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 2019. You have helped increase our knowledge about children's development, and also assisted our students in obtaining their degrees at both the postgraduate and undergraduate levels. We hope you will enjoy reading about our recent research results. To find out more about us, visit our website ecdc.psychology.uq.edu.au

From 8 years of age, children are starting to practice more difficult tasks

Children engage in practice on a daily basis to acquire and improve a range of vital skills. Studies previously conducted at the ECDC found that it is not until 6 years of age that children become able to engage in self-initiated deliberate practice. However, little is known about how children choose to allocate their limited practice time across the various components of a task. Therefore, we investigated when children aged 6 to 11-years become able to prioritise future performance and actively choose to practice the more difficult components of a task.

In this study, children were presented with an easy, medium and hard game which were otherwise identical. Children were asked to complete all of the games, by catching the ball once in each cup, in the fastest time. After doing this the experimenter left the room, giving children the opportunity to practice these games before being timed completing the three games again.

Children's goal was to improve their performance on the task, however they were not given explicit instructions to practice. We found that it was only from around 8 years of age that children achieved more successes on the hard game than the other two games during practice.

This suggests that only these older children were selectively choosing to practice the hard game. This study shows that the ability to selectively practice the more difficult components of a task emerges at around 8 years of age and continues to develop with age.

Is the self-talk of 3 to 5-year-olds' associated with better or worse performance on a task?


Easy Task


Difficult Task

Young children talk to themselves as they play, look at books, engage in puzzles or even when going to sleep. This self-talk is endearing and provides a snapshot of children's thinking. Research suggests that children use self-talk to strategically manage their thinking and behaviour. Children begin to use self-talk 'out-loud' in the toddler years and this increases in frequency throughout preschool. However, to date we know very little about what children say to themselves and whether this is associated with performance on a task.

In this study we recorded the self-talk of 101 children from 3 to 5 years as they built 2 Duplo structures, one that was easy and one that was difficult. We coded what children said out-loud while completing the tasks. Although self-talk can be used aloud or as inner speech, we were only able to code the self-talk that children used aloud. Self-talk was associated with performance when Duplo building was optimally challenging, but not when it was easy. On average, children used:

Forethought self-talk - One 'forethought' statement per minute. These statements capture task goals, plans and motivational statements of self-belief. For example,*"mmm, first I need to find the trick pieces" and "this is gonna be easy".* Forethought statements that capture task goals, plans and motivational content were associated with better performance on the Duplo building.

Performance self-talk - Three 'performance' statements per minute. These capture self-instructions or observations. For example, *"then go here" and "this one's blue".* Performance statements had minimal impact on Duplo building performance.

Self-reflective self-talk - One 'self-reflective statement per minute. These capture recognition or errors or displays positive or negative emotion about the task. For example, *"not there" and "hurray I did it".* Self-reflective statements had minimal impact on Duplo building performance.

Task irrelevant self-talk - Less than one 'task irrelevant' statement per minute. These capture wordplay or off-task comments. For example, *"choo, choo, choo" and "sss, a snake, sss".* Task irrelevant statements were associated with worse performance when Duplo building was challenging, had no effect when the task was achievable, and was surprisingly associated with better performance when the task was too easy. A similar effect has been found in multitasking research – when a task is too easy or boring, multitasking can boost performance (e.g., singing along with Beyoncé while cleaning!).

What does this mean for everyday life? Children use self-talk to support their engagement in a task. This might be aloud, as whispers, or as inner speech. Therefore, we should let children talk to themselves as they play, build or problem solve. *Forethought statements* – those that reflect planning, goals or motivation – are associated with better performance in a task. As adults we can model the use of this type of talk in our day-to-day activities. For example, "first I need to ___, and then ____" or "this is a big job, but I will try my best". *Task irrelevant* statements are generally associated with worse performance. If you notice this, your child may need your support to get back on task. Alternatively, the task might be too easy, and you can adjust the difficulty level.

Why 4 to 8-year-old farm children appear to understand the biological concept of death more-so than city children

Even before children begin school, they are already beginning to develop their own understanding and theories about the world around them. In fact, research has shown that children as young as 4 already possess their own theories and understanding about the world and have even begun to develop an understanding of more complex biological phenomenon as life, birth, genetic inheritance, and death.

There is also evidence to suggest that children develop their understanding of the natural world through their daily experiences and interactions with others, and that opportunities to observe, interact, and talk about nature and animals have the strongest impact on the development of this understanding in children.

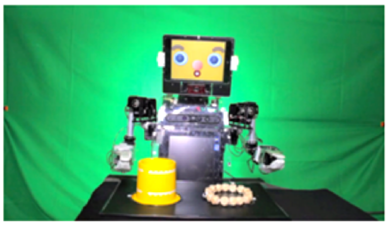
We asked children aged between 4 and 8 years living either in the Brisbane city area or on farms in Central and South-East Queensland, to complete three tests aimed at testing 1) how sophisticated their reasoning about nature is, 2) their understanding of death, and 3) their school-based life-science knowledge. In addition, their parents completed a questionnaire providing information about their demographics, farm involvement, experiences with nature, death, and pets; and how they talk to their children about death and dying.

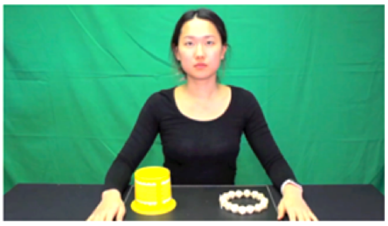
We found that farm and city children differed in their understanding of death as a natural phenomenon, with farm children understanding death from a biological stance at a slightly younger age than the city children. In particular, they grasped the understanding that body functions stop after death faster than their city counterparts. We also found that farm children have a greater understanding of ecosystems and the relationships between different species than children living and cities and are therefore more likely to draw on their understanding of nature when making judgements about an unknown animal, plant or biological property. These differences are likely to be due to the combination of experiences with nature, animals, and parental input which are unique to growing up on farms.

In addition to differences arising from living on farms or in cities, the study also provided several insights into how children's understanding of the natural world is influenced by their parents and family circumstances. Parents' level of education and religious beliefs were also found to have a strong influence on their children's understanding of death. Similarly, parents' religious belief, socioeconomic status, and the number of pet or human deaths their child had experienced influenced how they talked to their children about death or dying.

What are 1 to 3-year-olds' understanding of the intentions of robots and people?

Young children are increasingly exposed to information presented on electronic devices. Yet, we know little about what they learn from devices and are still only beginning to understand *how* they learn from these new technologies. We know that children learn very well from observing others, and that they quickly soak up information from their parents, caregivers, siblings, and friends.



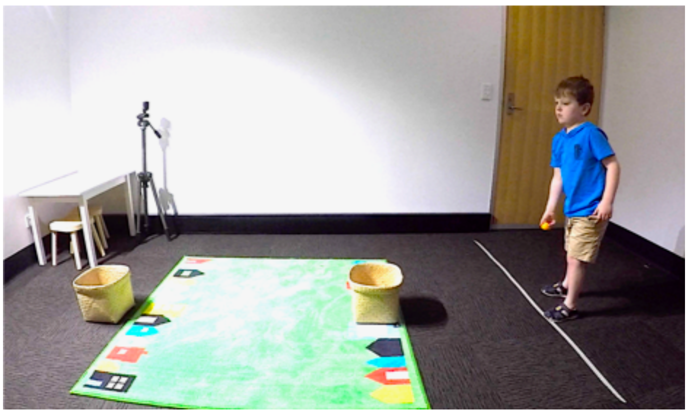


From about 18-months children can understand the intentions of others and can help others to complete their goals.In this study we were interested in finding out whether children aged 1.5 to 4 years extended this knowledge when they watch a video of someone trying (but failing) to perform a task.We were also curious about how this changes when the 'person' performing these actions is a robot! This exciting research was conducted by two separate research groups, here at UQ with PhD Student Kristyn Sommer (nee Hensby) and also by ECDC alumnus Dr Siobhan Kennedy-Costantini at the University of Auckland.

Over 180 children watched different videos of a person or robot trying and failing to perform a task. They were then given the same toys used in the videos and from there we observed how they played with them. Sometimes children *copied* the failed actions and sometimes they produced what they thought the person/robot was *trying* to do. We are especially interested to explore how this changes as children get older and better at understanding the intentions of others. We are still analysing these results from this study and hope to share them with you very soon. A big thank you to all the families who participated in this research.

Do 4 to 5-year-olds' cheat more after behaving generously?

It's well established that adults sometimes feel that they are allowed to behave immorally after behaving morally. For example, adults tend to more likely cheat after performing a task for a charity. We are investigating whether children also show this effect.



Four and 5 year-olds first played a series of games with a puppet. In some of these games the puppet needed help, and the child could easily help the puppet and almost always did so. They then had to stand behind a marked line to throw balls into buckets in exchange for a prize of stickers. They believed they were unobserved and therefore had an opportunity to cheat for a greater prize.

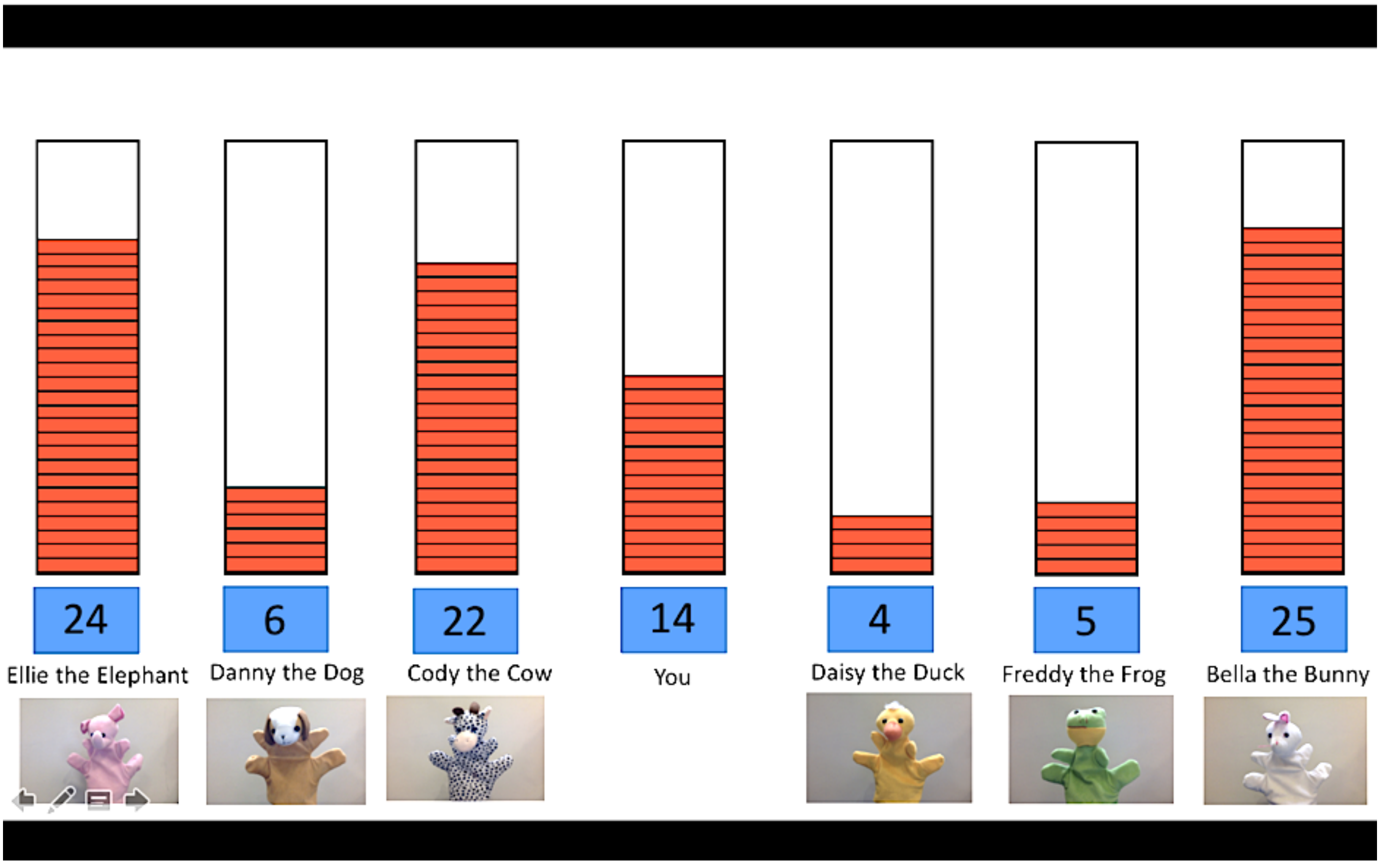
We expected that children who had an opportunity to help the puppet would cheat less than children who did not, thinking that their previous generous behaviour 'balances out' misbehaving later. However, we found no differences between the children who helped and did not help in terms of cheating behaviour. This suggests that children do not display this behaviour until they are older, or that the tasks we used were not able to produce the effect.

How does the gap between rich and poor affect 4 to 9-year-olds' generosity?

Economic inequality refers to a large gap between the rich and the poor. Economic inequality has been found to affect the way adults treat other people and has even been linked to lower helping behaviours.

This study looked at how high and low inequality affects how children behave, and how this change as they age. 4 to 9-year-olds played a series of colouring in games with six puppets and each gathered points during the competition. Some children saw *high inequality* in outcomes – where some puppets received many points and other puppets received very few. Other children saw *low inequality* in outcomes – where all puppets received a relatively equal number of points.

At the end of the games, children swapped their tokens over for stickers to keep. We then showed children an image of a poor child and asked them if they would like to give their stickers to this child. They were also given six extra points to share with whichever puppets they chose. Finally, they were asked about how fair or unfair they thought the inequality was.



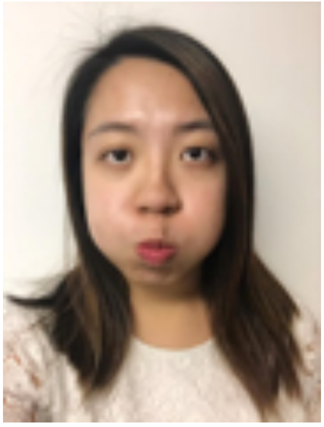
We found that children didn't donate stickers differently based on whether they experienced high or low inequality. We also found that older children (i.e. age 7-9 years), and children experiencing high inequality, were more likely to give extra points to the poor puppets. Younger children tended to ignore the inequality and gave out the extra points equally.

Finally, we found that older children and children experiencing high inequality were more likely to judge the inequality in a negative way, compared to younger children and those who experienced low inequality.

This study demonstrates how children react to inequality as they age, as well as how their judgments of fairness becomes more complex as they get older.

How do 4 to 9-year-olds' learn about new emotional expressions?

Children see other people express a variety of emotions during their day. Some emotions are familiar to them, like happiness or anger, but some might be unfamiliar, like contempt or embarrassment. How do children learn about the new emotional expressions they encounter in their daily lives?



To answer this question, we invented a nonsense emotional expression (puffed cheeks), which children were had never seen before and had no experience with. By showing children this brand-new puffed cheeks face, we can figure out how children learn about new emotions.

One common way children learn about the emotional expressions others show is to figure out what caused that person's feeling (e.g. they see a spider) and then match it with the facial expression that person makes (e.g. a fearful face).

So, we asked 4-9-year-olds to play a guessing game with us where an experimenter opened a series of boxes, and made a facial expression based on the object inside. There were four possible things that could be in the boxes, and four possible expressions the experimenter might make. The familiar emotions were happy (which matched to a sticker), scared (a spider), sad (a broken balloon), and the novel puffed cheeks expression, which was linked to a novel object we called a 'pax' (which was really a car fuse).

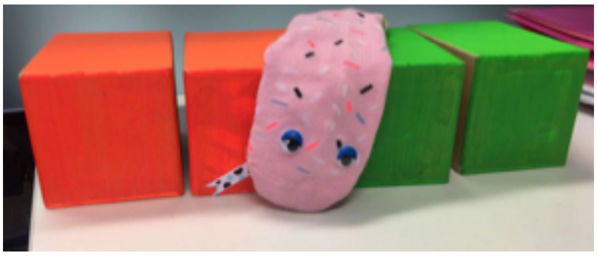
For the first part of the game, the child guessed which object was in the box based on the experimenter's expressions. Then, children got a turn to open the boxes and make an expression and the experimenter got to guess what was in the box. By doing this, we got to see how many times children needed to see the new expression before they learned about it, and we also got to see how quickly children could learn to make a new kind of expression.

We found that children quickly and easily linked the new expression to the 'pax' object, meaning children are great at learning about what kinds of things cause others to make emotional expressions. When it was children's turn to make the expressions, though, only about half made the puffed cheeks expression for the experimenter to guess when the 'pax' was in the box.
This suggests that children learn what objects and expressions go together quickly, but it takes some practice before they are able to make those expressions themselves.

At what age do children reason with logic?

As adults, we tend to take many aspects of our decision making process for granted, such as being able to draw simple logical conclusions in situations of uncertainty. For example, say you have lost your house keys, and the only time you left the house was to visit your mother earlier that day by car. The conclusion you might draw is that the keys could be in your car or at your mother's place. Therefore, after searching your car, you logically conclude they must be at your mother's place. Young children, however, are not automatically able to reason about such abstract ideas.

In the present study, we used a simple design that involved searching for stickers under four cups in order to test to what extent young children can think and reason about possibilities, that is, by reasoning 'The sticker could be in location A or it could be in location B. Therefore, if it's not it location A, it must be in location B'. We are unsure if other animals have this capacity, and therefore, while objectively simple, it may underlie a multitude of more complex human behaviours.



Our data suggests that only at 5 years of age were children searching for the hidden stickers in a manner that convincingly demonstrated that they were reasoning logically. 2.5-, 3- and 4-year-old children all appeared to be searching somewhat at chance on critical trials. If this finding is replicated in future research, it may have important implications for our understanding of how young children are making decisions and choices in uncertain situations.

Children at the age of 7 appear to start using containers to carry items

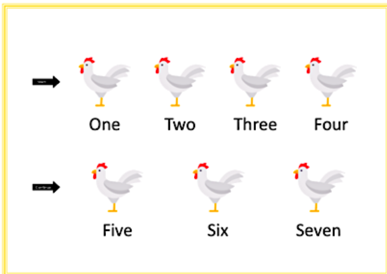
Humans use containers everyday, whether they are bags to carry the shopping in or boxes to pack things away. Understanding the usefulness of containers is very important, because it allows us to carry high numbers of items and over a long distance. However, relatively little is known about when children begin to use containers in this way.

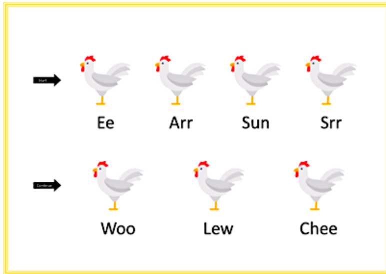
To test this, 3 to 7-year-old children were introduced to Tigger in the first room. I told children that Tigger wants to play games but doesn't have any toys. Children are then told that Mickey the Mouse is in the room next door with lots of toys and it's their job to bring back as many toys to Tigger as they can in one go. Importantly, the more toys they bring back, the more stickers Tigger will give them.

Children enter the next room and are shown a table full of 30 items: 29 of these are toys and one is a basket. The most efficient way to complete the task is to use the basket to carry the toys because it's the only way to get all of the items to the next room. We are interested in the age in which children begin seeing the basket as a special item rather than just another toy. Data collection is 95% complete, but preliminary results suggest that basket usage increases as children age, with a majority of 7-year-olds using the basket.

Can we accelerate 18-month-olds' understanding of counting?

Infants' understanding of counting develops well before they can verbally count for themselves. From a young age, infants master the 'routine' of counting.





That is, infants learn that correct counting follows three distinct rules: 1) when counting objects, each object is pointed to once and is paired with one count word, 2) counting is recited in the same fixed order each time, and 3) the final number used when counting represents the total number of objects being counted.

By 18 months of age, infants prefer correct counting but only when the count words are in the infant's native language. Bilingual infants of the same age, however, also prefer correct counting even in a language that is unfamiliar to them. Why? We propose that bilingual infants may have an advantage over their monolingual counterparts: Since bilinguals observe correct counting in more than one language, they learn that no matter what the count words sound like, the 'routine' of counting is constant. We therefore wanted to know whether limited exposure to counting in multiple languages would help accelerate monolingual infants' understanding of counting.

To test this, 30 English-speaking infants received either a multilingual or English-only counting book, where parents were asked to read the book to their infant daily over 4 weeks. Infants were then invited to the ECDC where they completed three counting tasks in an unfamiliar language that assessed their understanding of the three counting rules. We predicted that infants with the multilingual counting exposure would prefer correct counting (even in an unfamiliar language), more so than the infants with no multilingual counting exposure. We found that infants with the multilingual counting exposure did prefer correct counting, but only on the task that assessed the second rule of counting: that counting should be recited in the same fixed order (e.g., 1, 2, 3, 4 each time; not 4, 2, 1, 3 then 2, 4, 3, 1 etc).

Overall, our results suggest that this counting rule may be acquired first before the other two counting rules, and that limited multilingual counting exposure can improve monolingual infants' understanding of at least one of the counting rules.

We currently have studies in progress involving children aged from newborn to 12 years. If your child/ren falls into any of these ages, we would love to have you participate in our studies again. If you have friends with children who might like to get involved, we would be delighted for them to become involved in our research. To contact us, please email ecdc@psy.uq.edu.au or register your interest on our website below or click here