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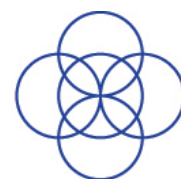
◉ BABIES@WAISMAN.WISC.EDU | ◉ (608) 263-5876 | ◉ 1500 HIGHLAND AVENUE

2018 Newsletter

ILLUMINATING RESEARCH ON
INFANT LANGUAGE ACQUISITION

The Infant Learning Lab

We study how infants and young children do such things as: learn language, learn the meanings of words, find the patterns in language and track properties of speech. Our research focuses on children between 6 months and 6 years of age.



WAISMAN
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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. 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



Infant Learning Lab
UW-Madison

What types of speech do babies prefer? The Infant Learning Lab Goes Global!

Last year, the Infant Learning Lab joined with 67 other labs around the world to ask a single question – what types of speech do babies prefer? When talking to babies, we often speak in a higher pitch and with more pitch variation in general, we draw out our vowels, and we speak more slowly and distinctly, among many other differences than how we speak to other adults. This type of speech, often referred to as “baby-talk,” is called **infant-directed speech**. In this study, we investigated whether infant-directed speech helps babies learn language, by comparing whether infants prefer listening to recordings of adults speaking to infants compared to adults speaking to other adults.

Infant development labs around the world were interested in how frequently they would find the same results when trying to test exactly the same question. The reason this is important is that we know that babies are difficult to work with – their behavior isn’t always easy to predict like that of adults. We want to know how well our methods are able to determine infants’ preferences and knowledge, and what we can do to improve our methods.

Conducting this study with over 2000 babies across the world, we can confidently say that babies consistently prefer infant-directed speech compared to adult-directed speech. These findings are useful for two reasons: first, we have confirmed a key fact about infants’ developing speech preferences, and second, these results can help us understand our own methods better. For example, we found that across many different ways of testing infants, a method known as the “Headturn Preference Procedure” was the best at demonstrating infants’ preferences. This is a method we frequently use in the lab, in which we direct infants’ attention to monitors to their left and right and play sounds for as long as they continue to look to that side. The success of this method gives us confidence in using it as a tool for tapping into infants’ knowledge in future

studies and may help us develop even better ways of tapping into what babies know.

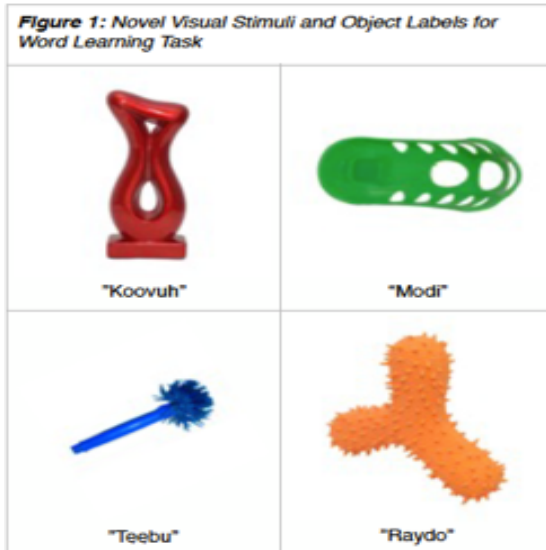
Martin Zettersten, M.S.
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Can Song Help Infants Learn the Meanings of Novel Words?

Past studies have shown that music is beneficial for language development, and other studies have shown that infants prefer to listen to the human voice over any other sound. That being said, we sought to determine if singing, in particular, could help infants learn the meanings of new words.

To investigate this idea, infants were taught the labels through either “infant-directed speech” or song of new and familiar objects appearing on a TV screen. Infant-directed speech is a common way adults speak to infants, defined by exaggerated characteristics such as higher pitch, longer vowels, and more variable intonation.

During the testing phase, infants saw pairs of novel objects on the screen, and if they looked at the object labelled, it signified that they learned the meaning of the new word. This test allowed us to determine if there was a difference in word learning between object names that were taught in song versus infant-directed speech.



Although we predicted that infants would have an easier time learning words that were taught in song, the results of this study showed no significant differences in word learning between sung and spoken novel object labels.

Interestingly, however, we found that younger infants identified novel objects with greater accuracy than older infants. These results may indicate that the exaggerated cues present in both song and infant-directed speech are more helpful to infants in the earlier stages of language development, and they become less useful as infants age.

Ultimately, continued research in this area is necessary in order to extend our knowledge about the connections between music and language and to begin to apply these connections to facilitating language development.

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Memory of New Words: Look at the blue one, the red one, and the tever.

For some objects, color is important (strawberries are red), but for other objects, color is not important (pencils come in many colors). When children learn the name of a novel object, they must learn and remember which properties are important. For instance, are all “tevers” green? In previous research in our lab, we found that children attend more to a familiar object’s color, when we previously asked them to identify other familiar objects using colors (red) rather than names (apple). In this current experiment, we are examining whether having children identify familiar objects using colors rather than names will influence whether they learn and remember that “tevers” are green. To do this, we first showed 38- to 42-month-old children pictures of familiar objects and asked them to find objects using their colors. They were then taught the names of novel objects that varied in color. We found that children did remember each object’s specific color. In ongoing work, we are now having children identify familiar objects using their *names* and will test whether they remember the specific colors of novel objects. Young children’s

attention gets stuck on one aspect of an object, but their attention becomes more flexible with age. These findings are important in helping us understand how young children’s “sticky attention” influences what they learn when they learn new words!

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Do infants incorporate gender into their memory of unfamiliar people’s names?

When meeting new people, adults use many automatic mental strategies to categorize and remember people’s faces. For instance, adults automatically store information about people’s gender, race, and age in their memory, and this process often occurs outside of their immediate awareness. Although we know much about how adults incorporate social category information into their memory of other people, much less is known about when and how this process begins.

We investigated whether infants remember novel people’s names differently depending on the gender of the person. Infants saw four unfamiliar adults’ faces, two male and two female, and were told each person’s name (e.g., “Look at Tevi. This is Tevi!”). We varied whether particular names were associated with the male or female faces; for example, half of the infant participants were shown the name “Tevi” with a female face, and the other half of participants were shown “Tevi” with a male face.

After a brief delay, infants listened to the names in pairs; some pairs were gender-matched, and some were gender-mismatched. Using a procedure which allows infants to decide how long they wish to listen to sound clips (via looking to a screen to hear a sound and looking away to stop a sound), we measured whether infants chose to listen longer to gender-matched pairs than gender-mismatched pairs.

Data collection is ongoing. If we find that infants listen longer to gender-matched name pairs than gender-mismatched name pairs, this will suggest that they are associating people’s genders into their memory of the names and thus

considering the names attached to females as more similar to one another than a male name paired with a female name. Overall, this project will help us better understand children's early social learning.

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Does infants' social category knowledge inform their language processing?

Adults link social category information to words and objects. However, the age at which people begin to draw connections between language and the social world is unknown. One potentially informative link is gender, which is marked by both speaker information (e.g., vocal pitch) and object attributes (e.g., color and design). The current study examines whether 22- to 24-month old infants use the perceptual cue of speaker voice to predict which object a speaker is referring to. That is, do infants make associations between objects and the intended referent of a speaker based on gender cues?

While sitting on their caregiver's lap, infants' eye movements were recorded as they participated in an eye-tracking study. On each trial, infants viewed two objects, a target and distractor object. Whilst viewing these objects, they heard a male or female speaker ask for the target object. The object pairs were either prototypically gendered (one masculine object and one feminine object) or neutral. Over the course of the trial, the eye-tracker recorded infant eye movements, allowing us to see where they were looking (and for how long) as the trial unfolded.



Data collection is ongoing. If we find that infants do look towards the prototypically feminine or masculine object that matches the

feminine or masculine voice prior to the speaker saying the label of that object, this would suggest that infants are encoding gender information of the speaker when learning about different words and their referents. An example would be hearing a feminine voice say, "do you see the..." and the infant looking toward the pink shirt rather than the blue hat before actually hearing "shirt?" at the end of the sentence. Overall, this groundbreaking research will illuminate the role of speaker gender in infant lexical processing, with implications for how social categories are encoded early in life.

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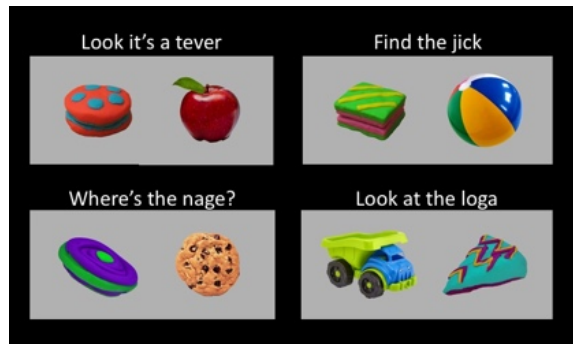
Roses are red, Socks are blue

When shown an apple and a shoe, children can quickly identify each object using its *name* ("Find the apple") -- but these objects differ in many ways! Children can also identify the apple using a common *action* ("Which one can you eat?") or even its *color* ("Where's the red one?"). In past work from our lab (Pomper & Saffran, 2016), we found that 3-year-old children have difficulty switching between different dimensions. Children were fast and accurate in looking to the correct objects when they were all identified by name or by color, but they were slower and less accurate in looking to the correct objects after a switch in dimensions (from objects' *names* to their *colors* or vice versa). We know that as children get older, they get better at flexibly shifting their attention and their behavior (e.g., switching rules in a game). We are currently testing whether older, 5-year-old children will be better able to find the correct object after a switch in dimensions. If so, is their ability to switch dimensions related to improvements in their ability to switch between rules in a sorting game? Stay tuned!

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Learning which words go together

Children expect some words to go together (like “cat” and “dog”) but not others (like “dog” and “shoe”). In this study, we wanted to test *how* children learn this, specifically, whether they are able to learn that some novel words go together (“loga” and “nage”) but not others (“loga” and “tever”). We taught 38- to 42-month-olds the



names of some novel objects (“loga” and “nage”) that were always paired with familiar foods and the names of other novel objects (“tever” and “jick”) that were always paired with toys. Children then heard the novel words played over a speaker. Preliminary results show that children listened longer to the pairs of novel words when they were from the same category (e.g., both were paired with foods) compared to when they were from different categories (one was paired with foods, the other with toys). These results are exciting because they show that children not only learn the names of novel objects but also the company that those objects keep! While familiar objects may make word learning more difficult (by making it harder to find which object around them is being labeled by the novel word), their presence can also help children learn more about a novel word.

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Hold up! How holding objects affects word learning

Children quickly learn adults’ preferences (for instance, an adult always choosing the teddy bear when choosing between toys) and expect adults to act according to their preferences (looking to the teddy bear before the adult even reaches for it). In this study, we wanted to see

whether children’s expectations about an adult’s preferences for novel objects would influence their ability to learn the names of those objects. On the one hand, we might expect children to learn better when adults act in a predictable way. On the other hand, we might expect children to be more interested and learn better when adults



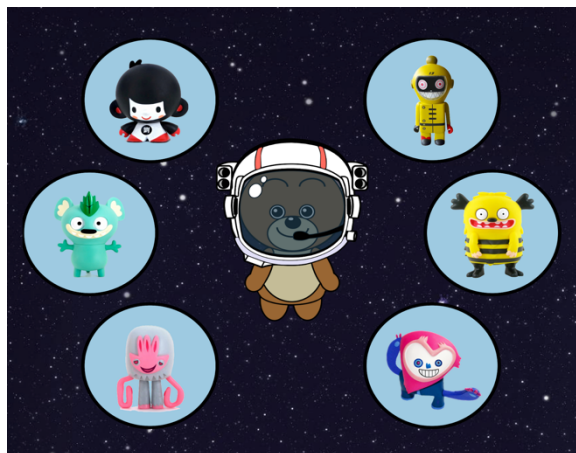
act in an unpredictable, and therefore surprising, way. We had 19- to 23-month-old children watch videos of an adult repeatedly reaching for one of two novel objects. They then watched a video of that same adult picking up and labeling the preferred object *or* the dispreferred object. We subsequently tested how successful children were in learning and remembering the name of that novel object. Preliminary results suggest that children are more successful in learning new words in the predictable rather than the unpredictable situation. In future work, we plan to examine how children’s visual attention to the objects during the videos affects their learning.

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Do children learn better when they can control what they’ll learn about next?

Children are curious explorers, actively engaging with the world around them. How does children’s motivation to explore new information relate to how they learn? In a series of studies, we are investigating how giving children active control over their learning supports their ability to learn new words. In this study, we teach children new words for little ‘alien’ characters in a touchpad game (to get an idea of what the game looks like, see the image below). During learning, some children can choose which ‘alien’ they will learn the name

for next, while other children will only passively learn the words for the ‘monsters’. Later we test how well children learn the words, to see whether being able to actively choose what word to hear helps children learn.



So far, we have found two main results. First, children who can actively control what they learn about next make smart choices. Children will tend to choose to hear the name of an alien that they have had less opportunity to learn. In other words, they make choices that are potentially more useful in their learning process. Second, children who are given active control over what they will learn next also tend to learn better than children who do not have the same control – even when those children hear *exactly the same words*. This means that having active control over their learning might be particularly beneficial to children learning new words. Potentially, being an active participant in their learning is a more motivating experience, or maybe it helps children tune their learning to what they want to know more about. Ongoing studies that follow up on these initial results will help us understand when and why being an ‘active learner’ is particularly helpful for young children.

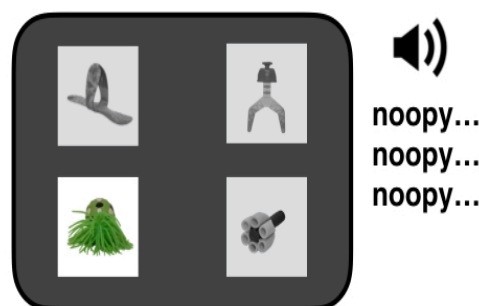
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How do babies sample the new words all around them?

Children hear millions of words during their first years of life. Every day, 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 this series of studies, we are interested in studying *how* children seek out which words go with which objects by allowing them to actively choose what they hear next.

To investigate this question, we designed an experiment in which children can control with their eyes which object they will hear the word for next. In the study, four objects appear on the screen. What happens next depends on which object an infant looks at: as soon as they focus on one of the objects on the screen, the eyetracker responds by lighting up that object, and the name for the object plays on repeat as long as the infant continues to look at it. When



the infant’s focus shifts to another object, that object is automatically triggered, and they can spend time listening to the name of the new object (see image above). This allows infants to sample information about new words quickly, controlling everything with their eyes.

So far, we have found that infants appear to be curious and strategic samplers – they tend to spend more time listening to the names of objects that they may be less sure about (because we have made the names for those objects more difficult to learn). These are exciting results, because they suggest that infants, from a very young age, are curious learners, motivated to figure out what the words are for the objects they see all around them.

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How do infants learn multiple languages?

When growing up in a multilingual environment, infants manage to keep track of each language separately to learn the words of each. To investigate *how* bilingual infants do this, we created two “artificial” languages, each with its own set of words, spoken by the same person. We conducted several tests to see if English-learning, monolingual infants are capable of rapidly learning the words of each “artificial” language separately.

First, we had infants listen to only one of two artificial languages to ensure that each language was learnable on its own. Based on measurements of their listening preferences, infants could tell the difference between words that were in the language they heard versus words that were not in either of the languages.

Next, we had two different groups of infants listen to both languages back to back, without a pause in between or any sound cues to signal that there were two different languages being heard. We tested if one group could learn the words in the first language and if the other group could learn the words in the second language. Results indicate that neither group of infants successfully learned either language.

To help infants notice and separate the two languages, we placed a pause between the languages, made the first language higher in pitch, and switched the speaker and the accent of the first language. Regardless of which language infants heard first or second, neither group was successful at learning the words of the artificial language tested.

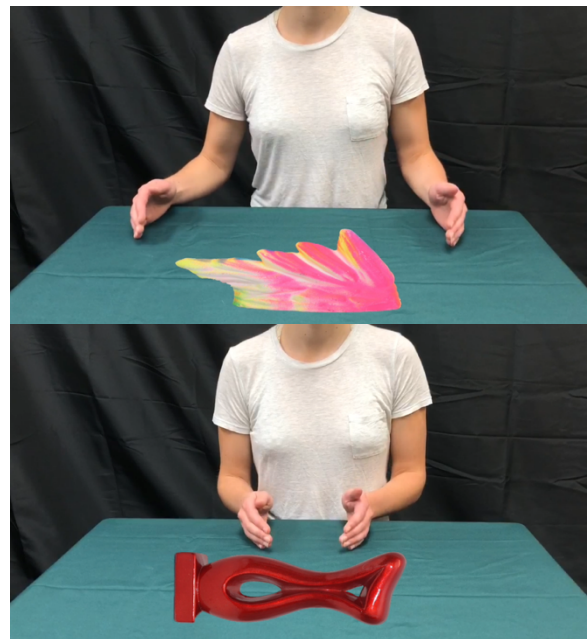
Together, these findings tell us that English-learning, monolingual infants may find it hard to learn the words of two separate languages from very short listening times. Instead, simultaneously learning the words of multiple languages may require longer and consistent exposure to each language.

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Can certain hand gestures facilitate or inhibit word learning?

Have you ever noticed yourself or someone else using lots of hand gestures while they speak? While gestures may feel random and insignificant, gestures actually serve as an important part of communication. Researchers believe that infants’ own gesturing facilitates the development of their oral linguistic communication abilities. Gestures can help language learning by reducing the cognitive demands of the task. Although many studies have shown the benefits of gesturing, few have asked the question of what happens when a speaker’s verbal message conflicts with their gesturing.

This study aims to investigate the effects of consistent or conflicting use of gesture on language learning. Infants were taught the names of novel objects from a video. In the video, an actor gestured about the size of the object while saying the object’s name. For each object, the actor’s gesture either did or did not match the dimensions of the object (i.e. a large gesture with a large object vs. a small object).

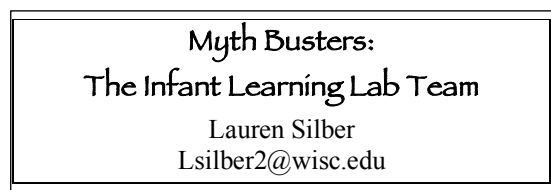


To test their word learning, the infants saw two side-by-side images of the trained objects and heard one of the objects labeled. We determined

if the infant learned the name of the object based on whether they looked at the correctly labeled object. To see where the infants were looking, we used our eye-tracker technology.

Data collection is ongoing, but we hypothesize that infants will learn the names of the objects trained with consistent gestures better than the objects trained with inconsistent gestures. The eventual results will help provide insight into how adults' gesturing affects learning and whether the consistency of gestures and information matters.

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MYTH: *Hearing two different languages in the home will confuse my child.*

ACTUALLY: Despite an initial delay in language production (Patterson, 2004), children who learn two languages at once are actually practicing a skill called “code-switching.” Code-switching is when an infant in a multilingual environment monitors two languages separately, inhibiting their knowledge of one, while the other is being spoken around them (Byers-Heinlein, Morin-Lessard & Lew-Williams, 2017). For example, let’s say a baby hears one parent speak English but the other speaks Spanish to her. This baby will hear the same objects being labelled in different languages, and her developing brain adapts and creates new mechanisms for switching between languages. In fact, infancy is an excellent time to expose your child to a second language, because this is when experience guides their brain development. In Byers-Heinlein’s study, they found that monolingual infants did not expect an object to have two labels but that bilingual infants were not surprised by this phenomenon (2017). Also, bilingual infants tune into small perceptual distinctions between languages, thus not confusing the two. Not only

they distinguish rhythmically dissimilar languages like English and Mandarin, but they also can tell apart more similar languages like Spanish and French (Byers-Heinlein & Lew-Williams, 2013). Experience with multiple languages grooms this sensitivity to rhythmic differences, which is adaptive in their environment and an ability that’s unique to bilingual infants after 8 months of age (Byers-Heinlein & Lew-Williams, 2013).

In general, a bilingual child will not fall behind in their comprehension of either language (De Houwer, Bornstein & Putnick, 2014). As far as producing language, bilingual children monitor two speakers and their language cues separately, speaking the appropriate language to each person, while also suppressing the other language (Blom, Boerma, Bosma, Cornips, & Everaert 2017). In essence, there are no differences between word comprehension and production of monolingual and bilingual children (Houwer et al., 2014).

So, parents, it’s time to overturn that myth that introducing your child to another language will confuse them. It’s simply not true!

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Looking for more research opportunities?

Little Listeners Project:

- Studying language in toddlers with and without autism spectrum disorder
- Sign up online!

<http://littlelisteners.waisman.wisc.edu/home>
(608) 262-9308

The Social Kids Lab:

- Studying the cognitive and social development of young children
- Dr. Kristin Shutts: socialkids@psych.wisc.edu
- Sign up online!

<https://socialkids.waisman.wisc.edu/sign-up/>

Child Emotion Research Laboratory:

- Exploring children's emotional development and the relationship between early experience and mental health
- Barb Roeber: childemotion@waisman.wisc.edu
- Sign up online!

<http://www2.waisman.wisc.edu/childemotion/parents.html>

Binaural Hearing & Speech Lab:

- Studying how children learn to locate sounds in their environment
- Sign up online!

<https://bhsl.waisman.wisc.edu/for-participants/>

Madison Children's Museum Living Lab:

- UW Madison labs including, the Infant Learning Lab, studying various aspects of child development
- Sign up online!

<http://madisonchildrensmuseum.org/>
(608) 256-6445

Thank you for your interest in our research! We appreciate the support of families like yours so that we can continue to uncover the secrets to infant language acquisition!!

Recent Publications

Benitez, V., & Saffran, J. R. (2018). Predictable events enhance word learning in toddlers. *Current Biology*. doi: 10.1016/j.cub.2018.06.017

Pomper, R., & Saffran, J. R. (2018). Familiar object salience affect novel word learning. *Child Development*. doi:10.1111/cdev.13053.

Zettersten, M., Wojcik, E. W., Benitez, V., & Saffran, J. R. (2018). The company objects keep: Linking referents together during cross-situational word learning. *Journal of Memory & Language*, 99, 62-73.

Santolin, C., & Saffran, J. R. (2018). Constraints on statistical learning across species. *Trends in Cognitive Sciences*, 22, 52-63.

Know someone with a baby?

We are always looking for more babies to participate in our studies! Our current studies involve infants as young as 6 months and children up to 5 years of age, and we conduct studies both in the Infant Learning Lab at the Waisman Center and at the Madison Children's Museum!

If your family just welcomed a new child and you would like to update your information with us, just give us a call at (608) 263-5876 or email us at babies@waisman.wisc.edu, and we'd be happy to inform you of studies as your child becomes eligible! Also, if you know a friend who has young children or recently had a baby, feel free to pass along our contact information.

If you are involved in programs with infants or expectant parents (e.g., 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!