





Intonation of polar questions produced by German 2.5- to 4-year-olds



Talina Weber, Muna Schönhuber & Janet Grijzenhout ProPro 2017 Eberhard Karls Universität Tübingen, 30 August 2017



QUESTIONS AT THE INTERFACES FOR2111

Background

Polar questions and statements in German adult speech

		polar questions (YNQs)	declarative statements (DCLs)
	pitch contour	mostly rising	mostly falling
<	pitch range	large	small
	word order	VSO(V)	SVO(V)
	answer	required	not required
	example	L* H-^H%	H* L-%
		Trinkt Peter Kaffee?	Peter trinkt Kaffee.
		'drink-3SG. Peter coffee' 'Does Peter drink coffee?'	'Peter drink-3SG. coffee' 'Peter drinks coffee.'

(e.g. Grice et al. 2005, Van Heuven & Haan 2000, Wochner et al. 2015)

Background

Production of pitch contours in first language acquisition

Snow (2002, 2004)

- English 1-year-olds do not actively control sentence intonation.
- English 1-year-olds' pitch range is narrower compared to that of pre-schoolers.
- English 4-year-olds have more difficulties realising an adult-like accent range in rises than in falls.

Patel & Grigos (2006)

- English 4-year-olds use a longer final syllable duration to signal interrogativity.
- English 7-year-olds use a combination of rising f0 and longer final syllable duration.
- Only English 11-year-olds can manipulate f0 as a single cue to signal a question.

Lleó & Rakow (2011)

 German and Spanish 2- and 3-year-olds show good intonational control in rising pitch contours and large pitch ranges of YNQs.

Background

Summary of the literature:

 different findings for children's realisation of pitch contours and pitch ranges in German and English (Snow 2002, 2004, Patel & Grigos 2006, Lleó & Rakow 2011)

Research questions:

In the period between 2.5 and 4 years of age,

- do children use rising vs. falling contours to distinguish YNQs from DCLs?
- does age affect their realisation of pitch range for YNQs?

Hypotheses:

- H1: German children use rising vs. falling contours to distinguish YNQs and DCLs from an early age on.
- H2: Pitch range increases as a function of age.
- H3: Rises are produced with a larger pitch range than falls from an early age on.

Participants:

12 monolingual German-learning children between 2.5 and 4 years of age (5 female)

The subjects were divided into the following age groups (4 children per age group):

- age group 1 (age range = 2;8 2;10, mean age = 2;9)
- age group 2 (age range = 3;1 3;4, mean age = 3;2)
- age group 3 (age range = 3;10 4;0, mean age = 3;10)



Set-up





- 2 hand puppets
- 1 doctor's bag
- 1 camcorder

Intonation of polar questions produced by German 2.5- to 4-year-olds

Procedure



Familiarization phase hand puppet play



Test phase elicited production/imitation task (Crain & Nakayama 1987)

Procedure: Familiarization phase



Procedure



Familiarization phase hand puppet play



Test phase elicited production/imitation task (Crain & Nakayama 1987)

Procedure: Test phase



Elicited production/imitation task (Crain & Nakayama 1987):

- The child examined one of the hand puppets with instruments of the doctor's bag.
- The experimenter encouraged the child to address the hand puppet with DCLs and YNQs.

Materials: Test phase

<u>Stimuli</u>:

16 target sentences (8 YNQs, 8 DCLs), direct/indirect speech, main/modal/copula verb in present tense, random order

(1) Target sentences for DCLs:

- a. "Bitte sag Max: Wir müssen das Bein verbinden." Please tell Max: We have to bandage the leg.
- b. "Bitte sag Max, dass er bald wieder gesund ist." Please tell Max that he will recover soon.
- (2) Target sentences for YNQs:
 - a. "Bitte frag Max: Tut das weh?" Please ask Max: Does it hurt?
 - b. "Bitte frag Max, ob er den Mund aufmachen kann." Please ask Max whether he can open the mouth.

11



Procedure: Test phase



Lars (3;10)

Intonation of polar questions produced by German 2.5- to 4-year-olds

Data analysis



Data analysis



Tier 4: f0 between the final accented syllable and the right boundary tone

- For pitch contour (rise/fall): f0 minima & f0 maxima were measured in Hz.
- For pitch range: The range was measured in semitones (st).



Data analysis



Results: pitch contour

DCLs: predominantly falling contour, independent of age

YNQs:

rising contour more reliably in 3- to 4-year-olds



General linear mixed effect model (Jaeger 2008): DV: contour; IV = age group glmer(contour ~ age group + (1 | subject) + (1 + age group | item), data = data set, family = "binomial")

- significant differences of *contour* use between the youngest and the two older age groups in YNQs (1 vs. 2: p = 0.01, 1 vs. 3: p = 0.04)
- no significant difference between the two oldest age groups in YNQs (p = 0.2)



Linear mixed effect model (Baayen 2008): DV: range; IVs = contour, age group Imer(range ~ contour * age group + (1 + contour | subject) + (1 + age group | item), data = data set)

- significant effect of *contour* (p = 0.03) \rightarrow range in rises higher than in falls
- no significant effect of age group (p = 0.7)
- no significant interaction between contour and age group (p = 0.4)

Discussion: pitch contour

- DCLs are predominantly marked by a falling contour, independent of age.
- YNQs are marked by a rising contour more reliably in the two older age groups than in the youngest age group.

Aspects that may play a role:

- Perhaps, age group 1 is still uncertain about which intonational pattern to use.
- Perhaps, the production of rises requires more effort than the production of falls (see Lieberman 1967).
- Perhaps, age group 1 is able to produce a rising contour for YNQs, but cannot do that consistently.

Discussion: pitch range

- All children produced a higher pitch range for rises than for falls.
- The youngest age group was able to produce the same pitch ranges for YNQ intonation as the older children.

H2: Pitch range increases as a function of age. 🗮



 \rightarrow No evidence that age affects the realisation of pitch range for rises

H3: Rises are produced with a larger pitch range than falls from an early age on.

 \rightarrow Evidence that rises are produced with a larger pitch range than falls from an early age on

General Discussion

sentence type	age groups	pitch contour	pitch range	
DCLs	all age groups	fall	smaller (4.59st)	
	age group 1	fall and rise	larger (6.11st)	
YNQs	age group 2	rise		
	age group 3	rise		

- H1: German children use rising vs. falling contours to distinguish YNQs and DCLs from an early age on.
- → German children start using native-like intonation patterns fairly early.
- Children do not have problems producing rises per se. Rather, the youngest participants had problems selecting the appropriate contour for YNQs.

Future studies will address...

- how intonation and syntax interact in the acquisition of YNQs.
- the comprehension of rising and falling intonation in short sentences.







Thank you. Questions or comments?

Talina Weber Tel.: +49 (0) 75 31/88 – 4265 talina.weber@uni-konstanz.de





QUESTIONS AT THE INTERFACESFOR2111

References

- Baayen, R. H., Davidson, D. J., & Bates, D. M. (2008). "Mixed- effects modeling with crossed random effects for subjects and items," *Journal of Memory and Language,* vol. 59, 390-412.
- Crain, S., & Nakayama, M. (1987). Structure dependence in grammar formation. *Language*, 63(3), 522-543.
- Grice, M., Baumann, S., & Benzmüller, R. (2005). German intonation in autosegmental-metrical phonology. *Jun, Sun-Ah (ed.): Prosodic typology. The phonology of intonation and phrasing., Oxford University Press*, 55-83.
- Jaeger, T. F. (2008). Categorical data analysis: Away from ANOVAs (transformation or not) and towards logit mixed models. *Journal of Memory and Language* 59(4). 434-446.
- Lieberman, P. (1967). Intonation, perception, and language (Vol. 38): M.I.T. Pr.
- Lleó, C., & Rakow, M. (2011). Intonation targets of yes/no questions by Spanish and German monolingual and bilingual children. In E. Rinke & T. Kupisch (Eds.), *The development of grammar. Language acquisition and diachronic change. In honour of Jürgen Meisel* (pp. 263-286). Amsterdam/Philadelphia John Benjamins.
- Patel, R., & Grigos, M. I. (2006). Acoustic characterization of the question–statement contrast in 4, 7 and 11 year-old children. Speech Communication, 48(10), 1308-1318.
- Pruitt, K., & Roelofsen, F. (2013). The interpretation of prosody in disjunctive questions. *Linguistic Inquiry 44*, 632-650.
- Snow, D. (2002). Intonation in the monosyllabic utterances of 1-year-olds. *Infant Behavior and Development*, 24(4), 393-407.
- Snow, D. (2004). Falling intonation in the one- and two-syllable utterances of infants and preschoolers. *Journal of Phonetics*, *32*(3), 373-393.
- Van Heuven, V.J. & Haan, J. (2000). Phonetic correlates of statement versus question intonation in Dutch. *Intonation*. Springer: Netherlands. 119-143.
- Wochner, D., Schlegel, J., Dehé, N., & Braun, B. (2015). The prosodic marking of rhetorical questions in German. *Speech Prosody*, [no page numbers].

Summary

sentence type	age groups	pitch contour	pitch range	
DCLs	all age groups	fall	smaller (4.59st)	
	age group 1	fall and rise	larger (6.11st)	
YNQs	age group 2	rise		
	age group 3	rise		

- H1: German children use rising vs. falling contours to distinguish YNQs and DCLs from an early age on.
- \rightarrow German children start using native-like intonation patterns fairly early.
- → Children do not have problems producing rises per se. Rather, the youngest participants had problems selecting the appropriate contour for YNQs.

H2: Pitch range increases as a function of age. 🗮



H3: Rises are produced with a larger pitch range than falls from an early age on.

Test phase: Stimuli

Thermometer:

- 1. Bitte frag Max: Hast du Fieber?
- 2. Bitte frag Max: Kannst du den Mund aufmachen?
- 3. Bitte frag Max, ob er den Mund zumachen kann.

Hammer:

- 4. Bitte frag Max: Darf ich auf das Knie klopfen?
- 5. Bitte sag Max, dass er ruhig liegen muss.
- 6. Bitte frag Max: Tut das weh?

Injection:

- 7. Bitte sag Max, dass er jetzt eine Spritze bekommt.
- 8. Bitte frag Max, ob er Schmerzen hat.
- 9. Bitte sag Max: Das machst du gut.

Bandage:

- 10. Bitte sag Max: Wir müssen das Bein verbinden.
- 11. Bitte frag Max, ob er den Fuß heben kann.
- 12. Bitte frag Max, ob er sich besser fühlt.

Medicine:

- 13. Bitte sag Max: Hier ist deine Medizin.
- 14. Bitte sag Max, dass er viel schlafen soll.
- 15. Bitte sag Max: Du darfst nicht mehr so schnell laufen.
- 16. Bitte sag Max, dass er bald wieder gesund ist.

Procedure: Test phase

(1) Target sentences for DCLs:

- a. "Bitte sag Max: Wir müssen das Bein verbinden." Please tell Max: We have to bandage the leg.
- b. "Bitte sag Max, dass er bald wieder gesund ist." Please tell Max that he will recover soon.

(2) Target sentences for YNQs:

- a. "Bitte frag Max: Tut das weh?" Please ask Max: Does it hurt?
- (fall \rightarrow rise, VE \rightarrow V1) b. "Bitte frag Max, ob er den Mund aufmachen kann." Please ask Max whether he can open the mouth.



(fall \rightarrow fall, V2 \rightarrow V2)

(fall \rightarrow fall, VE \rightarrow V2)

(rise \rightarrow rise, V1 \rightarrow V1)



Data analysis



DCL: falling contour



Das machst du gut. 'You are doing well.'



Data analysis



YNQ: rising contour

Lars (3;10)

Hast du Schmerzen? 'Are you in pain?'



Linear mixed effect model (Baayen 2008): DV: range; IVs = contour, age group Imer(range ~ contour * age group + (1 + contour | subject) + (1 + age group | item), data = data set)

- significant effect of *contour* (p = 0.03) \rightarrow range in rises higher than in falls
- no significant effect of age group (p = 0.7)
- no significant interaction between contour and age group (p = 0.4)

Results: final boundary tones



Results: nuclear tunes



Results: word order

Polar questions (YNQs):

(3) "Bitte frag Max: Darf ich auf das Knie klopfen?"

- a. du Knie klopfen ich
- b. Darf ich auf das Knie klopfen
- (4) "Bitte frag Max, ob er Schmerzen hat."
 - a. du Schmerzen noch
 - b. Hast du Schmerzen

Statements (DCLs):

(5) "Bitte sag Max: Du darfst nicht mehr so schnell laufen."

- a. nicht mehr so schnell laufen
- b. Du darfst nicht mehr so schnell laufen
- (6) "Bitte sag Max, dass er bald wieder gesund bist."
 - a. bald 'sund du
 - b. Du bist bald wieder gesund



Timo (2;8) 🜔 Fitia (3;10) 🜔





Laurenz (4;0)