What does anterior negativity index?

- Two main ideas
  - LAN is about objects (as opposed to subjects) … but it is not about syntax
  - LAN is about retrieving the less accessible material from working memory and integrating it with the current material

Why are non-subject relative clauses more difficult?

- ~~Frequency explanation~~
- ~~Thematic role differences~~
- Syntactic (structural) difference
- Retrieval and integration of material (which can be indirectly influenced by structure)

What does anterior negativity index?

Difficulty with retrieving the less accessible material from working memory and integrating it with the current material

Taking stock: Syntax is syntax

- There is no conceptual divide between theoretical and experimental syntax
  - They use different tools and vocabularies but the fundamental questions are the same
- Not all the effects we observe are about syntax, nor do they have to be
  - Understanding theory may be helpful in disabusing one of the structure-all-the-way-down illusion

Taking stock: Do we always need experimentation?

- Do NOT run experiments unless you absolutely have to and have a set of clear predictions

- Do NOT run experiments in the field unless you have done that kind of work with more familiar languages and/or can rely on a team with the relevant expertise (stimuli creation, electronic platforms, statistics, ERP analysis, etc.)

Thank you!