MIT Language Acquisition Lab

2022 Newsletter

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Dear parents, educators, and other friends of the Language Acquisition Lab,

This newsletter showcases some of our recent work, as well as studies that are ongoing. Our work focuses on diverse aspects of language – sentence structure, meaning, inference, and implication, to name a few. Our studies are designed to boil down these complex phenomena into more easily testable chunks, such as a particular word or phrase or grammatical construction. Through this method we work to tease apart how children, and therefore humans in general, acquire these aspects during their early years, during the pivotal age range where they can speak and be understood, but do not yet use language like adults do. This can teach us a great deal about children, about language, and about humanity. If you have a child still learning their first language, we hope to see you both soon to play one of these games! As we head into our Spring semester here at MIT, we wish you a happy year. Thank you for supporting our work in the study of language acquisition! We could not do it without your help.

With warm regards from the MIT Language Acquisition Lab Team

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Using emphasis to learn new words

In this study, we investigate how children interpret what others say to them. Can they use small differences in someone's intonation to figure out what they are talking about? We showed children two novel objects, and our cartoon character "Foxy" talked about one of them. Then the character asked the child to point to "the toy", with the word "toy" either (i) emphasized or (ii) de-emphasized (as in (1), where capitalization indicates emphasis and smaller font indicates de-emphasis).

1. Now you point to the **TOY**/the toy!

*(Foxy points to a "wug" and then will say: Now you point to the **TOY**/the toy!)*

When a word is emphasized, adults infer that something new is being talked about -- so "toy" in that case should refer to the previously unlabeled object. When the word is de-emphasized, on the other hand, something old/familiar is being talked about -- in this case, that would be the object previously discussed.

We found that 2-year-olds, like adults, selected different objects depending on whether the word "toy" was emphasized or not. These findings suggest that from a young age, children are sensitive to subtle information present in speech -- such as intonation -- and use such information to figure out what others are talking about, even when the words alone are not helpful.

Building "tough" sentences

In this study we investigate how children ages 5-6 handle sentences that are more complicated under the surface than they appear. One type of "complicated" sentence is a question, like "Who did Mary say John saw?" - Despite it being pronounced the way it is, we think parts of that sentence have moved, we can restate this question like "Mary said John saw [who]?" - which is still a good sentence in English, showing that some sentences have some moving parts.

Another type of those moving sentences happens with certain adjectives like "tough". Sentences like (1) are called "tough-constructions", and have moving parts similar to questions. Like we can restate a question, we can also restate (1) like "It is tough to talk to John", showing that like the question "Who did Mary say John saw?", these "tough" sentences have some moving parts. Not all adjectives have these movement-centered structures, however. Sentence (2) on a surface level looks similar to sentence (1) – both have adjectives ("tough" in (1) and "young" in (2)), both introduce a clause that starts with an infinitival verb ("to talk", and "to ride").

1. "John is **tough** [to talk to]"
2. "Mary is **too young** [to ride this roller coaster]

To investigate how children treat these seemingly similar sentences, we told them short stories, and then at one point in each story, we would ask them to repeat the key sentence that would be a variation of (1) or (2). We know independently that children cannot typically repeat a sentence if they do not have the underlying language tools to build that sentence themselves, so if a child succeeded in repeating a sentence without complex movements (like 2), but failed in cases with complex movement (like 1) we might conclude that those simpler sentences are learned earlier.


(Above is a short story where Mama Cat is talking to Baby Cat, but Baby Cat fell asleep! The child needs to repeat what Mama Cat said so Baby Cat can enjoy he story!)

Our results show that overall, the more movement in the sentence, the more difficult time children have accurately reconstructing the target sentence. 6-year-olds had an extra surprise in store, and struggled more with "tough" sentences than 5year-olds did, which may suggest that their understanding of the nuances of those structures are developing right around that time.

Words without meaning

In the study, we explore children's interpretations of different types of subjects. In English, there are referential subjects, which pick out objects (as in: ***It** [= a cookie] is delicious*!). But the language also has dummy subjects, which lack any intrinsic meaning, and instead are thought of as "placeholder elements" (as in: ***It** seems that Owl likes cookies!*). Here we examine if children are aware of this distinction, and if they have non-referential 'it' in their grammar.

We had children listen to a cartoon Owl tell us what his friend says, and then asked them to find his friend by pointing to one of two pictures. In each test item, one picture matched an interpretation using a dummy subject and the other matched an interpretation using a referential subject (Shown in picture below).
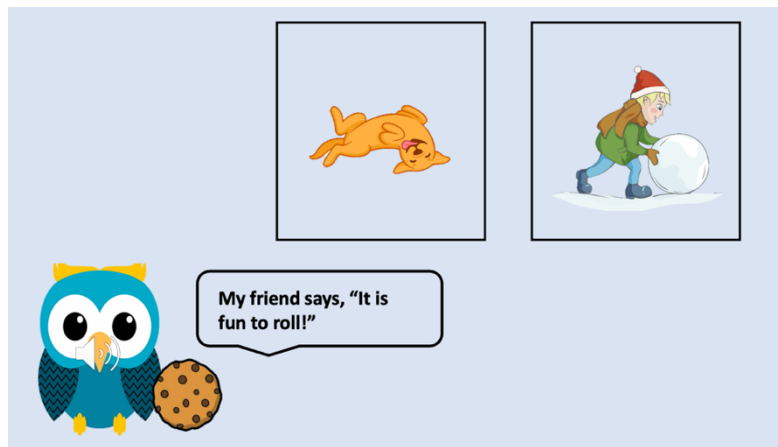
(*For item "It's fun to roll", the picture on the left shows a boy rolling a snowball, and picture on the right shows a dog rolling*)

Preliminary results suggest that 4-year-olds have both subject types in their grammar. When Owl provides an ambiguous prompt (It is fun to roll!), children not only had access to the non-referential interpretation, but they overwhelmingly provided responses consistent with this interpretation, i.e. selecting the image of the dog rolling, not the one of the boy rolling the snowball. We interpret this as evidence that children have non-referential subjects in their grammar by 4 years of age. When given unambiguous prompts (such as *This is fun to fly*! or *It is fun to fly this*!), children exhibited the opposite pattern, selecting the image with the kite. These findings indicate that children are able to make a distinction between subject types.

Learning natural and unnatural adjective patterns

In this study we are investigating the ability children to create a language "rule" from a sample of made-up languages. We know that children must be able to generalize grammar rules, such as "+ed = past tense" in English. Another rule in English and languages all over applies to modifying adjectives, and appears as a mix of affixes (suffixes or prefixes) and some changes to the stem of the word. Think "tall", "tall+er", and "tall-est", or "good", "better", and "best".

That first set pattern is called an AAA pattern, because each adjective has the same unchanged stem: "Tall", we will call this the A stem. The "good" pattern is an ABB pattern, with "good" being stem A, and stem B is underlying different, surfaces as "bett-er/b-est". In English, those are the options for modifying adjectives. But other languages, like Latin, have an ABC pattern.

One pattern we have never seen is an ABA pattern, where the base adjective and the superlative adjective share the same stem, but the comparative has a different stem. When looking across all languages that we know about, it seems unlikely that we haven't found an ABA pattern if it does exist, leading us to suspect that the ABA pattern is unlearnable. That is, the language learning part of our brain is not equipped to create a grammar rule based on language with ABA patterns.

To put this theory to the test, we have created an artificial, "alien" language containing the ABA pattern to teach to children, then we present new alien word and see what "rule" children apply. If they are sensitive to the ABA rule and learn it in training, we expect them to organically apply ABA patterns to new words.
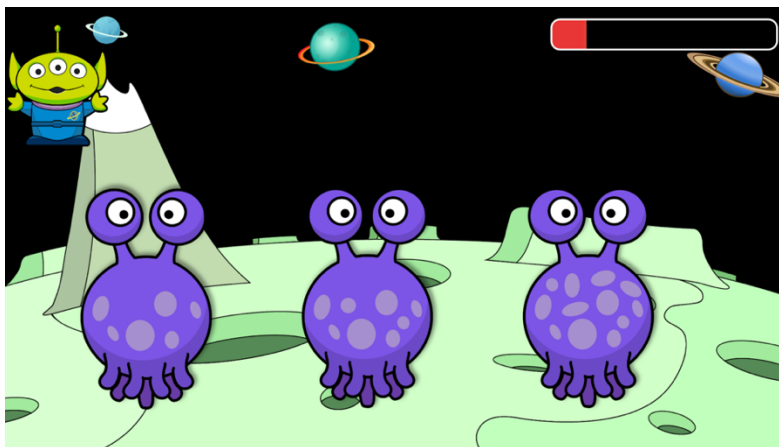
(Our alien friend has some "soob" friends, children need to help to say what the word is for "the most soob of them all!")

This work is ongoing in the Lab via Zoom. Children ages 6-7 are welcome to participate!

Answering questions

In this study, we are investigating what children ages 2-3-years know about questions involving more than one question (wh-) word. As adults, we have intuitions about such sentences. Sentence (1) is an acceptable question, but sentence (2) is much worse.

1. **Who** came out of **what**?
2. × **What** did **who** come out of?

Do young children also know the contrast between 1 and 2? We try to answer this question by comparing children's reactions and responses to each these multiple wh- word questions, as well as their responses to single wh- questions ("*What did bunny come out of?*"). This study is unique amongst our studies in that parents get to play a more active role in assisting our experimenter and make it a more interactive experience, we do this by showing **an instruction video beforehand**.

After we have parents help with starting Story Time, the child is introduced to all the characters, and sees a series of short picture scenes (like below), and parents ask one of the question types we are interested in and compare the responses children give.

(A short animation of bunnies jumping out, plays and the parent asks "Who came out of what?")

We are early in testing for this study, but preliminary results suggest that the youngest children in our sample might not recognize the difference yet, but older children do seem to treat the sentences differently. That is, unlike younger children, older children are more adult-like in their knowledge of how to form a question with more than one wh-word.

This work is ongoing in the Lab via Zoom. Children ages 2.5 to 3.5 are welcome to participate!

Expressing possibilities

In this study, we investigate children's understanding of a certain type of logical words –"modal" verbs. We use modal verbs to describe possible states of affairs, rather than the actual reality. They come in different "strengths": **possibility** modals like *allow* in (1) describe how the world *can* be – the rules of the world are compatible with me going to the store – whereas **necessity** modals like *have* in (2) describe how the world *must* be – the rules of the world dictate that I do dishes.

1. I am **allowed** to go to the store. (*possibility*)
2. I **have** to do the dishes tonight (*necessity*)

These modal words interact with other logical words – like "not" – in interesting ways. When in negative sentences, possibility modals express stricter rules than necessity modals (3 vs. 4)

3. I am **not allowed** to go to the store. (*negative possibility*)
4. I **don't have** to do the dishes tonight. (*negative necessity*)

In this study, we investigate how children learn these modals words and how they interact with other logical words. To do so, we ask if they can distinguish contradictory and coherent statements using them. In example (5), we have a contradiction because the rules cannot necessitate that the TV is both on and that the TV is off. On the other hand, example 6 describes two mutually compatible possibilities, and so is not contradictory.

5. The TV **has** to be on and it **has** to be off. (*contradictory*)
6. The TV is **allowed** to be on and it is **allowed** to be off. (*not contradictory*)
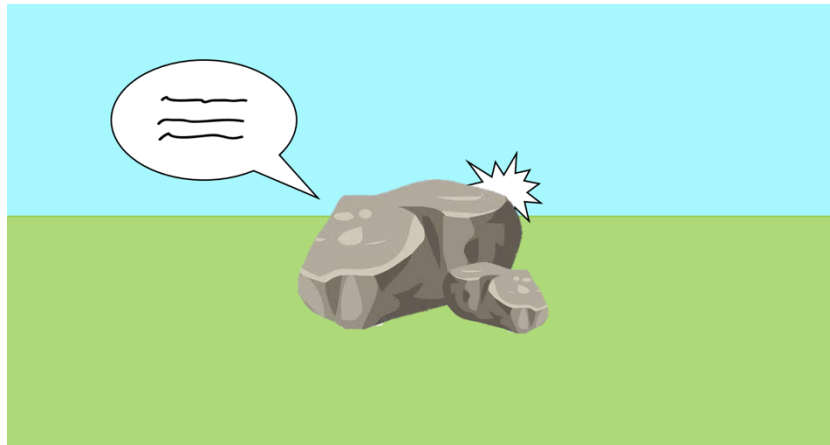
(A puppet is hiding behind the rock. Children listen to what the puppet says and tell us if it is a silly puppet or a nice puppet – did the puppet make sense?)

Strikingly, we found that children judged sentences like (6) as being contradictory, suggesting that they are treating possibility modals like necessity ones. Further work is being planned to see whether this results from a delay in semantics, or in pragmatics. That is, is the difference between child and adult grammar in this case a result in differences in *meaning* – do children think possibility modals (like positive *allow*) have the same meaning as necessity modals (like *have to*), or is the difference in *application* – do children have the same meaning for modals as adults, but they are using a different set of rules to interpret what they are hearing?