Comparing generalisation in children and adults learning an artificial language

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INTRODUCTION
Successful language acquisition involves generalization, but learners must balance this against the acquisition of lexical constraints. Examples occur throughout language. For example, English native speakers know that certain noun–adjective combinations are impermissible (e.g., strong winds, high winds, strong breezes, ’high breeze’). Another example is the restrictions imposed by verb sub-categorization (e.g., I gave/throw the ball to him; I gave/throw him the ball; I donated/carried/pushed him the ball).

The current experiments extend previous work which used Artificial Language learning to demonstrate that adults (Wonnacott et al., 2008) and 6 year olds (Wonnacott, 2011) are able to learn lexical based restrictions on generalization using distributional statistics. Here we directly compare the two age groups learning the same artificial language, with a view to exploring maturational differences in language learning. In addition to manipulating frequency (across high and low frequency items) and quantity of exposure (across days), languages were constructed such that a word’s semantic class was helpful for learning the restrictions for some types of lexical items, but potentially misleading for others.

METHOD: DESIGN
Participants: 30 Year 1 children (6-years-old), 30 adults (undergraduates, U. of Warwick) All monolingual English speakers

Language Paradigm (following Wonnacott, 2011)

Vocabulary
1 verb
10 nouns
8 nouns (moop…)
2 particles
day, lay

“What are TWO…?” (borrowed from English)

Restrictions
moop = noun + particle e.g. moop camel/dow (4)

Structure of Input Language

METHOD: PROCEDURE
4 Day Procedure
Day 1 Training on input language
Copy back 24 sentences
Experiment encourages participants to repeat aloud.
No other instructions

Day 2 and 3 Training ‘2’
Novel nouns test
Same procedure as familiar nouns
Tests one unseen vehicle and one unseen animal

Day 4 Training
Old nouns test
Novel nouns test

RESULTS: TRAINED NOUNS
Note: “error data” where participants didn’t produce the correct noun followed by EITHER dow OR lay are excluded. (1% adult data, 10% child data).

Alternating nouns: dow/lay produced around 50:50 across days and groups (not included in analyses)

Analyses: Linear mixed effect model predicting whether the correct (i.e., attested) particle was used

Findings:
- children over-generalize more than adults (z=3.3, p<0.005)
- more generalization with low frequency words (z=2.9, p<0.005)
- more generalization on day 1 than day 3 (z=4.5, p<0.001)
- no sig. (or near sig.) interactions with age
- no main effect of semantic type (p>0.3) but sig. interaction type/freq.
- adults overgeneralize inconsistent semantic items more with low frequency verbs (z=2.22, p<0.05; 12% difference)

RESULTS: NOVEL NOUNS
Analyses: linear mixed effect model predicting whether use the particle associated (consistently or inconsistently) with that semantics.

Findings:
- adults used predicted semantics more than children (z=3.36, p<0.001)
- children’s particle use not sig. different from chance (z=0.86, p<0.39)
- adult’s particle use IS sig. different from chance (z=4.18, p=2.9e-05)
- no main effect of day (z=0.74, p=0.2)
- consistent semantics no more strongly associated with particle1 than inconsistent with particle2 (z=0.74, p=0.2)

SECOND EXPERIMENT
How does performance compare to a matched language with no semantic cues?

RESULTS

ADULTS

CHILREN

conspitent semantics

inconsistent semantics

all nouns

analyses:
LME models comparing productions of attested particles with one particle only nouns in the all language and (i) particle1-only nouns with consistent semantics and (ii) particle2-only nouns with inconsistent semantics from the first experiment.

No effect of condition in either analysis and no sig. interaction of age with any other factor (p>0.05).

No evidence that learning of inconsistent semantics hinders learning.

CONCLUSIONS

1. Given matched input, adults show less overgeneralization than 6-year-olds, and this effect remains true after four training sessions.
2. Both groups overgeneralize more with low frequency than high frequency items.
3. Both groups improve with increased exposure.
4. Adult show clear evidence of having generalized the semantic cues with novel words, children do not.
5. Semantic cues influence the learning of the constraints with low frequency items. However we do not see evidence that “unhelpful” semantics lead to worse learning compared to control language with no semantic cues.

METHOD

VEHICLES

ANIMALS

VEHICLES

ANIMALS

PARTICLE 1 - ONLY NOUNS (2)

PARTICLE 2 – ONLY NOUNS (2)

ALTERNATING NOUNS (4)

NEW LANGUAGE

VEHICLES

ANIMALS

VEHICLES

ANIMALS

n = 15 adults 15 children

WORKSHOP

VEHICLES

ANIMALS

DATA COLLECTION IS ONGOING

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FUTURE EXPERIMENTS

New experiments are exploring learning of a language with entirely consistent semantic cues

Will children now pick up on semantic cues? Will it aid their learning of trained nouns?

VERB MATRIX

NEW LANGUAGE

VEHICLES

ANIMALS

VEHICLES

ANIMALS

n = 15 adults 15 children

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