

(Specifically) Language-impaired Processing of **Relative Clauses in German**



ΙΝ D Acquisition of Language And **Developmental Disorder Norms**

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Background

Pronoun Effect on Relative Clause

Relative clause development in SLI

•Specific Language Impairment (SLI) is a condition in which the age-appropriate development of expressive and/or receptive language is affected, in absence of sensory, mental and socio-emotional impairments [e.g. Leonard 2014] • Severe difficulties documented cross-linguistically make relative clauses a likely clinical • Both Structural Intervention [Belletti et al. 2012] and Discourse-based [Mak et al. 2008] accounts of relative clause comprehension predict Object Relative clause (OR) with an embedded pronoun (pro) to be processed at less cost/faster than OR with an embedded full noun phrase (NP).

marker of SLI [e.g. Frizelle & Fletcher 2014]

- •German-speaking children with SLI produce fewer fully-fledged relative clauses than their typically developing controls [Adani et al. 2016]
- These accounts make contrasting predictions in the case of Subject Relative clauses (SR): -> The Structural intervention approach predicts SR_pro = SR_NP;
 - -> The Discourse-based approach predicts SR_NP > SR_pro, whereby ">" means more accurate and/or processed faster

Research questions

- Are children with SLI able to process relative clauses in a qualitatively similar way as typically developing children do, when an implicit receptive measure (eye-gazes) is employed?



4

- Does the presence of an embedded 3rd person pronoun (pro) modulate the processing of relative clauses? If yes, are these effects similar between SR and OR?

- Are children with SLI sensitive to similar processing constraints on pronouns, like typically developing children?

Method

	Language- matched controls (LM)	Specific Language Impairment (SLI)	Age-matched controls (AM)
N	27	15	29
Age in y:m (SD)	6;9 (1;2)	7;3 (1;2)	7;10 (1;4)

Results

Effects for which we find reliable evidence are those where the posterior's 95% credible intervals (CrI) do not contain zero, the point of "no difference" (all variables were centered around zero).

Accuracy Data



(rc*dp|subject) + rc*dp*(sli_lm+am_sli) + GLMM: accuracy ~ (rc*(sli_lm+am_sli)|item) Effects with reliable evidence (">" more accurate than): -SR > OR (mean of $\hat{\beta}$ =-1.61, 95% CrI = [-2.01, -1.17]) -NP > pro (mean of $\hat{\beta}$ =.25, 95% CrI = [.04, .47]) -AM > SLI (mean of $\hat{\beta}$ =2.64, 95% CrI = [1.65, 3.69]) -Interaction: OR_NP=OR_pro; SR_NP>SR_pro (mean of β =-.32, 95% Crl = [-.53, -.12])



Condition	Stimuli	
SR_NP	Woist der Igel,derden Käfer fängt?Where is the hedgehog who the beetle tickles(Where is the hedgehog that tickles the beetle?)	We fitted Bayesia linear mixed models, estimatin a posterio probability fo each mode parameter [Vasishth & Nicenboim 2016]
SR_pro	Woist der Igel,derihn fängt?Where is the hedgehog who him tickles(Where is the hedgehog that tickles him?)	
OR_NP	Woist der Igel,den der Käfer fängt?Where is the hedgehog who the beetle tickles(Where is the hedgehog that the beetle tickles?)	
	Wo ist der Igel, <u>den</u> er fängt?	Informative prior



Eye-gaze Data Processed Data

LMM: elog | weights(1/weights) ~ (time1+time2)*rc*dp*(sli_lm+am_sli) + (rc*dp|subject)

LMM: elog|weights(1/weights) ~ (time1+time2)*rc*dp*(sli_lm+am_sli) + (rc|item)



Proportion of Looks to Target (PLT)= Looks to Target/(Looks to Target+Distractor+Center)

DV: empirical logit, computed within the Relative Clause (RC) window and the Silence window.

Effects with reliable evidence (">" means "higher PLT than"): -OR >SR (mean of $\hat{\beta}$ =.30, 95% CrI = [.29, .31])

-Interaction: SR_NP > SR_pro; OR_NP=OR_pro (mean of $\hat{\beta}$ =-.09, 95% CrI = [-.09, -.07])

four-way interactions with group differences: for LM, -Two



3

Participants

Where is the hedgehog who he tickles

Filler

5

(Where is the hedgehog that he tickles?) ist der Igel mit der Blume? Wo Where is the hedgehog with the flower (Where is the hedgehog with the flower?)

were uenneu based on Haendler et al. (2015) and Adani et al. (under review).

SR_NP>SR_pro; OR_pro>OR_NP; for SLI, SR_NP>SR_pro (small effect); OR+pro=OR_NP; for AM, SR_NP>SR_pro; OR_pro=OR_NP (mean of $\hat{\beta}$ =-2.64, 95% CrI = [-4.90, -.37]; mean of $\hat{\beta}$ =3.02, 95% CrI = [.74, 5.26]) -Effect of pronoun on SR is biggest in AM ($P(\hat{\beta}) > 0 = .96$), smaller in LM $(P(\hat{\beta})>0 = .93)$, smallest in SLI $(P(\hat{\beta})>0 = .87)$.

Discussion & Conclusion

• Embedded 3rd person pronouns do not appear to generally facilitate the comprehension and/or processing of ORs in 7-year-old speakers of German, whether they are language impaired or not. In SRs, we observe a disadvantage for the condition with embedded 3rd person pronouns compared to NPs, an effect present in all groups but which is stronger in the age-matched control group.

•The Discourse-based approach predicts the difficulty in interpreting a pronoun as direct object/patient in SRs because pronouns are typically used to refer to given entities, hence privileging a subject interpretation.

•Children with SLI do not reveal an atypical trajectory of SR and OR comprehension and processing, rather their performance is mostly in line with that of language-matched children. Despite the low OR accuracy in the SLI group, their eye-gazes do not reveal a pronoun facilitation, which was to some extent detected in the LM group.

Selected References

Adani et al. (2016) Elicited production of relative clauses in German: Evidence from typically developing children and children with Specific Language Impairment. First Language. Belletti et al. (2012) Does gender make a difference? Comparing the effect of gender on children's comprehension of relative clauses in Hebrew and Italian. Lingua. Frizelle & Fletcher (2014) Relative clause constructions in children with specific language impairment. Int. J. of Language and Communication Disorders. Haendler et al. (2015) Discourse accessibility constraints in children's processing of object relative clauses. Frontiers in Psychology

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