The right conditions to learn homophones

Goal: Investigating the conditions in which children accept a secondary meaning for a known word by 1) manipulating the distance (semantic-syntaxic) between the first known meaning and a novel second meaning that we will teach; 2) varying the position of the word in the lexicon (whether it belongs to a dense vs. sparse neighborhood).

Hypothesis 1: Homophones may be easier to learn if both meanings A and B for a word *w* are unrelated (rather than related). This comes from the observation that most of the homophonic pairs in the lexicon are from different grammatical categories (which is the extreme case of semantic unrelatedness).

Hypothesis 2: Homophones may be easier to learn if a word *w* lives in a crowded part of the lexicon rather than a sparse area as a) lexical retrieving of the first meaning is slowed down (compared to a word leaving in a sparse area) b) it is more likely that frequent segments can be reused to accommodate a new meaning than low frequency segments.

Experiment 1

The aim of this experiment is to see whether children can learn a secondary meaning for a word they know in ideal conditions:

a) the wordform is in a dense area in their lexicon
b) the secondary meaning is unrelated to the first one

Children in this experiment will learn one of four words (e.g., verre, pull, bain, pot - glass, sweater, bath, potty) which conform to a) and b).
If children *succeed* in learning a secondary meaning for a known word, we will manipulate two parameters to see in what condition children fail to learn homophones: semantic relatedness (Experiment 2) and neighborhood density (Experiment 3).
If children *fail* to learn these new meanings, we will increase the semantic distance between the two meanings of the word by teaching children a second meaning for a word of a different grammatical category (e.g. teaching that *give* is a kind of animal; Experiment 4).

Experiment 2

If children's success in learning new meanings for words they know (Experiment 1) depends on the semantic distance between the two meanings then we expect them to fail when the two meanings are related.
Children in this experiment will learn one of four words (e.g., poule, chat, loup, mouche) such that:

a) both meanings (known and novel) are related (all map to animals)
b) wordforms are form a dense area of the lexicon

Experiment 3

In this experiment if children success in learning new meanings for words they know (Experiment 1) depends on the neighborhood density of the wordforms used.
Children in this experiment will learn one of four words (e.g., livre, fleur, parc, pluie -- book, flower, park, rain) such that:

a) both meanings (known and novel) are unrelated
b) wordforms are form a sparse area of the lexicon

If children actually fail to learn these words, we will also run a control looking at whether such failure could be due to the phonotactics of these words since words in sparse neighborhood are less probable than words in dense neigborhood and hence can be more difficult to learn. For this control group, we will use non-words with the same phonotactic complexity than these 4 words.

Experiment 4

We will run this experiment in the case where children fail to learn a secondary meaning for a noun they know (Experiment 1). We will give children one last chance to learn an homophone by manipulating the syntactic category of the novel word. Children will learn a secondary meaning for a *verb* they know (e.g., veux, cache, prend, donne -- want, hide, take, give). Crucially the secondary meaning will be taught as a *noun* (the novel word will map to an animal as in previous experiments) such that not only both meanings will be semantically distant but the new meaning will be cued by different syntactic cues (a noun context) that should even prevent children to access the verb meaning in that case.

Method (common to all experiments)

Participants: French 20-month-olds (n = 16)

Procedure

Before coming to the lab, the parents will fill a questionnaire of vocabulary including the test words and their neighbors. This is to ensure that children will be taught a second meaning for a word they already know.

The experiment will be composed of two phases: a teaching phase and a testing phase. Each kid will learn a single word.

Word teaching will be done on a television screen. A first introductory video will show a speaker playing with a car and labelling it several times in a little story. This first video is to familiarize kids with the procedure and show them that the speaker is talking about the object she manipulates.

We will then present children with 4 videos where the speaker is playing with an animal kids are not familiar with (either a pink octopus-like animal with white spots or an imaginary animal with rabbit ears and a trunk). In 2 videos the speaker will teach a new word referring to one of the animals. In the 2 other videos, she will just play with the second animal without labeling it. In total, children will hear the new label 10 times before being tested on it and will have the same amount of exposure to the two novel animals.

The test phase will consist of 12 trials: 8 trials with familiar words and 4 trials for the novel word. Each trial will begin with the simultaneous presentation of two pictures positioned at the left and the right side of the screen. Two seconds later, the audio stimuli will start ("*Regarde le X, tu le vois le X?*" Look at the X, Do you see the X?). The trial will end about 4s after the first target word onset. Trials will be separated by a 1s pause.

The pictures will be photographs of objects on a light gray background. For familiar trials, we chose 8 words children of that age are likely to know: *voiture, banane, poussette, chaussure, chien, poisson, cuillère, maison* (car, banana, trolley, shoe, dog, fish, spoon, house). Pictures will be yoked in pairs (e.g., the banana will appear only with the car). For test trials, both pictures will feature the two animals seen during training to ensure no novelty preference.

Measure

We will use an eye-tracker to record eyes movement during each trial. The time course of eye movements will be inspected from the beginning of the first target word ("Look at the X?") until the end of the trial. Since no previous work looked at homophone learning in a preferential looking task, we are unsure as to whether increased looks toward the target will start at about the same time as for familiar words (about 500ms after the beginning of the target word according to previous studies with children of about the same age), so we will consider the whole trial duration in our analysis.
We will conduct a cluster based permutation analysis (Marys & Oostenveld, 2007) in order to find a time window where we observe increased look toward the target (if any).

Criteria for exclusion
Trials for which we have less than 75% of eye-data will be rejected. Children having less than 50% of valid trials (4 familiar trials and 2 test trials) will be rejected.
In addition, we will reject children who do not show any preference for the target picture during familiar trials (based on the average proportion of looks for all valid familiar trials from the onset of the target word until the end of the trial -- threshold = 0.55). This is to ensure that we keep only children who are on task.