



# Verb Aspect and Causality in Situation Models

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# Outline

- 1 Introduction
- 2 Verb Aspect experiments (1 and 2)
- 3 Verb Aspect and Causality experiments (3 and 4)
- 4 General discussion: conclusions and further developments



## Situation Models in Language Comprehension

- *situation models*: “mental representations of events” ( Van Dijk & Kintch, 1983; Zwaan & Radwansky, 1998)
- models incrementally updated with information:
  - **temporal** (e.g. Aspect)
  - spatial
  - **causal** (e.g. Causality of Agents)
  - motivational
  - object-oriented (Johnson-Laird, 1986; Zwaan et al. 1995)



## Verb Aspect

Croft (in press): theoretical basis on Aspect

- Grammatical

### Examples

Maria **was finishing** her homework when the door bell rang.

Maria **finished** her homework when the door bell rang.

- Lexical

### Examples

Jan bagged the bananas **in** an hour.

Jan bagged the bananas **for** an hour.

John died **in** an hour

\*John died **for** an hour



## Aspect in German isn't quite the same

### English

- was giving: imperfective
- gave: perfective

### German

no distinction of forms

So, we need to use **lexically realized aspect**.

- *Während*: imperfective
- *Als*: perfective



## Previous research on Verb Aspect

- 1 Madden & Zwaan, 2003
  - participants had to connect linguistic input to the relevant picture
  - stronger effect of completed over ongoing events
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### 1 Madden & Zwaan, 2003

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### 2 Ferretti et al., 2009

- offline and online task
- Verb Aspect does play a role in the construction of Situation Models



## Ferretti et al., 2009

- Offline

**Perfective:** John<sub>source</sub> handed a book to Mary<sub>goal</sub>. .....

**Imperfective:** John<sub>source</sub> was handing a book to Mary<sub>goal</sub>. .....

- Online (ERP)

Sue<sub>source</sub> was handing a timecard to Fred<sub>goal</sub>. She asked about the upcoming meeting.

Sue<sub>source</sub> handed a timecard to Fred<sub>goal</sub>. She asked about the upcoming meeting.

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# Causality

## 1 Causally-linked events

- It was hot inside, **so** John opened the window.
- Hannah was late **because** her car broke down.

## 2 Implicit Causality

- John **frightened** Mary because he...
- John **feared** Mary because she...

## 3 Causal Agents

- Tristan **broke** the window.
- Sarah **pulled** Jessica from the road.



## Theoretical framework

### Dowty (1991)

Agent proto-properties:

- **Volitional involvement** in the event or
- **Sentience** (and/or perception)
- **Causing an event or change of state** to another participant
- **Movement** (relative to another participant)
- **Exists independently** of the event named by the verb



## Causality research

**Causal Agents** - need a verb which can “enable” the Agent (subject) to cause the movement of the second participant

### Example

“Als Benjamin Lisa am Fenster **hochhob**, wollte ...”



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- **Previous** experimental research
  - ① **Causal links** between sentences: Kuperberg et al. (2010)
  - ② **Implicit Causality**: McDonald & MacWhinney (1995), Garnham et al. (1996), Ferstl et al. (2003), Koornneef & Van Berkum (2006), Pyykkönen & Järvikivi (2010)
  - ③ **Argument realization**: Kako (2006), Pyykkönen (2009), Pyykkönen et al. (2010)



## What is our contribution?

- Use German - towards **cross-linguistic** evidence of language comprehension
- Aspect experiments: establish a link to Ferretti et al. (2009), baseline of **aspect processing** in German
- Aspect and Causality experiments: study the **interaction** of the two factors in the construction of situation models



## Aspect experiments



## Experiment 1 - Material

- TOP (Transfer Of Possession) verbs

Während	Jan	Franziska	einen	Ball	gab,	wollte ...
While	Jan	Franziska	a	ball	give <i>PAST</i>	wanted
While	Jan	was giving	Franziska	a ball	...	wanted
Als	Jan	<b>Franziska</b>	einen	Ball	gab,	wollte ...
When	Jan	Franziska	a	ball	give <i>PAST</i>	wanted
When	Jan	gave	Franziska	a ball	...	wanted



## Hypotheses

- **imperfective** aspect (*Während*) - ongoing process
  - boosted activation of the **Source** (performer of the transfer, NP1)
  - more **NP1 completions** expected than in the perfective condition



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- **perfective** aspect (*A/s*) - event completed
  - boosted activation of the **Goal** (endpoint of the transfer, NP2)
  - more **NP2 completions** expected than in the imperfective condition

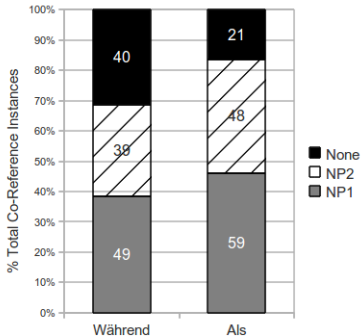


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- **perfective** aspect (*A/s*) - event completed
  - boosted activation of the **Goal** (endpoint of the transfer, NP2)
  - more **NP2 completions** expected than in the imperfective condition
- NP1 completions are structurally preferred
  - subject position
  - first mentioned effect
  - linguistic topic



## Results



TOP Co-Reference Frequency

## Experiment 2 - Material

### Als - perfective aspect

Als Jan Franziska einen Ball gab,

When Jan Franziska a ball give *PAST*

When Jan gave Franziska a ball

wollte er/sie ein süßes Getränk genießen.

wanted he/she a sweet drink enjoy *INF*

he/she wanted to enjoy a sweet drink.

- Counterbalanced male and female NPs

## Material

### Während - **imperfective** aspect

Während	Jan	Franziska	einen	Ball	gab,
While	Jan	Franziska	a	ball	give <i>PAST</i>
While	Jan	was giving	Franziska	a ball	
wollte	er/sie	ein	süßes	Getränk	genießen.
wanted	he/she	a	sweet	drink	enjoy <i>INF</i>
	he/she	wanted to	enjoy	a sweet	drink.

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## Hypotheses

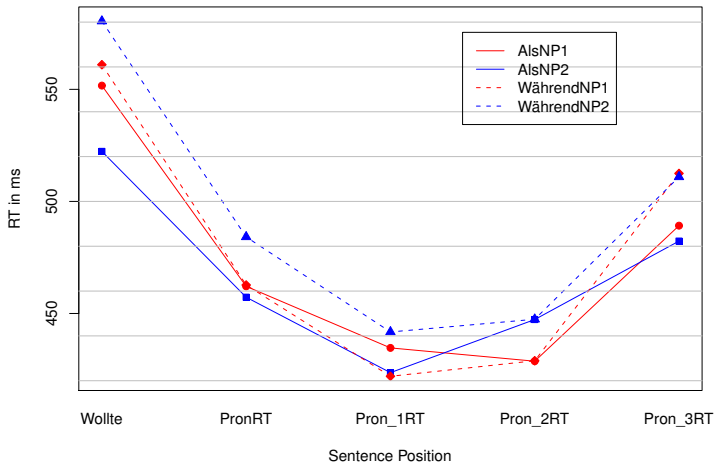
**Congruent** cases elicit faster reading times (RTs) compared to the incongruent ones:

- Faster RTs for NP1 than NP2 back reference in the imperfective condition (*Während*)
- Faster RTs for NP2 than NP1 back reference in the perfective condition (*Als*)



# Results

## TOP-Verbs





## Up to now

connection to previous findings

- Aspectual information affects the foregrounding of one of the participants:
  - imperfective case: confusion (many *None* continuations), more NP1 than NP2 continuations
  - perfective case: clearer (*None* continuations almost eliminated), stronger representation of situation
- Results congruent with Madden & Zwaan (2003)
- Different patterns than those seen in Ferretti et al. (2009)
- Aspect realization in German (Eisenberg, 1985; Huddleston, 2002)



## Aspect and Causality experiments



## Experiment 3

**Main question:** How does Causality (in the sense of causal agents) **interact** with Aspect?

**Realized** in Causal Agents

**Verbs** of Causal Movement (e.g. bring, guide, push, pull)



## Completion material

Als	<u>Stefan</u>	Caroline	nach	Hause	brachte,	wollte ...
When	Stefan	Caroline		home	bring <i>PAST</i>	wanted
When	Stefan	brought	Caroline	home	...	wanted
Während	<u>Stefan</u>	Caroline	nach	Hause	brachte,	wollte ...
While	Stefan	Caroline		home	bring <i>PAST</i>	wanted
While	Stefan	was bringing	Caroline	home	...	wanted



# Aspect and Causality Hypotheses

## Biases

- Aspect:
  - perfective (*Als*) → NP2
  - imperfective (*Während*) → NP1
- Causality: focus to the causal agent → NP1



## Aspect and Causality Hypotheses

### Biases

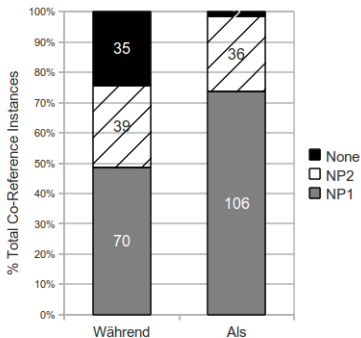
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  - perfective (*Als*) → NP2
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### Hypotheses

- causality **strengthens the NP1 preference** when combined with imperfective aspect - **more NP1 completions** in this condition.
- perfective aspect and causality are two **competing cues** - the number of completions following causality or aspect bias would show which of the factors has a stronger effect.



## Completion Results



## Causal Co-Reference Frequencies



## Experiment 4 - Material

### perfective case

Als	<u>Stefan</u>	<b>Caroline</b>	nach	Hause	brachte,
When	Stefan	Caroline		home	bring <i>PAST</i>
When	Stefan	brought	Caroline	home	
wollte	er/sie	ein	großes	Bild	malen
wanted	he/she	a	big	picture	paint <i>INF</i>
	he/she	wanted to	paint	a big	picture.

- Counterbalanced male and female NPs



# Material

## imperfective case

Während	<u>Stefan</u>	Caroline	nach	Hause	brachte,
While	Stefan	Caroline		home	bring <i>PAST</i>
While	Stefan	brought	Caroline	home	
wollte	er/sie	ein	großes	Bild	malen
wanted	he/she	a	big	picture	paint <i>INF</i>
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## Main question

Which effect manifests itself **first** in the RTs?

**Note:** in general more completions in the offline study

→ faster response times (RTs) in the online one



# Hypotheses

- 1 Early effect of Aspect:
  - target word (pronoun): effects observed in Exp. 1 should be manifested in the RTs
  - later testing point, when causality kicks in: RTs pattern equivalent to Exp. 3 results



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- 2 Early effect of Causality:
  - target word (pronoun): the RTs would favor the Causal Agent (NP1)
  - later testing point, when aspect manifests itself: RTs should picture the effects found in Exp. 3



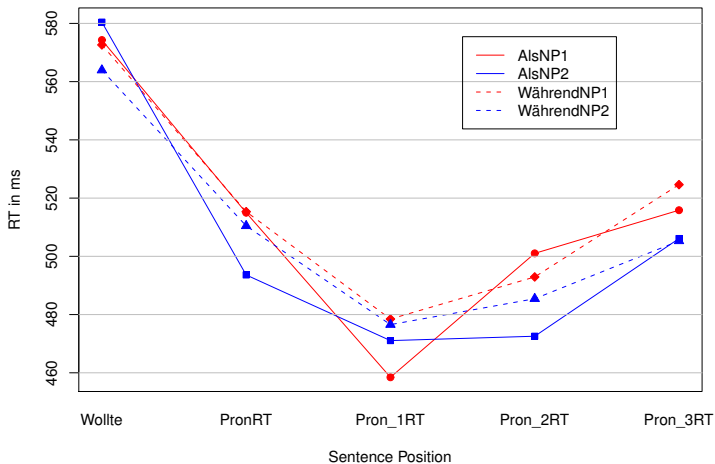
## Hypotheses

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  - target word (pronoun): effects observed in Exp. 1 should be manifested in the RTs
  - later testing point, when causality kicks in: RTs pattern equivalent to Exp. 3 results
- ② Early effect of Causality:
  - target word (pronoun): the RTs would favor the Causal Agent (NP1)
  - later testing point, when aspect manifests itself: RTs should picture the effects found in Exp. 3
- ③ Act both at the same time: equivalent graph of Exp. 3 would emerge at the point the factors set in.



# Results

## Causal-Verbs





## Up to now (2)

### connection to previous studies

- Additional factor: Causality of Agents
  - stronger representation of the situation: especially in the *AI*s condition (perfective aspect)
- general preference of source over goal - like in Stevenson et al. (1994)
- in contrast with Rohde et al. (2006), where the source over goal preference was found for the imperfective condition
- no clearly observable pattern has been yet found - data still being analysed



## Conclusions

- Results should be considered as tendencies revealing the way Aspect is processed for German
  - Verb Aspect is taken into account by the comprehender when building co-referential chains
  - In combination with Causality - clearer responses
- Connection to mental/situation models



Thanks  
Ευχαριστώ



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