The University Of Queensland
AUSTRALIA
Early Cognitive Development Centre
School of Psychology

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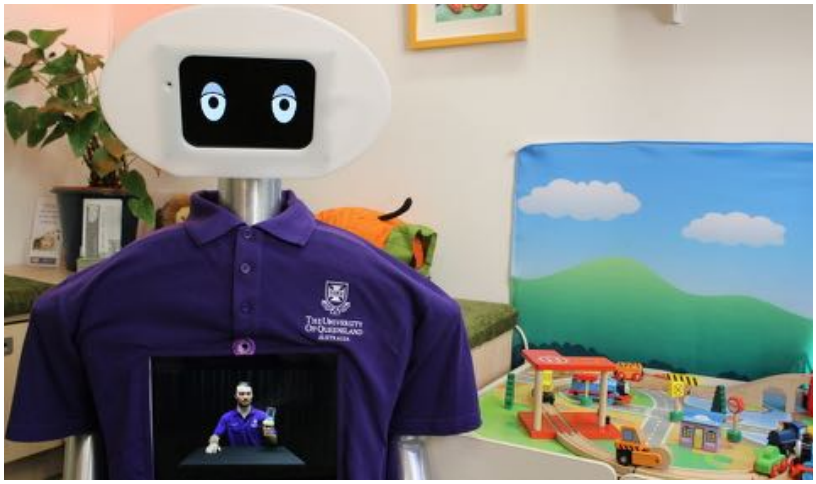
ECDC RESEARCH RESULTS

All of us at the ECDC would sincerely like to thank you for participating in our studies during 2016. You have not only increased our knowledge about children's development, but also assisted our students in obtaining their degrees at both the postgraduate and undergraduate levels.

We hope you enjoy reading about our recent research results and look forward to your return to the ECDC in 2017. For more information about us, check out our new website ***ecdc.psychology.uq.edu.au***

Do 2 year-olds prefer to learn from an iPad or a robot?

The video deficit is a modern phenomenon that suggests children learn poorer from a screen (such as an iPad or a TV) than from a real-life interaction. This problem is thought to occur as a screen lacks the social interaction present during the learning interaction between a child and an adult.



In the first few years of life, children are dependent on social cues to guide their learning and a lack of social interaction may lead to poorer learning. In this study we set out to investigate whether adding a social robot to a screen, thereby increasing social interaction, would facilitate learning above that of a screen alone.

We showed 2 year-old children a series of tasks demonstrated by a human in real-life, on a screen alone or on a screen embedded within our social robot, Opie. Opie either stayed completely still, or interacted with the children using head and eye movements. The tasks involved simple toys which included building a rattle, turning a light on and building blocks. Children were asked to show what they could do with each of the toys after observing the demonstration.

This study is still in the process of being completed, however we do have early results. We compared children's performance based on whether they saw a human demonstrate on a screen alone, or on a screen embedded within Opie when he stayed completely still. We found that children copied the actions of the human significantly more when watching the screen in Opie, than when watching the screen alone.

These early results suggest that a stationary robot may serve as the social aspect a screen needs to facilitate the learning process. However, we do not yet know whether this learning is equivalent to learning from real-life interactions. These results will be available as soon as testing has concluded.

Children with Autism spend less time playing alone following involvement in social engagement activities

Autism Spectrum Disorder (ASD) is a pervasive neuro-developmental disorder that results in severe social and communicative deficits. It is therefore important that we work to develop simple yet effective interventions to promote social engagement in children with ASD.

The purpose of the study was to investigate the effects of a joint-synchronous hand-clapping intervention on the social engagement of children diagnosed with ASD. To do this, children were engaged in two activities, a simple joint-synchrony hand-clapping activity and an imitation-based game of Simon Says.

Our results indicated that children with ASD spent less time playing alone following engagement in the joint-synchrony and imitation interventions, and engaged in more eye contact following participation in the imitation intervention. The results therefore provide support for the use of both joint-synchrony and imitation interventions in promoting social engagement in children with ASD.

How do 4 & 5 year-olds learn new emotions?

As children, being able to understand how someone is feeling plays a vital role in social interactions. It has been suggested that one way in which children learn how to do this is similar to the strategies they use to learn a new word.

This study looked at how children use a process-of-elimination word learning strategy to learn a new facial expression, in comparison to how they learn a new animal and colour. 4 and 5 year-old children were shown a handful of pictures that included a made-up facial expression, animal or colour. They were asked to play a series of selection, labelling, and sorting games with the pictures. In doing so it was predicted that children would use a process of elimination strategy to learn a nonsense word for the made up pictures.

We found that 5 year-olds used this strategy, whereas 4 year-olds didn't. This strategy helped children learn the animal, but was no more helpful when learning the facial expression.

6-12 month-olds tend to react to other infants displaying positive emotions

In this study we were interested in the development of empathy in infants, through studying their precursory empathic responses.
We showed 6-12 month old infants videos of other infants exhibiting a range of emotions, and observed their tendencies to mimic the facial expressions of the infant in the video and to check back with parents, as well as their attention to the videos.

We found that babies do not necessarily mimic the expressions seen in the video, but would check back frequently with parents when it came to positive emotions.

Babies are not born with the ability to imitate, however parents play an important role in their babies' development of this social skill.

PhD student Siobhan Kennedy-Costantini has recently completed and submitted her PhD thesis "Very Early Social Behaviour in the Context of the Mother-Baby Relationship".

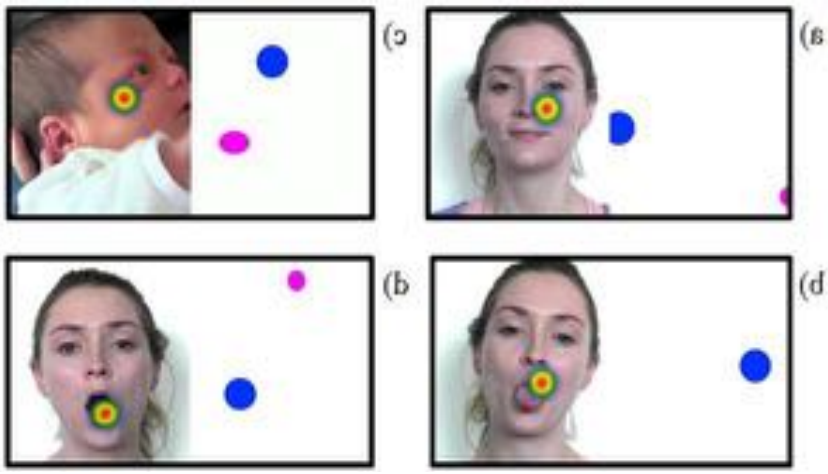
Many of you may know Siobhan from participating in our longitudinal imitation study or by participating in her PhD projects. Through various studies at the ECDC over the last 6 years, Siobhan has tested more than 250 newborn and toddlers! In her PhD research, she wanted to establish how parents help to influence the development of neonatal imitation.

To see how parent interaction might influence imitation, she had parents practice tongue poking, mouth opening or hand movements with their baby every day for two weeks.

She tested babies' imitation before and after to see if the parents' behaviour changed the way the babies interacted. She found that babies whose parents who practiced tongue poking learned to imitate this gesture. The same wasn't found for babies whose parents practised mouth opening or hand movements.

To see how this tongue poking imitation learning might take place, she also ran an eye-tracking study. Parents either practiced tongue poking, played general face games or interacted normally with their baby daily for two weeks.

When the babies were about 2 months old they came into the labs at UQ to do an eye-tracking task.They saw videos of a baby and an adult relaxing or an adult poking out her tongue and opening her mouth. She found that all babies preferred to look at the faces over the coloured dots.

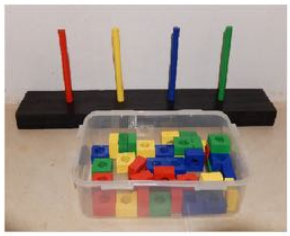


She also found that babies whose parents practiced tongue poking were significantly more likely to look more often and longer at the tongue poking video than the other babies.

This study shows that exposure seems to direct babies attention towards a tongue poking face and that through patent interaction this extra exposure and attention to this gesture might help babies learn to imitate.

Previously researchers have argued that babies are born with the ability to imitate. Siobhan's research did not find any evidence to support this. Instead her research suggests that parents play an important role in their babies' development of this very important social skill.

Most 4 year-olds may not be willing to help others if it means they will go without



It is well established that children engage in helping behaviours from an early age, and will spontaneously offer altruistic help to others. Raising children in an environment that encourages compassion and helping others could benefit childhood physical, mental, and social wellbeing. However, of the altruism research which has been done to date, none has focussed specifically on compassionate helping (i.e., altruistic helping in response to the distress or suffering of another). Additionally, the extent to which children will reliably help others when there is a personal cost involved in doing so, remains unknown.

The aim of the study was to determine whether children display compassionate helping, and whether this behaviour would be affected if children incur a cost for doing so. 4 year-olds were presented with three novel tasks, in which the child and a puppet had the opportunity to win a sticker by completing their respective version of the same tasks. Each time, the puppets were unable to complete their tasks due to missing resources.

The demeanour of the puppets would appear to be either upset or not upset at the fact they couldn't complete their tasks. Some children could provide help at no cost to themselves, whereas other children had a cost for helping the puppet.

The results of the study suggest that while children are strongly motivated to provide compassionate help to others, this response may be blocked when helping has a personal cost. When helping is costly, 4-year-old children may be unable to ignore their self-interests as easily, and find it difficult to sacrifice the opportunity to receive a reward in order to help another.

Preschoolers communicate with peers equally when they have shared or different goals

Children show large improvements in their social skills during the preschool years. By age 3, they can imagine what others are thinking and they show more empathy when interacting with peers. We were interested in how preschoolers cooperated with a peer when both children had a shared goal and when they had unique goals.

Preschoolers were tested in pairs where both children were the same age and gender. In one condition the two children worked together to build a single castle using blocks, and in the other condition the two children worked to complete separate puzzles.

We found that children showed no difference in cooperative behaviours (including statements, questions, and requests) when they were working together with their peer or when they were working separately. This suggests that children's levels of communication in social interactions may be largely based on individual personality characteristics, rather than on the context of the interactions themselves.

3-6 year-olds are best at adding materials together to create a tool

Humans are incredible tool users: the versatility and complexity of our tools are unrivalled in the animal kingdom. Children are very good at learning how to use tools from watching how their parents and other adults use them.

However, it appears that children are poor at creating tools on their own. We developed a task to examine whether children were better at creating some types of simple tools over others. We did this by providing children with the same problem-solving task 3 times, but giving them different tools each time that needed to be modified in a certain way to solve the problem.

Children were shown a sticker that was placed in the middle of a transparent horizontal tube. They were required to create a tool that was long and straight enough to fit into the tube and push the sticker out the other end. Children had to add three pieces of dowel together, subtract dowels away from a straight rod, or reshape an S-bend piece of rubber in order to create the straight rod needed for the task.

We collected data from children in Brisbane and children in Vanuatu to see how different cultural groups might solve these problems.

We found that children in both cultures were better at adding materials together to create the tool than subtracting parts away or reshaping the tool. This suggests that children have strengths in certain domains of tool-making over others. We have also tested children from South Africa, but their results are still being analysed.

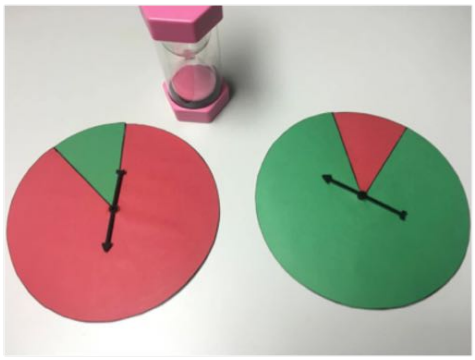
2 year-olds remember where objects are hidden but they don't 'mark' these locations like adults would

In the classic children's story *Hansel and Gretel*, the characters leave a trail of breadcrumbs on a path so they can remember the way home. We were interested in whether two-year-old children would also leave 'markers' to help themselves remember information in the future.

An experimenter hid an object under one of three containers and asked the children to wait before they could select the container where the object was. We were interested in whether they would point at or otherwise mark the container during the delay to help them remember.

Our results showed that children rarely used the pointing strategy and when they did use it they weren't more successful than when they didn't. Therefore, the ability to mark the environment to help yourself remember important information may not emerge until children are much older.

Are 4 year-old's choices to pursue future rewards affected by the certainty of attaining those rewards?



As adults, we are often forced to choose between seizing a smaller, immediate opportunity or forgoing those to pursue a future preferred reward. When making these decisions, we are able to assess the likelihood of actually achieving those future rewards before deciding to do so or not.

This study was aimed to test whether 4 year-olds have the ability to switch between choosing larger, delayed rewards when there is a high chance of receiving them and choosing smaller, immediate rewards when there is a low chance of receiving larger, delayed rewards.

Children were presented choices between game spinners that had different chances of receiving stickers. In one task, children chose between a smaller, immediate reward with a high chance of winning and a larger, delayed reward with a high chance of winning. In another task, children chose between a smaller, immediate reward with a high chance of winning and a larger, delayed reward with a low chance of winning. Children were also presented a subsequent task where they chose between a smaller, immediate reward and a larger, delayed where both rewards were guaranteed if they chose them.

Contrary to predictions, 4 year-olds did not switch strategies between immediate and delayed rewards as expected. However, when compared to the task where both immediate rewards and delayed rewards were guaranteed, children chose to delayed rewards less when there was a low chance of receiving delayed rewards. This suggests that 4 year-olds may be starting to take future likelihoods into account when choosing to pursue preferred future rewards.

Preschool children copy more when actions are 'useless' and produced by everyone

By the kindergarten years, most children have learned that people sing "Happy Birthday" and share cake whenever someone is having a birthday. But why are children so good at learning 'ritual' behaviours like this? Our research focused on two features of ritual behaviour that we thought might be important for children's learning.

We showed 68 preschoolers a number of ways to open three boxes. Before the demonstrations, children were either told that the box-opening actions were something that "only the experimenter did" or that "everyone did". After the boxes were opened, children either saw a clear goal being achieved (i.e., stickers being retrieved) or no goal achieved.

We found that children were more likely to copy the experimenter when their actions were something that "everyone did" and when there was no clear goal. Both of these factors were just as important as each other in children's copying behaviour. This suggests that children might easily learn the "Happy Birthday" song and other ritual behaviours when these behaviours have no obvious goal and they are produced by everyone.

7 year-olds struggle to identify risky situations in their environment

As any parent knows, young children often fail to recognise dangers in their environment and end up injuring themselves, damaging household objects, or simply creating a big mess. While an adult knows to move a cup of milk sitting at the edge of a table, a child might just leave the cup there and knock it off with their elbow. This research aimed to find out when children first begin to recognise risky situations, both without help and when prompted by others.

We brought 5-7 year-old children (and some adults) into a room containing a number of risky situations (e.g., some wet paintings lying on the floor and a cup of paint on the edge of a table). We also showed the children some short videos depicting children engaging in risky behaviours, and checked if they knew what could go wrong.

Our results showed that even 7-year-olds found it difficult to identify risky situations and prevent poor outcomes (e.g., by moving the wet paintings on the floor), even when prompted by the experimenter. The 7-year-olds were able to spot about half of the potential risks, whereas the adults could identify around 80-90%. We will be conducting further work to identify what cognitive abilities children are lacking in such situations.

2 year-olds find it easy to prepare for certain events but find it hard to prepare for uncertain events

When you prepare for a future event, you might imagine that it could happen in more than one way. You may plan a pool party for your birthday but also make plans to move the event inside it case it rains. We were interested in how 2.5-year-old children reason about 'uncertain' future events like these, compared to 'certain' future events (like the sun rising tomorrow).

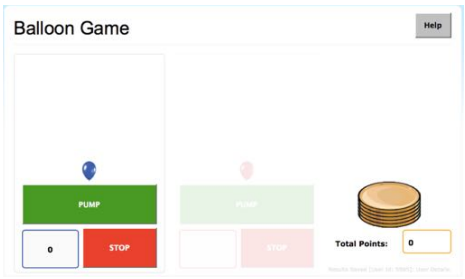
We built two very simple tubes – one shaped like a H and one shaped like a Y. The experimenter could drop bouncy balls into the top of the tubes so that they would fall out of the bottom. For the H-shaped tube, the outcome was certain – two balls always exited from two exits at the bottom. For the Y-shaped tube, the outcome was uncertain – one ball could exit from the left or right side. After demonstrating both of these tubes, the experimenter gave children a chance to catch the balls.

We found that children typically prepared for two outcomes on the H-tube task (by placing hands under both exits when catching the balls), but they only prepared for one outcome on the Y-tube task (by placing one hand under the left or right exit). This suggests that young children can imagine and prepare for future events, but when those events are uncertain they may not be able to imagine more than one possible outcome.

Can 3 to12 year-olds detect a change in rule, and update their behaviour correspondingly?

We live in a dynamic world where everything around us is continuously changing. For this reason, we must be able to effectively and constantly make second-by-second decisions in order to optimise benefits and minimise losses associated with our behaviours. This ability to detect a change in rule, and update one's behaviour correspondingly is known as reversal learning.

Past research in adults has shown that, better reversal learning facilitated them to be more successful in dealing with relationship conflicts, better negotiators in the business context and were able to gain more compliance from others.



This study aimed to examine the development of reversal learning and also whether it would predict social competence in children. Through the balloon-pumping game, we found that as children grow older they were better at learning the first rule of the game. However, they did not become better at detecting the second rule.

Plausible explanations to why we did not find that older children were better at detecting the second rule is because older children were also found to be more risk-taking in the task, and this behaviour may have hindered their ability to learn the second rule. Most importantly, this ability may still be developing through late adolescent years; therefore, future research with older children is required to build upon these findings.

At 2 years of age, pointing may not help a child remember where a hidden object is

This study was investigating whether 2 year-old children were capable of helping themselves remember the location of a hidden target object when a delay was introduced to a task, and whether doing so would help children pass the task at a higher rate. Specifically, pointing-like behaviours were watched for, with the thought that children may potentially use their arm as a symbol for what they thought about the location of the hidden object. This would be particularly interesting as it would imply children as young as 2 years-old were capable of monitoring their performance and employing a strategy to better ensure the correct retrieval of the hidden object.

However, it was found that children rarely employed pointing as a strategy to meet this end, and this behavioural strategy was neither consistently used among the children that did engage in pointing-like behaviours nor especially beneficial.

That is, pointing did not appear to help children pass at higher rates, such that children who did not point passed the tasks as frequently as those children who did. It also did not appear as though children were using their arm as a symbol in an actively employed strategy, and instead these behaviours were more likely preparatory in nature, where children were simply waiting to be told they could look for the hidden object. This opens up new research possibilities to explore when children begin to display and employ such strategies, and under what circumstances.

7 year-olds recognise the importance of moral behaviour

We know that children value moral behaviour and doing the right thing. We also know that children value group membership and loyalty.

This study sought to examine which was valued more strongly in children. In the experiment we assigned children to a group (red or yellow) and they saw their group and another group doing helpful or harmful things, such as sharing or not sharing their toys.

We then asked children a number of questions about which group they preferred, which group they wanted to be in and how much they felt the same as their group and asked them to share 5 stickers between the two groups.

We found that by 7 years of age, seeing a group member behave in a harmful way resulted in children liking the group less, feeling less similar to the group and no longer wanting to be in that group. However, children tried to share evenly with both groups, regardless of behaviour.In summary, we can see that moral behaviour matters to children and that their own actions reflect this concern.

We compare 4 to 8 year-old farm and city children on their understanding about nature and the world around them

Before children even begin attending school they are already learning about nature and the world around them. They start to develop an understanding about numerous biological concepts including what is inside the body, animals and their ecosystems, life and death, illness, and growth.

Previous research has shown that this knowledge can be influenced by children's everyday experiences. For example, the child's cultural group, the type and amount of contact they have with nature and animals, and how their parents talk to them, are all believed to influence children's biological knowledge. However, to date no research has looked at possible differences in biological knowledge between children raised on farms and those raised in cities – especially in Australia where there are vast differences between rural and urban communities. Furthermore, while it is understood that parental communication and contact with nature influence the development of biological knowledge in young children, there is still a lot to learn about these influences.

This study compares city and farm children's understanding of certain biological concepts, to determine whether there is any difference in the type and amount of knowledge they possess. We ask young children (aged 4 to 8 years) questions about animal relationships, the topic of death as a biological event, and the biological facts covered by the Queensland school curriculum between kindergarten and year 4. We also ask parents to provide information about their child, including their experiences with nature, and how they communicate with their child about the topic of death (a biological concept almost exclusively taught to children by their parents or caregivers). This study will enable us to determine whether farm and city children differ in the amount and type of biological knowledge they acquire at different ages. It also enables us to gain new insights into the roles of parental communication and experiences with nature on children's understanding of biology prior to, and outside of, formal schooling. Furthermore, it will help us understand what aspects of everyday living can improve children's understanding of biology. This study is currently ongoing, and results will be available as soon as testing is finished.

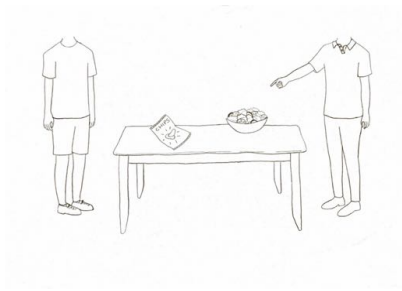
4 year-olds are showing a critical shift in their ability to think about the future

As adults we know the future is uncertain – this is, of course, the very basis of the concept of insurance! For example, we insure our homes, cars, holidays and even bodies 'in case of a rainy day' and indeed may even prepare for literal rainy days by taking both our sunglasses and an umbrella with us if we venture outside! Though we may not often think about it, foresight is an integral part of our everyday lives.

In this study we were interested in when and how children develop foresight – specifically the ability to prepare for multiple versions or outcomes of events in the immediate future. To test this, we presented 2 to 4 year-old children with a set of parallel tubes and told them we were going to play a catching game and that they should try to catch as many balls as they could. Over the course of 12 trials we would hold one ball at a time up between the tubes and wait for children to show a response (i.e. to cover one or both bottom openings) before dropping the ball into one or other of the tubes in a pseudorandom order. The premise of this task was, that if children could 'foresee' that the ball could go either way, they would cover both openings in preparation. Afterwards, we presented children with a set of bonus measures examining their higher-order thinking, their ability to consider others' perspectives and their ability to switch between rules, to see how these things might relate to performance on the tube task.

We found that 2 to 3 year-old children tended to only prepare for a single outcome by covering one hole, while 4 year-olds were more likely to prepare for both. This suggests that a critical shift occurs between the 3rd and 4th years with regard to children's ability to think about the future. However, we failed to find any association between performance on the tube task and any of our bonus measures; suggesting that there is still further work to be done in determining the cognitive underpinnings of this ability!

Does empathy motivate 6-13 year-olds to approve of white lies more than black lies?



Even though lies are seen as morally and socially inappropriate, not all lies are created equal. Specifically, children above the age of 6 have been shown to judge white lies (those told to benefit another) as more appropriate than black lies (those told for selfish reasons). Furthermore, the relative difference in the approval of white versus black lies can vary from child to child.

This study investigated whether children's *empathy* is linked to their approval of white relative to black lies, as children who possess a greater ability to feel and understand how another person feels (i.e., empathy) may also approve of white lies due to their importance in protecting the feelings of others, over black lies (which are inherently selfish). Participants aged 6 to 13 years old were assessed on their level of empathy, and evaluation of white and black lies told by fictional story characters.

Overall, results showed that children who were more empathic also reported greater approval of white lies, but not for black lies. This relationship was present regardless of age. This established preliminary evidence for empathy as a crucial factor in the way we judge different lies, and may have potentially far-reaching implication into domains where the consequences of lies are especially dire.

Do 3 to 6 year-old monolingual and multilingual children learn the same?

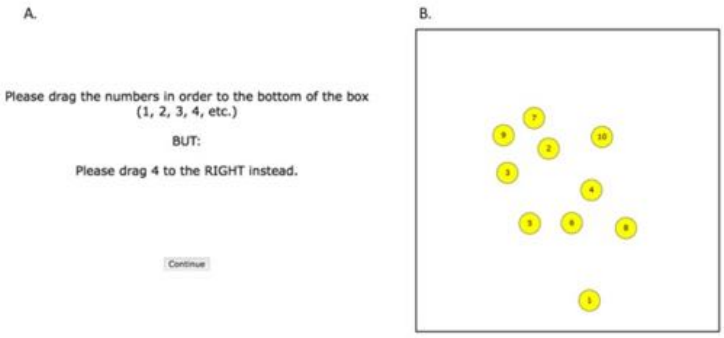
Names and shapes are an important part of our everyday learning. When we encounter a new object, we generally rely on the object's shape to figure out what we think it is. Additionally, when someone tells us the name of an object, we rely on that name to learn about the object. For example, a child encounters a new dog-like animal for the first time and relies on the shape of the animal to determine that it is a dog. However, when the child is corrected by her mother and told that the animal is in fact called a wolf, the child will rely on the name given to learn about this new animal.

We aimed to investigate whether mere exposure to additional languages influenced children's approach to learning.In this study, 3- to 6-year-old monolingual and multilingual children were presented with a picture and video of an object on an iPad. A new object was then brought out, which either had the same name or the same shape to the object on the iPad. We were interested to see whether children would learn to group the new object in the same category as the iPad object based on the objects' name or shape.

The results showed that both monolingual and multilingual children relied on shape when learning to categorise the new object. This suggests that maybe monolingual and multilingual children do not differ in the way they approach learning. Alternatively, mere exposure to additional languages might not be enough to tease apart the differences in learning for monolingual and multilingual children.

7 to 12-year-old children are able to think about future tasks and will set reminders for themselves

Prospective memory (PM) refers to memory for future tasks and this has been shown to develop throughout childhood. This study aimed to determine what conditions would lead children to set themselves external reminders in prospective memory tasks.



A computerised prospective memory task was presented to 62 children, aged 7-12 years old. Children were presented with 10 numbered circles and instructions to drag these circles in numerical order to the bottom of the screen. They were then told that each trial would include different, specific instructions for either one or three different circles to be dragged elsewhere (e.g. "Please drag 5 to the left").

In phase 1 of the task, the circles could not be moved out of order. In phase 2, however, children could move the target circles out of order to create reminders for themselves.

We found that children set themselves external reminders and that these reminders increased their performance in the task. We also found that older children were more likely to set themselves reminders on the more difficult trials and completed the easy trials unaided.

Most 2 year-olds who have father's with beards, think they look more like a dad and appear stronger

Historically, beards have been an integral characteristic of male faces, and some researchers have suggested that beards convey important information to others. In particular, beards may convey information to women regarding suitability as a mate, and to men regarding the likelihood of engaging in aggression. Ultimately, the presence of a beard may influence observers' perception of that person.

Past research with adults has indicated that the presence of a beard does influence others' ratings of a man's dominance, aggression, attractiveness, and masculinity. Whether children also interpret beards as an index of these characteristics – and whether these interpretations change with age – was the focus of this study. With the help of over 300 child participants who have visited us at the ECDC or the Science Centre we have found that for 2-4-year-old children, beards did not influence their perception of men, although children of this age who had bearded fathers said bearded men were stronger, and looked more like a dad. Beards did influence 5-6-year-olds' perceptions; these children said bearded men looked stronger, older, and less attractive. By the time children reached 7-8 years of age, they also said that bearded men looked more masculine, and looked less like a dad.

These results suggest that children's use of facial characteristics in judging other people develops throughout childhood, and these judgments do not emerge fully formed. Rather, children first seem to use beards initially as indicators of strength and age, and only later associate them with masculinity or attractiveness.

6-8 year-olds are able to recognise the combination of voice, face and body language to interpret emotions in the same way adults can

When people show emotions, they can use faces, bodies, and even voices to do so. But, what if some of this emotional information gives conflicting emotions? For example, someone might mask their sadness with a smile, but have a sad voice and posture. When faced with this situation, do children preference facial expressions, concluding the person feels happy? Or, do they use a "majority rule" heuristic, deciding that the emotion shown in two of the three sources of information – in this case sadness – is what the person is feeling?

We showed 6- and 8-year-old children, as well as adults, videos of people who were showing different emotions through face, body and vocal expressions (e.g. a happy face with a sad body and voice). By asking children and adults to decide what each person was feeling we were able to determine how children and adults judge these complex expressions.

We found that for 71% of the videos, both children and adults used a majority rule heuristic, rather than relying on the facial expression, and this did not change between childhood and adulthood. This suggests that from an early age, we are able to pay attention to several kinds of emotional expressions at the same time, and we use the number of expressions that show the same emotion to decide how someone is feeling. Our findings suggest that as children, we reliably apply a majority rules heuristic, but as we get older, we begin to preference some types of emotional expressions, particularly angry or fearful ones.