

Language, Reading, & Math in Children

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A study of the skills that support children's learning
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Early Screening of Children's Learning

Our study is aimed at understanding the early skills children need in order to learn language, reading, and math at school. Our Kindergarten screening tool includes tasks found to be important for school learning. More than 600 kindergarten students have completed our screening. It helps us understand the patterns in children's learning when we have many children in our study! This year, we'll be seeing more kindergarten students. And, we'll be going back to see the children from the study who are now in Grade 1 or 2. The Grade 1 & 2 students will do some listening, talking, reading, and math activities. We'll be able to examine the connections between our screening measures, and children's learning in different areas during the primary grades. The results of this study will help us understand children's school learning.

- Lisa Archibald, Ph.D

Brain Activities at Rest Tell Us About Language Skills

Electroencephalography (EEG) is the measurement of the electrical activity of the brain. We are interested in how this brain activity is related to language learning. Some of you may recall coming to our EEG laboratory in Elborn College at Western University. The children in our study wore a mesh cap with some small, wet sponges. Different parts of our brain use small electrical activities to “talk” to each other. This cap is designed to record these electrical activities.

During our study, we recorded the electrical activities of each child’s brain at rest while the child watched a movie. We found out that this “resting-state EEG” can tell us about the language skills of children with normal language development. These findings are important because they help us understand more about the brain activity that supports children’s language learning!

- *Elaine Kwok, M.Sc.*

The Development of Number Processing in the Brain

Learning to understand number symbols involves learning that the digit ‘3’ means 3 items (e.g., 3 dots: •••). This understanding is a necessary step towards learning more complex math. Studying how the brain represents number symbols can help us to better understand the mechanisms that support number symbol learning. Using functional magnetic resonance imaging (fMRI), we can measure the brain activity of children while they are looking at numbers. Currently we are asking children ages 6 to 14 to participate in a study where we ask them to look at numbers and then examine what their brain is doing!

Our participants complete some number and math tasks in the first session, and then come back to the lab for an fMRI session. We will look at how number processing changes with age, and how brain representation of number is related to important math skills, such as arithmetic and magnitude comparison. Studies like this help us to better understand how people learn to use number symbols.

- *Celia Goffin, M.Sc.*

Our Work with School-based Speech-Language Pathologists

Speech-language pathologists (SLPs) assess and treat children who struggle to learn language. There are a variety of assessment tools SLPs use to identify and understand a child’s language strengths and weaknesses. Often, SLPs create assessment tools that provide the best fit for their school setting. SLPs at the Durham District School Board have adapted a quick assessment tool for use with kindergarten students. Based on the results of this assessment, SLPs lead small guided groups and whole class interventions to teach kindergarten students an awareness of the sounds that make up words, a skill called phonological awareness, and the ability to tell a story. We are working together with these SLPs to learn more about their assessment tool. In this study, children complete the assessment tool twice during the school year. Some of the children will also participate in the guided lessons with the SLPs. We’ll examine how the tool captures the children’s skills and skill change. We’re excited to be working directly with SLPs in their educational setting to develop feasible tools for use in practice.

- *Meghan Vollebregt, B.A.*

Processing of Sounds and Language in Children

There are many different factors that impact how children learn language. We think that one of these factors is how well children are able to process the sounds that they hear. We want to know how this processing of sounds is related to processing what goes on around us in general, and in turn, how these things are related to how children learn language. We've just finished testing processing of sounds, processing in general and language in a group of children whose language has developed as expected using some fun computer tasks. Our next step is to test these things in children who have language difficulties so we can look at differences in the processing abilities of children with and without language difficulties.

- Rachel Smyth, M.Sc.

Measuring Brain Activities to Understand Reading Disability

Some children have more difficulty learning to read than others. We know that connections in the brain help to support successful reading, so we want to understand how connections in the brain might differ in children who are struggling readers. We study connections in the brain using magnetic resonance imaging (MRI), which uses a magnetic field to measure brain structures and brain activity. In our study, children with reading disabilities participate in an MRI scan and complete different kinds of reading tasks such as naming letters, reading familiar words, reading new words, and answering questions about different passages. We are finding that children who are struggling readers

have smaller and fewer connections between areas of the brain that are important for reading. These children are also participating in a reading intervention program at their school and will come back for another MRI scan at the end of the program. This way, we can study whether there are any changes in the connections in their brains as the reading improves. This will help us to better understand how the brain supports reading and how we can best help children with reading disabilities.

- Alex Cross, M.Sc.

Stories Tell All!

Children who have difficulty learning language often struggle at school. It's important to identify these problems in children as early as possible so they can receive the support they need. One way to identify young children with language disorders is to use a story telling task. Children with language disorders typically have trouble retelling a story they just heard: They use fewer words, shorter sentences, and remember fewer events from the story. We have partnered with Speech-language pathologists (SLPs) in Upper Grand District School Board who have developed a story telling task to measure change in language abilities in students in kindergarten to grade two. The children in our study complete two very similar and short story telling tasks, and other tests of vocabulary and language. We found that the story telling tasks were very good at helping us understand a child's language level.

- Alex Cross, M.Sc.

Learning Number Words in Preschool

During the preschool years, children make great strides in numerical thinking or thinking with numbers. One of the most important things they learn is how to count. Learning the meaning of verbal number words like the word “two” is a major milestone for children. We wanted to know if learning verbal number words changes the way that children think about quantity, that is, the amount of material a set of items in the world around them. We worked with 140 children in preschools across London, Ontario.

For each child, we looked at the verbal numbers the children knew, and how much they paid attention to the amount of blocks in a set we showed them. We discovered that children only attended to quantity if they knew the meaning of the verbal number word of that quantity. For example, if a child knew that the word ‘two’ represents two objects, but did not know that ‘three’ represents three objects, then that child is more likely to attend to quantity when shown two blocks compared to three blocks. This research teaches us that when children learn number words, it changes the way that they attend to quantity in the world.

-Moriah Sokolowski, M.Sc.

OUR THANKS

A SPECIAL THANK YOU

Thank you to all of the school personnel, parents, and children who make our studies possible. Thank you also to the talented graduate students working on these research projects!

WE ARE STILL WORKING

Thank you to all of the parents who have indicated that they would like to be contacted for future studies. As we continue working on our research projects, we greatly appreciate your continued participation.

FIND OUT MORE ABOUT OUR RESEARCH!

Follow the links to find out more about our work:

Our past newsletters: <http://www.uwo.ca/fhs/lwm/newsletters.html>

Lists of our published papers can be found at the lab website:

<http://www.uwo.ca/fhs/lwm/>

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