Birkbeck
UNIVERSITY OF LONDON
LONDON'S EVENING UNIVERSITY

BABYLAB NEWSLETTER 2020

THE BIRKBECK BABYLAB WOULD LIKE TO THANK ALL OF THE FUNDERS WHO HAVE SUPPORTED US IN OUR RESEARCH

Action Medical Research & Great Ormond Street Hospital Children's Charity
www.action.org.uk

Autistica *www.autistica.org.uk*

Autour des Williams
www.autourdeswilliams.org

Baily Thomas Charitable Fund
www.bailythomas.org.uk

BIAL Foundation
www.bial.com/com/bial-foundation

Bill and Melinda Gates Foundation
www.gatesfoundation.org

Brain Canada Foundation
www.braincanada.ca

British Academy
www.thebritishacademy.ac.uk

CareTech Charitable Foundation
www.caretechfoundation.org.uk

Department of Health, UK
gov.uk/government/organisations/department-of-health-and-social-care

Economic and Social Research Council
www.esrc.ukri.org

Education Endowment Foundation
www.educationendowmentfoundation.org.uk

Edward Glover CMG and Dame Audrey Glover Elizabeth and Daniel Peltz OBE
Engineering and Physical Sciences Research Council
www.epsrc.ukri.org

European Union
www.ec.europa.eu/info/index_en

Garfield Weston Foundation
www.garfieldweston.org

The Great Britain Sasakawa Foundation
www.gbsf.org.uk

Innovative Medicines Initiative - EU
www.imi.europa.eu

Jacobs Foundation
www.jacobsfoundation.org

Japan Society for the Promotion of Science
www.jsps.go.jp/english

Jérôme Lejeune Foundation
www.lejeunefoundation.org

Kansai University
www.kansai-u.ac.jp/English/index.html

L'Oreal UK and Ireland *www.loreal.co.uk*

Leverhulme Trust *www.leverhulme.ac.uk*

The Maurice Wohl Charitable Foundation
www.wohl.org.uk

Medical Research Council
www.mrc.ac.uk

MQ: Transforming Mental Health
www.mqmentalhealth.org

National Institute for Health Research
www.nihr.ac.uk

Nuffield Foundation
www.nuffieldfoundation.org

Riksbankens Jubileumsfond *www.rj.se/en*

Royal Society *www.royalsociety.org*

Simons Foundation
www.simonsfoundation.org

Society for Education, Music & Psychology Research
www.sempre.org.uk

VolkswagenStiftung
www.volkswagenstiftung.de

The Waterloo Foundation
www.waterloofoundation.org.uk

Wellcome Trust *www.wellcome.ac.uk*

The Wolfson Foundation
www.wolfson.org.uk

ONLINE RESEARCH

Innovation is key to research at the Babylab. We are striving to create accessible online research for families to take part in from the comfort of home. Please check out our latest offerings at *cbcd.bbk.ac.uk/online-studies*

TESTING METHODS WE USE AT THE BABYLAB

EEG
(electroencephalography) measures the naturally occurring electrical activity that is produced when brain cells communicate with one another.

EMG
(electromyography) uses skin sensors to record the electrical activity naturally produced by muscle movements.

EYE TRACKING
uses an infrared light source to measure the reflection of light on the pupil. The data gained will determine the rotation of the eye and the direction of gaze so we know exactly where the baby or child was looking.

MOTION TRACKING
originates from sports science and uses cameras that record infrared light to locate exactly where a reflective marker is in space. This allows us to analyse the movement of reflective markers on hands or other body parts in relation to action and specific tasks.

fMRI
(functional magnetic resonance imaging) uses MRI technology to measure brain activity; by detecting changes in blood flow within the brain, fMRI enables us to see which areas of the brain are active.

MRI
(magnetic resonance imaging) uses magnetic fields and radio waves to produce detailed images of structures in the body, such as the brain.

NIRS
(near infrared spectroscopy) uses infrared light-absorption to measure blood-oxygen levels in specific regions of the brain.

CAVE
(cave automatic virtual environment) is an immersive virtual reality environment where projectors direct images at walls and floor of a room size cube.

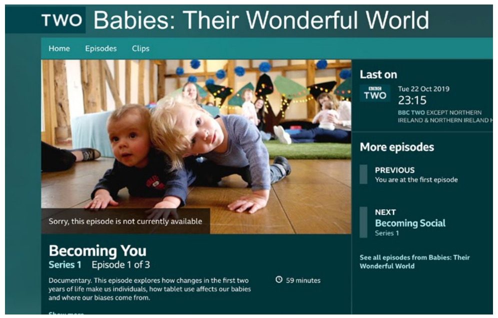
MEDIA STORIES

The Babylab has been featured in a variety of news articles

BABIES: THEIR WONDERFUL WORLD

BBC Two featured Professor Emily Jones and Dr Tim Smith, alongside other CBCD staff and alumni in a three-part series which explored the impact of the changes babies experience in the first two years of life.

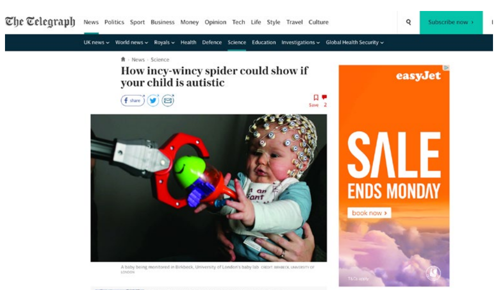
bbc.co.uk/programmes/b0bt7v0j



HOW INCY-WINCY SPIDER COULD PREDICT SOCIAL DEVELOPMENT

Dr Sarah-Lloyd Fox explains to The Telegraph how different patterns of brain activity were identified in toddlers later diagnosed with Autism when engaging in social games and viewing pictures of inanimate objects.

telegraph.co.uk/science/2018/08/18/incy-wincy-pider-could-show-child-autistic



ROOM TO ROAM IN NEW TODDLERLAB

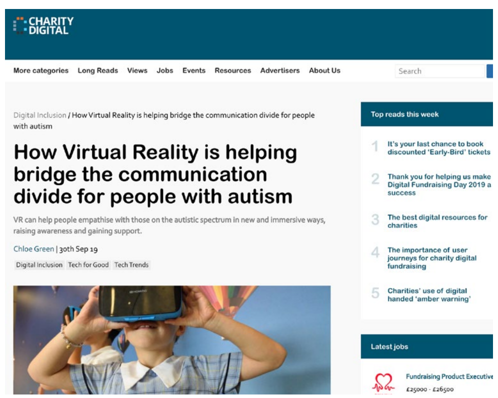
The Psychologist reports on the construction of our very own world's first 'ToddlerLab', including the specialist technology which will allow toddlers to roam freely and behave as they would in the real world while measuring their brain activity.

thepsychologist.bps.org.uk/volume-31/may-2018/room-roam-new-toddlerlab

HOW VIRTUAL REALITY IS HELPING BRIDGE THE COMMUNICATION DIVIDE FOR PEOPLE WITH AUTISM

Charity Digital dedicated a section of their article to the innovative virtual reality technology that will be used at our new Toddler Lab, allowing us to transport toddlers to different surroundings, for example a farmyard or city street.

charitydigitalnews.co.uk/2019/09/30/how-virtual-reality-is-helping-bridge-the-commnication-divide-for-people-with-autism



WHY DOES CHILDREN'S TV SEEM SO RIDICULOUS AND ADDICTIVE?

Dr Tim Smith discusses with The Independent how educational TV programmes such as 'Baby Einstein' can backfire if their content is not age-appropriate.

independent.co.uk/life-style/health-and-families/childrens-tv-addictive-sesame-street-spongebob-squarepants-a9224156.html

SEVERE CHILDHOOD DEPRIVATION REDUCES BRAIN SIZE

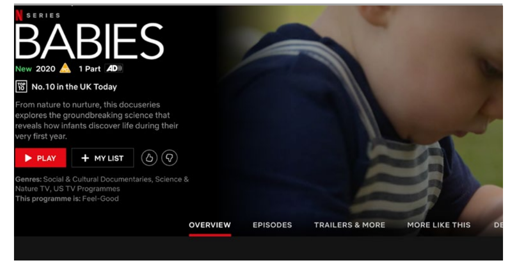
The Guardian references Professor Denis Mareschal for his opinion on the recent findings from a longitudinal study investigating the effects of severe childhood deprivation.

theguardian.com/science/2020/jan/06/severe-childhood-deprivation-reduces-brain-size-study-finds

BABIES

Our colleague the late Professor Annette Karmiloff-Smith was involved in developing a 12-part series, now available on Netflix, exploring the science which reveals how infants discover about life during their very first year.

netflix.com/gb/title/80117833



HOW MUCH TV SHOULD YOUR CHILDREN BE WATCHING RIGHT NOW?

The Financial Times published an article discussing the importance of content when choosing television for children, citing research by many psychologists including our own Dr Tim Smith.

ft.com/content/0eee3338-7928-11ea-9840-1b8019d9a987

TODDLER LAB AIMS TO DECODE YOUNG MINDS

The Times published an article about the amazing wearable technology being de-ployed at our soon to open ToddlerLab.

thetimes.co.uk/article/toddler-lab-aims-to-decode-young-minds-7vkmkrnj9

THE TODDLERLAB WILL OPEN SOON!

Studying toddlers requires technology that moves with them, for example, wireless or wearable headsets which can monitor toddlers' brain activity while they run around and play. The Wohl Wolfson ToddlerLab will open in early 2021 and is recruiting participants!

As the ToddlerLab and Babylab our both part of the CBCD, if you're already signed up with us, you'll automatically be invited to take part in any new studies running, depending on your child's age. But If you're not signed up with us and would like your child to be one of our first Toddler Scientists, please get in touch!

CBCD Director Professor Denis Mareschal laying a brick for the ToddlerLab back in November 2019, we've come a long way since then!

CBCD 21ST ANNIVERSARY CONFERENCE

In November 2019, over 100 past and present CBCD members gathered to celebrate the tremendous amount of world-renowned research stemming from our labs over the last 21 years. Researchers from all around the world (and the UK!) came to share their passion for infant and child developmental research.

The Psychologist featured an article describing the celebration: thepsychologist.bps.org.uk/whats-mechanism

OUR NEW ARRIVALS

We would like to welcome the newest additions to the CBCD, recently born to Babylab staff. Congratulations!

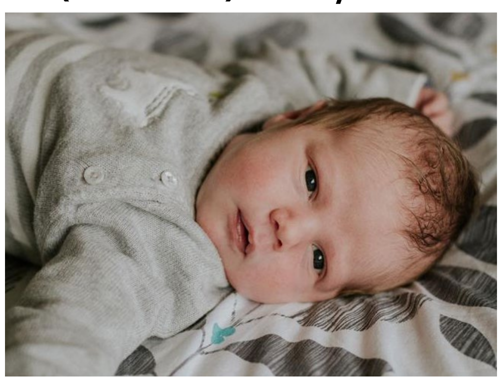
Sid (Sinead) December 2018

Giovanni (Anna) April 2020

Arden (Suzanne) November 2019

Elodie (Hannah W) August 2020

Arlo (Tim & Rachel) February 2020



Leo (Chiara) August 2020

TODDLER ATTENTIONAL BEHAVIOURS AND LEARNING WITH TOUCHSCREENS (TABLET) PROJECT

Ana Maria Portugal, Rachael Bedford, Claire Essex and Tim J. Smith

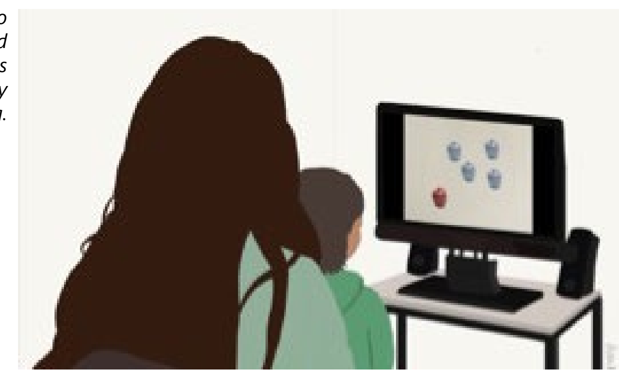
How does the use of touchscreen devices affect our little ones' cognitive development?

The TABLET project started way back in 2014 to understand how children between 6 months and 3.5 years use touchscreen devices and how this use might be influencing their developing brain and behaviour. Families around the UK participated via a series of online questionnaires, by visiting the BabyLab or by taking part in our public engagement activities.
To better understand the possible influence of touchscreen exposure, in one study we are investigating toddlers' attention, testing whether high users of touchscreens are faster or slower than low users at finding targets which 'pop-out' in a simple scene (a red apple in the middle of blue apples). Results to be reported in our next newsletter!Over the past two years, the TABLET team have helped to run a public engagement project called 'Toddlers and Touchscreens'. It aimed to start a dialogue between scientists, parents, and early-years practitioners, about the latest scientific evidence and guidelines, as well as discuss their thoughts, feelings and behaviours around (touch)screen time. We ran a series of focus groups and a workshop with collaborators from the National Childbirth Trust and the Early Years Alliance, and some fun family activities, including interactive science festivals and a science show at the Polka Theatre in Wimbledon!

Stay tuned for our latest science discoveries at www.cinelabresearch.com/screen-time-and-child-development
or by following @TABLETproj on Twitter

We are thankful to all the TABLET families who visited the BabyLab when their children were 12 months, 18 months and 3.5 years

The eye tracker allows us to study attention in high and low users of touchscreens by telling us where a baby is looking.



THE LOONEY TOONS STUDY: WHY ARE KID'S CARTOONS SO WEIRD AND HOW DO THEY IMPACT ATTENTION AND LEARNING?

Claire Essex, Teodora Gliga, Rachael Bedford, Nicholas Walters and Tim J. Smith

Kid's cartoons often include weird breaks with reality (Road Runner's casual regard for the laws of physics, SpongeBob SquarePants.... everything) that are believed to entertain children and provide an opportunity for learning. But are these fantastical moments too much for the developing brain to process? In this study we are using an eye tracker to measure where children look while they view specially edited Looney Tunes cartoons and complete tasks designed to investigate how they control their attention and learn from screens.

We are currently looking for baby scientists aged 18 months to take part! Please contact the Babylab if you would like to participate.

We also have an online version of this study you can do from the comfort of your own home! The online task is suitable for 12 month olds through 6 year olds. Visit cbcd.bbk.ac.uk/online-studies for further info

This study is part of a wider ESRC funded industrial challenges PhD project in partnership with children's media platform Hopster. The broader project seeks to examine the dynamics of attention in response to media presented on digital devices. We are interested in how aspects of the content (editing techniques such as pace) and different types of interaction (video viewing, educational games) may influence the allocation of attention and a child's ability to comprehend and learn from the content.

BRAIN COMMUNICATION IN THE BASIS STUDY

Mark Johnson, Emily Jones and Rianne Haartsen

When two people are talking with each other, they know exactly when it is the other's turn to talk. If they don't wait for their turn, they will have difficulties understanding each other. Their conversation needs to be precisely timed for good communication.

Similarly, activation in different brain areas needs to be precisely coupled in time

"Brain connectivity at the front and middle of the brain while watching the videos during infancy was associated with more restricted and repetitive behaviours during toddlerhood in infants who later received a diagnosis of autism"

for smooth communication, also named functional connectivity. We do not currently know how these connectivity patterns develop during infancy and whether these may relate to later autism diagnosis and autism traits. Our research aimed to find out how functional connectivity during infancy is related to autism traits during toddlerhood.

In the British Autism Study of Infant Siblings (BASIS), we showed 14-month-old infants alternating videos of women singing nursery rhymes and spinning toys while we measured their brain activity with EEG. Two years later, the families returned to the lab and we asked parents whether they noticed any autism-like behaviours their toddlers were experiencing.

We found that brain connectivity at the front and middle of the brain while watching the videos during infancy was associated with more restricted and repetitive behaviours during toddlerhood in infants who later received a diagnosis of autism

This is very exciting because these results replicate previous studies that found the same associations. This further demonstrates that research should also consider whether neural mechanisms associate with autism traits rather than just the diagnosis of autism. This will help towards our understanding of how autism traits emerge, and **provide possible targets for intervention during early development.**

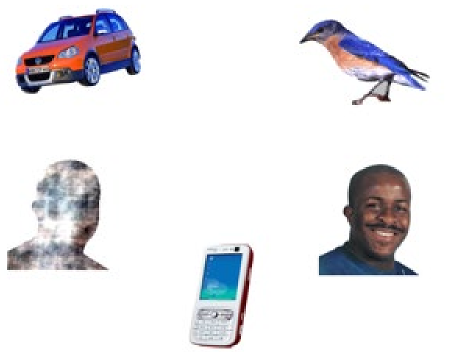
GBASIS: NEW INSIGHTS ABOUT THE ROLE OF GENETICS ON EARLY ATTENTION

Anna Gui, Rebecca Harrison, Emma Meaburn, Emily Jones and Mark Johnson

The BASIS Genome (gBASIS) study officially started 4 years ago when we began to collect DNA samples from the family members of the children (ex-infants!) who took part in the British Autism Study of Infant Siblings. The aim of the gBASIS study is to fill the gaps in our understanding of the biological mechanisms that contribute to neurodevelopmental disorders such as Autism and ADHD. We have obtained and processed 648 DNA samples for this project - thank you to all the BASIS families who participated! As promised in the last newsletter, we can now share some findings with you.

"We have obtained and processed 648 DNA samples for this project - thank you to all the BASIS families who participated!"

In a study that is under review in a scientific journal, we looked at the link between DNA differences or variants and early differences in looking behaviour as measured in eye tracking studies. The DNA variants we picked are known to have a role in the development of Autism and ADHD. We were interested to see if these same variants also play a role in how we direct our attention towards social stimuli like faces in infancy. We found that at 14 months of age, infants who carry a high number of these genetic variants show difficulties in shifting their gaze away from an image of a face when it is presented among other non-face images (as in the figure). This looking behaviour is also associated with increased symptoms of ADHD at school-age in children who had an older sibling with Autism, suggesting that DNA variations linked with neurodevelopment disorders appear to influence how infants direct their attention before the second year of life.



Example of the face and non-face images presented to 14-month-old infants (face pop-out task).

"DNA variations linked with neurodevelopment disorders appear to influence how infants direct their attention before the second year of life."

Intrigued by these findings, we now plan more investigations! Dr Emma Meaburn and Professor Emily Jones have secured additional funding from the Simons Foundation Autism Research Initiative to look deeper into the DNA code of the BASIS families. As part of this effort, Dr Rebecca Harrison joined the team to look at the role of different types of DNA variants in early brain development and infant behaviour. Stay tuned to know more about the links between DNA, the brain and behaviour!

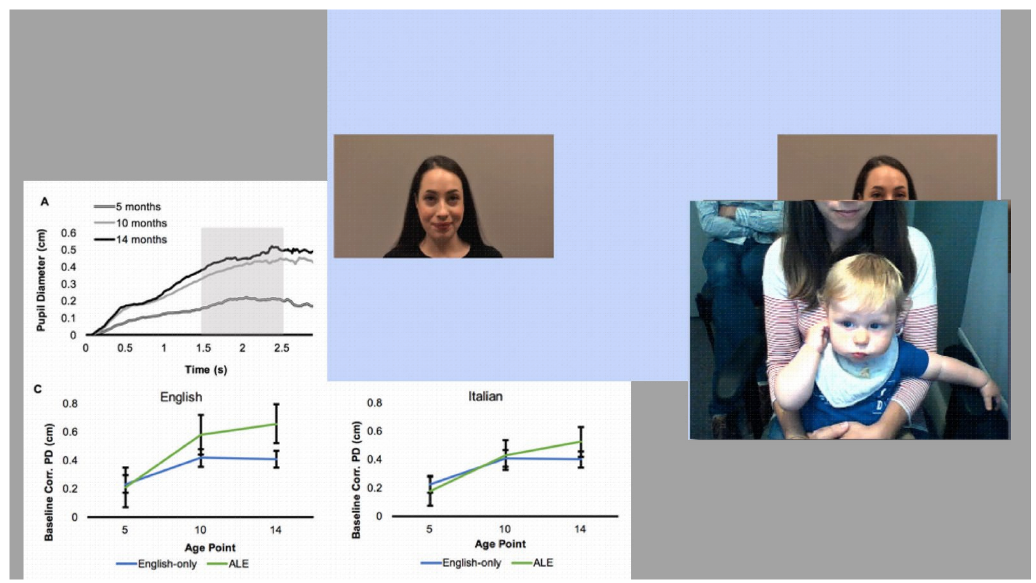
For further information about gBASIS, please visit staars.org/gbasis
Information on our work in genetics and behaviour can be found here gel.bbk.ac.uk/about-us

GABBLES UPDATE! (GAMMA AND BRAIN-BASED LANGUAGE SPECIALIZATION STUDY)

Anna Kolesnik, Isabel Quiroz, Shannon Connelly and Emily Jones

Babies take huge steps within their first year to become experts in language and social communication. In this study, we looked at different aspects of specialisation towards language processing in babies from 5 months to 2 years of age using eye tracking, EEG and behavioural assessments. As many of the parents who took part in the GABBLES study remember, one eye tracking task involved the baby 'choosing' which side of the screen they look at to activate a video in their native English or non-native Italian languages. We found that infants do not have a particular preference towards either English or Italian phrases, but they do show longer looking times with increased age as well as faster reaction times towards English rather than Italian. In addition, we found that infants who are familiar with more than one language show larger pupil dilation responses to English stimuli with age, suggesting enhanced attention with age.

The findings from this study as well as the several EEG tasks are currently being written up for publication. A huge thank you to all our little participants (now not so little!) and their families for taking part. We will keep you updated with all the exciting findings that are emerging.



Preview of the language preference task and one of our lovely participants as well as a group average of the pupil responses with age.

LANGUAGE EXPERIENCES AND PERCEPTION STUDY (LEAP)

Victoria Mousley, Evelyne Mercure and Mairéad MacSweeney

We aim to understand how early language experience affects language and cognitive development. As babies learn their native language, they lose the ability to perceive foreign sound contrasts. Some researchers think that bilingual babies, raised with exposure to two languages from birth, may possess some "language processing advantages." It's possible that the demands of learning two languages could allow bilingual babies to remain "flexible" in their foreign-language-listening skills. For example, while monolinguals lose the ability to perceive foreign language sounds by 12 months, bilingual babies may retain this skill longer than 12 months.

The Language Experiences and Perception (LEAP) study invites 15- to 18-month-old toddlers to take part in eye-tracking and behavioural tasks designed to test whether bilingual toddlers retain the ability to perceive sounds of foreign language past the point where monolingual toddlers no longer can. **Please contact the Babylab if you would like to participate!**

BRAINTOOLS

Emily Jones, Luke Mason, Teresa Del Bianco, Rianne Haartsen, Jannath Begum Ali, Georgia Lockwood Estrin, Amy Goodwin and Eleanor Braithwaite

Some lucky Birkbeck researchers have been travelling recently, as part of a global health project conducted with teams in Africa and India. This global health project is called BRAINTOOLS and aims to develop a 'toolkit' for measuring brain development in locations worldwide.

Existing research has mostly taken place in high-income countries such as the UK and USA, however the BRAINTOOLS project extends this to lower-income countries. The aim is to develop a method of measuring brain development which is optimised for low-income settings. Our first goal is to develop an acceptable, feasible and reliable portable EEG toolkit for assessing functional brain development. It is hoped that this toolkit could then be used in large-scale projects to detect early risks of developmental difficulties.

Birkbeck researchers have now seen over 110 children across the three project sites (London, Delhi and The Gambia) and have finished collecting data. In London, over 60 children between 2.5 and 4.5 years made two visits to the Birkbeck Babylab. During both visits, children wore a type of EEG hat which does not need to be physically connected to anything else while watching some pictures and videos on a screen. We hope to demonstrate a good correlation between measures taken from the same child on two different occasions. This would demonstrate good toolkit reliability and applicability for future research. Equivalent studies were carried out in Delhi and The Gambia, with additional questionnaires and in-depth interviews conducted in Delhi to establish the feasibility and acceptability of the toolkit in these settings.

We are now working on the data we gathered and look forward to sharing our findings in the next newsletter!

We would like to send a huge thank you to all the families who took part in this project in the UK and abroad – we loved working with you all!

To read more about this project please visit braintools.bbk.ac.uk

KEEP ME INTERESTED!

Cecile Gal, Isabel Quiroz, Francesca Penza, Raul Muresan, Marie Smith and Teodora Gliga

Babies are incredibly talented learners. Very quickly after birth, they start learning about the world around them. Every baby's experience of the world is different, and we cannot teach them as explicitly as we teach the older kids at school. Yet they still manage to pick up on the information surrounding them and to develop their knowledge on their own. We were interested in how babies decide on what to learn and when. Moreover, each baby has their unique way of interacting with the world around them and their own strategy to learn: these differences were at the centre of our study.

We looked at how 15-month-old babies play with toys when they can choose what to play with. Do they spend more time with some toys and leave the others aside? Or do they like to play with everything? Do they interact with their preferred toys in a specific way? We also looked at two key general functions (called executive functions): memory and inhibitory control.

We wanted to see whether these abilities would influence babies' strategies to play. Do all babies with a lot of inhibition control stick to their preferred toy rather than going for all the toys? Finally, we also included a more standard learning task: we presented shapes on a screen, two of which matched, and observed whether babies seemed to be learning and getting better with time at matching them (looking at them both rather than looking at the others). We were interested in seeing how each baby learns this game, whether their general "executive functions" influenced their specific learning and their point of disengagement. This was also a way for us to look at whether learning progress influences interest to learn: our hypothesis was that they would keep going as long as they progress in the game and disengage when they reach a plateau and stop progressing.

The visits for this study are now finished, and we are very thankful for all the families who took part.

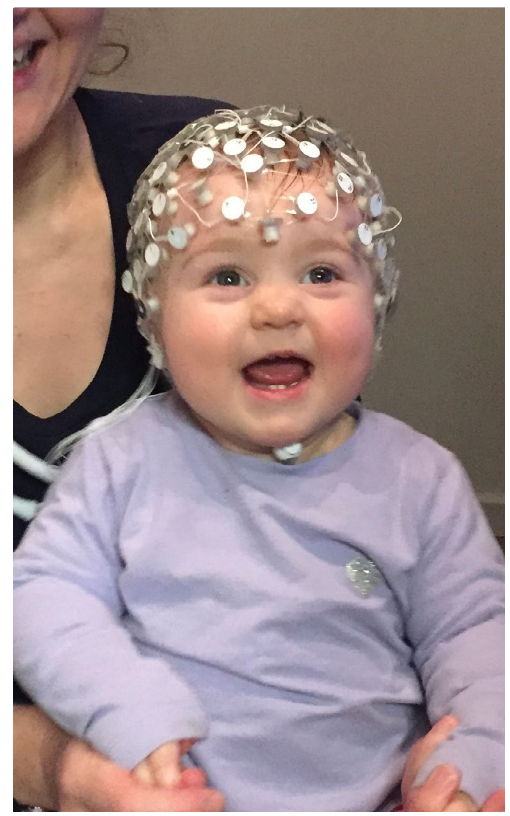
Cecile is busy analysing the data and we are excited to share our findings with you next year!

PREDICTIVE LEARNING & INTEREST

Cecile Gal, Elena Piccardi, Tamsin Osborne, Raul Muresan, Marie Smith and Teodora Gliga

This study was started by Elena Piccardi, who was interested in sensory processing in babies. She showed babies a video composed of a specific mixture of predictable features (repetitions of the same short clip from the animated cartoon "Fantasia") and random events (checkerboards appearing at unpredictable timings). This kind of mixed information offers different learning possibilities for babies depending on what they focus their attention on, which in turn seems to strongly reflect their individual differences in how they learn. During testing, Elena realised that the video elicited a wide range of interests from babies who watched it. Some of them would watch avidly for the whole duration, others would disengage after a few minutes and all of them would clearly show their interest (watching) or disengagement (turning away from the screen).

While Elena focused her investigation on learning strategies and information intake, Cecile wanted to look at another component: **interest**. How does interest evolve as information intake unfolds and knowledge builds up? Can we identify specific signals for information intake on the one hand and interest on the other hand? Can we predict when babies will look away (momentarily disengage) or stop watching (fully disengage) from these brain signals? The wide range of interests that this video elicited in the babies who took part suggests that there are strong differences in interest which we will try and disentangle. **We wish to warmly thank all the families who took part!** Cecile is now busy analysing the data and we will share our findings with you in the next newsletter!



FACE2FACE

Alicja Brzozowska, Teodora Gliga, Matthew Longo, Frank Wiesemann, Johanna Maninger and Denis Mareschal



How do babies process familiar and unfamiliar faces expressing different emotions? In Face2Face, we asked mums of 6-month-olds to pose for a photograph, smiling. During the study, we showed the babies photos of their mums as well as unfamiliar adults. The adults were either smiling, frowning or showing neutral expressions. While the babies were watching the photos, we measured their brain activity using EEG.

Previous studies have shown that in positive (happy) situations, left frontal brain regions have stronger activation, compared to right frontal regions. The opposite is true in negative situations. We are interested to see if various facial expressions elicit the same brain activation pattern in babies. Will we see right frontal activation when babies look at a sad stranger? Will we see left frontal activation when babies see a woman smiling – especially if it's their mum?

Will some faces be more engaging to babies than others? Theta rhythm, a particular slow frequency in frontal brain activity, is linked to focused attention. It has been shown that the strength of this signal while looking at an object is linked to a baby's remembering of that object later. We are interested in whether some of the presented faces, depending on the expressed emotion, are associated with stronger theta rhythm, therefore being more 'memorable' for babies.

Alicja is currently analysing the EEG data as part of her doctoral work. We will share the results in the next newsletter. Stay tuned!


BUILDING A DUPLO HOUSE

Lisanne Schröer, Richard Cooper and Denis Mareschal

Using Duplo and motion capture technology, we studied when preschoolers are able to execute an action sequence to achieve a key goal. For example, making a delicious sandwich consists of stringing together several actions. Five-year-olds are able to execute that sequence in the right order, because they can maintain the key goal of making themselves a sandwich. However, younger children seem to have difficulties with maintaining the primary goal in a difficult action sequence. For example, they might lose track of the overarching goal of making a tasty sandwich, and instead eat the cheese right away!

In this study, we were interested in finding out what changes in the early preschool period when controlling and executing an extended goal-directed action sequence. We asked children between 3 and 5 years of age to build a house using colourful Duplo blocks. We measured the ability to complete the subgoals (walls, roof) while maintaining the primary goal (building a house). In addition, the children in this study played four small games to measure executive functions (inhibition, shifting and working memory) and motor competence.

As expected, our results showed that 5-year-olds were better at executing the action sequence to build the house and were more often successful at maintaining the key goal compared to 3-year-olds. Four-year-olds performed somewhere in between. At the moment, we are also looking in more detail at children's movements to give us information on how and when children decide which action comes next in the action sequence. For example, in adults, we see longer pauses in their acting when they engage in planning. We are interested to see whether this is also the case in children. More about this in the next newsletter!

MOTION TRACKING

An exciting technology using specialist cameras that record infrared light to locate exactly where a reflective marker is in space. By putting reflective markers on a person's body, movement can be identified and recorded in real time. This allows us to analyse the position of reflective markers on hands or other body parts in relation to action and specific tasks, as Lisanne does in her study.



SUPER COOK! CAPTURING THE MECHANISMS OF CHILDREN'S EVERYDAY-LIFE ACTION SEQUENCES

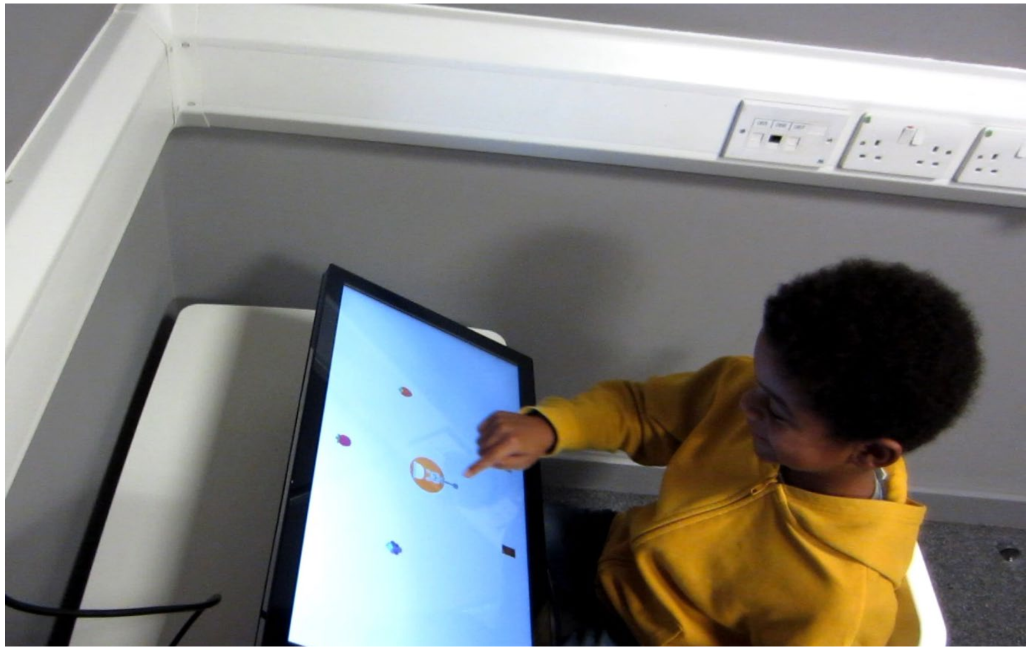
Aude Carteron, Denis Mareschal and Richard Cooper

From childhood onwards, we repeat many sequences of actions on a daily basis, such as having breakfast, brushing our teeth and tying shoelaces etc. As adults, we can carry them out 'on autopilot' using low mental effort. For example, in the 'having breakfast' sequence, we may go to the kitchen drawers, collect a spoon, get the cereal box, pour the cereal into a bowl, pick up the spoon, take a spoonful of cereal and bring it to the mouth without paying attention to every action. If we notice an error in the sequence, when trying to bring the cereal to our mouth we realise we got a fork instead of the spoon, we will step out of 'autopilot mode' and update the action sequence (perhaps go and get a spoon from the dishwasher if there are no more in the drawer).

As adults, we are remarkably efficient at such forms of action control, but how well do children acquire and master new action sequences? How flexible are they when the environment changes and requires them to update their action plans? And how does this relate to other general cognitive mechanisms? We are addressing these questions in our study with children from 5 to 7 years old. We expect the ability to learn and perform action sequences on 'autopilot mode', but also to regain step-by-step conscious action control, to increase with age in parallel with increases in inhibitory control.

During the study, children are invited to play a fun game on a touchscreen computer where they learn to make cakes for cartoon pets and to pay attention to the tricks the pets might play on them. In another game, they will be tasked with catching a sneaky mole.

If your child is between 5 and 7 years old, and would like to take part in this exciting study, please contact the Babylab.



STAARS: THE YOUNGEST BABIES YET?

Emily Jones, Jannath Begum Ali, Chloe Taylor, Rebecca Holman and the STAARS Team

The STAARS (Studying Autism and ADHD Risks) study is a subset of BASIS which has been running since 2006. Since 2014, the STAARS team has seen over 200 infants! The aim of the study is to identify early markers in the development of Autism and/or ADHD to understand more about the mechanisms of the neurodevelopmental disorders, with the aim to develop more effective early interventions. To do this, we recruit both participants who have parents or siblings with a diagnosis of either ASD and/or ADHD and those infants with no familial history of the disorders. We see the infants at 5, 10 and 14 months old with follow up toddler visits at 2 and 3 years; this allows us to see how they grow and develop over these first few years of life.

STAARS has recently been expanded to include infants from as early as 1 month of age! This new part of the study sees some very brave parents coming to the lab, for a couple of hours, with their infants when the babies are between 1 and 3 months old. While they are here, infants take part in an electroencephalography (EEG) task. The researchers place a hat made up of sponge sensors on the baby's head; this hat measures naturally occurring brain activity. Babies can fall asleep with the net on which allows us to look at the brain during sleep compared to the brain while baby is awake. We also place small sensors in the palms of their hands, these send out little vibrations to each hand at different times and from this we can see how the different sides of the brain respond to touch. The final part of the protocol involves putting headphones on and playing them some auditory tones (as you can see finding wireless headphones to fit very young infants is one of our biggest challenges!) and this shows us how the brain responds to repeated sensory stimuli.

To find out more, please email us at staars@bbk.ac.uk
Or check out our website www.staars.org

With many thanks to our 1-month pilot babies!

HOW DO BABIES CREATE THEIR FIRST SOCIAL BONDS? BEHAVIOUR AND ONLINE NEUROIMAGING TO STUDY THE DEVELOPMENT OF SOCIALISATION

Emily Jones, Robert Leech, Anna Gui, Elena Throm, Pedro F Da Costa, Laura Carnevali and Luke Mason

Over the first year of their life, babies gradually learn to socialise and create bonds with other human beings. Social cues - like smiles, humming, speech, singing - can be considered the initial cement that will bind together the baby with their mother, father, siblings and broader social circle. But how do infants come to detect these cues and which do they prefer from the numerous options available?

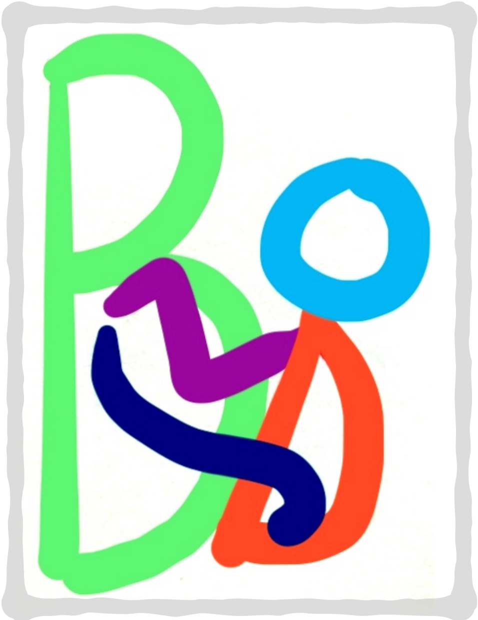
“We are using a new method to scientifically explore how every individual baby starts to be engaged in social interactions.”

We all know that every baby is unique... but so far researchers have mainly studied the development of socialisation by looking at responses in groups of individuals. We are using a new method to scientifically explore how every individual baby starts to be engaged in social interactions.

Our method builds on an innovative artificial intelligence method previously used to ”adapt” to individuals’ personal interests. We are using a similar approach which involves measuring brain activity using EEG and fNIRS while showing babies pictures and sounds. Using their brain response, we will continue to show them only the stimuli they are more interested in.

Years of research has taught us that brain differences are normal! Studying how each brain develops in a unique way and how this relates to behavioural differences will allow us to take a step forward towards understanding neurodiversity. This study has just started and we look forward to sharing new updates in the next newsletter!

If you would like to learn more and take part, please get in touch www.sites.google.com/view/bonds-project



SLEEPING FOR THE BRAIN?

Louisa Gossé, Frank Wiesemann, Clare Elwell and Emily Jones

How’s your baby’s sleep? This question features prominently in every (new) parent’s mind because how the baby sleeps can have an impact on everyone in the household! Babies spend a large part of their early life asleep; a time when they are also developing numerous new and crucial life skills such as smiling, crawling, walking and talking. So it may not come as a surprise that sleep has been shown to play a key role in learning and development. However, we scientists still don’t fully understand how that relationship plays out.

To find out more, we are currently conducting an ambitious study where we investigate how babies’ brains learn and process information while they are sleeping. We are using a technology called near-infra-red spectroscopy (NIRS) that has been commonly used here at the Babylab for studying infants’ brain activity while they are awake, but never before to study babies’ sleeping brains. We integrated NIRS optodes into a custom-built, soft cap that is especially made to be comfortable to wear for babies while they are sleeping and have the babies nap in our lab. When they wake, we show them some videos while we measure which information they pay attention to with the help of an eye-tracker. Once we have collected all our data, we will look at how their brain activation patterns during sleep relate to how they pay attention during the eye-tracking tasks. Stay tuned for results of this study in our next newsletter!

We are still looking for 5-6 months old babies and their parents who want to come into our cosy lab for a nap. If you would like to be part of this study, please contact the Babylab.

THE UNLOCKE PROJECT RESULTS UPDATE

Denis Mareschal, Hannah Wilkinson, Iroise Dumontheil, Michael Thomas and colleagues from the UCL Institute of Education

Learning new concepts in maths and science can be difficult because they may conflict with theories children have previously learnt (a belief that -5 > -4 because 5 > 4), or ideas they have built based on their experience of the world (a belief that the world is flat because the ground beneath us appears flat). Evidence from cognitive neuroscience suggests that learning counterintuitive concepts requires inhibitory control, the ability to withhold an intuitive response in favour of a more considered response. The aim of the UnLocke project was to find out whether training children to use their inhibitory control in the classroom could improve learning of counterintuitive concepts. However, traditional executive function training has shown limited success in terms of participants transferring skills beyond the specific task in which they trained. Therefore, we took a novel approach and developed a computerised classroom-based intervention, 'Stop & Think', which embeds inhibitory control training within the specific domain in which we would like children to use it (maths and science).

The development and testing phases of UnLocke are now complete and we are excited to share the positive findings! An initial pilot study with 456 children found improvement in Year 3 children's reasoning on counterintuitive maths and science tasks for children taking part in 10 weeks of 'Stop & Think'(12 minute lessons, 3 times per week). Importantly, there was evidence of transfer to academic attainment in terms of significant improvement in standardised science achievement scores for the 'Stop & Think' Year 3 children.

In a larger external evaluation, 6,672 children from 89 schools were randomly assigned to one of three intervention groups for a 10-week period: Stop & Think, teaching as usual (TAU), or an alternative intervention called 'See+' which focused on socio-emotional skills. In this evaluation, Year 5 children made the equivalent of one additional month's progress in mathematics (although not statistically significant) and two additional months' progress in science (statistically significant) compared to children in the other groups. Furthermore, Year 5 pupils in Stop & Think had significantly greater progress in science and mathematics achievement compared to those in the other groups.

"Evidence that an intervention informed by neuroscience and delivered by teachers, can improve 'real-world' academic learning"

These findings provide important evidence that an intervention informed by neuroscience and delivered by teachers, can improve 'real-world' academic learning, which supports the effort to 'bridge the gap' between neuroscience and education in the classroom. In addition, despite its educational and economic importance, there is relatively little research that aims to improve primary school science compared to literacy or maths. Our findings of improved standardised science achievement have both positive educational and economic implications.

You can read more about our research, find links to our published papers, blog and other videos on our website: unlocke.org

ENVIRONMENTAL NOISE AND ATTENTION

Brittney Chere, Allison Haack, Giulia Serino, Robyn Baldwin and Natasha Kirkham

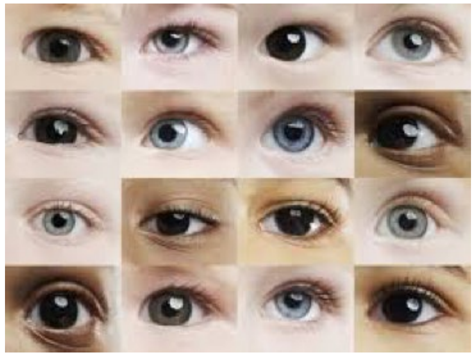
Our project is looking to understand how environmental noise may be playing a role in shaping the early development of attention. As the world is filled with many sights and sounds, children must learn to determine which information is important and which information is merely noise and distraction, in order to efficiently learn. Importantly, as the brain is rapidly changing and being shaped during the first few years of life, we want to determine how any early experience with noise might influence how child learn best in various environments when they are older, especially when considering school settings.

In order to accomplish this, we have a two-fold approach: testing young children using eye tracking techniques at the Babylab and measuring the sound levels from their home. This will help us to better understand how experience with noise might be an important factor to consider. We are also looking into how sensory processing, sociodemographics, and quality of sleep may play a role in the complex relationship between noise and attention.

If you have a baby between 7 and 13 months of age, please contact babylab.sound@gmail.com as we would love to have you and your baby be a part of our project! We plan to share our findings with you in our next newsletter.

LABELS - HOW DO BABIES RESPOND TO SURPRISING EVENTS?

Viktoria Csink, Denis Mareschal, Teodora Gliga, Sampath Rajapakse and Lianne Keighery



Pupil dilation has been linked to surprise and interest in babies and adults, showing that unexpected events result in more pupil dilation than events we are able to predict. We were interested to see how babies respond to spoken words and pictures of objects that do or don't match. To investigate, we measured babies' pupil dilations with an eye-tracker while they viewed objects. The objects were accompanied by a voice naming them with either the correct or incorrect label. For example, a 'ball' was either called a ball (as expected) or a banana (wrong) or a blicket (a made up name). **On average, babies' pupils dilated more when they heard the wrong names, indicating that they were surprised, and that they noticed that the objects didn't match with the words.**

In the second part of the experiment, after a short pause, we showed the objects to the babies again, along with some new objects that they had never seen. The size of the pupils is also an index of recognition memory, and it has been shown in adults that objects we remember result in more pupil dilation than objects we have forgotten. We were interested to see if babies would be better at remembering objects that had previously surprised them, as we predicted that surprise might help babies remember things that they would otherwise forget.

The results showed that on average, babies

remembered both the mislabelled and the correctly labelled objects 5-10 minutes after they were presented, as these images were associated with more pupil dilation than the objects they hadn't seen.
However, there was no difference in memory between the correctly and incorrectly labelled objects. Although babies were surprised by the strange labels, they remembered both types of objects equally.

This is one of the first studies to show that babies' recognition of objects is associated with a change in their pupil dilation. The study also shows that a few minutes after presentation, 17-month-old babies can remember a relatively large number of objects that they have only seen for a few seconds!

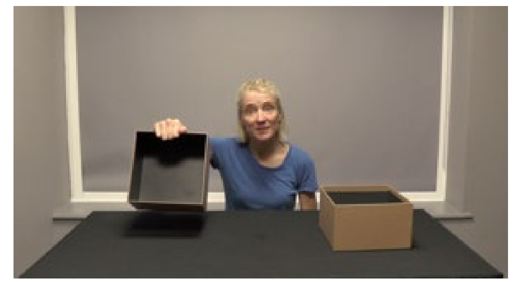
ABSENCE - DO BABIES KNOW THAT OBJECTS CANNOT COME FROM NOTHING?

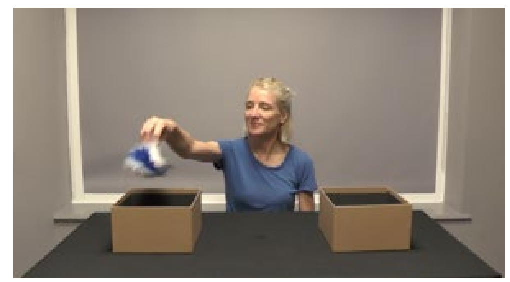
Viktoria Csink, Denis Mareschal and Teodora Gliga

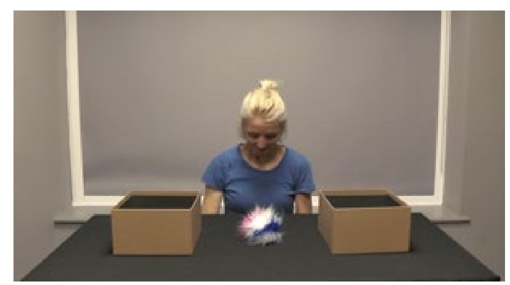
There is ample evidence in the literature that babies have a rudimentary understanding of object permanence (knowing that objects still exist when hidden), and are surprised by the unexpected disappearance of things from as early as 2-months of age. It would be logical to assume that if babies know that objects cannot disappear from where they were before, they should also know that objects cannot appear out of nowhere. However, there is very little evidence to show this, and the earliest studies on this question are with 2-year-olds.

To investigate, we showed 12-month old babies a scenario where a toy went into a box, and a few seconds later it appeared out of the same box, as expected. Babies also saw another scenario, where the toy was taken out of the box, but a few seconds later it 'magically' appeared back in the box, violating our adult intuition that an object cannot come from nowhere. We used an eye tracker to measure babies' looking times during both scenarios. We know that babies tend to look longer at events that violate their expectations, as if they were trying to resolve the oddity of the events.

In this study, although we showed babies that the box was empty before taking the toy out, the babies did not seem to be surprised by this magical appearance and they did not look longer at this outcome compared to the other "expected" outcome. This seems to indicate that although 12-month-olds know that objects cannot disappear, they seem to be comfortable with the idea that toys can appear out of nowhere.







SURPRISE - ARE SURPRISING OBJECTS BETTER REMEMBERED?

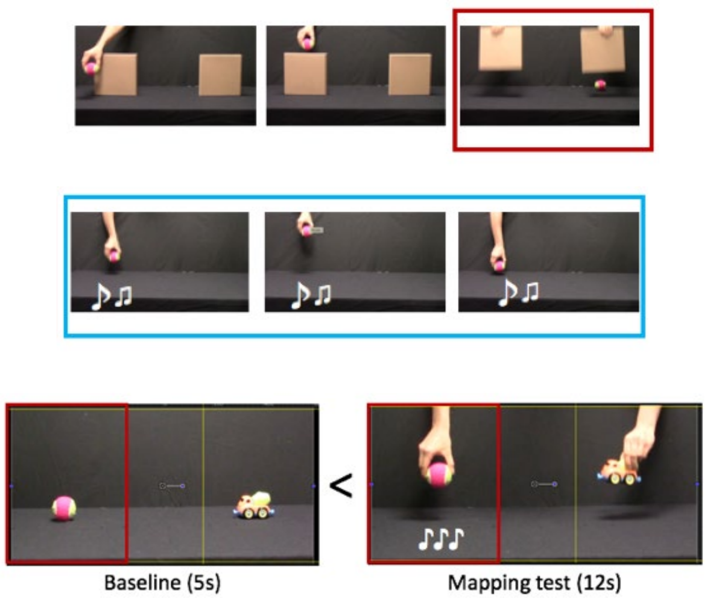
Viktoria Csink, Denis Mareschal and Teodora Gliga

There is a wealth of evidence for both babies and adults, that objects we find interesting in some way elicit more attention and are remembered for longer than the objects that we are not interested in. In this study, we wanted to see if objects that behave in an unexpected way, are later better remembered by babies.

We showed 12-month-old babies an object being placed behind a wall on the left side of the screen, but later reappearing from behind the wall on the right side. Babies have been shown to respond to such violations of physical laws, and in this study, we were interested whether their surprise would help them remember this object better compared to another object that reappeared in its original location.

We also showed the babies the object reappearing from a distant location or its original location, followed by a sound. Later, they saw the same object paired with a new toy, while hearing the same sound. We were interested to see if babies looked longer at the old object, showing they remembered that the old object made the sound.

We found that babies in both groups preferred to look at the new toy, in line with babies' natural response of seeking novelty rather than familiarity. Babies who saw the old object reappear from behind a distant screen also preferred to look at the new toy, demonstrating that the surprising shift of location did not elicit better memory.



LONDON DOWN SYNDROME CONSORTIUM (LONDOWNS) INFANT STREAM

Collaborators include: Birkbeck, University College London, King's College London, Queen Mary University of London, The Francis Crick Institute and Nanyang Technological University in Singapore

The LonDownS consortium is investigating the link between Down syndrome and Alzheimer's disease across many areas. The LonDownS Infant Stream was set up at Birkbeck by our late colleague Annette Karmiloff-Smith. Michael Thomas, who worked closely with Annette in his early career, took over when she passed away. LonDownS explores the large individual differences in the cognitive development of children with Down syndrome overtime. Virtually all people with Down syndrome have the plaque that is linked to Alzheimer's, although only roughly half develop Alzheimer's. By studying this, we can begin to understand whether any of these differences in developmental trajectories are linked to earlier states in infancy. This will provide important insights for early risk indicators and protective factors.

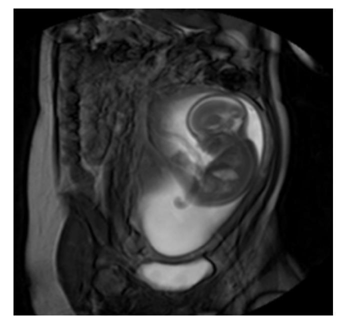
Wave 1
At the Birkbeck Babylab, we have already seen around 100 infants and toddlers with Down syndrome to study individual differences. These children participated in all sorts of fun tasks related to attention, memory, language, social interaction, sleep and other important areas of development. We also collected blood and saliva samples to study differences at the genetic and cellular level.

Viewed as 'snapshots' at a single point in time, children's cognitive and motor skills were related to each other. Relationships were found between nearly all scales, even when age was taken into account. No reliable association was found between gross motor skills and expressive language skills, suggesting these develop somewhat independently.

Wave 2
Approximately 2 years later, 45 of the children involved in Wave 1 were seen again and the stability of their development was compared overtime. The children showed stability in their profiles for only some skills. Visual reception showed a strong improvement with age and with positioning of individual performances, relative to the cohort group, remaining stable overtime. By contrast, early performance did not strongly predict later performance on language skills or motor development. All children improved over time.

Wave 3
We are now in the process of revisiting the original cohort of over 100 children to see how these individual differences continue over time. The study focuses on primary school aged children with Down Syndrome and looks at how early abilities might be associated with later educational skills. It also looks at whether sleep plays a role in these trajectories.

As part of her PhD project, Olatz Ojinaga Alfageme is further investigating the underlying causes of individual cognitive differences found in children with Down Syndrome. In collaboration with the Perinatal Imaging & Health Department at King's College, she is investigating whether measures of brain structure around birth, using prenatal and neonatal Magnetic Resonance brain Imaging (MRI), can predict different rates of cognitive development across infancy. We'll keep you posted on the results!



(MRI Image of a 22-week baby in the womb)

Twitter: @LonDownS
Website: ucl.ac.uk/london-down-syndrome-consortium/research-themes/infants

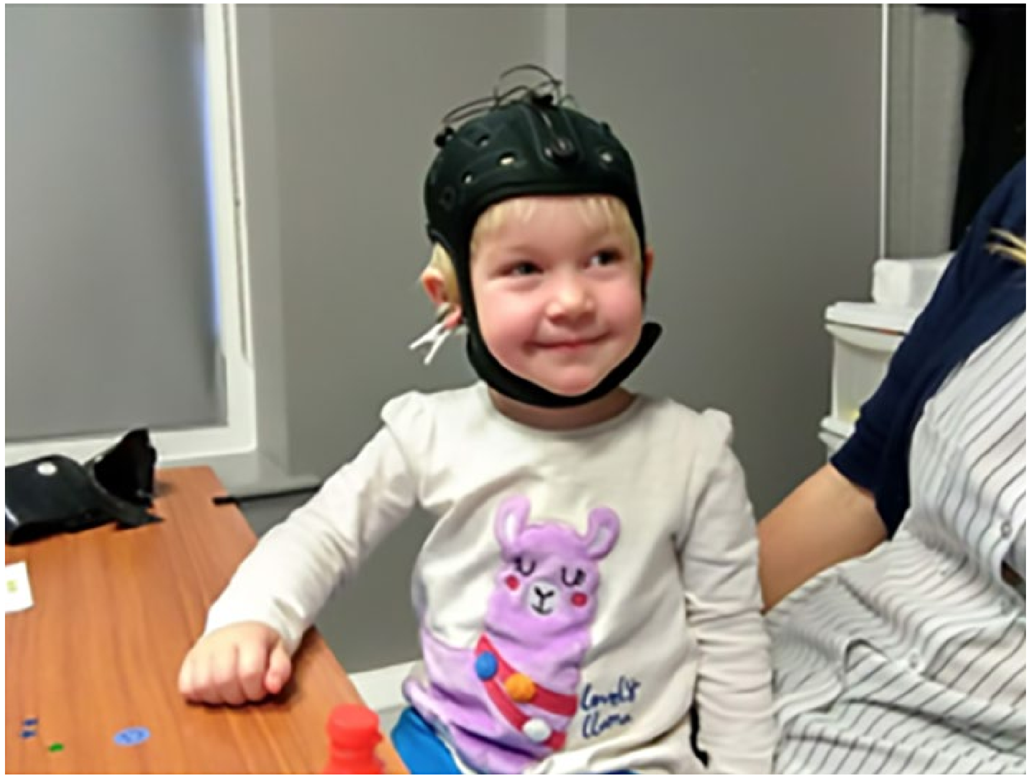
PRESCHOOL BRAIN IMAGING AND BEHAVIOUR PROJECT (PIP)

Emily Jones, Luke Mason, Amy Goodwin, Greg Pasco, Tony Charman, Eva Loth and the PIP team

PIP is a Europe-wide study of brain development in pre-schoolers. The aim of the study is to better understand brain development in a broad range of children with and without an autism diagnosis. We would then like to see how differences in brain development are related to a child's behaviour, learning, and their social and emotional development. The hope is that in the future, these findings might help with earlier diagnosis and better support for children with autism.

The PIP study involves two visits to King's College London, Denmark Hill. The visits include some touchscreen tablet tasks, interactive games, EEG, eye-tracking and an MRI brain scan. Professor Emily Jones and Dr Luke Mason at the CBCD are directing the EEG and eye-tracking data collection for the study.

The PIP team are currently looking for children with an autism diagnosis between 3 and 4 years old and children without an autism diagnosis between 2.5 and 4 years old. If you are interested in participating with your child, or would like any further information about the study please contact the PIP team on 020 07848 0956 or pip.brainexplorers@kcl.ac.uk



FREQUENTLY ASKED QUESTIONS

Although I received my Babylab information pack a while ago, I have not yet been asked to participate in a study. Will I get a call?
Whether or not you get called for a study is dependent on the studies being currently run. Each study has an age range specific to a particular stage of development. If you have not been contacted, it is not that we have forgotten about you, it is just that your baby or child currently does not fit into the age range of any on-going study. Our studies are constantly beginning and ending so new opportunities may arise.

You're called the Babylab, but do you test older children?
Yes! We are interested in child development, so our studies range from newborns to school age children and even adolescents. We have something for everyone! With the Toddlerlab opening soon, we will have purpose built labs designed with active little ones in mind. In summary, we are interested in studying babies and children of all ages. Our brains develop throughout life!

What if my baby is asleep, hungry or needs changing upon arrival?
Many babies fall asleep during their journey to the Babylab. We try to let the babies make their own schedule as it helps us have happy babies who will sit through our studies.
If a baby is tired, hungry, or wet, they are unlikely to want to participate. Therefore, we encourage you to carry on with their normal schedule as much as possible, even if it is during a visit. We have changing facilities at the Babylab and you can also feed your baby in the reception area. Water, tea and coffee are available for parents and carers. However, if you know that your baby naps or eats at a certain time, please mention this when booking an appointment.

If my baby is ill but we're scheduled to come in for a study, should I still bring him/ her?
Please don't bring your baby in until he or she gets better as your baby may not be in tip-top shape to participate and as a result may not have fun. We can always reschedule for a time that is better for you and this also helps us keep illnesses away from the Babylab.

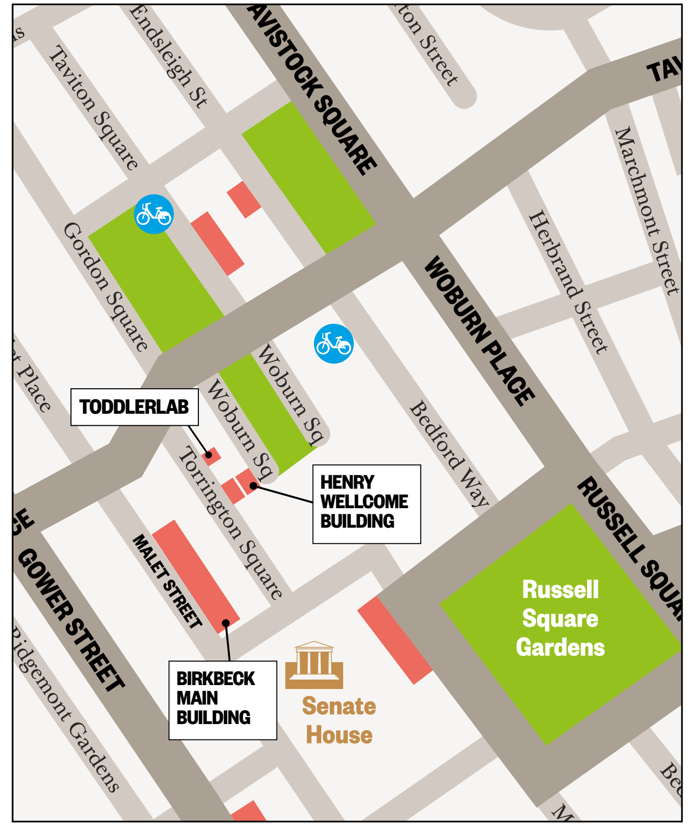
What if my baby does not want to participate on the day?
Don't worry if your baby decides they do not want to participate on the day of your appointment. They may be tired, teething, feeling unwell or just find the study too boring! This does not mean that your baby will always react this way during a study. Babies change hour-to-hour, day-to-day. We will be happy to invite you round for another visit if your baby comes within the appropriate age range for another study.

What sort of travel arrangements do you provide for families visiting the Babylab?
We will cover any travel expenses up to £40 when you visit the Babylab. We appreciate families using public transport to reach us, but where this is not possible (and if you live within certain surrounding postcodes) we can provide a taxi service to the Babylab. If you are outside our taxi zone you will need to make your own arrangements – just keep your receipts and we will reimburse you during your visit. Alternatively, if you choose to drive in, we have parking spaces available close to the Babylab. We will reimburse petrol costs and the congestion charge, though please remember to pay it yourself on the day! We are happy to help you through any additional questions when planning your visit.

How do you keep my details secure?
We take the protection and storage of your data very seriously. We are extremely grateful to all the parents and volunteers who sign up to our database to take part in our research. Our database is stored on a secure, encrypted, password protected server and meets all of the new data protection guidance (GDPR). We will only contact you if your infant/child is eligible for a study that may interest you, or to communicate research findings.

If you no longer wish to be a part of our future research and would like to unsubscribe from our database, please let us know and we will delete your details. Contact us on babylab@bbk.ac.uk or 020 7631 6258.

HOW TO FIND US



Directions
The Birkbeck Babylab is located in the Henry Wellcome Building, just off Torrington Square, around the corner from the Clore Management Building (on the walking path between Torrington Square and Woburn Square). Signs on either side of the doors say 'The Wolfson Institute for Brain Function and Development' and 'The Henry Wellcome Building'.

By public transport
We are within walking distance from the following stations: Russell Square, Goodge Street, Euston, Euston Square, Warren Street, Kings Cross and St Pancras.

By car
If driving and using a satnav, please input WC1H 0AA which will bring you adjacent to 28 Woburn Square (not our building). The Babylab has two areas available for parking: Woburn Square (both sides) and Torrington Square (one side only). Woburn Square is easier to access within the one-way system in this area.

By taxi
Please ask the driver to drop you adjacent to 28 Woburn Square. Once at the top of the square turn right and walk up the paved slope. The Henry Wellcome Building is the building on the right. If you have any problems, phone us on *020 7631 6258*.

PLEASE JOIN THE BABYLAB/ TODDLERLAB OR UPDATE YOUR INFORMATION!

Don't lose touch! If you are moving house or having another baby, please let us know so that we can update our records.

Contact us via e-mail at babylab@bbk.ac.uk, ring us on 020 7631 6258 or register online at cbcd.bbk.ac.uk/babylab

If you have a friend who you think may enjoy a visit to the Babylab or ToddlerLab, please ask them to contact us too. Babies age quickly so we are constantly in need of babies and children from birth through school age to help us with our research.

It's easy to sign up online! Just visit our website: cbcd.bbk.ac.uk/babylab

Alternatively, please write to us using the Freepost address below:

The Babylab
FREEPOST RRGX-ARGH-SESR
Centre for Brain & Cognitive Development
The Henry Wellcome Building
Birkbeck, University of London
Malet Street
London WC1E 7HX

REMEMBER TO CHECK OUT OUR NEW ONLINE STUDIES YOU CAN DO FROM THE COMFORT OF HOME!

cbcd.bbk.ac.uk/online-studies

For all other enquiries, please phone or email.
Tel: 020 7631 6258
E-mail: babylab@bbk.ac.uk
Website: www.cbcd.bbk.ac.uk