Using the visual world paradigm to study the online processing of the German scalar focus particle "sogar"

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Introduction

In this study we investigate the contribution of the German scalar focus particle "sogar" (ENG ~ *even*) in aligning linguistic units to establish a pragmatic scale. In particular we shed light on the unfolding of the particle's assumed procedural meaning (Blakemore 2002) during online comprehension.

Research question

How does world knowledge about objects in specific contexts (verbs) interact with the meaning/function of German "sogar"?

Experiment 1

Materials and participants

Scale type	Focus particle				sogar/ adjective	visual target (focus element)	visual competitor
inherent	present (Condition 1)	Er repariert *He fixes*	Autos, Rasenmäher *cars, lawn mowers*	und *and*	sogar *even*	Flugzeuge *airplanes*	Motorräder *motorbikes*
inherent	absent (Condition 2)	Er repariert *He fixes*	Autos, Rasenmäher *cars, lawn mowers*	und *and*	kaputte *broken*	Flugzeuge *airplanes*	Motorräder *motorbikes*
Non-inherent	present (Condition 3)	Er verkauft *He sells*	Zwiebeln, Tomaten *onions, tomatoes*	und *and*	sogar *even*	Paprika *peppers*	Gurken *cucumbers*
Non-inherent	absent (Condition 4)	Er verkauft *He sells*	Zwiebeln, Tomaten *onions, tomatoes*	und *and*	grüne *green*	Paprika *peppers*	Gurken *cucumbers*

- 6 items in each condition (24 critical item in total), 48 filler items; 26 native speakers of German

Procedure

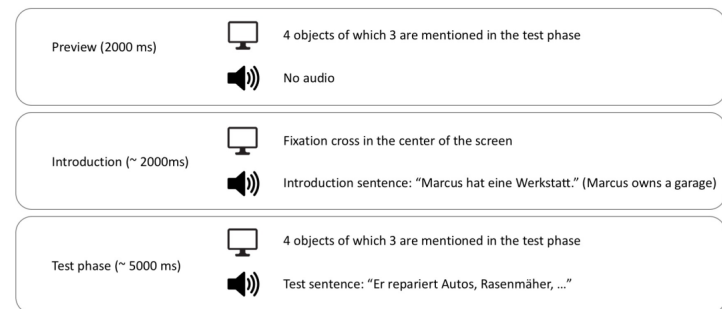|		
Preview (2000 ms)	🖥	4 objects of which 3 are mentioned in the test phase
	🔊	No audio
Introduction (~ 2000ms)	🖥	Fixation cross in the center of the screen
	🔊	Introduction sentence: "Marcus hat eine Werkstatt." (Marcus owns a garage)
Test phase (~ 5000 ms)	🖥	4 objects of which 3 are mentioned in the test phase
	🔊	Test sentence: "Er repariert Autos, Rasenmäher, …"

Figure 1: Progression of one trial

Hypotheses

1) Early effect: In condition 1, participants predict the focus element on the basis of the elements encountered and the procedural meaning of "sogar"; earlier attention allocation (before focus onset) to the target compared to condition 2

2) Late effect: In condition 3, participants show integration costs associated with the implicature that arises as the result of the elements encountered and the meaning of "sogar"; longer attention allocation to the focus element compared to condition 4

Results Experiment 1

- comparison of aggregated log-transformed target fixation proportions (seperately over subjects and items) over successive 50 ms time bins in three analysis windows between condition 1 and 2, as well as condition 3 and 4 (Barr 2008)
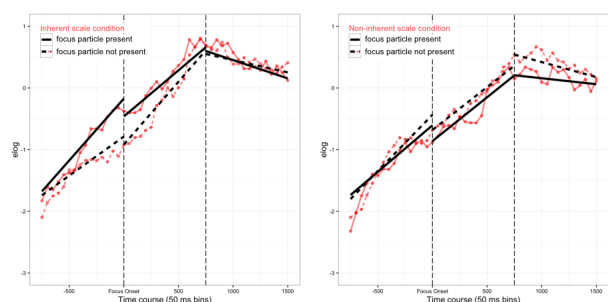

Figure 2: (fitted) Mean target elogits over time

Discussion Eperiment 1

- **Early effect:** attention to the visual target increased significantly faster before focus onset in condition 1 compared to condition 2 (prediction effect)

- **No late effect:** neither in analysis window 2 nor 3, there were differences between condition 3 and 4 (no costs for calculating the implicature)

- **Question:** Do participants in an experimental setting only calculate the implicature triggered by "sogar", if they perceive the audio stimulus as being produced by a communication partner?

Experiment 2

Materials, participants, and procedure

- same conditions as in Experiment 1; more stimuli were added (N=12 in each condition); 24 filler items, 10 participants

- to make participants interpret the audio stimulus as a unit of human communication, the following question was added after 1/4 of the critical stimuli (after 6 in condition 1, and after 6 in condition 3): "*Hebt der Sprecher durch den letzten Satz eine Sache besonders hervor?*" (ENG: Does the speaker highlight one thing with the last sentence?)

Hypotheses

Late effect: In condition 3, participants show a higher degree of attention to the visual target associated with the implicature that arises as the result of the elements encountered and the meaning of "sogar" compared to condition 4

Results and Discussion Experiment 2

- analysis as in Experiment 1, but with special focus on time course **after** focus onset

- **Late effect:** a sign. steeper slope (increase) after focus onset, a sign. higher peak at approximately focus offset, and a sign. steeper slope (decrease) after the peak towards the end of a trial in condition 3 compared to condition 4

- the implicature triggered by "sogar" is only calculated if the audio stimulus is perceived as transmitting a speaker's intention
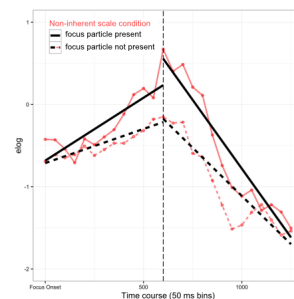

Figure 3: (fitted) Mean target elogits after focus onset over time

General Discussion

Early contribution: "sogar" accelerates the alignment of linguistic units (NPs) by triggering the prediction of the last element of a scale; this process presupposes that world knowledge about the units in question allows inferring a scale without "sogar"

Late contribution: "sogar" triggers pragmatic processing, i.e., constructing an implicature, only if the experimental setting highlights the audio stimulus as being intentionally produced by a speaker

Conclusion

The German focus particle "sogar" contributes early and late to an interpretation in which several units are aligned to form a scale, depending on world knowledge about the units in question.

References

Barr, D. J. (2008): Analyzing 'visual world' eye-tracking data using multilevel logistic Regression, Journal of Memory and Language, 59, 457–474.

Blakemore, D. (2002): Relevance and Linguistic Meaning. The Semantics and Pragmatic of Discourse Marker, Cambridge: Cambridge University Press.