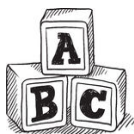
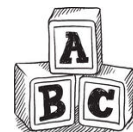


Infant Learning Lab Newsletter



2016 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 you 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

Rachel Reynders, B.A. – Laboratory Manager



Our 2016 Studies

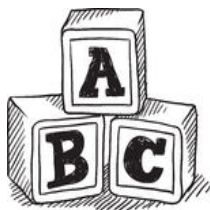
How do infants learn grammar?

During the first year of life, infants begin to acquire the grammatical patterns of their native language. Babies learn that words belong to different categories such as determiners, nouns, verbs, etc. To what extent is this learning process specific to language? In this new project, we are interested in whether infants can acquire grammatical patterns resembling those found in natural languages from non-linguistic sounds.



To address this question infants 12.5 to 13 months old listen to a made-up language composed of tones instead of words. In this language the tones follow each other according to an underlying grammatical structure where some tones predict the

presence of others. After they listen to the “tonal” language, we measure whether they have a preference towards listening to either patterns that match the language or patterns that are inconsistent. If babies show a difference in listening preference between the two types of tone strings, this will suggest that the mechanism through which infants acquire grammar may not be specific to language.



Chiara Santolin, Ph.D.
vbenitez@wisc.edu

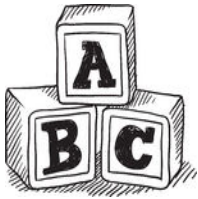
How do infants learn multiple languages?

Many babies grow up listening to and learning more than one language. When growing up in a multilingual environment, how does a young baby keep track of each language separately to learn the different rules and patterns of each?

To answer this question, we created two “artificial” languages. These “artificial” languages are short languages that contain made-up words that sound like English. Both languages have their own words and patterns that make them different from each other even though they were spoken by the same person.

We had one group of 8- to 9-month old babies listen to only one of the two languages, as a first step to ensure that each language was learnable on its own. After babies listened to one of the languages, we measured their listening preferences to words in the language, and words that were not present in either of the languages. If babies show a difference in listening preference between words in the language compared to words that were not in the language, this would suggest that babies were able to successfully learn the language. We found that 8 to 9-month old babies can successfully learn the words when only listening to one of the languages.

Next we had a separate group of babies listen to both languages back to back, without any pauses in between or any other sound cues that signaled that there were two different languages being heard. Can babies learn the words in the first language or the second language when they listen to them back to back? We found that young babies have a hard time separating out the two languages to learn. For the next steps, we would like to add some additional information that may help babies to separate the two languages, like adding a pause in between the languages and having each language spoken by two different people. We hope the findings will help to better understand how young babies learn multiple languages.



Viri Benitez, Ph.D.
vbenitez@wisc.edu

Does music help infants to learn patterns in language?

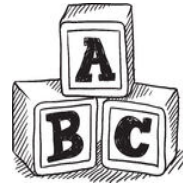


Have you ever wondered if music can play a role in infants' ability to pick up on new words? We know that infants prefer to listen to the human voice over any other sound, and that certain instruments may be more similar to the human voice than others. Given this knowledge, this study aims to explore the interactions between music and language.

During the study, some infants hear cello music, while others hear trumpet music. Infants then hear an “artificial” language comprised of

two-syllabled words. Because the music infants hear is in increments of two notes at a time, we believe it may facilitate their ability to understand that the words of this “artificial” language are each two syllables long. We predict that infants who listen to the cello music will be better able to learn words from this language based on the cello’s stronger similarity to the human voice over the trumpet. This study is ongoing, so we are still interpreting its results!

Allison Hare, UW Undergraduate
ajhare@wisc.edu

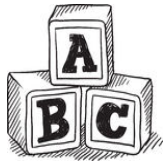


Can babies understand words in an unfamiliar accent?

Even as adults, we often find that it is difficult to understand people who come from different regions and speak with different accents. Our past studies have shown that young babies from Wisconsin don’t typically understand a speaker from London, even when they get practice hearing other people with unfamiliar accents. In our most recent work, we wanted to know whether older babies (18-month-olds) were up for the challenge.

To see if babies can understand new speakers, we asked whether they could tell the difference between real English words and made-up words that they had never heard before. We already know that babies can do this when they hear someone who speaks with a familiar accent, but that they have trouble when the accent is new. In this study, we wanted to know whether they would be more likely to recognize the familiar words after they had had a chance to listen to people who spoke with

several different accents. We had the toddlers listen to a story, read by three different speakers each with a unique regional accent. One of these readers was from Australia, one was from India, and one was from the American South, so none of them sounded like the British speaker that we later used to test toddlers' comprehension. It turned out that that experience was helpful. Toddlers who heard speakers with different accents could then tell the difference between the real and made-up words when they were spoken by the new British talker. Getting practice hearing multiple speakers who all sounded a little different seemed to help our participants ignore the differences between this new British accent and the American accent that they were used to hearing. This suggests that when toddlers have a wide variety of experiences, they have an easier time understanding accented speech and recognizing that even when people sound a little different, they may still be using a familiar language.



Chris Potter, Ph.D.
cepotter@wisc.edu

Do children learn words better when actively choosing what to learn about??

Children hear millions of words during their first years of life. How do they sift through all of this new information to figure out what words mean? In a series of studies, we are investigating how children selectively collect more information as they are learning new words.

In their day-to-day lives, children have a lot of control over what they learn about: they make choices about what to look at, what object

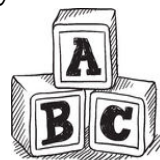
to play with, when to reach out to their parents for help, among many other decisions. In these studies, we are interested in studying how children seek more information about new words by allowing them to actively choose what they hear.

To investigate this question with infants in the lab, we first teach babies the words for a set of new objects they have never seen before. To let babies have control over what they are watching, we use an eye-tracker to measure where babies are looking on the screen. We then show them the objects they just learned about. As soon as they look at one of the objects, we play the label for that object. This allows babies to control which word they will hear next based on which object they look toward. Later we test babies on how well they learned these novel words. The key question is whether babies learn words better when they get to choose what they will learn about next.

We are also investigating how older children (3-5 years of age) actively learn new words. In this study, we teach children new words for little 'monster' characters in a touchpad game (see picture). During learning, some children can choose which 'monster' they will learn the name for next, while other children only passively learn the names for the 'monsters'. Later we test how well children learned the words, to see whether being able to actively choose what word to hear helps children learn.



Together, these studies will help us understand how young children actively seek to make sense of the incredible number of words they hear used all around them.



Martin Zettersten, M.S.
zettersten@wisc.edu

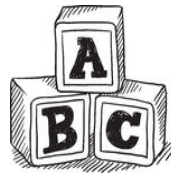
How do infants learn complex patterns in language?

Language is full of complex patterns that infants learn over their first few years of life. In this study, we are interested in one particularly difficult kind of pattern: sometimes, the form of words depends on words that occur earlier in the sentence, “at a distance”. For instance, in English, we add an “-s” to a verb only if the sentence begins with a third person singular noun (“dinosaur”) or pronoun (“he/ she/ it”), e.g. “the dinosaur eagerly walks toward the cake” or “she celebrates the dinosaur’s birthday”. To learn this kind of pattern, infants must keep track of two words that occur far from each other in a sentence. This is a really difficult task, even for adults!

How do infants learn this type of pattern? One situation that helps infants track these patterns is if there is a lot of variability in the words that occur in between the two elements that depend on each other. For instance, babies hear a lot of different verbs in the third-person form: “she runs”, “she jumps”, “she kicks”, “she skips”, “she eats”, etc. Hearing a lot of different elements helps infants track what is remaining constant – the connection between she and –s.

In our study, we are interested in whether picking up on patterns “at a distance” then helps infants pick up on new patterns of the same kind. When you’ve recognized patterns “at a distance” once, do you have an easier time recognizing a new pattern of this kind? To test this question, we play infants an artificial language with patterns embedded in it. We then test how well they learn these patterns by seeing whether they prefer to listen to sentences consistent with the pattern as compared to sentences inconsistent with the pattern. This tells us they have learned the ‘grammar’ of the artificial language. This

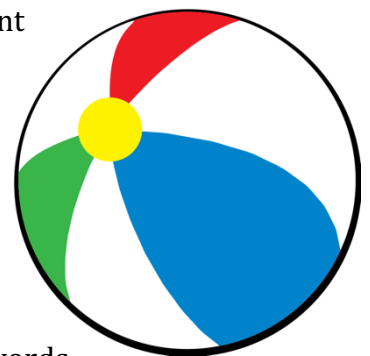
study will help us understand how infants build on what they have learned about language to discover new, complex patterns.



Martin Zettersten, M.S.
zettersten@wisc.edu

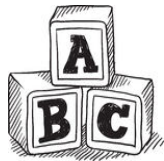
When is a ball a vall?

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 are able to learn. 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 did learn the novel words (McMillan & Saffran, 2016). 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 a quiet environment. 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 hypothesis we taught 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 were then tested on whether they recognized the picture of a boskot when the word boskot was

mispronounced as either toskot or voskot. When children were taught the word without any background noise, they did not accept that toskot or voskot were acceptable labels for the boskot. However, children who heard background noise when taught the word accepted voskot as a substitute for boskot, but not toskot. This tells us that when children learn words in noisy environments they are a bit uncertain about the sounds that make up the word, and are more willing to accept a mispronunciation of that word. This has important consequences for children's later language and literacy development because being able to distinguish between the different sounds that distinguish words is an important skill for later reading development.



Brianna McMillan, Ph.D.
bmcmillan@wisc.edu

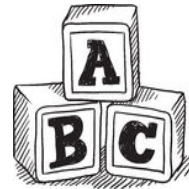
How differently do children and adults learn new languages?

We've all heard that the best way to learn a new language is to start it young, but we still don't really know why children tend to be more successful. In this study, we wanted to know if young children and adults tend to notice the same kinds of patterns when they first hear a new language.

To do this, we invented our own language and gave 5- to 6-year-olds and college students the exact same experience listening to it. The kids and adults all saw the same video of a cartoon monster and heard the monster speaking in our made-up language. We didn't tell any of them that there were several different patterns in the language, but we later tested whether they had noticed these patterns. We asked if they could tell the difference between

items that were in the language, new items that followed the patterns, and new items that broke the patterns. We found that overall, children and adults showed very similar learning. They were very good at remembering what they had heard, but most of them did not show that they had learned the patterns. However, there were some participants that successfully picked up on those patterns, suggesting that not everyone uses the same strategy when they are learning a new language.

In follow-up studies, we wanted to see if we could change these strategies. In one version, we repeated items in the language multiple times in a row to try to make it easier to remember. In another version, we tried to make one of the patterns especially easy to learn. To our surprise, these changes helped adults find the patterns, but children's learning did not change. This suggests that children and adults may approach language learning differently, even when it looks like they are able to learn the same things.



Chris Potter, Ph.D.
cepotter@wisc.edu

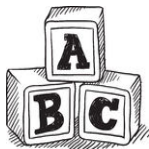
How does the ability to make predictions affect word learning?

As children learn about how the world works, they are likely to begin to make predictions about what is going to happen. For example, babies start adjusting their body to be ready to be picked up when parents start reaching for them. Babies and children will also know to open their mouth when parents bring food close to their mouth. Making predictions may be important for learning and remembering, particularly when predictions are incorrect or

when something unexpected happens. In this study, we are exploring how predicting events impacts children's word learning.

For this study, 2-year-old children are shown a video where four windows open and close to reveal pictures of novel objects. The windows open in a specific order (window 1, followed by window 2, window 3, and window 4). Children first see the windows open over and over again in this order. If children learn the order, children should be able to predict which window will open up next. After a few minutes of seeing the sequence, children then hear some of the objects being named. Some objects are named at the window that was supposed to open up next, and therefore, children had the opportunity to correctly predict that event. Some objects, however, are named at a window that was NOT supposed to open up next. This event was therefore unexpected, and children could not predict that the window would open. We then test if children learn the names of these different types of objects.

For this study, we are using an eye-tracker that allows us to measure in detail where children are looking throughout the video. What we are finding is that children are learning the order of the windows opening, such that they are successfully predicting which window will open up next. Additionally, we are starting to find that this ability to predict events also affects how children learn words. Objects that were labeled at predicted events are being learned much better than objects that were labeled at unexpected or unpredicted events. These findings suggest that experiencing events that are consistent with young children's expectations may be particularly beneficial for learning.



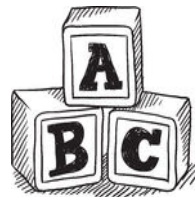
Viri Benitez, Ph.D.
vbenitez@wisc.edu

What is the role of attention in memory processing?

From home to the classroom, distractions are everywhere in a child's environment. We wanted to better understand the role that attention, specifically amidst distraction, has in a child's memory processing. To do this, we give children ages 4- to 6-years a central task of pressing a button every time they see a yellow star in a sequence of differently colored shapes appearing on a screen and measure their reaction time to determine how attentive they are to the task. During the task, distracting pairs of cartoon characters pop up in the corners of the screen. The characters always occur in the same pairs. Following the central task, we show the child all of the characters that appeared throughout the task and ask them to match each character with its partner.

This study measures two skills. First the child's ability to focus on a central task amidst distractions. Second, the child's ability to learn information about the distraction while attending to the central task. By measuring both of these skills, we hope to better understand the intertwined processes of attention and memory. This study is ongoing and still in need of participants ages 4 to 6.

Elizabeth Hoff, UW Undergraduate
ehoff2@wisc.edu



What is attention's role in word learning?

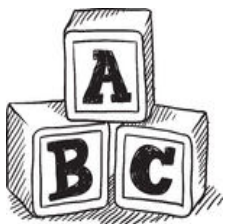
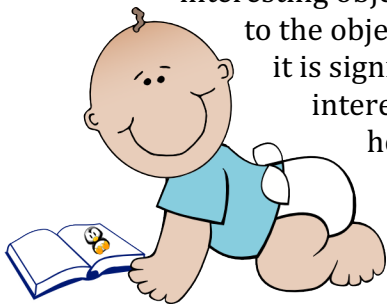
In order to learn new words and process the world around them, infants must learn to allocate their attention selectively. Sometimes, there may be interesting or enticing distractions in the environment that make this more difficult. We know from previous research that infants are influenced by their own interest in the objects in their environment when it comes to learning new words, but it is still unclear how much this influence affects their processing of words they already know. This study examined whether 24 – 26-month old children's language processing is influenced by their visual interest in objects presented. We tested this by showing children two objects at a time, one of which was named and one of which was not. In one condition, both objects were equally interesting, and in another condition, one object was significantly more interesting (e.g., had lots of bright colors and a geometric pattern).

What we found was that infants in this age range do in fact, perform quite well at resisting the urge to look at the highly

interesting object and accurately look to the object that is named, even if it is significantly less interesting. In the future, we

hope to investigate whether younger children and/or children who have Autism Spectrum

Disorder perform differently on this task.



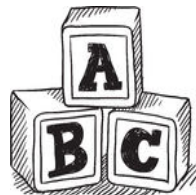
Janine Mathee, B.A.
mathee@wisc.edu

Does exposure to sound patterns help infants learn new words?

From as young as 9-months-old, infants can detect sound patterns within and across sets of novel syllables following a brief listening experience. We know that older infants, 18 month-olds, prefer to assign words to objects when those words follow native language sound patterns. For example, an English-learning child may prefer to assign the label “dref” to a novel object over the label “dlef” because the sound sequence “dl” is not allowed in their native language. But how do these object-label mapping preferences emerge? In this study, we are interested in how infants’ detection of sound patterns in their environment influences their ability to learn words in their native language.

To investigate this, we are having 21-23-month olds listen to made-up words that have the same beginning sound (for example, all words beginning with “b”). We then teach them novel words that either begin with the same sound they were exposed to, such as “baftoo,” or begin with another sound, such as “kothar”. We are predicting that children will have a preference for assigning words to objects that follow the same sound pattern from the listening portion of the study.

As this study is ongoing, we are still in the process of recruiting participants. With our findings, we are hoping to better understand how children’s experiences to different sound patterns in their environment influences their subsequent word learning.



Ellen Breen, B.A.
epbreen@wisc.edu

What drives babies' preference for speech?

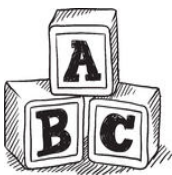
Human beings, like other animals, prefer vocalizations of their own species, and this preference emerges very early in life. Babies treat human speech as a special sound, and they love to listen to people speaking. But what makes spoken language such an interesting sound? We want to investigate whether the sound properties driving this preference are unique to



speech or whether they are shared with other animals' vocalizations.

We are currently investigating whether 6- to 8-month-old infants prefer to listen to human

vocalizations in an unfamiliar language (Japanese) over non-human vocalizations (birdsong). Songs produced by birds represent an interesting comparison because they retain some of the patterns and rules that typically characterize natural (human) languages, but are innately non-human. By measuring the presence or absence of a listening preference, we hope to understand whether the typical preference for human speech exhibited by infants is the result of a general interest for sounds produced by all animals, or whether it reflects a preference for vocalizations produced only by primates (people, monkeys, etc.).



Chiara Santolin, Ph.D. &
Martin Zettersten M.S.

santolin@wisc.edu &
zettersten@wisc.edu

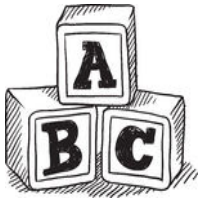
What role does environmental noise play on children's word learning?

How do children's day-to-day experiences with the sounds in their home affect their language development? Electronic sounds from television, radio, and apps are becoming increasingly common in children's environments. In a two-part study we looked at whether 27- to 30-month-olds' familiarity with electronic sounds affected their ability to recognize familiar objects. In this study families completed an in-home recording that was later used as background noise in an in-lab follow-up study.

In the first part of the study we collected day long audio recordings of children's homes using a small recording device called a LENA. The LENA system tells us what types of sounds children hear throughout the day, such as adults talking, children talking, electronic sounds, and ambient noise. The LENA recording tells us the amount of each type of sound a child hears, which gives us an indication of how much experience each child has with electronic sounds. The LENA system also tells us when different sounds occurred in the audio file, which helps us identify sources of electronic sounds for the in-lab follow-up study.

For the in-lab follow-up study children heard a sample of electronic sounds from either their home or another child's home. These samples were played as background noise while children listened to sentences that directed their attention to a picture of a familiar object. While listening to the background noise, children saw two familiar objects, such as a cake and a bike, on the screen. Children then heard a phrase that directed their attention towards one of the objects. Some of the phrases children heard had

an informative verb that helped them look more quickly towards the correct object, such as “eat the cake”, while others had a neutral verb, such as “find the cake”. Both groups of children looked towards the correct object when it was labeled. However, children who heard electronic noise from another child’s home were faster at looking towards the objects when they heard the informative verb than children who heard familiar electronic noise. This tells us that children who heard electronic sounds from their home may have been distracted by the familiar electronic noise, which made them slower to take advantage of the extra information provided by the informative verb. These findings indicate that having unrelated background sounds, such as background television or radio, may distract children from important language learning moments.



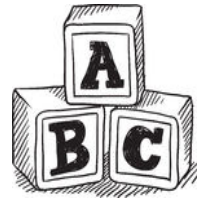
Brianna McMillan, Ph.D.
bmcmillan@wisc.edu

Where’s the wuggy? Can children use diminutives when learning new words?

Parents use a distinctive style of speech when communicating with infants and young children. This child-directed speech includes many features like exaggerated intonation, higher pitch, and the use of diminutives. In English, diminutives are formed by adding -y or -ie to the ends of words (e.g., doggy). However, only a small number of animals (e.g., doggy), proper names (e.g., Ronny), and baby objects (e.g., blanky) have diminutive forms.

When children hear new words, they are often surrounded by many unfamiliar objects. In

order to learn a new word, children must be able to figure out which object is being labeled by the word. We wanted to know whether children can use their knowledge of diminutives—specifically, that they usually refer to living things—to learn new words. To test this, we showed 14- to 16-month-olds pictures of unfamiliar animals (e.g., a meerkat) paired with unfamiliar vehicles (e.g., a rickshaw). They then heard a sentence with a novel word that was either a diminutive (e.g., Where’s the wuggy?) or was not a diminutive (e.g., Where’s the blicket?). Preliminary results suggest that children spent more time looking at the unfamiliar animal when they heard a diminutive novel word compared to a non-diminutive novel word. If confirmed, these results would indicate that children have learned that nouns with diminutive endings typically refer to living things and can use this knowledge to help identify the meaning of novel words in ambiguous situations.



Ron Pomper, M.S.
ron.pomper@wisc.edu

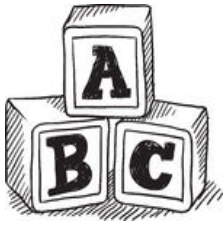
Learning you can eat an object before learning its name

When children learn the name of a novel object it is often surrounded by other familiar objects. These familiar objects are not random and usually belong together (e.g., foods in a kitchen). We

hypothesized that children may learn facts about a novel object (i.e., that it’s edible) based on the company it keeps. To test this, we taught



38- to 42-month-olds the name of a novel object that was always paired with familiar foods and the name of another novel object that was paired with random objects. When later shown both novel objects, children succeeded in looking at the correct object when asked, "Which one can you eat?" but not when asked, "Where's the modi?" These results indicate that children learn to associate actions (i.e., eating) with a novel object based on the company it keeps, and they're able to do this before they learn the name of that object.



Ron Pomper, M.S.
ron.pomper@wisc.edu

Looking for more research opportunities?

Here are some other labs in Madison that are looking for families with kids to participate!

- ✓ **Little Listeners Project** - Studying language in toddlers with and without autism spectrum disorder
 - Sign up online!
<http://littlelisteners.waisman.wisc.edu/home>
 - Or call today at (608) 262-9308
- ✓ **The SPACE Lab** - Studying the development of children's memory for visual features and locations of objects
 - Sign up online!
www.spacelab.psych.wisc.edu/parents
 - 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
- ✓ **Madison Children's Museum Living Lab** – UW Madison Labs including the Infant Learning Lab studying various aspects of child development
 - Visit the museum website at
www.MadisonChildrensMuseum.org
 - Call today for hours and events
(608) 256-6445

Recent Publications

Please visit our website for direct links to these and other lab publications:
<http://www.waisman.wisc.edu/infantlearning/Publications.html>

McMillan, B. T. M. and Saffran, J. R. (2016), Learning in Complex Environments: The Effects of Background Speech on Early Word Learning. *Child Development*. doi: 10.1111/cdev.12559

Pomper, R., & Saffran, J. R. (2016). Roses are red, socks are blue: Switching dimensions disrupts young children's language processing. *PLoS ONE 11(6): e0158459*. doi:10.1371/journal.

Cashon, C. H., Ha, O. R., Graf Estes, K., Saffran, J. R., & Mervis, C. B. (2016). Infants with Williams Syndrome detect statistical regularities in continuous speech. *Cognition*, 154, 165-168.

Perry, L. K., & Saffran, J. R. (2016). Is a Pink Cow Still a Cow? Individual Differences in Toddlers' Vocabulary Knowledge and Lexical Representations. *Cognitive Science*. doi: 10.1111/cogs.12370.

Know someone with a baby?

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

Our current studies involve infants between 6 and 28 months of age. We are also recruiting children, ages 4 to 6 years old to participate in studies at the lab and the Madison Children's Museum!



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 in 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!

~ Lastly, we always welcome new babies! If you would like to update your information with us, we are more than happy to do so! Just call or email us! ~

Thank you for your continued interest in our research! We couldn't do it without the support of families like yours!!