

# The Beneficial Role of Variability for Acquiring Novel Words: A Habituation Study with 14-Month-Old German-Learning Children

Tom Fritzsche, Adamantios Gafos & Barbara Höhle University of Potsdam

Contact: tom.fritzsche@uni-potsdam.de

## 1 Background & Research Question

- Two realisations of a word are never identical in natural speech.
- What are the effects of this variability on the language-acquiring child with regard to
  - Establishing phonemic categories?
  - Word learning?
  - Vocabulary size?
- Which kind of variability supports learning and what are the underlying mechanisms?
- In a first step, we aimed to replicate the findings from a word-learning study by Rost & McMurray (2009) with the following hypothesis:

**Does speaker/intonation variation compared to zero variation aid in the formation of word-object associations in 14-month-old children?**

## 2 Method

### Participants

- Monolingual German children between 13–15 months of age

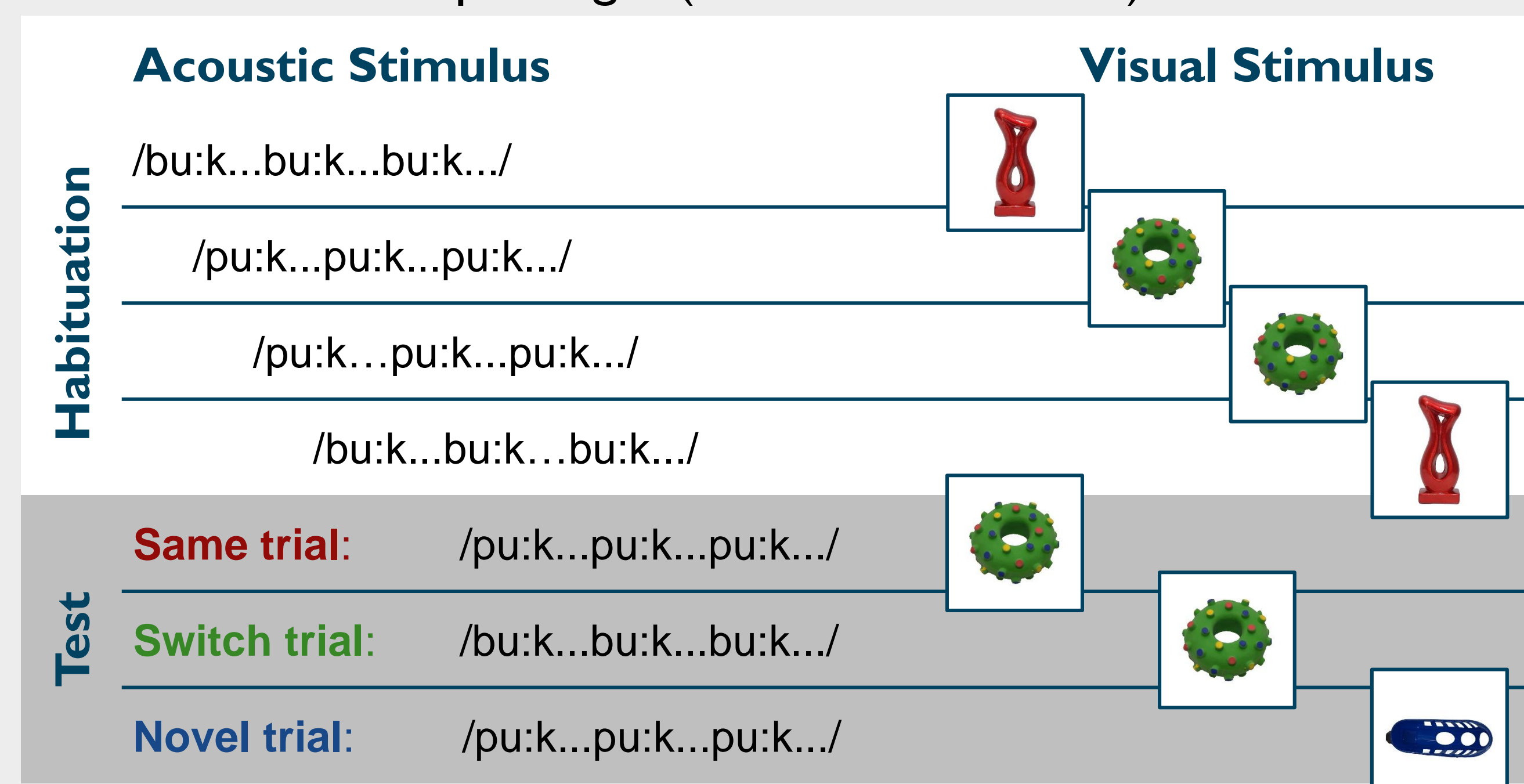
Group	N	Female/Male	Mean Age	Dropouts
No Variation	17	8/9	13.6 months	5 (25%)
Variation	17	8/9	13.9 months	12 (41%)

### Materials

- Nonwords (/bu:k/, /pu:k/) recorded from 18 native German speakers (6 male) in three different intonations:
  - Neutral: produced in isolation
  - Focused: »Look... X«
  - Question: isolated with rising pitch or »Is that a ... X«
- Between-participant factor *Variation*:
  - No Variation: 1 token (focused) from a female speaker
  - Variation: 54 tokens (18 speakers x 3 intonations)

### Procedure

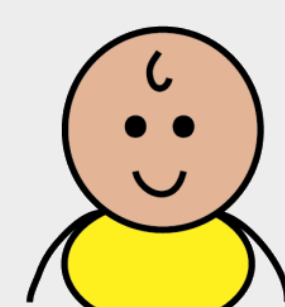
- Habituation switch-paradigm (Werker et al., 1998)



- Habituation criterion: 50% drop in looking times for a window of 4 trials compared to the first 4 trials
- Maximally 30 habituation trials
- Counterbalanced assignment of words to objects and order of test trials
- One test trial for each condition (Same, Switch, Novel) for each child

### Apparatus

- Habit 2 (version 2.1.25)

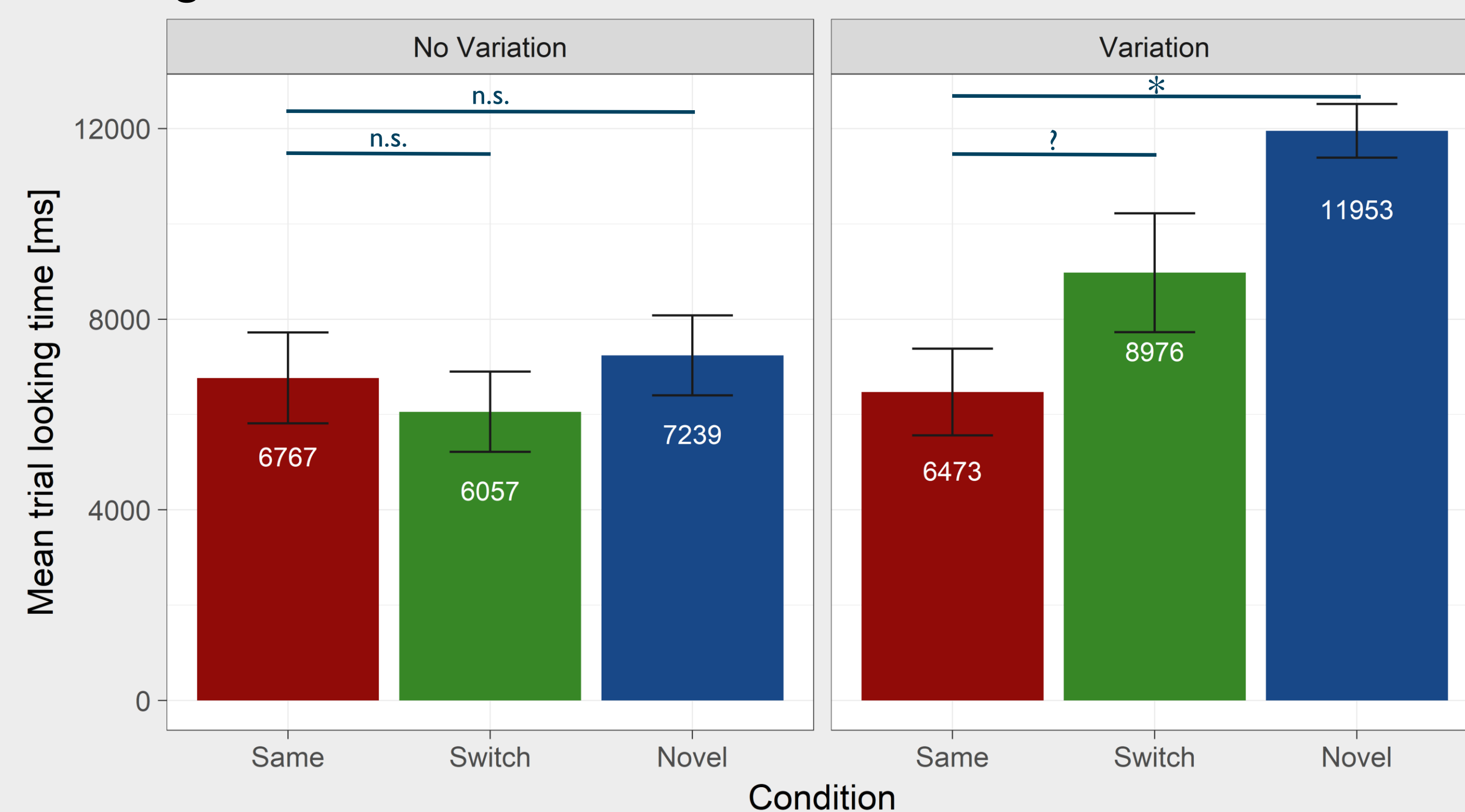


### Predictions (if variability has a beneficial effect)

- No Variation group: Looking times **Same** = **Switch**
- Variation group: Looking times **Same** < **Switch**

## 3 Results

- Number of habituation trials:
  - No Variation: Mean = 18.4 (8–28)
  - Variation: Mean = 16.8 (8–27)
- Habituation duration:
  - No Variation: Mean = 153 s (75–307)
  - Variation: Mean = 164 s (62–277)
  - No difference in habituation duration:  $t(32) = .534, p = .597, n.s.$
- Looking times in test trials:



- Comparison of:
 

<b>No Variation</b>	<b>Variation</b>
Same vs. Switch: $t(16) < 1, p = .484, n.s.$	$t(16) = 1.93, p = .071$
Same vs. Novel: $t(16) < 1, p = .692, n.s.$	$t(16) = 6.65, p < .001$

- Individual differences in learning novel words
  - Positive correlation between Switch and Novel effect
  - No Variation  $\rho = .61, p = .011$
  - Variation  $\rho = .22, p = .39, n.s.$



## 4 Discussion & Future Directions

- Variability plays a beneficial role in word learning.**
  - The findings of Rost & McMurray (2009) could be replicated (albeit with weaker effects).
- Successful learning seems to be possible with zero variation.**
  - Individual performance patterns suggest that learning took place in the No Variation group as well and that there is a relation to looking time towards a novel object.
- The nature of this variability advantage needs to be explored further.**
  - Is it a specific effect related to the phonetic/phonological properties or is it a domain-general effect related to attentional processes?
    - Effect of visual variation
    - Use of pupillometry in combination to habituation
    - Investigation of different linguistic variables: vowel context, variation of VOT, different feature contrasts in word learning



## 5 References & Thanks

Oakes, L. M., Sperka, D. J., & Cantrell, L. (2015). Habit 2: Center for Mind and Brain, University of California, Davis. Retrieved from <http://habit.ucdavis.edu>

Rost, G. C., & McMurray, B. (2009). Speaker variability augments phonological processing in early word learning. *Developmental Science*, 12(2), 339–349. doi:10.1111/j.1467-7687.2008.00786.x

Werker, J. F., Cohen, L. B., Lloyd, V. L., Casasola, M., & Stager, C. L. (1998). Acquisition of word–object associations by 14-month-old infants. *Developmental Psychology*, 34(6), 1289–1309. doi:10.1037/0012-1649.34.6.1289

Thanks to the children and their parents and Mareike Philipp, Katharina Meß and the team at the

