Did you know that by 4 months, a baby can already know its own name, and can recognize it even in noise? That starting in the first year of life, babies reason about other people’s intentions, perceptions and emotions? That by 30 months, infants knows the rules that govern reflexive pronouns like “himself” and “herself”?

These are just a few of the recent findings from researchers at the University of Maryland that have been made possible by your participation in our infant and child studies. The Linguistics department’s Project on Children’s Language Learning, the Maryland Infant Studies Laboratory in the department of Psychology, and the Language Development Laboratory in the department of Hearing and Speech Sciences wish to thank you for your support by sharing some of the exciting progress we’ve made this year.

We hope you find it as interesting as we do, and we look forward to seeing you and your child again soon!

Dr. Jeff Lidz
Project on Children’s Language Learning
Department of Linguistics

Dr. Amanda Woodward
Maryland Infant Studies Laboratory
Department of Psychology

Dr. Rochelle Newman
Language Development Laboratory
Department of Hearing and Speech Sciences

Recently Moved? New Baby?
Let us know so we can update our database!

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Web Site: www.infantstudies.umd.edu
The Project on Children’s Language Learning studies fundamental questions about how children learn their first language. Because so much of this learning process takes place before children are 2 years old, we rely on clues like infants’ attention to videos and images to study how they learn the sounds, words and sentence structures of their language.

This year, we have learned about how 2-month-olds align visual and auditory information in speech perception, how 15-month-olds learn about categories of words, and how 2-year-olds learn the meanings of verbs. Read on to learn about the details of these studies.

### The Head Turn Method

Long before children are old enough to tell us what they know about language, we can gain clues based on actions as simple as a turn of the head.

In this procedure, the infant sits face-forward on a caregiver’s lap. The wall in front of the infant has a video monitor at eye-level. The walls on the sides of the infant have lights mounted at eye-level, and there are speakers beneath the lights. Audio files are played from the side speakers. The audio files start when the infant looks towards the blinking light and end when the infant looks away for more than two seconds. Thus, the infant controls how long he or she hears each sound file.

A strong preference for one type of audio file over the other is used as evidence that infants can detect a difference between the types of files.

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**METHODS**

**The Head Turn Method**

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**GRAMMATICAL CATEGORIES**

**The Noun is Verbing!**

One of the most important pieces of acquiring a language is knowing which words are nouns and which are verbs. While you may have learned that these categories are defined by their meanings (nouns are people, places or things; verbs are actions), grammatical categories are better distinguished by the positions they can occupy in a sentence.

<table>
<thead>
<tr>
<th>NOUNS</th>
<th>VERBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>The ___ is late.</td>
<td>My sister will ___ a frog.</td>
</tr>
<tr>
<td>My ___ swallowed a marble.</td>
<td>The dog is ___ ing the couch.</td>
</tr>
<tr>
<td>Can you give me a ___?</td>
<td>You can ___ if you want to.</td>
</tr>
</tbody>
</table>

Nouns are words that can follow “function” words like *the, my, a, or some*, whereas verbs are words that can follow function words like *will, is, can or might*. We wanted to know when infants become aware of these patterns, so we used the head turn method described at the left to test their sensitivity to them.

We began by playing audio clips of short sentences containing a nonsense word, which was used consistently as a noun or consistently as a verb. For example, a child might hear: “After the morning song, *my keb* sat on the table. Before we play the game, *my keb* should be all clean.” In these sentences, the novel word, “keb,” is used as a noun (e.g., after my).

After the child had accumulated 30 seconds of listening time to these kinds of sentences, two new kinds of sentences were presented. In one version, we used the same novel word in a new environment that was consistent with familiarization, such as: “Because the swing was broken, *her keb* lay on the ground.” Here, “keb” is still used as a noun, but it follows a function word (*her*) that was not present during familiarization.

The other version presented the novel word used after a new function word that was inconsistent with the first 30 seconds, such as: “His aunt, who visits us often, *will* keb a slice of cake.” Here, “keb” is used as a verb because it follows the function word *will*.

We wanted to know whether infants would listen longer to words used in the...
consistent or the inconsistent sentences. We found that 15-month-olds listened
longer to the consistent sentences than they did to the inconsistent sentences. In
other words, if they initially heard the word as a noun, they listened longer when that
word was used in a new sentence as a noun than they did when that word was used
in a new sentence as a verb. Similarly, if the new word was presented as a verb
during the first 30 seconds, infants listened longer when it was used as a verb than
they did when it was used as a noun.

This tells us that by 15 months, an age at which most children are not yet combining
words into phrases, they have already learned the grammatical categories of noun
and verb.

– Jeff Lidz

VERB LEARNING

The Category Clue

There is more to word learning than just figuring out what grammatical category a
new word belongs to. Once a child knows what category a word falls into, he or she
then has to determine its meaning. Luckily, the grammatical category already
provides some clues (i.e., nouns tend to label objects, while verbs tend to label
events).

We wanted to know whether infants would use the grammatical category of a novel
word as a clue to its meaning. Knowing that children do not normally begin using
lots of verbs in their own speech until about 2 years of age, we asked whether
children just under 2 would infer that a novel word used as a verb refers to an event.

To ask this question, we used the “preferential looking” method described at the
right. In our study, we presented videos of an object (e.g. a flower) undergoing a
particular motion (e.g., spinning). During this familiarization phase, a voice said,
“Look! It’s blicking. Do you see it blicking?” This happened several times. Then we
probed to see what the infants thought “blicking” meant.

At this point, two videos appeared on the screen side by side. On one side, the
video showed a flower spinning, just like before. On the other side, the video
showed a flower doing something new (e.g. moving up and down). After a few
seconds for the infant to get used to the new videos, we asked, “Which one is
blicking?”

At this point, we began to measure which of the two videos the baby was looking at.
If the baby understood that “blicking” referred to the spinning event, we expected
him to look more at the spinning video. If he thought “blicking” referred to any other
aspect of the scene, we expected him to look equally at the two videos.

In the end, the children looked more at the familiar video, on average, suggesting
that they learned that “blick” refers to the spinning event and not, say, to the flower.
This is initial evidence that children under 2 years of age know that verbs are likely
to refer to a type of event.

– Jeff Lidz

METHODS

The Preferential
Looking Method

The preferential looking method
involves videotaping children’s eye
movements as they watch short movies
on a large TV screen.

The child sits on a caregiver’s lap, and
the caregiver wears headphones so he
or she does not influence the child’s
behavior.

The movies use a split screen to show
two different objects or events at the
same time. When the child hears a
sentence, word or sound that matches
one side of the screen, we expect the
child to spend more time looking at the
matching side than the non-matching
side.

For example, if the screen has a picture
of a dog on the right and a baby on the
left, a child will shift his gaze to the baby
when he hears the question, “Where’s
the baby?”
PRONOUNS AND REFLEXIVES

It Takes Two … Sometimes

Think about the following two sentences:

A) She’s patting Stacey.
B) She’s patting herself.

Who does the pronoun “she” refer to in these examples? Without any context, it’s hard to say. Now, imagine that you have two videos to choose from. In one, Stacey is both the patter and the pat-ee. In the other, Stacey is the pat-ee but someone else (maybe Patty) is the patter. Which video would you choose for each of our example sentences? If you are an adult native speaker of English, you know that only sentence B can go with the video in which Stacey pats herself.

We wanted to know when children learned this property of English, so we conducted a preferential looking experiment in which we showed two videos side-by-side, as at the right. In one video, a girl was patting herself while a second girl stood by. In the other video, one girl was patting the other.

While these videos played, we said either sentence A or sentence B. We wanted to know whether children would look more at the matching video than the non-matching video. If they knew that the pronoun in sentence A could not refer to Stacey, then they also know that in a sentence like A, unlike B, there have to be two participants in the patting event.

We found that 30-month old children preferred to look at the two-participant videos for sentences like A, but at the one-participant video for sentences like B. This tells us that they know about the properties of English pronouns.

– Cynthia Caviglia, Stacey Conroy and Jeff Lidz

VOWELS

Read My Lips

Most of what happens in speech happens inside the mouth, involving factors like the position of the tongue. However, some information about certain sounds is reflected in the position of the face. When we make an “ee” sound, our lips are spread and taut, but when we make an “oo” sound, our lips are round. Do infants know about the connection between the auditory and visual components of speech?

To test this, we presented 2-month-olds with videos of two faces (e.g., an “ee” face and an “oo” face) while playing audio consistent with only one of the faces. These infants showed a clear preference to look at the face that matched the vowel they were hearing. So far, infants have looked at the matching face when comparing “ah” and “oo” and also when comparing “ee” and “wee.” These results suggest either that infants learn very quickly what face shapes correspond to what kinds of sounds, or that they are born with a predisposition to match certain face shapes with certain kinds of sounds. Future work will attempt to tease these possibilities apart.

– Rebecca Baier, William Idsardi and Jeff Lidz
At the Maryland Infant Studies Laboratory in the Department of Psychology, we study babies’ social intelligence. Babies grow up surrounded by human activity, and others’ actions carry rich information for them. From others, babies learn language, they learn which things are safe and which are not, and they learn how to be members of their social and cultural communities. All of this learning requires that babies first be able to make sense of what others are doing. In our research group, we ask when and how babies come to understand that others’ actions express their goals, their focus of attention and their emotional evaluations. Since infants cannot tell us in words what they understand, we use behaviors that infants can control as evidence about what they think. In some studies, we measure infants’ patterns of visual attention—how long they stare at events and where they look. In other studies, we investigate infants’ propensity to imitate others’ actions.

**Baby See, Baby Do**

**How Babies Imitate Others’ Actions**

The ability to recognize that other people’s actions are directed at goals is important in both adults and young children. As adults, when we watch someone reach up to grasp a toy off of a high shelf, we see more than the motion of that person’s arm; we know that the person has a goal of retrieving that toy. Young children’s understanding of others’ goals is expressed in the ways they imitate others. Children selectively imitate others’ goals, while varying parts of the action that seem less relevant to the goal. In these studies, we asked whether infants, like older children, imitate others’ goals.

**Goals in Hand**

In one study, 7-month-olds saw an adult interact with one of two toys. The experimenter would say, “Hi. Look!” and either reach toward the toy in a goal-directed way (grasping or attempting to grasp the toy) or in an ambiguous way (touching the back of her hand to the toy). Then the experimenter would say, “Now it’s your turn!” and give the infant the opportunity to interact with the toys. Babies who saw the goal-directed action were more likely to choose to play with the same toy the experimenter interacted with, but babies who saw an ambiguous action chose randomly.

Currently, we are conducting a similar study in which a self-propelled box (instead of a hand) acts on one of the toys. Recent research has suggested that babies might, under some conditions, think of inanimate objects as if they were animate agents. We are testing this claim by seeing whether babies will imitate the box’s “goal.” So far, babies are not imitating the box’s goal, but instead are responding randomly.

**Thinking Outside the Box**

With an older age group, we asked a slightly harder question – whether babies could understand goals of not just single actions, but actions in a complex sequence. These 13-month-olds saw an adult experimenter say, “Hi. Look!” and open a clear plastic box to retrieve a toy from inside. Adults viewing this action understand that although the actor touched both the box and the toy, her ultimate goal was the toy, not the box. In the study, the experimenter placed the box and toy on opposite sides of a tray and gave the baby the opportunity to choose one. Infants at this age were more likely to choose the toy, indicating that they are able to reason that the box is a means used to retrieve the goal (the toy) and imitate that goal. In contrast, if the toy started outside the box and the same sequence of events occurred, infants were more likely to choose the box, indicating they did not perceive the same kind of means-ends relationship between the toy and the box, since in this case, the box is not a means to retrieve a goal inside.
In a study with an even older age group, we used toddlers’ tendency to imitate others’ actions to find out how context can shift their inferences about someone’s goals. The 18-month-olds in this study watched as a researcher moved a toy mouse by either bouncing or sliding it to its destination. Sometimes the mouse stopped moving after arriving at one side of an empty mat, and sometimes it stopped when it arrived inside a house (or “cubby”) on the mat. The actions were the exactly the same, and only differed by what was physically present when the mouse stopped. But did the infants view these actions differently?

It turns out the answer is yes. When infants saw an experimenter hop or slide a toy mouse into one of two houses, they subsequently imitated the action by putting the mouse directly into one of the houses, ignoring the type of action used to get there. However, when infants observed the same action take place on a mat with no houses present, they were more likely to imitate the hopping or sliding action.

These findings are suggestive that the context in which an action takes place can influence 18-month-olds’ interpretations of another person’s goal. Furthermore, they suggest that by this age infants can reason about more abstract goals (such as an action itself as a goal).

We are currently running a new version of this study in which the mat has a house on one end and nothing on the other. We want to see what infants will do when faced with an action goal to the empty side of the mat with the house still present in the scene. Will they show the same likelihood to imitate the action itself, or will they be unable to resist the more interesting goal of putting the mouse into the house?

What’s in a Hand?

Even young infants can sometimes understand other people’s goals. In this study, we used 9-month-olds’ patterns of visual attention as evidence about the actions they can understand as goal-directed.

Adults can readily recognize some familiar actions, such as grasping, as goal-directed, and they distinguish between these actions and others that are more ambiguous. For example, if we saw someone touch an object with the back of her hand, we might not readily understand what her goal was.

We showed infants in one group events in which a person grasped a toy. After repeatedly viewing that event, infants readily detected a change in the actor’s goal, looking longer when she reached to a new toy than when she reached to the same toy. This suggests that infants understood the reaching action as goal-directed. Next, we repeated the study with another group of infants who saw the person contact the object with the back of her hand. For this more ambiguous event, infants did not show strong attention to the person’s “goal.” This suggests that, like adults, babies use information about an action’s familiarity in reasoning about a person’s goal. Next, we plan to ask whether adding more information to the event can convince babies that the ambiguous action is goal-directed.
Understanding others’ emotions is critical in everyday social interactions. Information gathered from others’ emotions helps us to make judgments about whether novel events or objects are dangerous or safe. This ability is seen in babies’ social referencing behavior. When confronted with an ambiguous situation, babies check the reaction of a caregiver or other adult, and use this information to decide how to respond. If the parent looks calm and happy, babies are likely to approach and explore the situation. If the parent looks frightened or disgusted, babies are likely to avoid the situation.

In this study, we ask whether 18-month-old infants can also use an adult’s emotional response to predict what the adult will do next. Babies saw an actor display a “happy” emotion (saying, “Ooh! Wow!” and smiling) or a “disgusted” emotion (saying, “Eww! Yucky!” and grimacing) while looking at an ambiguous object. They then saw the actor either push the object away from herself or pull the object toward herself.

Infants in the “happy” condition were surprised (looked longer) when the actor pushed the object away from herself than when she pulled the object toward herself. That is, babies seemed to understand that when someone is excited about something, he or she will probably want to interact with it.

Infants in the “disgust” condition, however, did not respond systematically to either the push or the pull events. They did not assume that if the actor was disgusted by an object, she would avoid it rather than approach it. These findings suggest that 18-month-olds understand some of the ways that emotion can predict actions, but disgust may be a more complicated emotion for them to reason about.
At the Language Development Laboratory in the Department of Hearing and Speech Sciences, we study how infants acquire spoken language, and how their perception of language changes with development. We look at how well infants can follow a talker’s voice in noise, and how they take fluent sentences and figure out where one word ends and another begins. We also explore language perception in older children and adults, looking to see how listeners adjust for variability in the speech signal, and how both listeners and speakers find the appropriate words from the thousands that they know.

HEARING ABILITIES IN NOISE

Can You Hear Me Now?

Many of our research studies focus on how well infants can hear and understand speech when they are in noisy environments. One of the most important tasks facing young infants is learning their native language, yet much of the speech they hear occurs in noise. Consider an infant sitting in a room with her family. Her father might be speaking to her while her older sister is watching television and her two brothers are playing (and talking) nearby. In order to understand her father, the infant must separate her father’s speech from that of all of the other voices in her environment. How does the infant succeed at this task?

To answer this question, we have been using something infants typically learn very early: their own name. In a quiet environment infants will listen longer to their name than to another child’s name by the time they reach 4 months of age. In our studies, we have been testing whether infants still do this when there is background noise.

We have found that infants in their first year of life do have some capacity to understand speech and pay attention to one voice, even in the presence of other talkers. However, infant listeners are far more sensitive to background noise than we expected. While infants can recognize their own name in low levels of noise, they fail to do so in noise levels comparable to those found in many daycare centers.

Moreover, while adults typically find it more difficult when there are more people talking at the same time, some recent findings suggest that infants actually show the opposite pattern: when the overall noise level is the same, they do better when there are many people (each talking somewhat softly) than when there is a single person talking more loudly.

These findings are particularly important given concerns over the quality of childcare environments and the impact such environments might have on language acquisition. Our lab is currently conducting follow-up research on the types of noise most detrimental to infants and what parents can do to make it easier for infants to attend to their voice.
HEARING ABILITIES IN NOISE

What Did You Say?

What about toddlers’ ability to hear in noise? We have been testing older children’s ability to understand things said to them in noise using the preferential looking method described on page three.

Children aged 24 months are shown two video screens, each showing a different animal (i.e., a cat and a dog). They hear a voice saying things such as “Find the kitty!” or “Where is the doggy?” Generally, when children understand what is being said, they look longer at the video that matches what they are hearing, so they’ll look longer at a video of a cat when they hear “Find the kitty!”

We have been using this same procedure, but adding background noise to see what levels and types of noise prove to be most distracting to young children. Not only does this tell us something about how children’s language and attention skills develop, but it also has practical importance in determining what levels of noise can be tolerated in school and daycare settings. These studies are ongoing, but we know that children at this age seem to be better able to deal with background noise than are children only a year younger.

WORD LEARNING

The Memory Factor

In order to successfully learn language, infants must be able to store information about what they are hearing. We have begun exploring the limits of one type of memory called “working memory.” This is the type of memory that allows individuals to hold things in mind long enough to work on them, and is thus likely to be particularly important for word learning. The child may hear a sound pattern, but he or she needs to hold onto that pattern long enough to match it to an appropriate object in the world.

We are beginning this line of work by trying to determine how many items infants can hold in memory and how this skill changes with development. To examine this, we play infants a series of notes from musical instruments. On some trials, one item changes with each repetition, as in the picture to the right; on other trials, the same series is played over and over. Infants tend to listen longer when things change slightly. But noticing the change requires that infants remember the series from one repetition to the next. So this lets us examine how long of a sequence infants can remember. Results from our first study suggest that at 10 months of age, infants can store at least two items in memory, but cannot hold onto four items. We suspect this may place limits on the length of words infants will be able to remember – they may have difficulty learning long words (ones with more than two syllables) because of this memory limitation. We expect to explore this further over the next year.
WORD FINDING

The Um… Uh… Thingamabob

Everyone occasionally has problems finding a word that they know. For children, this happens even more often than for adults. We have been exploring properties of words that might make them easier or harder for children to find or access. These factors can tell us about how children’s “mental dictionaries” are organized. Most recently, we have also been comparing children who are developing typically to children who stutter.

One possibility is that children who stutter have subtle deficits in their ability to find words that then might lead to their production difficulties. To test this, we have been using a confrontational naming task. In this task, children see a picture of an object on a screen and are asked to come up with the name for it as quickly as possible.

We are exploring whether different groups of children, and children of different ages, find the same types of words to be more challenging. This work may help us to identify the underlying cause of differences between these groups of children.

Although we haven’t yet finished collecting data from children who stutter, we have been analyzing data from typically-developing children of different ages. So far, the data suggest that while older children do better on naming tasks overall, this is not because they know more words. Children who have a larger vocabulary are actually not necessarily any better at gaining access to the words they know than are children who know fewer words. Apparently, how well you can access a word is a very different skill from how well you know it.

GRAMMAR LEARNING

One little piggie… two little piggies…

Children understand many aspects of language long before they can produce them. A lot of our research has examined when children begin to understand different aspects of their native language.

One particularly interesting aspect of language is that of plurals. Like words, the plural marker carries meaning – but it is also very short, and thus less obvious perceptually. Perhaps for this reason, it is an area of particular deficit for children with some types of language disorders. Although a number of studies have looked at when children begin to produce the plural marker, almost none have looked at children’s comprehension. We are examining when children begin to understand this concept. Children see two television screens, one showing a single object, and one showing a pair of objects. They also hear a voice, telling them to “Find the ____!” Sometimes the word the voice says ends with an “s”, and sometimes it doesn’t.

So far, the result suggest that children don’t learn this as a general rule at first – instead, they learn individual words in their plural and singular forms. So children aged 20 months seem to know the difference between “horse” and “horses” – but they don’t extend that knowledge to new words. So, if shown new objects and asked to “Find the goish!” or “Find the goishes!” children of the same age don’t know which video to look at! It seems that they need another 4 months or so of learning before they realize that plurality is a general rule that can be applied to any object.