Auditory Neuroscience Laboratory

www.brainvolts.northwestern.edu

Discovering early markers of language development by studying brain activity, listening, and learning

Studying Learning across the Lifespan

In the Auditory Neuroscience Laboratory we study how the experiences we've had in the past shape the way we experience the world in the present. We've used the same methods to study how enrichment (music, bilingualism, software-based training) and deprivation (poverty, hearing loss) shape brain circuits for learning. By doing so, we hope to influence science and education policy. Studying the listening and learning brain can inform the design of diagnostic techniques, therapies, hearing technology, and curricula.

But we can only do this thanks to families like yours! Thank you for your contribution to our research. We can't wait to see you in 2014!



What a busy year for BIOtots!

It's been a wonderful first year for the BIOtots study - we've had over **120** families enroll in the study.

And this month we just published our first paper from the BIOTots project! Travis and Nina discovered that one of the hallmark 'neural signatures' of reading is linked to language skills in preschoolers—even before they've learned to read. The paper was published in *Frontiers in Human Neuroscience*.

The first of many!



Researcher Spotlight



Steven Zecker, Ph.D. Professor, Project Investigator

Steve Zecker, PhD, associate professor in the Department of Communication Sciences, directs the Attention and Auditory Processing Lab at Northwestern University, and works closely with the Auditory Neuroscience Lab on many of our projects. He is also a clinical psychologist who has overseen the Learning Clinic at Northwestern for over two decades.

Dr. Zecker's work focuses on the role of attention and auditory processing skills in learning. He has most recently been studying how auditory processing influences literacy development.

Dr. Zecker led the effort to create the computer games your kids play when they come to participate in our study!



We hope you had fun playing with us!

If you have any questions about the project or would like to share photos of your child with us, please call or email: (847) 491-2457 biototsresearch@gmail.com

Meet the BIOtots team!



Dana Strait

Dana enjoys playing piano, dancing, and reading with her 2year old daughter, Lucy. Dana's favorite color is purple and when she was little she had a purple bedroom with rainbows and unicoms.



Travis White-Schwoch

When not in the lab, Travis enjoys running, swimming, concerts, and cake. When he was three his favorite movie was Who Framed Roger Rabbit? and he developed a lifelong interest in Batman.



Ellie Thompson

When Ellie was three years old, Kali loves playing clarinet and some of her favorite things included: her dog Spot, Spaghetti O's, and Aladdin! She lived in Florida and loved making sand castles and swimming in the pool.



Kali Woodruff

talking to her little pet bird, Dmitri. When she was three she lived in Puerto Rico and watched The Jungle Book every morning while eating a banana.



Rafael Escobedo

Rafael loves going running with his dog and playing Legos with his two children. He enjoys playing soccer and rugby, and going sledding in the winter.



Emily Spitzer

Emily is from Minnesota and loves stomping around in snow with her big boots. When she was she liked watching three. Pocahontas and drinking hot chocolate with mini marshmallows.



Hillary Sigale

was three was The Little friends. She also likes to travel to Mermaid, and liked reading Dr. far away places like Korea with Seuss books. Her favorite color is her family. In her free time she blue and her favorite animal is a cooks tasty treats for her friends lion. She loves to sing, act, and and family. play drums.



Yurie Kim

Hillary's favorite movie when she Yurie loves to dance with her



Karen Chan

Karen plays piano and enjoys swimming and movies. She loves baby animals because they make her happy. She now lives in Baltimore, and hangs out with people who play music all day long.



Sam O'Connell

Sam is a violinist and loves things that start with P: pickles, pandas, and puppies! Now that Sam lives in California, she's traded her mittens and scarves for sunglasses.



Ahren Fitzroy

Ahren enjoys the color blue and loves to play guitar, eat crab, and hang out with his six-month old daughter. He always tries to get good sleep, because it's super good for his brain!

We want to keep in touch! Moving? Have a new e-mail or phone number? Update your contact information with us by sending an email to biototsresearch@gmail.com or calling us at (847)-491-2457.

We're looking forward to seeing you next year!

BIOtots travel to California

We're presenting findings from our BIOtots research at the annual Association for Research in Otolaryngology conference in February! Kali, Travis, and Ellie will travel to San Diego, CA to present some of our latest discoveries.

Here's a glimpse of the action:

- Kali: Brain responses to sounds are important for language learning. New data from BIOtots show that children whose brainwaves were more in sync with sounds they heard did better on our drumming game and had higher scores on pre-reading measures. These results suggest that kids who can tap along to a beat are more than budding musicians: they might end up being good readers and having brains that show it!
- Travis: Years of past research in our lab have studied what brain functions are linked to reading ability in school age children. These discoveries have allowed us to identify what we call 'neural signatures' of reading—biological indicators of a child's reading ability. Most of these, fundamentally, represent the precision with which the brain processes consonants in speech. Thanks to BIOtots, we are now learning that some, but not all, of these neural signatures are linked to language skills even before children have learned to read. Eventually, our hope is to make predications about reading development by exploring how these neural signatures change over time.
- Ellie: The ability to pick out a teacher's voice from background sounds is especially important for children who will soon be entering noisy classrooms. Using our BIOtots listening in noise game, we found older children performed better, suggesting it's a skill learned with time. Your child will likely get better at hearing in background noise as s/he gets older! Interestingly, children with a family history of dyslexia had trouble hearing in noise, regardless of age. This finding highlights the need for early screening of children who may have language problems to help them out before they enter noisy learning environments.



Brain Science Word Search												
Р	Ν	J	Μ	Ι	Y	E	Т	S	L	V	В	Ι
Ι	E	Ζ	J	E	F	М	Y	С	Т	Ι	Q	Η
R	D	L	Ν	Т	Т	S	Η	Ι	R	Т	Y	0
G	A	0	A	Q	Q	Ι	Е	Е	Κ	В	F	Η
S	Μ	Т	Y	А	Y	E	F	Ν	J	Х	Κ	Е
Η	Т	Ζ	Y	V	Μ	А	Р	С	Р	Т	R	Η
Е	E	Ι	V	В	0	R	W	Е	R	Μ	F	А
Χ	В	А	С	Т	V	S	D	G	J	V	Т	0
S	Η	R	R	Κ	Ι	Ν	R	Ι	Α	S	В	U
Y	S	Ι	A	Ι	Е	А	U	D	Ι	Е	R	G
Q	Q	W	F	Ι	Ν	R	Μ	А	S	С	V	D
Η	Η	Ν	L	D	Ν	G	S	Р	F	Ζ	Е	F
Х	Ν	G	Y	J	0	G	А	Μ	E	S	Η	Κ
EARS GAMES TSHIRT BRAIN					A M HE ST	UDI ONE ARI [CK]	E EY NG ERS	DRUMS MOVIE SCIENCE				

Auditory Neuroscience Laboratory in the News!

The New York Times

Childhood music lessons leave a lasting impact on the adult brain. Older adults who played music when young had faster brain responses to sound—even if they hadn't touched an instrument for 40 years. The results suggest that childhood music lessons can set the brain up for healthy aging, paying dividends for decades.

White-Schwoch, Woodruff Carr, Anderson, Strait, Kraus (2013) J Neurosci



Experiences we have in life can help, but depriving children of those experiences appears to hurt. Children who grew up in poverty had smaller, less consistent, and noisier brain responses to sound. Poverty appears to mold the brain to make it a less efficient sound processor, affecting language and cognitive skills throughout life.

Skoe, Krizman, Kraus (2013) J Neurosci



People who can move to a beat are great at parties, but they might also be better readers. Scientists have known for a long time that there is a curious link between rhythm and reading, but now we've found a biological connection in the brain's response to sound. Music training may improve reading due their shared reliance on rhythm.

Tierney & Kraus (2013) J Neurosci

To learn more about our work, visit our website: www.brainvolts.northwestern.edu

start with "slideshows" to learn about our current projects

