

Investigating Word Order and Givenness Effects as Part of Expected- first Strategies in Information Structure

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Word Order in German

Canonical Subject-before-Object	“Ein Pilot_{SUBJ} hat einen Bäcker_{OBJ} gestern angesprochen.” (A pilot_{SUBJ} has a baker_{OBJ} yesterday spoken to.)
Non-canonical Object-before Subject	“Einen Bäcker_{OBJ} hat ein Pilot_{SUBJ} gestern angesprochen.” (A baker_{OBJ} has a pilot_{SUBJ} yesterday spoken to.)

→ Non-canonical structures increase processing cost relative to their canonical counterparts (e.g., Bornkessel, Schlesewsky, & Friederici, 2002)

Information Structure

Context

Ein Pilot ging auf ein Konzert.

A pilot went to a concert.

Canonical
Subject-before-Object

“Der Pilot_{SUBJ} hat einen Bäcker_{OBJ} dort angesprochen.”

(The pilot_{SUBJ} has a baker_{OBJ} there spoken to.)

Non-canonical
Object-before Subject

“Einen Bäcker_{OBJ} hat der Pilot_{SUBJ} dort angesprochen.”

(A baker_{OBJ} has the pilot_{SUBJ} there spoken to.)

Information Structure

Context

Ein Pilot ging auf ein Konzert.

A pilot went to a concert.

Given-before-New

“Der Pilot_{SUBJ} hat einen Bäcker_{OBJ} dort angesprochen.”

(The pilot_{SUBJ} has a baker_{OBJ} there spoken to.)

New-before-Given

“Einen Bäcker_{OBJ} hat der Pilot_{SUBJ} dort angesprochen.”

(A baker_{OBJ} has the pilot_{SUBJ} there spoken to.)

→ Information structural constraints impact linearization preferences

- Given-before-new principle (e.g., Krifka & Musan, 2012; Arnold et al., 2013; Primus, 2017)

Information Structure

Context

Ein **Bäcker** ging auf ein Konzert.

A **baker** went to a concert.

Subject-before-Object

New-before-**Given**

“Ein **Pilot**_{SUBJ} hat den **Bäcker**_{OBJ} dort angesprochen.”

(A **pilot**_{SUBJ} has the **baker**_{OBJ} there spoken to.)

Object-before Subject

Given-before-**New**

“Den **Bäcker**_{OBJ} hat ein **Pilot**_{SUBJ} dort angesprochen.”

(The **baker**_{OBJ} has a **pilot**_{SUBJ} there spoken to.)

→ Some studies suggest that the cost for object-first structures is mitigated when the object is given (e.g. Bader & Portele, 2021; Kaiser & Trueswell, 2004; Yano & Koizumi, 2018)

Information Structure

Context

Ein **Bäcker** ging auf ein Konzert.

A **baker** went to a **concert**.

Implied-before-Given

“Der **Musiker**_{SUBJ} hat den **Bäcker**_{OBJ} dort angesprochen.”

(The **musician**_{SUBJ} has the **baker**_{OBJ} there spoken to.)

Given-before-Implied

“Den **Bäcker**_{OBJ} hat der **Musiker**_{SUBJ} dort angesprochen.”

(The **baker**_{OBJ} has the **musician**_{SUBJ} there spoken to.)

→ Unmentioned information may, however, be contextually implied (e.g., Burkhardt, 2006; Kaiser & Trueswell, 2004) rather than entirely new (e.g., Burkhardt, 2006; Yano & Koizumi, 2018)

Research questions

1. Are the effects of Givenness on the processing of non-canonical word orders of additive or licensing nature?
2. What is the status of implied information?
 - How does it relate to given and new information?

Predictions

- Interplay of Word Order and Givenness
 - Additive: $\text{SOV-Given-first} < \text{SOV-New-first} = \text{OSV-Given-first} < \text{OSV-New-first}$
 $\text{SOV-Implied-first?} \qquad \qquad \qquad \text{OSV-Implied-first?}$
 - Licensing: $\text{SOV-Given-first} \leq \text{SOV-New-first} \leq \text{OSV-Given-first} \ll \text{OSV-New-first}$
- Information status of **Implied** constituents
 - **Given** \leq **Implied** \leq **New**

Self-Paced Reading Experiments Overview

EXP 1

Given
New

EXP 2

Given
Implied

EXP 3

Implied
New

EXP 4

Given / Implied / New

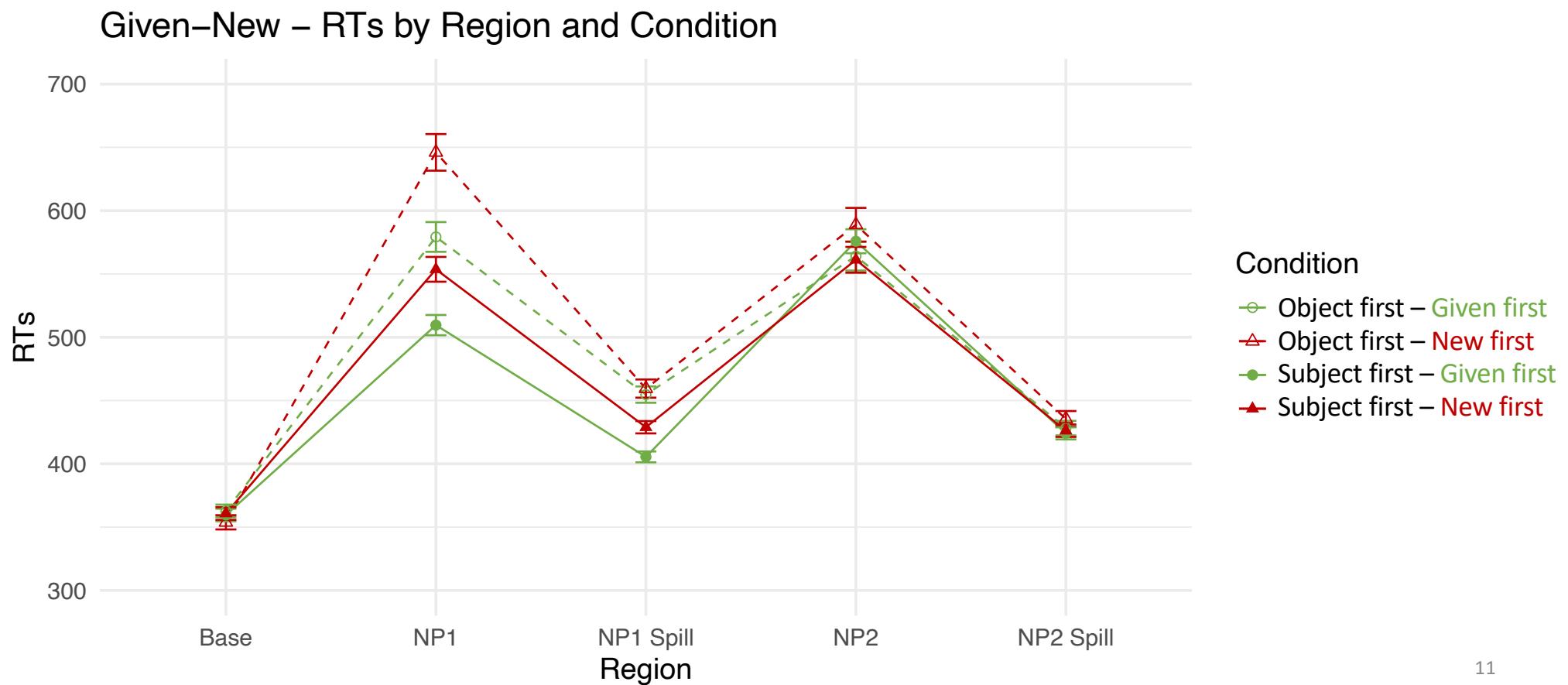
Experiment 1 – Given - New

Ein **Bäcker** ging auf ein **Konzert**.

(A *baker* went to a *concert*.)

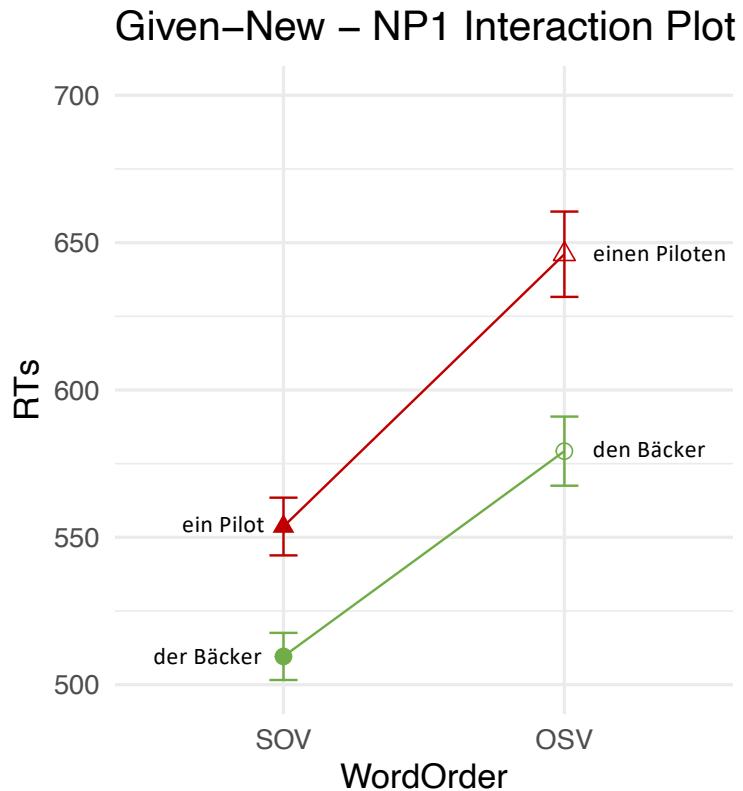
	NP1	Status	NP2	Status	
SOV Ich habe gesehen, dass (<i>I saw that</i>)	der Bäcker	GIVEN SUBJ	dort (<i>there</i>) gestern angesprochen hat. (<i>yesterday has talked to.</i>)	einen Piloten	NEW OBJ
	ein Pilot	NEW SUBJ		den Bäcker	GIVEN OBJ
	den Bäcker	GIVEN OBJ		ein Pilot	NEW SUBJ
	einen Piloten	NEW OBJ		der Bäcker	GIVEN SUBJ

Experiment 1 – Given - New



Experiment 1 - NP1

Context: Ein **Bäcker** ging auf ein **Konzert**. ...
(A *baker* went to a *concert*. ...)



Contrast	Estimate	t - Value	Sig.
Word Order	45.82	3.59	*
Givenness	39.92	3.81	*
Interaction	2.40	0.15	-

- Main effects for both Word Order and Givenness
 - SOV < OSV
 - Given < New
- Effects are of additive nature

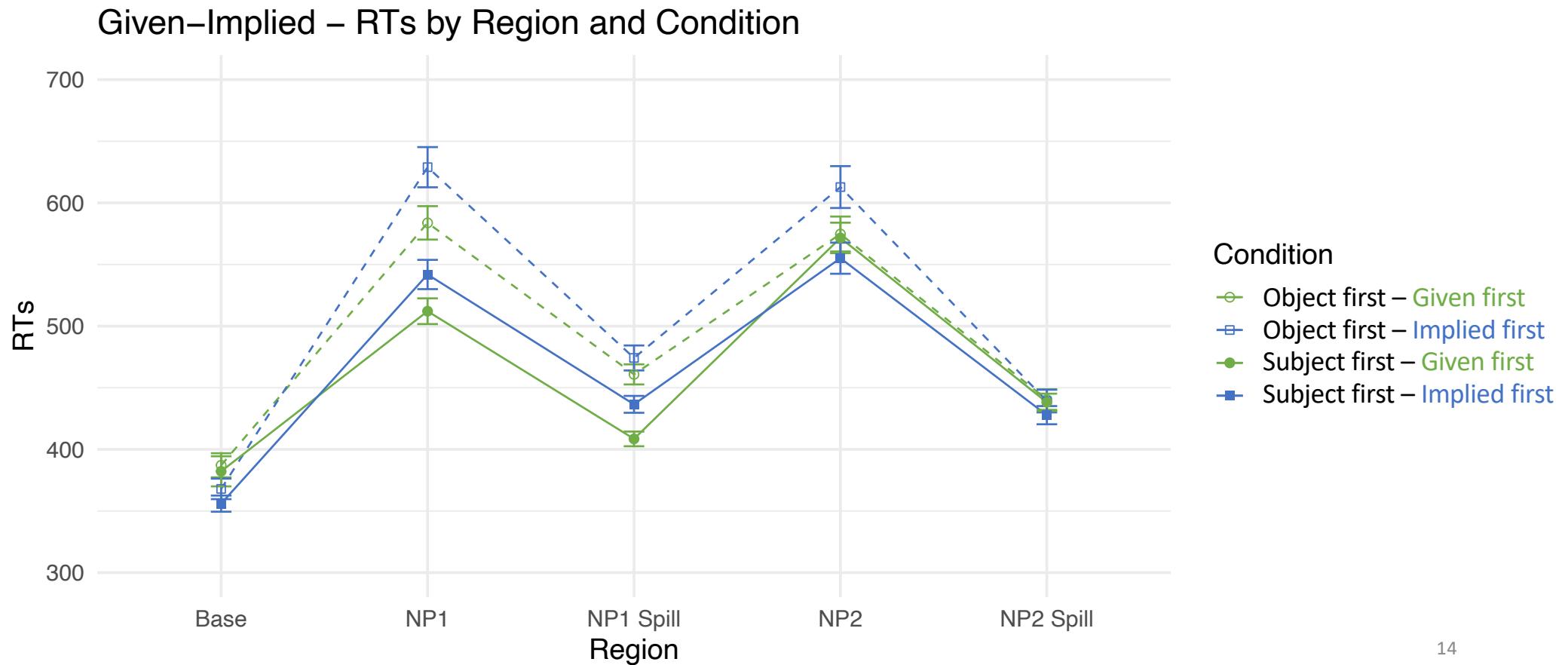
Experiment 2 – Given - Implied

Ein **Bäcker** ging auf ein **Konzert**.

(A *baker* went to a *concert*.)

	NP1	Status	NP2	Status	
SOV Ich habe gesehen, dass (<i>I saw that</i>)	der Bäcker	GIVEN SUBJ	dort (<i>there</i>) gestern angesprochen hat. (<i>yesterday has talked to.</i>)	einen Musiker	IMPLIED OBJ
	ein Musiker	IMPLIED SUBJ		den Bäcker	GIVEN OBJ
	den Bäcker	GIVEN OBJ		ein Musiker	IMPLIED SUBJ
	einen Musiker	IMPLIED OBJ		der Bäcker	GIVEN SUBJ

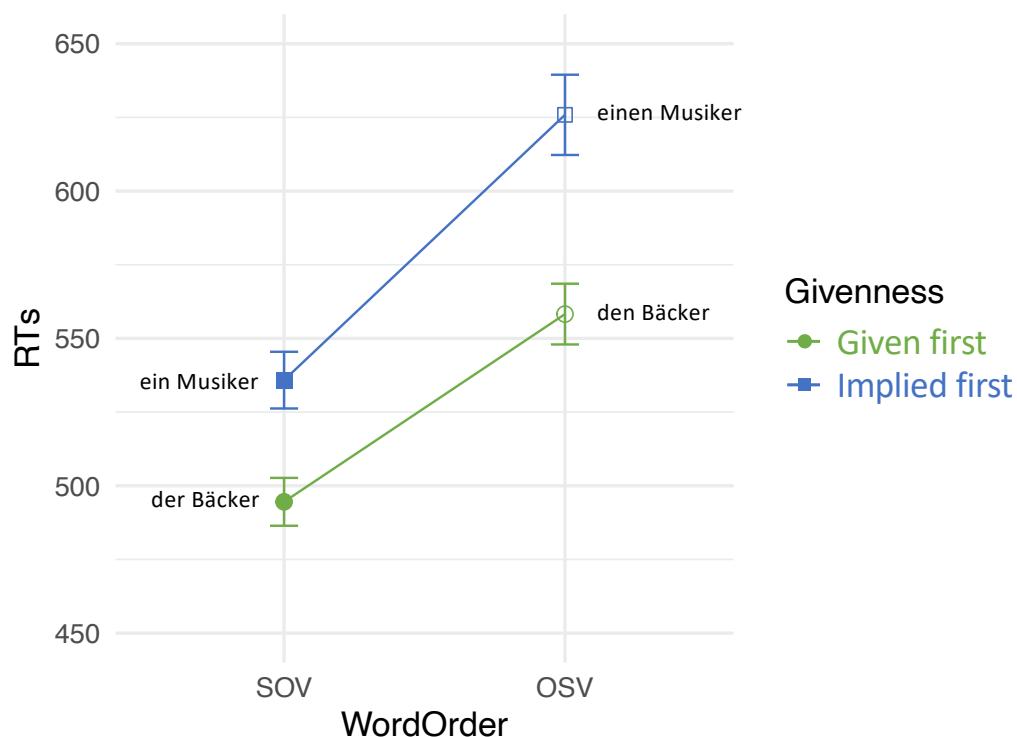
Experiment 2 – Given - Implied



Experiment 2 - NP1

Context: Ein **Bäcker** ging auf ein **Konzert**. ...
(A *baker* went to a *concert*. ...)

Given–Implied – NP1 Interaction Plot



Contrast	Estimate	t - Value	Sig.
Word Order	41.07	4.35	*
Givenness	26.90	3.31	*
Interaction	0.75	0.06	-

- Main effects for both Word Order and Givenness
 - SOV < OSV
 - Given < Implied
- Effects are of additive nature
- Similar effects of Implied as compared to previous New condition

Experiment 3 – Implied - New

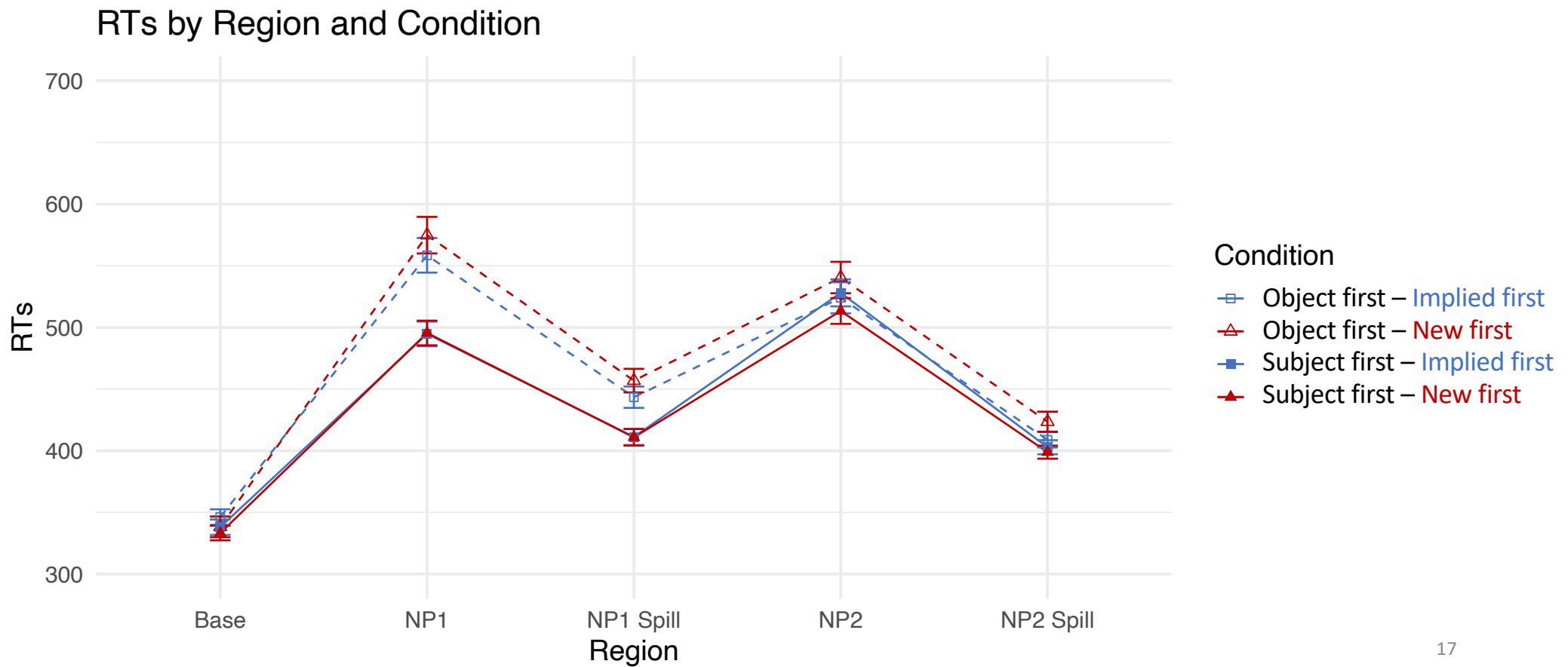
Ein **Bäcker** ging auf ein **Konzert**.

(A *baker* went to a *concert*.)

	NP1	Status		NP2	Status
SOV Ich habe gesehen, dass (<i>I saw that</i>)	ein Musiker	IMPLIED SUBJ	dort (<i>there</i>)	einen Piloten	NEW OBJ
	ein Pilot	NEW SUBJ		einen Musiker	IMPLIED OBJ
	einen Musiker	IMPLIED OBJ		ein Pilot	NEW SUBJ
	einen Piloten	NEW OBJ		ein Musiker	IMPLIED SUBJ

gestern angesprochen hat.
(yesterday has talked to.)

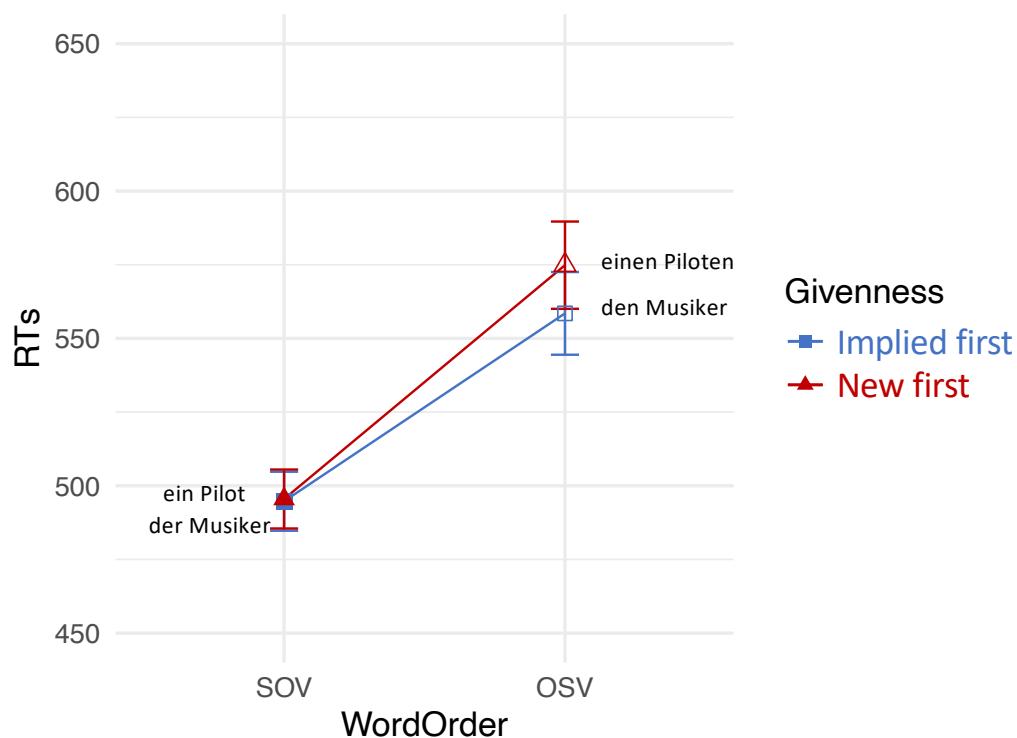
Experiment 3 – Implied - New



Experiment 3 - NP1

Context: Ein **Bäcker** ging auf ein **Konzert**. ...
(A *baker* went to a *concert*. ...)

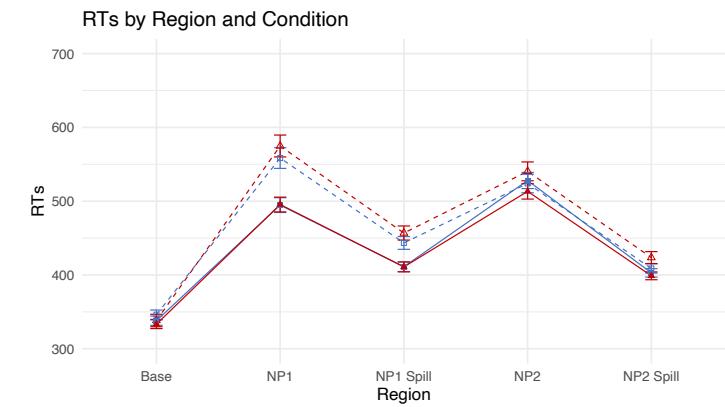
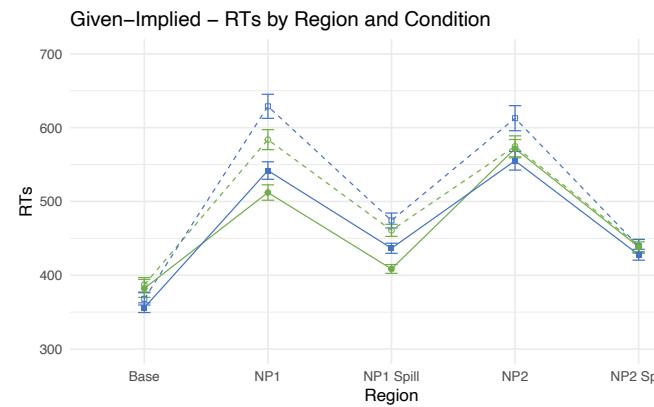
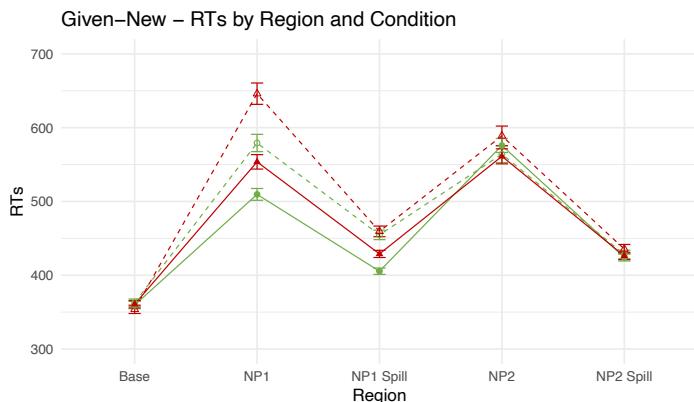
Implied–New – NP1 Interaction Plot



Contrast	Estimate	t - Value	Sig.
Word Order	33.92	2.70	*
Givenness	-10.31	-0.91	-
Interaction	-34.43	-1.59	-

- Main effects only for Word Order
 - SOV < OSV
 - Implied = New
- No difference between **New** and **Implied** suggest similar information status

Spill-over effects



- Effects on NP1 Spill-over and NP2 consistent with NP1
- Becoming smaller as compared to effects on NP1
→ Potential spill-over effects from NP1

Linearization of multiple referring expressions

- Can the *given-before-new* principle of information structure and word order preferences be reduced to an *expected-first* strategy?

	Word Order Preferences		Given-before-New Principle		Expected-first Strategy	
	NP1	NP2	NP1	NP2	NP1	NP2
Word Order Expectations	Subject	Object	–	–	Subject	
Information Status Expectations	–	–	Given	New	Given	

Experiment 4 – Given - Implied - New

Context: Ein **Bäcker** ging auf ein **Konzert**.
 (A *baker* went to a *concert*.)

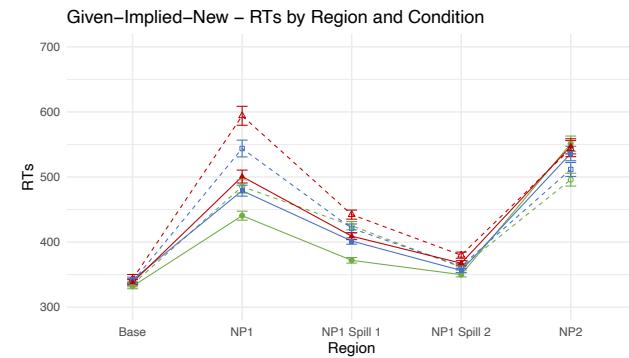
Ich habe gesehen, dass ...
 (I saw that ...)

NP1	Status
der Bäcker	GIVEN SUBJ
der Musiker	IMPLIED SUBJ
ein Pilot	NEW SUBJ

dort gestern ...
 (there yesterday ...)

NP1	Status
den Bäcker	GIVEN OBJ
den Musiker	IMPLIED OBJ
einen Piloten	NEW OBJ

OSV

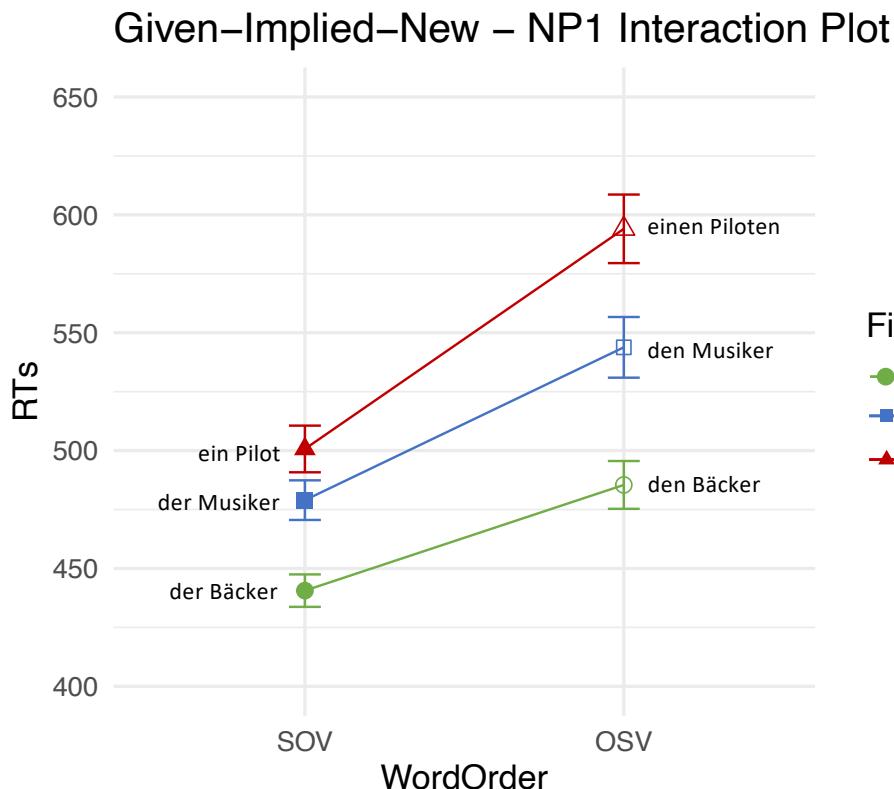


Condition

- Object first - Given first
- Object first - Implied first
- Object first - New first
- Subject first - Given first
- Subject first - Implied first
- Subject first - New first

Experiment 4 – NP1

Context: Ein **Bäcker** ging auf ein **Konzert**. ...
(A *baker* went to a *concert*. ...)



Contrast	Estimate	t - Value	Sig.
Word Order	38.34	4.72	*
Given vs. Impl/New	49.77	5.95	*
Implied vs. New	18.73	2.07	*

- Main effects for Word Order and all Givenness comparisons
 - Difference between Implied and New
 - Intermediate difficulty of implied information
 - Different from Experiment 3 “Implied-New”
- Possibly due to “oddly” unused Given status
→ Possibly due to direct contrast with entirely New and contextually given information

Experiment 4 – NP2

Context: Ein **Bäcker** ging auf ein **Konzert**.
(A *baker* went to a *concert*.)



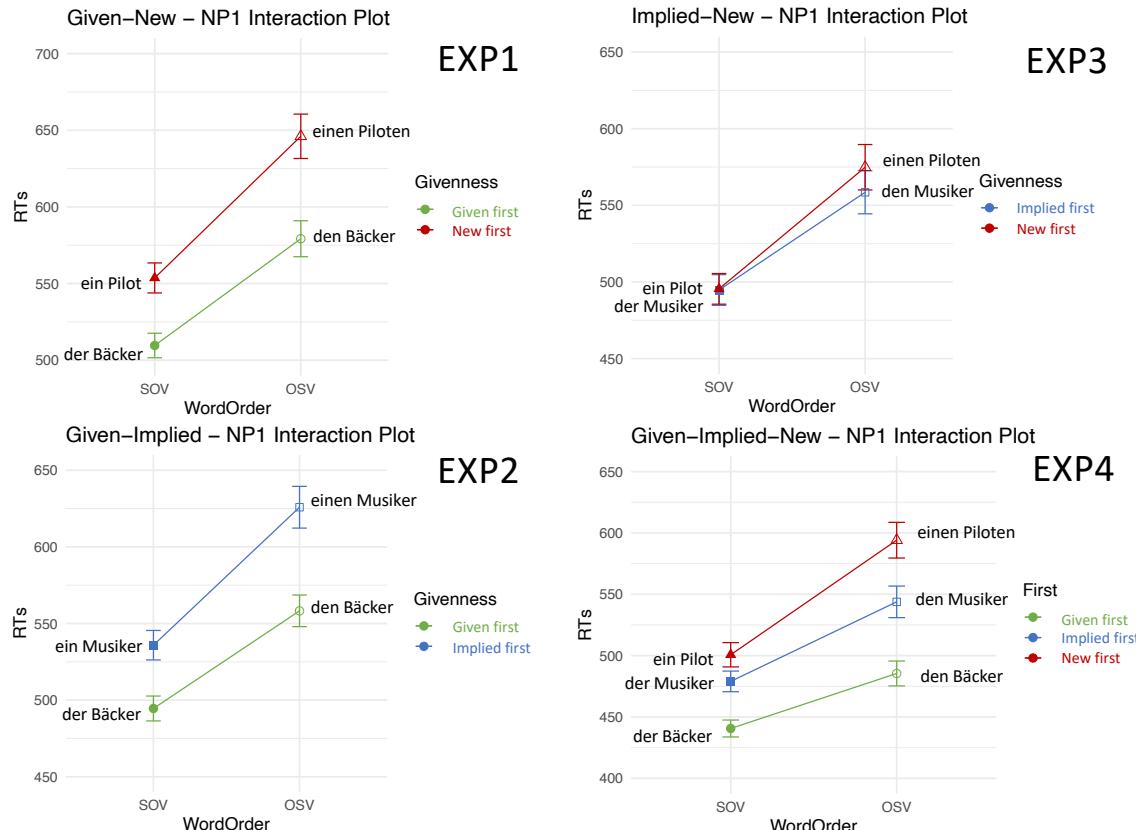
Contrast	Estimate	t - Value	Sig.
Word Order	-5.35	-0.67	-
Given vs. Impl/New	-11.27	-1.49	-
Implied vs. New	1.49	0.16	-

- Only considers current Information Status (unrelated to status of NP1)
- No effects of any factor
- Additional spill-over region between NP1 and NP2
 - Supports previous assumption of spill-over effect
 - In line with expected-first strategy

Summary

Context: A baker went to a concert. ...

(Ein Bäcker ging auf ein Konzert. ...)



- 4 experiments investigating the interplay of Word Order preferences and Givenss
- Experiments 1–3
 - Pairwise comparisons
 - Additive effects
 - SOV < OSV
 - Given < Implied = New
- Experiment 4
 - Fully crossed design
 - Additive effects
 - SOV < OSV
 - Given < Implied < New
- No significant interactions in any experiment

Conclusions

- Interplay of Word Order and Information Status
 - Additive: SOV-Given-first < SOV-New-first = OSV-Given-first < OSV-New-first 
 - Licensing: SOV-Given-first <= SOV-New-first = OSV-Given-first << OSV-New-first 

→ Givenness alone does not entirely license non-canonical word orders
- Implied Status 
 - Given <? Implied <? New \rightarrow Given < Implied </= New

→ Implied information is less available/expected than Given information
- Evidence for expected-first strategy
 - With increased distance to NP1 effects on NP2 entirely disappear
 - Effects on NP2 are driven by expectations on NP1

Thank you



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Definite vs. Indefinite

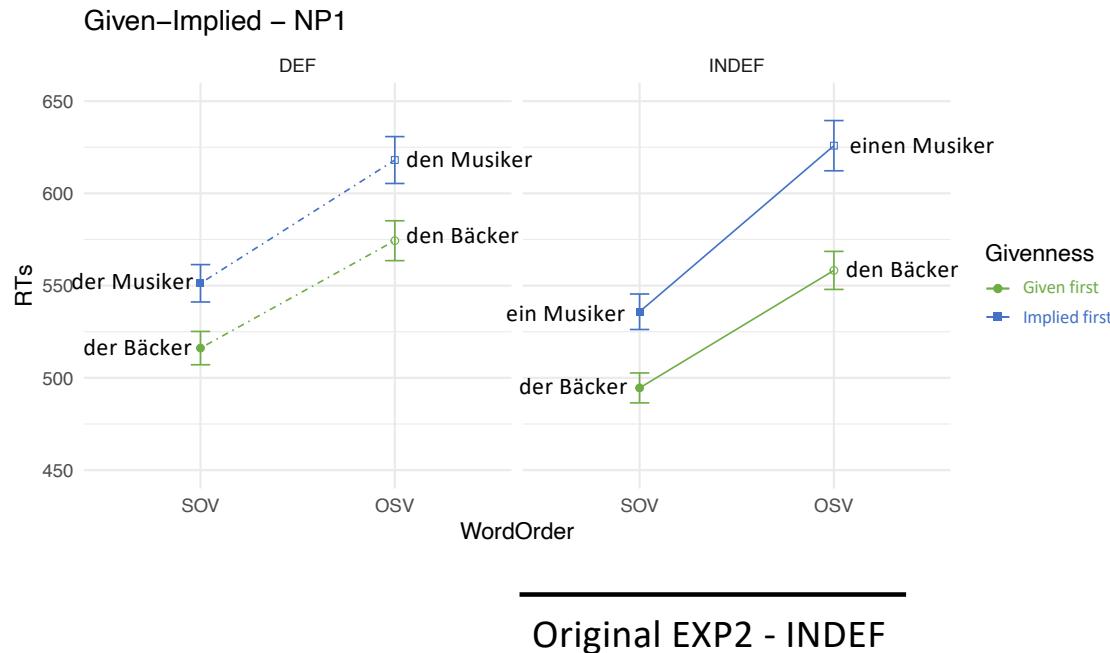
- Contrast of Conditions via Articles

Experiment	Definite Article	Indefinite Article
Given - New	Given	New
Given - Implied	Given	Implied
Implied - New	Implied	New

- Potential differences between definite and indefinite article realizations of **Implied** information

Experiment 2b - NP1 – Definite vs. Indefinite

Context: Ein **Bäcker** ging auf ein **Konzert**.
 (A *baker* went to a *concert*.)

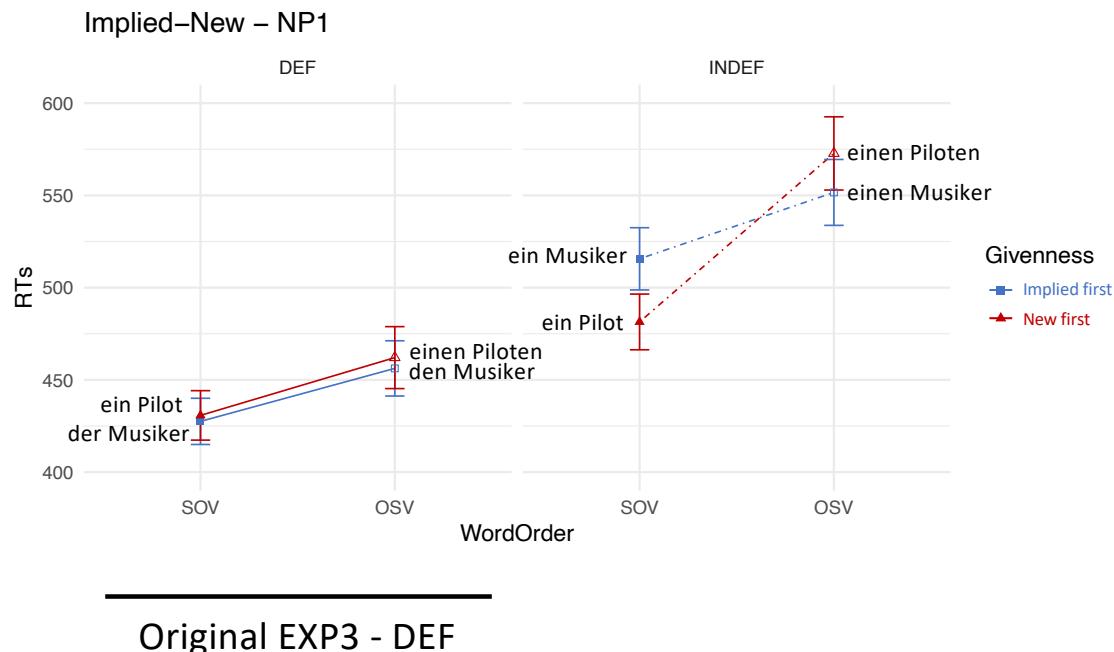


Contrast	Estimate	t - Value	Sig.
Word Order	50.17	6.67	*
Givenness	38.80	4.79	*
Experiment	-10.19	-0.25	-

- Word Order and Givenness effects across both experiments
- No difference between experiments
- Numerically larger difference between INDEF Implied and Given than DEF Implied and Given

Experiment 3b - NP1 – Definite vs. Indefinite

Context: Ein **Bäcker** ging auf ein **Konzert**.
 (A *baker* went to a *concert*.)



Contrast	Estimate	t - Value	Sig.
Word Order	28.43	2.94	*
Givenness	-4.43	-0.47	-
Experiment	93. 26	1.42	-
wo:gi:ex	93.65	3.06	*

- 3-way Interaction suggests an Interaction of Givenness and Word Order only for Indefinite article implied realization
- However, unexpected direction
→ Potential ambiguity resolution of indefinite realization