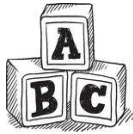
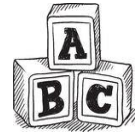


Infant Learning Lab Newsletter



2014 In Review



Dear Parents and Friends,

Thank you so much for participating in the language research studies being conducted at the University of Wisconsin's Infant Learning Lab!

Even though many of our participants are not yet talking (we have studies with children as young as 6 months of age), all of our participants are paying close attention to the sounds, syllables and words that surround them. With your and your child's help, we are able to address important questions related to language acquisition. Answering these questions will help us to better understand how typically-developing infants process and learn language, information that could lead to a better understanding of what happens in cases where children don't acquire their first language as readily.

Many families participated in one or more studies over the last year, and we have been busy collecting data for all of these studies! As always, we have had some very interesting and exciting results. This newsletter is intended to highlight the findings of some of the different studies we have been conducting over the last year. In addition to the study highlights, you can find a list of recently published work at the end of this newsletter.

We hope that you and your child had an enjoyable visit to the Infant Learning Lab. Thank you again for your participation! Without your help, this important research could not happen. If you would like copies of any of the papers we are writing or have any additional questions or comments, please feel free to call us at (608) 263-5876, or email us at babies@waisman.wisc.edu.

Thanks again!

Jenny Saffran, Ph.D. – Principal Investigator
Erin Long, BA – Laboratory Manager



Our 2014 Studies

Do caregiver voices support learning?

Babies hear a lot of language during their first year of life, but most of it comes from a small number of people: their primary caregivers. Babies spend the vast majority of their early life interacting with their parents, and become highly sensitive to the way that parents respond to their actions and vocalizations. In our study, we asked whether this might make a difference in how quickly babies learn. Do 6-month-old infants learn faster from a parent's voice as

opposed to voices unfamiliar to them?



To test this, we brought parents into the lab and recorded them speaking short syllables. In one condition, babies

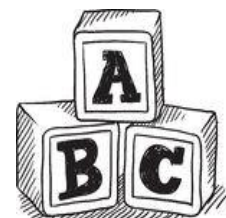
would learn from their parents' voices. Another group of babies heard the same voices, only for them, these voices were unfamiliar. In the study, babies first heard a short syllable (e.g. "lee") spoken either by their parents or by two unfamiliar adults, and a rewarding video would appear either on the left or the right side of the screen, depending on which of the two voices had just spoken. The question was how quickly babies would learn to correctly anticipate where the video was going to appear, based on who was speaking. We predicted that babies learning from their parents' voices would learn faster than babies learning from unfamiliar voices.

What we have found so far has been somewhat surprising: first, babies learning from unfamiliar voices don't seem to learn to predict the video locations at all. This shows that this task, associating a speaker with the location of a rewarding experience, is actually quite hard! But what is most interesting is the pattern shown by babies learning from their parents' voices: these babies seem to be gradually improving across the course of the experiment, learning to look to the correct location based on who is speaking. In other words, babies learning from their parents' voices appear to be learning best. We are currently running follow-up experiments to confirm this finding.

If babies really do learn faster from their parents' voices in this task, the next question is *why*. One possibility is that, since babies have so much experience with their parents' voices, it's simply easier for them to process these voices. Another possibility is that babies expect parents' voices to be connected to something rewarding, and are therefore more motivated to learn from them. In later studies, we will try to tease apart these potential explanations for why babies might learn better from their parents' voices.

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How do infants discover words in speech?

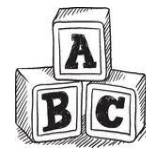
Young babies learn their first words by listening to the speech of their caregivers. However, it's not trivial figuring out which sounds go together to make up the words of a language. When we speak, we speak in a continuous stream of speech, where words run together and there are few pauses that signal where words start and end. Additionally, the sound patterns that make up the words in natural languages are complex. How do young infants discover words given the complexities of the spoken language they hear?

To study how infants discover words in speech, in this study, we have 8-10 month olds listen to an “artificial” language. The artificial language contains novel words that follow a specific pattern (75% of the words start with the sound /t/ and end in the sound /u/, for example, *teedu*, *tehku*, *tiepu*). These novel words are put together without any pauses between words, creating a fluent stream of speech that resembles the speech infants hear in their environment (for example, *teedutehkulehfaytiepukeeda*). Once infants have listened to the artificial language, we test to see if they learned the pattern that made up the words in that language, that words start with the sound /t/ and end in the sound /u/.

We measure if infants have learned the word pattern in the artificial language (that words begin with /t/ and end in /u/) by having them listen to novel test words that either follow that pattern (*taydu*, *tiefu*) or do not follow the pattern, but still contain the two common sounds in the artificial language (*kuteh*, *puteh*). Infants' listening preferences will tell us if they have learned the word pattern that is in the artificial

language they heard. If they listen longer to the test words that are consistent with the word pattern in the artificial language, then this will tell us that infants in fact were able to discover the words and their structure in the artificial speech. This study is currently ongoing, and results will provide insights into the process of how young infants discover words in speech.

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When do children understand the meaning of “who” and “what”?

Question words, like “who” and “what”, are frequently heard in children’s language input. However, these words may be difficult to learn because they can be used to refer to many different things. For example, “who drives the red truck?” refers to a different person than “who rides in the stroller?”, and “what is that?” can refer to dozens of things in the child’s environment.



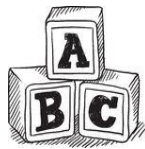
Nevertheless, more parents report that their 14-month-old children know what “what” means than words like “pillow”, “fork”, or “face”, which generally refer to the same type of thing each time a child hears them.

In order to figure out *how* children learn the meanings of these abstract words, we first have to figure out *when* they begin to understand them. To test this, we showed 14-month-old

children two pictures side-by-side on a screen: one person and one inanimate object (i.e., a vehicle). We then asked children either “who do you see?” or “what do you see?” If children understand what “who” means, they should look more at the person than the car.

We found that 14-month-old children did not increase their looking to the person when they heard “who do you see?”, nor to the vehicle when they heard “what do you see?” This indicated that they did not yet understand the meaning of “who” or “what”. Therefore, we need to test older children in order to find the age at which children first understand the meanings of wh-question words. Then, we can design new studies to figure out what types of information help children learn these abstract words.

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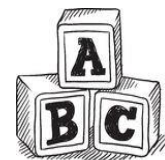
Can babies understand words in an unfamiliar accent?

As babies begin to learn language, they have to learn not only what is important, but also what is *not* important. Different speakers may pronounce words slightly differently, for example, and a baby has to learn that when one person says “melk” and another says “milk,” they are referring to the same beverage. There may be many such differences in pronunciation between people who have different regional accents, and even adults may initially have difficulty understanding someone from a different region or county.

We wanted to know when young infants would be able to ignore these differences and understand speakers with a different accent. To do this, we asked whether they would be able to tell the difference between real words that they should recognize, like *mommy* or *shoe*, and made-up words that they’ve likely never heard before, like *guttle* or *shammy*. So far, we’ve seen that babies can tell the difference when a speaker has a familiar, Wisconsin accent, but they don’t seem to be able to understand a British speaker.

What we’re currently working on is seeing whether or not hearing other people who have different accents might help babies understand this unfamiliar British accent. We are having infants listen to a story, spoken in an unfamiliar accent to see if they can learn to recognize familiar words spoken in that accent, or another new accent. We think that even a small amount of experience with new speakers might make infants more flexible in what they think sounds familiar, and we are hoping to understand what allows them to eventually be able to ignore the differences between speakers that do not matter for meaning.

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When is a ball a vall?

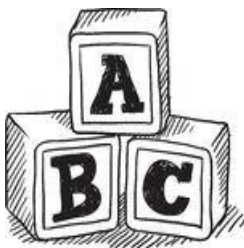
The environment in which children learn words influences what they learn. Recent research in our lab has found that the volume of background speech heard when learning words impacts whether or not two-year-olds were able to learn.

What helps children with Autism and children with language impairment learn new words?

To test this we taught two different groups of children made up words. While learning the words the children also heard two-talker babble speech—a scenario that would be similar to two people talking over one another. Children who heard the louder babble speech when they were taught the words did not learn the words; however, children who heard background speech that was slightly quieter learned the novel words. What remains to be seen is whether the words that children learn in a noisy environment are as stable as the words they've learned in quiet. For instance, are children willing to accept that the object *ball* could also be a *vall* if they've learned the word *ball* in a noisy environment?

To test this we are teaching 22- to 24-month-olds a completely made-up word, *boskot*. For this study, children are taught the word *boskot* either with background speech or without any background speech present. They are then tested on whether they recognize the picture of a boskot when the word *boskot* is mispronounced as either *toskot* or *voskot*. Data collection is ongoing, but if children in either the noise or the quiet condition look to the picture of the boskot when they hear *toskot* or *voskot*, we will have additional evidence to show that background noise in a child's environment influences how they learn words.

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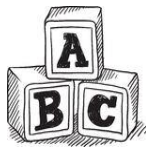
Children with autism spectrum disorder (ASD) have difficulties with social communication and display repetitive behaviors. Many children with ASD have language impairments. In fact, early delays in word learning are one of the first signs that parents notice. Children without autism sometimes have language impairments too. For example, children with specific language impairment (SLI) have language difficulties without having a history of hearing loss or neurological damage. This study examined word learning skills and other learning skills that may improve word learning in children with ASD, children with SLI, and children with typical development to determine whether or not the same underlying skills hinder word learning across the groups.

Children participated in three tasks over two visits. In one task, children completed in a segmenting task, much like some of the studies that babies in the Infant Learning Lab have done. Children listen to a made up language that has many sounds that follow a pattern. Afterwards, children are asked to listen to two options and pick the one that sounds like the thing they heard before. If children were able to pick up on the pattern, they demonstrated a skill called statistical learning. Children also participated in a word learning study, where they were taught four words. Lastly, children completed a second word learning study, but this time heard a different artificial language beforehand. Half of the words they learned were in the artificial language and the other half were not. We wanted to see if children learned the words that

appeared in the artificial language better than the words that were not.

Preliminary findings indicate that children with ASD and typical development are able to find the pattern in the artificial language used in the segmenting task. Also, children with typical development and children with ASD, on average, learned 3 of the 4 words in the word learning study and children with SLI learn around 2. Lastly, all groups show a benefit from listening to the different artificial language before the word learning study. This possibly indicates that children across the three groups are able to gather information about patterns and sounds and use it to help them learn words later.

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Learning what to remember

When baby Emma hears the word “dog” for the first time, it may be at her house when her mom is talking about their Golden Retriever. However, Emma also needs to be able to recognize other types of dogs in other places, and she may not hear that word again for a couple days or even weeks. Part of learning a word is being able to use it flexibly (but appropriately) in new situations, and to be able to remember words across time delays. How do these two aspects of word learning interact? Do toddlers remember words a week after hearing them? Is their ability to generalize new words affected by time and memory processes?

For the past year, I have been running a study to investigate these questions. Two-year-olds came into the lab, and watched a movie that taught them the words for four new objects. Each object had a distinct color, and was always seen with its own distinctly colored background. Then, toddlers either watched a short video clip, or they went home and came back a week later. After the short or weeklong delay, toddlers watched another video to test their memory for the words, and how they generalized them to different colored but same-shaped objects, or the same-colored objects but with a different background context. This is like testing to see if after learning about her own dog in her own house, Emma recognizes a Black Lab as a dog, or a Golden Retriever at the park as a dog. We also asked parents to fill out a checklist of the words that their toddler says to get a measure of the

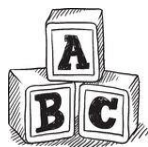


size of their vocabulary.

We found that while children with smaller vocabularies were able to generalize the words across both types of changes, whether they were tested after a short or weeklong delay, children with larger vocabularies did something different: if they were tested after only a short delay, they generalized equally well to new objects and to new contexts. If they were tested after a week delay, they generalized very well to new contexts, but not to new objects. This result is striking: why are children with more words in their vocabulary worse at generalizing? We think children realize that it's more important to remember details about a word's referent, than the contextual background information. By testing children's memory for new words after different time delays, we have shown that as

children learn more words, they're figuring out what they need to remember and what they can forget.

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How do children learn to identify the same object using different words?

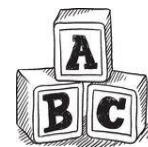
When shown a picture of an apple and a shoe, children are able to quickly identify the correct object using its name (*Find the apple*). Apples and shoes, however, differ along many dimensions. We could instead ask children to identify the apple using a familiar action (*Which one can you eat?*) or its color (*Where's the red one?*). In such situations, there are many different words we can use to direct children's attention to the same object.



In this study, we examined whether children have difficulty switching between dimensions when identifying the correct object. Children were first asked to identify a series of objects using their names. They were then asked to identify a series of objects using their colors (for some children the order was flipped with colors first and names second). Children also played a sorting game where they were asked to match pictures based on color and then shape. Preliminary results indicate that children who were better able to switch during the sorting game were also faster in identifying the correct

objects following the switch in dimensions (e.g., from names to colors). These results suggest that children differ in their ability to flexibly switch between dimensions to identify objects. Future work will examine how we can help to improve children's ability to switch dimensions when comprehending language.

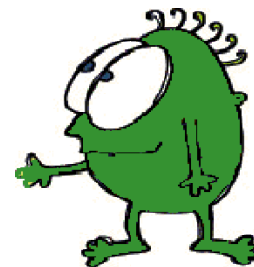
Ron Pomper, B.A.
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What happens when children first encounter new languages?

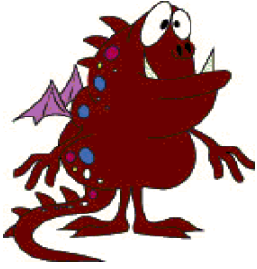
What happens when children first encounter new languages? Do all languages sound the same? Or can they tell which languages are the same and different?

In ongoing research conducted at the Madison Children's Museum, we wanted to see how hearing new languages affects children's ability to tell the difference between languages that they don't know. First, we had children watch a short movie where they heard someone in the background speaking either a familiar language (English) or an unfamiliar language (Italian or Mandarin Chinese). Then they played a game with cartoon monsters where we asked them to tell the difference between two languages. Some children were asked to tell the difference between languages that sounded very similar (Spanish and Italian), while others heard languages that sounded more different (Spanish and Mandarin Chinese). We wanted to know not



only if they had an easier time telling one of those language pairs apart, but also if hearing a different language beforehand might make their job easier or harder.

Unsurprisingly, children tended to find it easier to tell the difference between languages that



sounded more different, although they also did well with the more similar-sounding pair. In addition, even just 30 seconds of experience listening to a new language could help them do

even better. Children were more accurate in telling the languages apart after hearing an unfamiliar language (either Italian or Mandarin) than they were after listening to English. What was surprising, however, was that watching a movie with the language that was *not* part of the test was the most helpful in allowing children to tell the difference between the languages. That is, children who were tested on the difference between Spanish and Italian did best after hearing Mandarin, while children who were tested on Spanish and Mandarin did best after listening to Italian.

These results show us that even just small amounts of experience with new languages can change what children notice when they hear speech that they don't understand. It could be, then, that children who grow up in homes or communities where they encounter more than one language may be particularly sensitive to the differences between languages. In future research, we hope to continue to understand when children think different languages are the same and different, and how experience in their daily lives may influence the way they interpret unfamiliar speech.

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☞ Looking for more research opportunities? ☞

Here are some other labs in the Waisman Center that are looking for families with kids to participate!

- ✓ **The SPACE Lab** - Studying the development of children's memory for visual features and locations of objects
 - Sign up online! www.waisman.wisc.edu/socialkidslab/socialspacelabs/Sign_Up.html
 - Dr. Vanessa Simmering: spacelab@psych.wisc.edu
- ✓ **The Social Kids Lab** - Studying the cognitive and social development of young children
 - Sign up online! www.waisman.wisc.edu/socialkidslab/socialspacelabs/Sign_Up.html
 - Dr. Kristin Shutts : socialkids@psych.wisc.edu
- ✓ **Child Emotion Research Laboratory** - Exploring children's emotional development and the relationship between early experience and mental health
 - Sign up online! www.waisman.wisc.edu/childemotion/parents.html
 - Barb Roeber: childemotion@waisman.wisc.edu
- ✓ **Binaural Hearing & Speech Lab** - Studying how children learn to locate sounds in their environment
 - Visit the website for current studies!
http://www.waisman.wisc.edu/bhl/patients_participants.html

Recent Publications

Please visit our website for direct links to these and other lab publications:

<http://www.waisman.wisc.edu/infantlearning/Publications.html>

Wang, T., & Saffran, J. R. (2014). Statistical learning of a tonal language: The influence of bilingualism and previous linguistic experience. *Front. Psychol.* 5:953. doi: 10.3389/fpsyg.2014.00953.

Willits, J.A., Seidenberg, M.S., & Saffran, J.R. (2014). Distributional structure in language: Contributions to difficulty differences in infant word recognition. *Cognition*, 132(3), 429-436.

Wojcik, E. H., & Saffran, J. R. (2013). The Ontogeny of Lexical Networks: Toddlers Encode the Relationships Among Referents When Learning Novel Words. *Psychological Science*, 24(10), 1898-1905. doi: 10.1177/0956797613478198

Wojcik, E. H. (2013). Remembering new words: Integrating early memory development into word learning. *Frontiers in Developmental Psychology*. 4, 151.

Lany, J., & Saffran, J. R. (2013). Statistical learning mechanisms in infancy. In Rubenstein, J. L. R. & Rakic, P. (eds.) *Comprehensive Developmental Neuroscience: Neural Circuit Development and Function in the Brain*, Volume 3, pp. 231-248. Amsterdam: Elsevier.

Willits, J. A., Wojcik, E. H., Seidenberg, M. S., & Saffran, J. R. (2013). Toddlers activate lexical semantic knowledge in the absence of visual referents: Evidence from auditory priming. *Infancy*. doi: 10.1111/inf.12026.

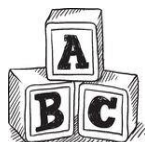
Know someone with a baby?



We are ALWAYS looking for more babies to participate in our studies!

Our current studies involve infants between 6 months and 45 months of age. Please pass on our phone number (608-263-5876) and/or email address (babies@waisman.wisc.edu) to any parents who might be interested in participating on our research studies.

If you are involved in programs with infants or expectant parents, including child care programs, play groups, or childbirth classes, and would be willing to post a flyer or distribute articles describing our research, please let us know!



Thank you for your continued interest in and support of our research! We could not do it without you!

