University of East Anglia | DEVELOPMENTAL DYNAMICS LABORATORY

SUMMER 2018

WELCOME

Welcome to the Summer 2018 Newsletter of the Developmental Dynamics Lab. Here is an update on our progress since last year. We hope you enjoy reading the newsletter.

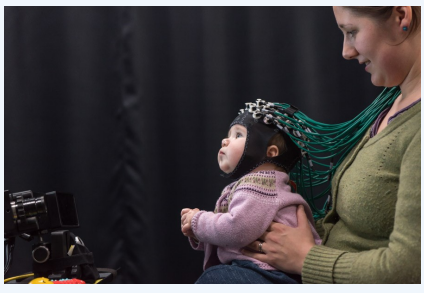
INSIDE THIS ISSUE

THE BRAIN STUDIES

We are now 1.5 years into a project we refer to as the 'Brain Study'. This is a large, multi-year project to examine the early development of visual working memory. We are also running a companion study in Uttar Pradesh, India to examine how early adversity including poverty and under-nutrition impacts this form of working memory.

Visual working memory is used over 10,000 times per day to remember where objects are in the world (my coffee mug is on the kitchen table) and to detect changes when they occur (my son left his snack bowl in the lounge...again). As you might imagine, any system that is used 10,000 times per day is probably pretty important to development.

This is indeed the case. Visual working memory develops dramatically in the first few years of life: infants can only remember properties of a single object, while children around the age of 3 can keep track of 2-3 visual objects at once. Critically, differences in working memory are predictive of later school outcomes. Thus, if we could invent ways to improve visual working memory in infancy, we might be able to give children a boost early on, particularly in cases of early adversity.



Our study is progressing really well thanks to the wonderful contributions of families in Norfolk. By February of 2019, we will have reached full enrolment—a fantastic achievement. And so far, families have been really invested in the project, participating in sessions at home, in the lab at UEA, and at the MRI Facility at Norfolk and Norwich University Hospital. We have collected a mountain of data so far. We are just starting to analyse the data now, so results will have to wait until the next newsletter. For now, a huge 'thank you' to everyone involved in these projects. We're excited to share our discoveries with you in the years to come!

A DAY IN THE LIFE OF A DEVELOPMENTAL SCIENTIST

In April this year, I started my dream job as a research assistant working with children aged 11-20 months.

I'm using eye-tracking to gain an understanding into how children learn words! My interest in psychology was initially kindled after seeing pictures of babies participating in eye-tracking research, so to be in a lab with a mum and child...well, it's hard to resist doing a happy dance!

What do I do in my job? Greeting carers in the car park is the first step. Sometimes the little ones are waking from a sleep, sometimes they are awake and curious, but I always enjoy meeting the children and their "big people". I give them a car parking pass and walk them to the lab. Sometimes I walk with a toddler who is doing that just-learnt-to-walk "I'm clever and I know I am" strut. This always makes me smile!

The first room we go into is the waiting area. This is where I explain the study, and the parent is offered the consent form to sign. The next room is where the study takes place. It's a cosy room with a big chair and even bigger TV screen. When we enter, a cartoon is usually playing on the TV. This helps children relax and gets them focused on the screen. The child sits on the lap of the adult. Next, I put a small sticker on the little one's forehead. This sticker enables the eye-tracking camera to follow the child's eye as they look at the pictures that appear on the big screen.

Once everything is set up, the experiment begins. We show the child a series of pictures; some will be familiar and some will be ones we have specially made up to investigate how children learn labels. The eye-tracking and computer software operate in a "gaze contingent" manner, which means that the computer waits until the child looks at a particular picture to give the name for that object. How cool is that?!

While the experiment runs, I sit in a "control room" around the corner. I keep an eye on the eye-tracking, the computer running the experiment, and, most important, I make sure the child and caregiver are happy and comfortable. For a lot of children, the experiment can be hard work. If it seems like too much, I'll offer a break filled with bubbles and biscuits.

When the experiment ends, I answer any questions. Then we come to my favourite bit: The child gets a "Child Scientist" t-shirt and choses something out of my basket of toys. I think the best ones are the cuddly animals wearing tiny t-shirts...but I'm biased!

I walk the family back to the car. On my way back to the lab I am smiling. I love my job!

PLAYING WITH IPHONES!?

Babies learn amazingly quickly. Within several months, they often transition from crawling to walking and from cooing to talking. This growth is fuelled by their curiosity to explore and learn. In a study we call *IPHONE*, we are interested in this curiosity and how it shapes infants' learning about the relationship between objects and words.

The study is called IPHONE because it came out of a discussion we were having about...an iPhone! We were wondering if babies could 'glue together' the different views of an object to know that, say, the front-facing black rectangle of an iPhone is the same object as the slender silver side view of the phone.

To test this question, 3- to 12-month-old infants are shown familiar and unfamiliar objects on a puppet stage. Critically, the objects come out in one orientation on the left and in a different orientation on the right. They really seem to enjoy the show. Next, infants are given a couple of objects to play with. Some of the babies get to wear 'sticky mittens' – special Velcro mittens that objects will stick to.

Results have revealed that the way infants look at objects is related to their motor development, gender, and age. As children get older and gain motor skills, they are able to glue the different views together to form one understanding of the object. Interestingly, if infants are given play experiences with the sticky mittens, this helps them understand that the different views all go together. This is exciting because the sticky mittens might be a good way to help children with motor delays.

CAN YOU GIVE ME YOUR 'DAX?'

Children hear new words and see new things every day, and by the age of 3, some children can have up to 200 words in their vocabulary. This ability to learn language so quickly is impressive. We know children use perceptual cues like shape, colour, and texture when learning new names for things, but how do they use these cues to learn so many words so fast? To answer this question, we look at what children do with objects they have never seen or heard the name of before. Imagine a child is presented with three objects--a smooth ball, a furry ball, and a smooth box which is made out of the same material as the ball. The child is then told that the smooth ball is called a 'dax' and is asked to find another 'dax'... which object do you think the child will pick?

Adults typically pick the furry ball because it has the same shape. We call this a "shape bias". We found that most children between 30 and 40 months also choose the shape match. But sometimes children choose material matches (the smooth box). Our results show that these children differ in the attentional skills and their prior experience with words.

This year we have used this task with younger children aged 17 to 30 months. We are analysing the data to understand what looking patterns can tell us about the child's second-by-second decision -making. This research will help us better understand how young children use perceptual cues to link labels to new things even when they aren't producing many words yet. We hope these studies will inform interventions for children who have language impairments or difficulties with word learning.

HOW DO CHILDREN LEARN TO CONTROL THEIR OWN BEHAVIOUR?

Executive function (EF) skills are the cognitive processes that allow children to control their own behaviour. Executive functions enable children to plan, focus attention, remember instructions, and juggle between multiple tasks. These skills are crucial for development. Indeed, differences in executive function skills early in development have been shown to predict school performance and quality of life decades later.

Many studies have explored the development of executive function from early childhood to adulthood. A key challenge is to understand how executive function develops early in development, before the age of 3. This is the period when we think early interventions might have the most impact.

In this study, we are looking at the relationship between infant attention and executive function, asking whether attention measured in early development can predict executive function later in childhood. Participants 2 to 6 years of age complete an attention task that measures their ability to disengage from an interesting object. The task also measures their ability to shift attention to anticipate where a new object will appear. Finally, participants complete an executive function task where they sort cards on a tablet.

Results show that, as expected, executive function improves as children get older. We have also found that how children control their attention is predictive of executive function abilities. In addition, younger children rated as better in effortful control by parents were more likely to shift attention to anticipate where a new object would appear.

These results suggest that we might be able to measure attention in infancy and predict a child's emerging executive function skills. This would help us evaluate interventions targeting executive function very early in development.

SOCIALLY COOPERATIVE BRAINS

In the preschool years, children build their vocabulary and learn to cooperate with others by interacting with their caregivers. How do they learn in such interactive settings? We are looking at this critical question using brain imaging to examine whether parents' and children's brain activity is in-sync while they learn and play together.

During the study, parents teach their children the names of novel toys. They also play a cooperative game with their child (Jenga). As they learn and play, we use a brain imaging system called Near-Infrared Spectroscopy (NIRS) to measure the brain activity of both the caregiver and the child simultaneously.

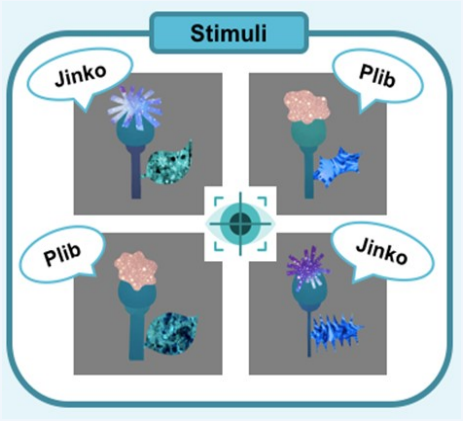
Our early findings suggest that brains are more in-sync when parents and children are working together, including when they are learning new words or playing a difficult game. We are currently examining whether parents' and children's brain activity is more in-sync in cases where children are successfully learning new words, compared with cases in which they are not. Ultimately we hope this study will help us identify resources that are most critical for early learning.

HOW DO LABELS DIRECT INFANTS ATTENTION?

I have just finished my third-year dissertation project working in the lab. I conducted an eye-tracking study with 18-20-month-olds to investigate how children learn new categories. For example, how do children learn to tell apart cats and dogs? In particular, I was interested in whether learning words can help children identify the 'diagnostic' parts of a category, such as the white spots on a toadstool.

I used two sets of new objects which I named 'plib' and 'jinko' to examine whether children paid more attention to the objects' similarities (a blossom feature) or differences (a leaf feature). Contrary to my predictions, I found that children paid more attention to the leaf feature rather than the blossom feature. Children seemed to understand that the 'blossom' determined category membership, but they seemed confused by the high variability of the 'leaf'. Perhaps reflecting this confusion, children did not show robust memory for which name went with which object.

I have been working in the lab with Dr Nadja Althaus for just over a year now and have been involved in four different eye-tracking studies examining children's early language development, specifically how children learn to categorise new objects and how they interpret mispronunciations. This has been an amazing opportunity and it has been incredible to work with so many lovely families. I have thoroughly enjoyed being a part of the child research team at UEA and have learned so much about child development and research processes.



Thanks for partnering with us!

Thanks to all the families who have given up their time to take part in our studies. We are sincerely grateful to you and for giving us the opportunity to continue with our research here in the Developmental Dynamics Laboratories.

Follow us on facebook: **https://www.facebook.com/DDPSYUEA**

CHILD SCIENTIST