

TWO MECHANISMS FOR LEARNING A LANGUAGE

(Peña et al. 2002; Endress & Bonatti, 2002; 2015)

1) One mechanism is based on statistical computation to identify words. → IMPAIRED IN CHILDREN WITH SLI

ADJACENT DEPENDENCIES LEARNING IN CHILDREN WITH SLI

- Children and adolescents with SLI were unable to use statistical information to discover word boundaries (incidental exposure, 21 min) (Evans et al., 2009; Mainela-Arnold & Evans, 2014).
- Performance above chance when exposure is doubled (42 min) (Evans et al., 2009).
- Correlation between statistical learning ability and both expressive and receptive vocabulary knowledge.

ADJACENT DEPENDENCIES LEARNING IN CHILDREN WITH SLI

- Adolescents and adults with SLI showed difficulties in learning of non-adjacent dependencies in (English: Grunow et al., 2006; Hsu et al., 2014; Cantonese: lao et al., 2017). [Stimuli consisted of 3 dependency pairs: aXd, bXe and cXf. Variability of middle element varied. Test material: trained vs. untrained (Gómez et al. 2002)].
- In contrast to control participants, variability of X does not facilitate learning in participant with SLI.

2) One mechanism supports the discovering of higher level (grammatical) structure. → CHILDREN WITH SLI???

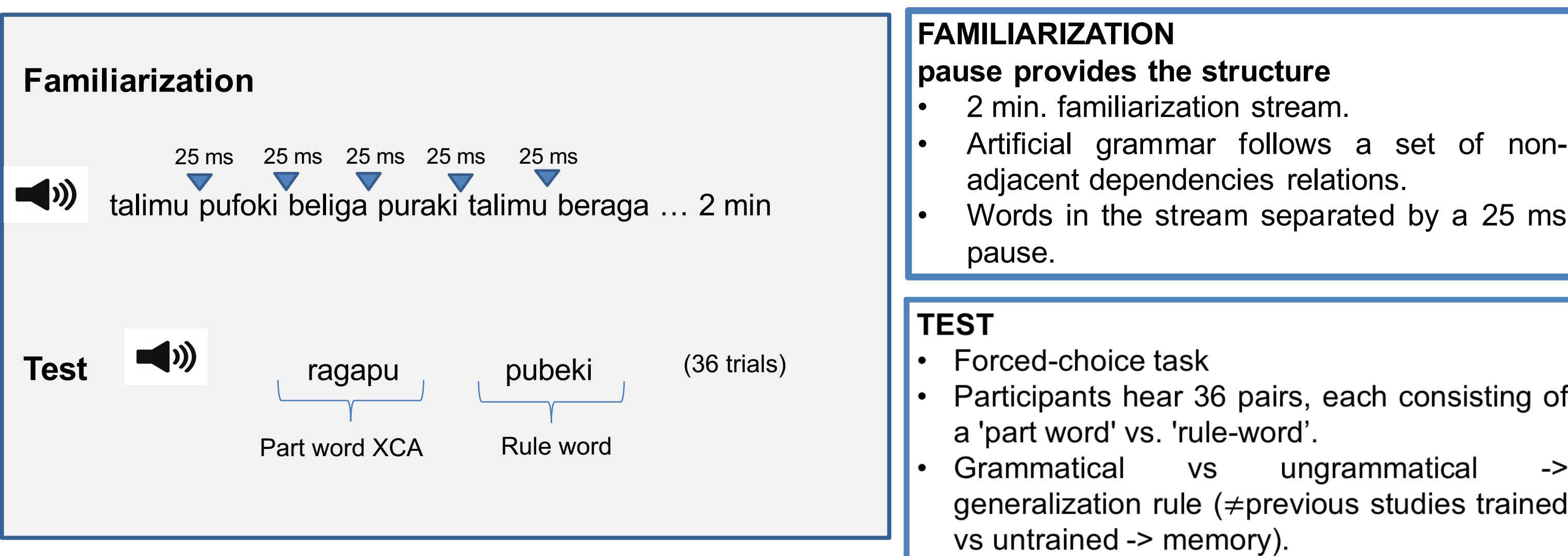
12 and 18 month-old-infants can generalize morphosyntactic regularities when exposed to a segmented stream (Marchetto & Bonatti 2013; 2014) [= adults (Peña et al. 2002)].

RESEARCH QUESTIONS

- Are children with SLI able to capture within-word generalizations, provided that they are exposed to a segmented stream?
- Does the pupil tell us something about the process?
- Is rule-extraction ability in children with and without SLI related to measures of expressive and receptive vocabulary, expressive and receptive grammar?

EXPERIMENT

Adaptation of the procedure in the Peña et al., 2002; Pupil diameter is recorded with a Tobii, sampling rate 50 Hz



STUDY 1 - ADULTS

Not statistically different from the results of Peña et al. 2002.

Pupil data analysis in progress.

STUDY 2 – CHILDREN WITH SLI

RULE LEARNING EXPERIMENT – same material as the adult study but adapted design.

Pupil diameter is recorded with a Tobii, sampling rate 50 Hz

STANDARDIZE TESTS:

- WWT: Wortschatz- und Wortfindungstest (Glück, 2007)**
Expressive and receptive vocabulary
- TSVK: Test zum Satzverstehen von Kindern (Siegmüller, Kauschke, 2011)**
Test for sentence comprehension
- CPM: Coloured Progressiv Matrices (Raven, 2001)**
- ProsA: Prosodie-Analyse (Walther & Otten, 2015)**
- PDSS: Pathologische Diagnostik bei Sprachentwicklungsverzögerungen (Kauschke & Siegmüller, 2009)**
Phonology expressive and receptive
Grammar expressive and receptive
Lexicon expressive and receptive

MATERIAL

- The stimuli were an adaptation as those used by Peña et al., 2002.
- The stimuli were synthesized using the MBROLA speech synthesizer selecting the D7 German diphones database.

Familiarization

Family	X = li	X = ra	X = fo
A ₁ X C ₁	[puliki]	[puraki]	[pufoki]
A ₂ X C ₂	[beliga]	[beraga]	[befoga]
A ₃ X C ₃	[talimu]	[taramu]	[tafomu]

Test

Part-word (9 items)	Rule-word (9 items)
Structure CAX (i.e., [kitara]; [gapufo])	Structure A _i X [*] C _i , where X [*] appears in the stream, but not as a middle syllable of any family A – C.
Structure XCA (i.e., [likita]; [ramube])	

STUDY 1 - ADULTS

Participants

30 adult participants, students at the University of Potsdam.

Results

59 % correct responses.
Participants showed a preference for rule word over part word ($p < .001$).

Above/below chance values 1 SD from the mean

Range [15, 21]

binom.test(X,Y)

At group level, significantly different from chance.

At individual level: 17 participants above chance;
 11 at chance;
 2 below chance.

Participants

Children ranging from 5 to 11 year old

EXPECTED RESULTS

- Children with SLI might be facilitated by the presence of subliminal segmentation cues and therefore being able to extract the structural regularities included in the stream.
- Pupillometry: pupil dilation can show the on-line course of learning during familiarization (adults/children).
- More difficult trials evoke larger pupil changes. Greater pupil dilation when rule words or part words are presented?
 - Rule words might be hard because they imply the implementation of a rule; but if the rule is learned it might be easy.
 - Part words are "ungrammatical".