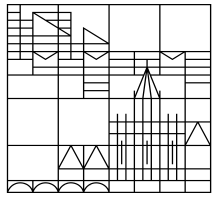
QUESTIONS AT THE INTERFACES
DFG FOR2111 Project P1

Universität Konstanz



Pragmatic licensing of the German discourse particle *denn*: ratings and ERP evidence

Anna Czypionka, Doris Penka, Maribel Romero

Experiments on the Semantics/Pragmatics Interface (XPRAG FEST 2025)

Outline

- Introduction on question-sensitive discourse particles (QDiPs)
- QDiP licensing: Syntactic account and semantic-pragmatic account
- Predictions
- Stimuli
- Study 1: Ratings – which account predicts acceptabilities?
- Study 2: ERPs - qualitative processing differences?
- What does it all mean?

Background: Question-sensitive discourse particles

Question-sensitive **di**scourse **p**articles (QDiPs) are a special case of DiPs.

*(1) Wer hat (**denn**) meine Brille versteckt?*
`Who has (DENN) hidden my glasses?'

Adding *denn* links the question to the preceding discourse context.

Out of the blue, questions with *denn* sound odd!

Background: QDiPs are clause-type sensitive

QDiPs must occur in an interrogative context:

(1) *Wer hat **denn** meine Brille versteckt?*
Who has DENN my glasses hidden
"Who hid my glasses?"

(2) **Peter hat **denn** meine Brille versteckt.*
Peter has DENN my glasses hidden
"Peter hid my glasses."

Background: Syntactic account

Syntactic licensing condition: Bayer et al. (2016)
QDiPs are only licensed on the path of an interrogative *wh*-chain.
(leaving aside polar interrogatives here).

(1) *Wer hat **denn** [vP t meine Brille versteckt]?*
Who has DENN my glasses hidden
"Who hid my glasses?"

(2) **Peter hat **denn** meine Brille versteckt.*
Peter has DENN my glasses hidden
"Peter hid my glasses."

(3) *Wo meinst du, dass meine Brille **denn** t sein könnte?*
Where think you that my glasses DENN be could be
"Where do you think that my glasses could be?"

Background: Challenges for the syntactic account

Two challenges to the syntactic licensing condition:

- Data A: There is an interrogative *wh-chain*, but *denn* does not lie on its path. Yet, the sentence is judged as (quite???) acceptable.

(4) *Wer sagt, dass meine Brille* ***denn*** *im Auto sein könnte?*
Who says that my glasses DENN in.the car be could?
"Who says that my glasses could DENN be in the car? " Czypionka et al. (2021, 2022)

- Data B: Syntactically, there is no interrogative clause (and thus no interrogative wh-chain). Yet, the sentence is acceptable in context.

(5) *(...), kann ich nicht so ganz glauben, dass es denn wirklich so aussieht.*
can I not so completelly believe that it DENN really so looks.like
"I cannot completely believe that it DENN really looks like this."
(Fortmann 2017)

Thus, the syntactic account can only explain a part of the data.

Background: Semantic-pragmatic account

Two ingredients in semantic-pragmatic licensing:

- QDiPs must be in a clause with a question meaning:
  The question meaning **Q** need not come from an interrogative host,
  but may also come from the focus value of an (embedded) declarative host.

  Romero (2017), Czypionka et al. (2021, 2022)

- Some anchor individual **x** must have an inquisitive attitude towards the question meaning Q:
  The anchor individual x is often the speaker but in embedded contexts it can also be the subject of the matrix clause.

  Rapp (2018)

Licensing condition for *[denn$_x$ Q]* (Conventional Implicature, CI):
x has a pressing / discourse relevant inquisitive attitude towards the question meaning Q.
(Thurmair 1991, Theiler 2021, Penka & Romero 2025)

Background: Semantic-pragmatic account

(1) *Wer hat **denn** meine Brille versteckt?*
Who has DENN my glasses hidden
"Who hid my glasses?"

- Speaker serves as anchor individual x of the inquisitive attitude towards the Q

(2) **Peter hat **denn** meine Brille versteckt.*
Peter has DENN my glasses hidden
"Peter hid my glasses."

- Speakes does not have an inquisitive attitude (towards any Q arising from clause)

(5) *(...), kann ich nicht so ganz glauben, dass es denn wirklich so aussieht.*
can I not so completely believe that it DENN really so looks.like
"I cannot completely believe that it DENN really looks like this."

- Deriving a question meaning Q:
  $[[\text{it really}_{\text{Focus}} \text{ looks like that}]]^{o}$ = 'that it really looks like that'
  $[[\text{it really}_{\text{Focus}} \text{ looks like that}]]^{f}$ = { 'that it really looks like that', = **Q**
  'that it doesn't really look like that'}
- Identifying anchor individual x with an inquisitive attitude towards Q:
  The subject of the matrix clause (which happens to be the speaker) serves as anchor individual **x**.

Research questions and predictions

Research questions:

What is the underlying reason for the clause-type sensitivity of *denn*?
Is the licensing condition syntactic or semantic-pragmatic?
What are the processing correlates of semantic-pragmatic *denn*-licensing?

Predictions:

Different approaches to *denn*-licensing make different predictions for **embedded declarative clauses where *denn* is not on the path of the *wh*-chain:**

- **Syntactic approach:** *denn* is uniformly unlicensed.
- **Semantic-pragmatic approach:** Acceptability of *denn* in embedded declaratives varies, depending on
  - how easily a question meaning Q can be constructed (e.g. from the focus value of the host clause)

Czypionka et al. (2021, 2022), Kharaman et al. (2025)

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- **Semantic-pragmatic approach:** Acceptability of *denn* in embedded declaratives varies, depending on
  - how easily a question meaning Q can be constructed (e.g. from the focus value of the host clause)
  - how easily an inquisitive attitude of some anchor individual x can be inferred

Czypionka et al. (2021, 2022), Kharaman et al. (2025)

Stimuli

non-inquisitive embedding verbs:

interrogative: Wer hat **gesagt**, dass die Oma den Kuchen denn / jetzt backen will?
Who has said that the granny DENN / now wants to bake the cake?

declarative: Eva hat **gesagt**, dass die Oma den Kuchen *denn / jetzt backen will.
Eva has said that the granny DENN / now wants to bake the cake.

inquisitive embedding verbs:

interrogative: Wer war **erstaunt**, dass die Oma den Kuchen denn / jetzt backen will?
Who was astonished that the granny DENN / now wants to bake the cake?

declarative: Eva war **erstaunt**, dass die Oma den Kuchen denn / jetzt backen will.
Eva was astonished that the granny DENN /now wants to bake the cake.

All preceded by a short context clause to make *denn* more natural.

Predictions of the syntactic account

- INQUISITIVE embedding verbs: Since *denn* does not lie on the path of the *wh*-chain, *denn* is unlicensed, regardless of the clause type of the matrix clause.

inquisitive embedding verbs:

interrogative:	Wer war **erstaunt**, dass die Oma den Kuchen denn / jetzt backen will? Who was astonished that the granny DENN / now wants to bake the cake?
declarative:	Eva war **erstaunt**, dass die Oma den Kuchen denn / jetzt backen will. Eva was astonished that the granny DENN /now wants to bake the cake.

*Interr and *Decl

- NON-INQUISITIVE embedding verbs: Since *denn* does not lie on the path of the *wh*-chain, *denn* is unlicensed, regardless of the clause type of the matrix clause.

noninquisitive embedding verbs:

interrogative:	Wer hat **gesagt**, dass die Oma den Kuchen denn / jetzt backen will? Who has said that the granny DENN / now wants to bake the cake?
declarative:	Eva hat **gesagt**, dass die Oma den Kuchen *denn / jetzt backen will. Eva has said that the granny DENN / now wants to bake the cake.

*Interr and *Decl

Predictions of the semantic-pragmatic account

- INQUISITIVE embedding verbs: Given their lexical meaning, they facilitate identifying the subject x of the matrix clause as holding an inquisitive attitude, regardless of the clause type of the matrix clause.

inquisitive embedding verbs:

interrogative:	Wer war **erstaunt**, dass die Oma den Kuchen denn / jetzt backen will? Who was astonished that the granny DENN / now wants to bake the cake?
declarative:	Eva war **erstaunt**, dass die Oma den Kuchen denn / jetzt backen will. Eva was astonished that the granny DENN /now wants to bake the cake.

No matrix clause type effect:
✓Interr and ✓Decl

- NON-INQUISITIVE embedding verbs: No facilitation effect given their lexical meaning.
But, extending Simons' (2007) notion of main point status, matrix declaratives can be used to convey a commitment attitude of the speaker x while interrogatives can be used to convey an inquisitive attitude of the speaker x.

noninquisitive embedding verbs:

interrogative:	Wer hat **gesagt**, dass die Oma den Kuchen denn / jetzt backen will? Who has said that the granny DENN / now wants to bake the cake?
declarative:	Eva hat **gesagt**, dass die Oma den Kuchen *denn / jetzt backen will. Eva has said that the granny DENN / now wants to bake the cake.

Matrix clause type effect:
✓Interr and *Decl

Two studies – we begin with ratings

Stimuli: 36 quartets for each embedding verb type

Ratings:

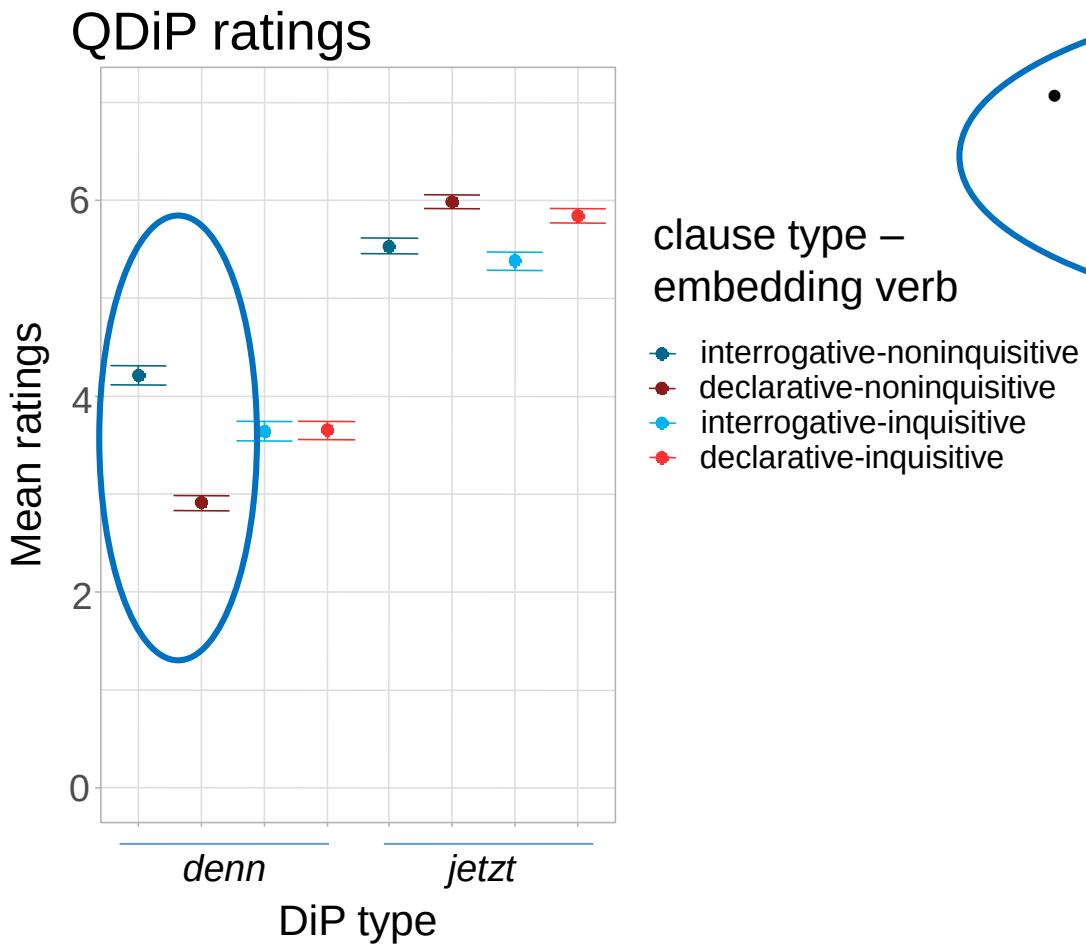
- What is the role of the embedding verb for *denn* licensing in embedded clauses?
- Can we see different influences of matrix clause type for *denn*-licensing, depending on the embedding verb?

→ 7-point scale, 40 participants; each list with 36 *denn* items, 36 *jetzt* items, 46 fillers.

Ratings

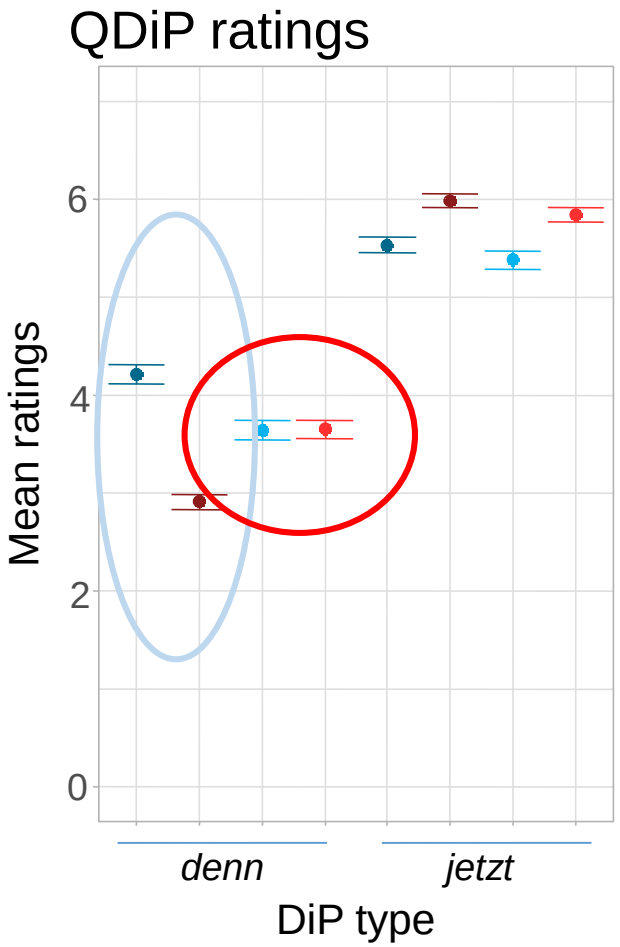
Condition	mean ratings
interrogative-regular-denn	4.21 (1.84)
declarative-regular-denn	2.91 (1.51)
interrogative-emotive-denn	3.64 (1.74)
declarative-emotive-denn	3.65 (1.70)
interrogative-regular-jetzt	5.53 (1.38)
declarative-regular-jetzt	5.98 (1.25)
interrogative-emotive-jetzt	5.38 (1.56)
declarative-emotive-jetzt	5.84 (1.30)

Ratings



- non-inquisitive-*denn*:
  higher ratings for interrogatives than declaratives ($p < .001$)

Ratings



- non-inquisitive-*denn*:
  higher ratings for interrogatives than declaratives ($p < .001$)
- inquisitive-*denn*:
  similar ratings for interrogatives and declaratives, differences n.s..

Interpretation ratings

With **non-inquisitive** embedding verbs, sentences are

- kind-of acceptable with interrogative matrix clauses
  *Wer hat **gesagt**, dass die Oma den Kuchen denn backen will?*

- unacceptable with declarative matrix clauses
  Peter hat **gesagt, dass die Oma den Kuchen denn backen will.*

→ When the matrix clause is interrogative, we can infer an inquisitive attitude of the speaker towards the content of the embedded clause; this allows semantic-pragmatic licensing.

→ When the matrix clause is declarative, we cannot infer an inquisitive attitude, so semantic-pragmatic licensing is out.

Interpretation ratings

With **inquisitive** embedding verbs, sentences are

- kind-of acceptable with interrogative matrix clauses
  *Wer war **erstaunt**, dass die Oma den Kuchen denn backen will?*

- kind-of acceptable with declarative matrix clauses
  *Peter war **erstaunt**, dass die Oma den Kuchen denn backen will.*

  → Here, we can infer an inquisitive attitude of the matrix subject thanks to the lexical semantics of the embedding verb, so the matrix clause type becomes irrelevant.

Background: EEG correlates of QDiP processing

Relative to the corresponding *jetzt* baseline,

straightforward licensing (in the same clause as *wh*-element):

*Wer hat den Kuchen **denn** gebacken?*

→ Mild increases in P600 amplitudes

clear licensing violations (declarative matrix clause, non-inquisitive):

Peter hat den Kuchen **denn gebacken.*

** Peter hat gesagt, dass die Oma den Kuchen **denn** backen soll*

→ Strong increase in P600 amplitude

semantic-pragmatic licensing (interrogative matrix, non-inquisitive embedding):

*Wer hat gesagt, dass die Oma den Kuchen **denn** backen soll?*

→ Mild increase in P600 amplitude
→ Shorter P600 duration than clear licensing violation

Czypionka et al. (2021), Czypionka et al. (2022), Kharaman et al. (2025)

Our EEG study

Stimuli: 36 quartets for each embedding verb type

ERP research questions:

- What are the processing correlates of different types of *denn* licensing in embedded clauses?
- How do matrix clause type and embedding verb type interact?

→ 44 participants, two sessions

Approach to EEG analysis

We analyse

- EEG curve on the QDiP or the baseline
- 25 electrode subset, 5 medial-lateral and 5 anterior-posterior positions
- difference curves between each *denn*-condition and the corresponding *jetzt*-condition.

*Wer hat gesagt, dass die Oma den Kuchen **denn** backen will?*
*Wer hat gesagt, dass die Oma den Kuchen **jetzt** backen will?*

Identify time windows with data-driven approach (Tomasello et al. 2020)

Analysis: (Matrix) CLAUSE TYPE * (Embedding) VERB TYPE * TOPOGRAPHY (2x2x5x5)

→ This gets rid of lexical difference effects,
and also of effects of clause type and embedding verb that are not relevant for QDiP processing.

We are mainly interested in CLAUSE TYPE : VERB TYPE interactions here.

Predictions ERP study

With **non-inquisitive** embedding verbs, we expect
- strong P600 enhancement for violations (=declarative matrix clause)
- mild P600 enhancement for semantic-pragmatic licensing (=interrogative matrix clause)

With **inquisitive** embedding verbs, we expect
- some amount of P600 enhancement relative to the baseline.
- no marked influence of matrix clause type in the P600 time window.

-- Always relative to a non-QDiP baseline!

Results EEG, overview

The data-driven approach identified seven time windows.

We are interested in
- the P600 time window
- interactions of VERB and CLAUSE TYPE

Time windows TW5, TW6 and TW7 are within the P600 time frame

→ Increased P600 for declarative vs. interrogative
→ TW6 and TW7: Only for non-inquisitive verbs!

Results EEG, *Spicker*

Five time windows

TW1 (148 – 175 ms): VERB

TW2 (202 – 228 ms): more positive-going for (P200) for declarative vs. interrogative

- in medial / medial-left regions (p<.05, p<.01) noninquisitive
- nothing in inquisitive

TW3 (304 – 322): → interaction VERB:CLAUSE TYPE doesn't survive resolution

TW4 (468 – 498): VERB and CLAUSE TYPE interact with topographical factors, but not with each other

TW5 (612 – 640 ms): CLAUSE TYPE : TOPOGRAPHICAL

Curves are more positive-going for declarative than for interrogative conditions → P600

CLAUSE TYPE significant in left-medial (p<.01), medial (p<.001), right-medial (p<.001).

Descriptively, stronger for noninquisitive than inquisitive.

TW6 (688–720 ms): CLAUSE TYPE:VERB:TOPOGRAPHICAL (F (4,168) = 2.97, p <.05, HF ε = .62).

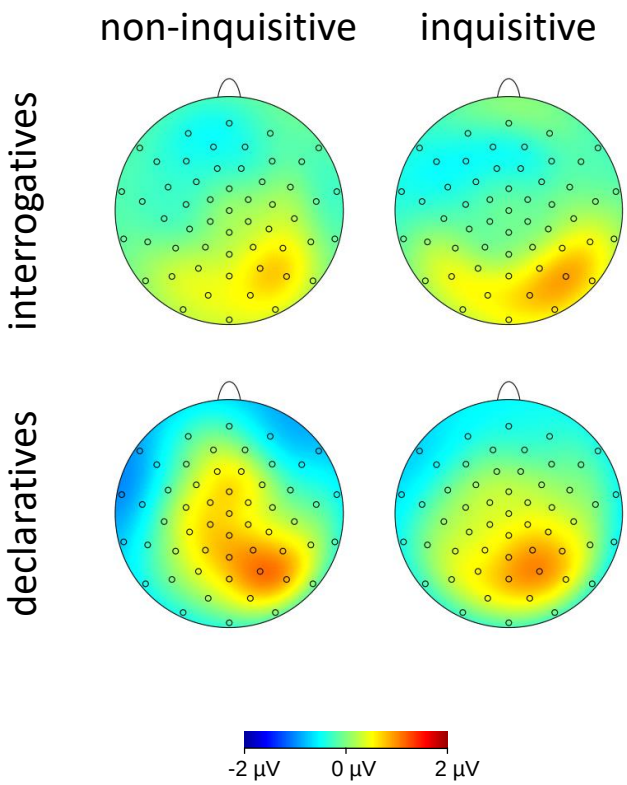
- noninquisitive: CLAUSE TYPE in medial (p<.01), medial-right (p<.001) → P600 for declarative vs. interrogative
- inquisitive: no effects of CLAUSE TYPE

TW7 (766–796 ms): VERB:CLAUSE TYPE: TOPOGRAPHICAL (F (16,672) = 2.07, p <.05, HF ε = .58).

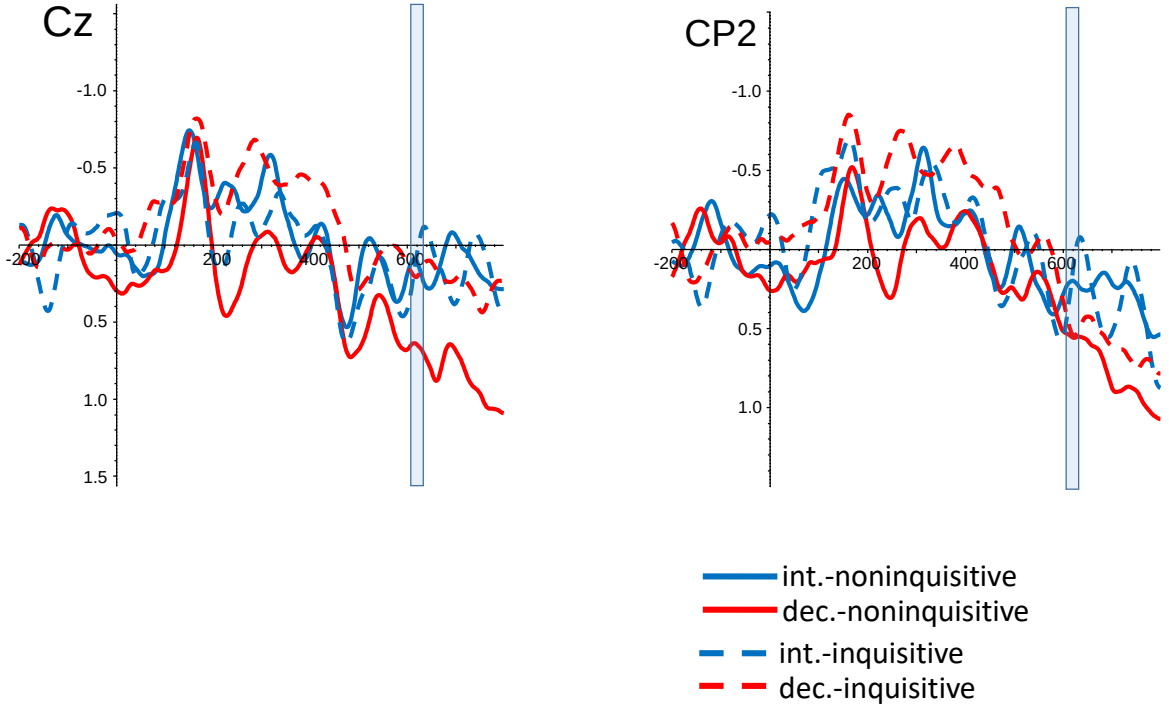
- noninquisitive: CLAUSE TYPE at posterior-central (p<.06) and anterior/anterior-central (p<.01).
  → P600 for declarative vs. interrogative
- inquisitive: no effects of CLAUSE TYPE

Results: early P600 time window (TW5, 612 - 640 ms)

Voltage difference maps



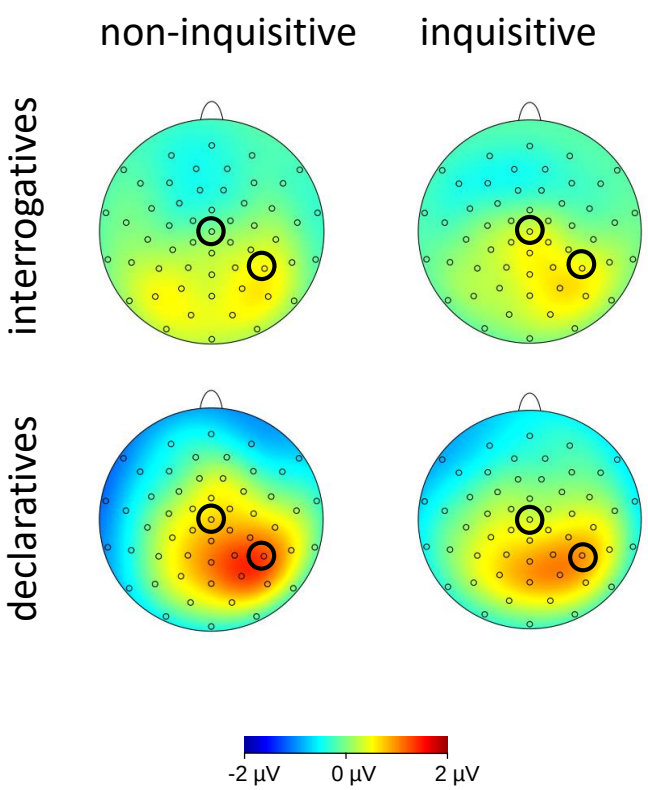
Selected EEG difference curves



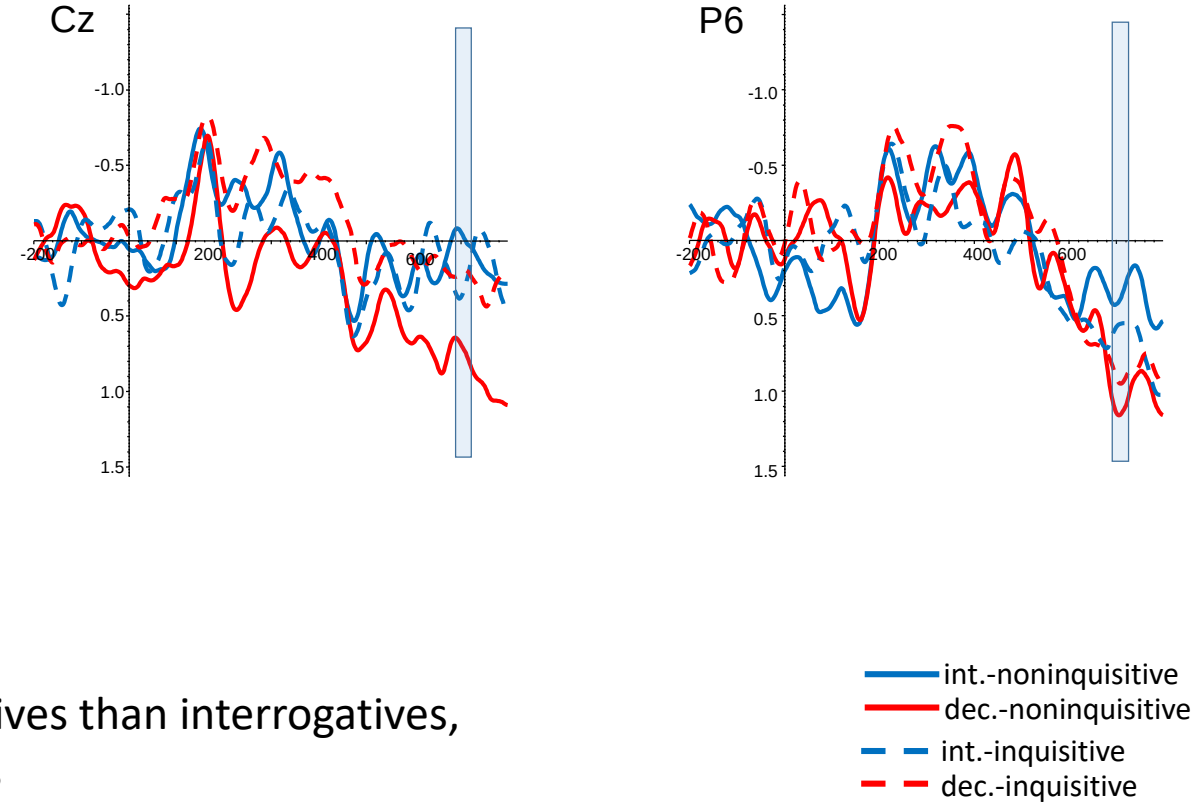
P600 increase *denn* vs. *jetzt*, stronger in declaratives than interrogatives, roughly same for both kinds of embedding verbs (at least in stats)

Results: late P600 time window (TW6, 688 - 720 ms)

Voltage difference maps



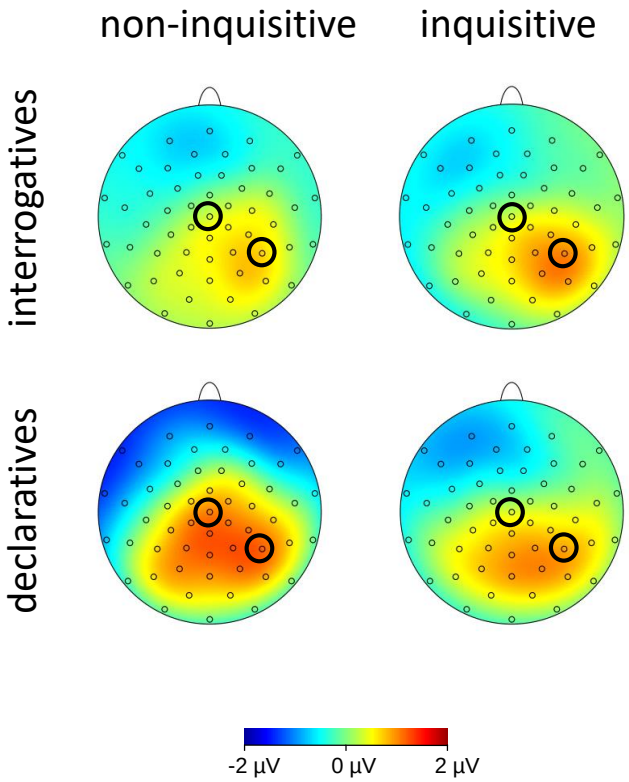
Selected EEG difference curves



P600 increase, stronger in declaratives than interrogatives,
- but only for non-inquisitive verbs

Results: later P600 time window (TW7, 766 - 796 ms)

Voltage difference maps



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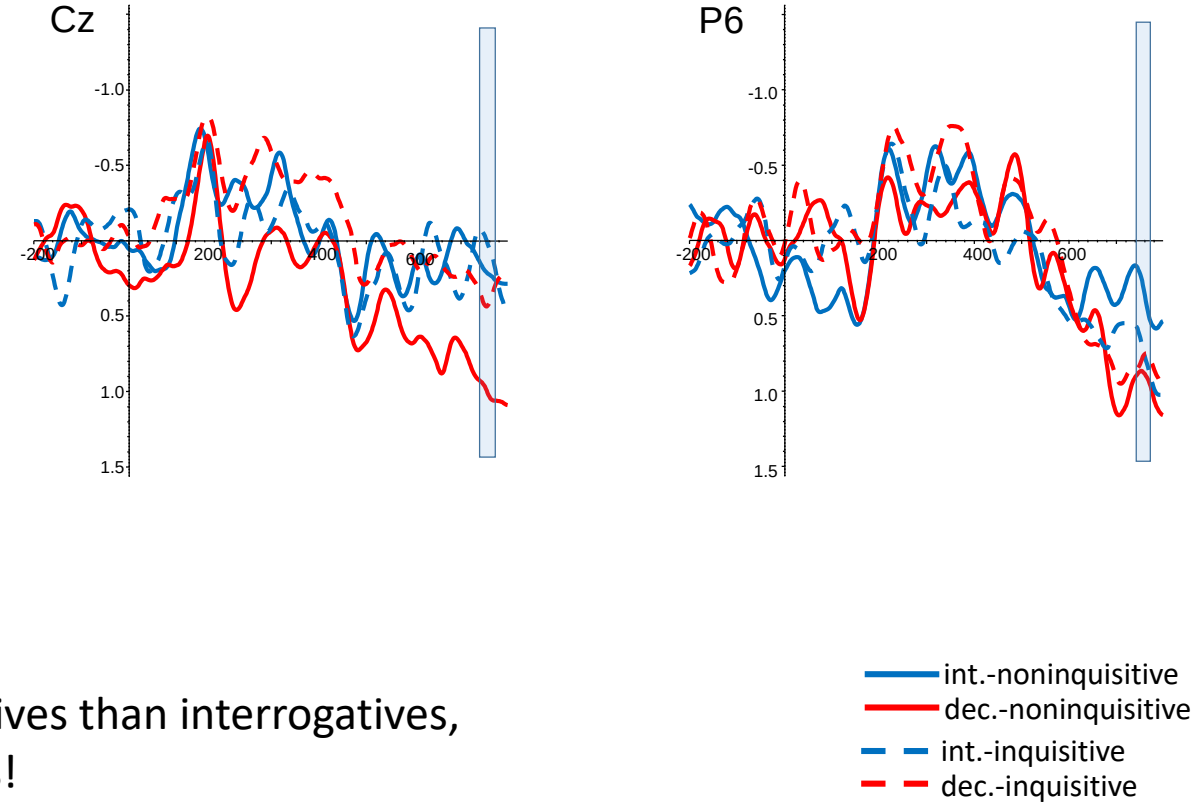

P600 increase, stronger in declaratives than interrogatives,
- but only for non-inquisitive verbs!

Summary EEG

non-inquisitive embedding verbs

- declarative: long-lasting P600 enhancement → licensing violation
- interrogative: shorter and weaker P600 enhacement → semantic-pragmatic licensing

This replicates earlier findings.

inquisitive embedding verbs

- P600 increases for denn vs. jetzt, but no difference of clause type for later P600

→ Semantic-pragmatic licensing is possible independently of the matrix clause type

Interpretation

Is the licensing condition of *denn* syntactic or semantic-pragmatic?

Syntactic approaches: *denn* is uniformly unlicensed in embedded declarative clauses without wh-chain.
→ Doesn't fit our data! *Denn* is licensed in embedded declarative clauses

- if the matrix clause is interrogative (for non-inquisitive verbs)
- OR if the embedding verb is inquisitive (then matrix clause type is irrelevant)

Semantic-pragmatic approach: Acceptability of *denn* in embedded declaratives varies, depending on how easily we can infer an inquisitive attitude of some anchor.
→ Fits our data! Denn is licensed in certain embedded declarative clauses

- non-inquisitive embedding verb: matrix interrogatives convey an inquisitive attitude of the speaker x, matrix declaratives don't → matrix clause type effect

- inquisitive embedding verb: x with an inquisitive attitude can be identified without the matrix clause type → no matrix clause type effect

Conclusion and outlook

Our results support the idea that the licensing conditions of *denn* are semantic-pragmatic, rather than purely syntactic in nature.

Syntax is still relevant – semantic-pragmatic conditions line up with certain syntactic structures encoding them.

Future directions:

- Details of timecourse for licensing under inquisitive embedding verbs.
- Pursue potential effects in early time windows, early semantic-pragmatic effects?

Thank you!

And

Anna Shapiro, Beatriz Longo Cesar da Paixão, Mary-Kate Murphy, Huimin Ye, Jette Galas,

Oleksiy Bobrov

Mariya Kharaman, Carsten Eulitz, Josef Bayer

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Appendix: Simons (2007) on main point status POSS 1

Certain (non-inquisitive) embedding verbs like *say* and *think* allow for a semantic parenthetical use, where the embedded declarative clause carries the main point of the utterance while the main clause has an evidential-like discourse function (Simons 2007).

- Simons (2007) investigates this semantic parenthetical use only in matrix declaratives:

  A: *Why didn‘t Sue come to the meeting yesterday?*
  B: *John said that she‘s out of town.*
  → Main point: ‘Sue is out of town‘ (=p)
  → Evidential function: ‚The evidence for Sue being out of town is John‘s report‘

- But a similar semantic parenthetical use may also be at work in matrix interrogatives:

  A: *Sue can‘t come to the meeting because she is out of town.*
  B: *Who says that she‘s out of town?*
  → Main point: ‘Is Sue out of town?‘
  → Evidential source: ‚The evidence for Sue being out of town is whose report?

Appendix: Speaker's inquisitive attitude from discourse moves
POSS 2

- In reacting to an assertion *[p.]*, a speaker S has several options (Bledin & Rawlins 2019, Penka & Romero 2025): (i) to accept *p*, as in (xx.a); to reject *p*, as in (xx.b); and to resist *p*: (xx.c).

(xx) H: *Alfonso bought a new Ferrari.*
a. S: *Yes.* → S commits to p
b. S: *No.* → S commits to ¬p
c. S: *(How do you know?/Really?) Did you see it?* → S considers the issue {p, ¬p} unsettled.

- Our data A from above can be intuitively analysed as a resistance move:

(yy) H: *Sue can't come to the meeting because she is out of town.*
S: *Who says that she is DENN out of town?*
→ S considers the issue {p, ¬p} unsettled.
That is, S signals that S (still) has an inquisitive attitude towards the question meaning {p, ¬p} .