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Distributional learning of visual object categories in school-aged children



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ACLIC

DISTRIBUTIONAL LEARNING

- Distributional learning is a type of statistical learning based on the frequency distributions of tokens along a continuum
- Distributional learning plays a role in forming phonetic categories (e.g. Maye et al., 2002)
- Junge et al. (2018) found that distributional learning also contributes to the formation of novel visual object categories in infants
- It is unknown whether distributional learning also plays a role in novel visual category learning in older children

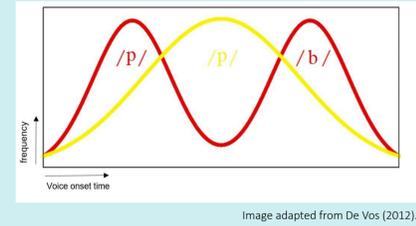


Image adapted from De Vos (2012).

RESEARCH QUESTION

Do school-aged children learn novel object categories based on distributional information?

METHOD: FAMILIARIZATION PHASE

Experiment based on Junge et al. (2018), adapted to school-aged children. Design familiarization phase based on Chládková et al. (2020).

Participants

49 neurotypical Dutch-speaking children (7-9 years old)

- An 11-step novel object continuum was constructed



- Participants were familiarized with tokens from the continuum (288 tokens in total, duration +/- 8 minutes)

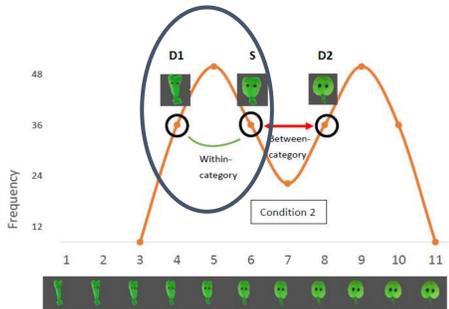
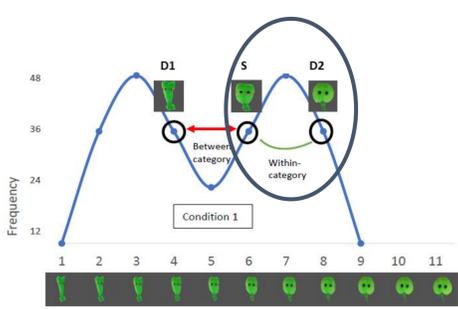
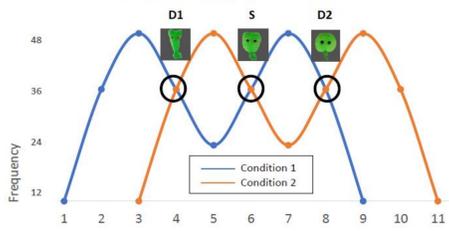


A familiarization trial.

- Between-participant design: PPs did one of two familiarization conditions

- The conditions differed in the position of the distribution peaks along the continuum

Conditions familiarization phase

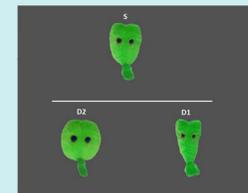


Hypotheses

- PPs in Condition 1 learn that tokens S and D2 belong to one category
- PPs in Condition 2 learn that tokens S and D1 belong to one category

METHOD: TEST PHASE

- Eight 2A-FC test questions
- Does token D1 or D2 look more like token S?



Prediction

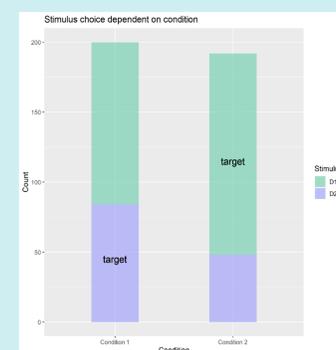
PPs in Condition 1 will choose token D2 more often than pps in Condition 2

RESULTS

A generalized logistic linear mixed effect model in R was used to test whether familiarization condition influenced stimulus choice.

In line with our prediction, participants in Condition 1 were 3.29 (95% CI 1.26 ... 9.54) times more likely (odds ratio) to choose stimulus D2 than participants in Condition 2, and this effect of Condition was significant: $z = 2.385$, $p = 0.0171$.

Familiarization condition significantly influenced whether participants preferred the combination S + D1 or S + D2.



DISCUSSION

- Familiarization condition influenced the preference for combining token S with token D1 or D2, indicating that the distributional properties of the input in the familiarization phase influenced categorization of the stimuli.
- Distributional learning seems to play a role in categorizing new visual stimuli in school-aged children.
- There seems to be an inherent preference for the combination S + D1. Perhaps the visual continuum should be changed in future studies.
- Currently, children with developmental language disorders (DLD) participate in this research. As children with DLD have difficulties with statistical learning (e.g. Obeid et al., 2016), we are analysing their performance on the same task to investigate their distributional learning in the visual domain and to understand whether this ability correlates with vocabulary knowledge.

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