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In this Issue:

"4-year-old children did not demonstrate understanding of practice or engagement in practice behaviour, but five-year-old children did."

Puppets used in the task (real as shown above; alien as shown below)

As 2012 draws to a close, all of us at the ECDC would like to sincerely thank you for participating in our studies. 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 for 2012 in this edition of our newsletter.

Recent Research Results

"Why Should I Practice?"

Why don't young children practice? Our research project found they may simply be too young to understand that practicing will improve their skills. In a series of tests, we found that 4-year-old children did not demonstrate understanding of practice or engagement in practice behaviour, but 5-year-old children did.

In one task, children were told a short story in which two puppets both wanted to be good at a skill. One puppet practiced every day until he grew up; the other didn't. Children were asked to choose the puppet that would win in a competition for that skill. Children were given a human-based version of this task, where the puppets represented boys and the skill was juggling; and an alien version, where the puppets represented aliens and the skill was made-up.

Five-year-old children identified the puppet that had practiced as the winner of the competition in both the real-life and alien versions of the task, suggesting they understood that practice was a key component in the puppet's success.

Four-year-old children chose randomly, indicating that they could not understand that the puppet who had practiced should be better at the skill.

This pattern was replicated over several other measures of practice understanding and behaviour. When asked how people did get better at things, some 4-year-olds thought that people just got better at things as they got older, or bigger. But 5-year-old children could reliably identify practice as a method for improving a skill.

Although most 4-year-olds failed at tests for practice understanding, most parents thought that their children did understand practice. This mis-match between parents' high expectations and children's low understanding may create frustrating situations, in which the parent expects the child to practice, but the child doesn't understand why he or she should.

So although children under the age of five years may use the *word* "practice", they do not necessarily understand what practice *means*.

Children under the age of five may not understand that practicing now will make them better at something in the future, so they may need explicit instructions and instant rewards for practicing. And if they aren't practicing, it doesn't mean they aren't interested in doing well – they may simply need more time to understand why practice works.

Memory & Planning for the Future in Preschoolers

"Older preschoolers may be better than younger preschoolers at rehearsing information that will help them solve a future problem. This may be crucial as they move into the schooling years."

Young children often need their parents' help to remember past events and plan for future events. For example, they might struggle to recall details of a trip to the beach or remember to bring their lunch to kindy. This study was designed to identify when children develop a specific aspect of memory and planning for the future. They had to remember a past problem in which they lacked a crucial piece of information, and seek out this information to solve the problem in the future. 4-and 5-year-olds were introduced to three puppets – a snail that had a favourite food, an elephant that had a favourite colour and a tiger that had a favourite toy. The children were invited to guess these favourite things in return for stickers, only to find that they lacked the knowledge required. The children were then taken to another room, but 15 minutes later they were told they would be returning to the room containing the puppets very soon. They were then shown a booklet in which they could lift up pictures of the puppets and find out their favourite foods, colours, and toys. After this process, the children returned to the puppets and were again invited to guess their favourite things. We are still reviewing the results, but they suggest a number of interesting things. The 4- and 5-year-olds performed at the same level when lifting up the pictures of the puppets. Both age groups lifted the correct pictures at a level better than chance, suggesting they could remember the past problem and were truly thinking about the future! The 5-year-olds performed better than the 4-year-olds when they had to guess the puppets' favourite things a second time after going through the booklet. This suggests that older preschoolers may be better than younger preschoolers at rehearsing information that will help them solve a future problem. This ability will be crucial for children as they move into the schooling years.

Finally, nearly every child received an above average score for their age on an accompanying vocabulary test, suggesting they were a very smart bunch! We are now conducting a second study with 3-, 4- and 5-year-olds using a similar procedure. This time, the three puppets are housed in different coloured boxes and the child has to choose a picture from the booklet based on which box they will be returning to in the future. The results from both studies may eventually help in the identification of children who are at risk of developmental delays in thinking about the past and future.

Do 3 and 3 ½ -year-olds prefer to Follow a Group?

"3 and 3 ½ -year-olds preferred to copy what the majority did even if they used irrelevant actions, however, only if the outcome was successful."

Children engage in social learning from a young age. One recent study found that a bias toward following the majority may influence children's learning. Children preferentially copied behaviours that were demonstrated by most individuals, rather than behaviours that were demonstrated the most times. We extended upon this research by investigating whether children continue to follow the majority even when the majority is unsuccessful.

In our study, children aged between 3 and 3½-years viewed a video showing actors using different tools and performing different causally irrelevant actions to retrieve a toy from three apparatuses. The majority was comprised of three actors, each employing the same method of retrieval. The minority was one lone actor who employed a different method of retrieval.

Half the children watched a video in which both the majority and minority successfully retrieved the toy, while the other half watched a video in which only the minority successfully retrieved the toy.

We found that children performed the causally irrelevant actions demonstrated by the majority more than those demonstrated by the minority but only when the majority was successful. But we were surprised to find that rather than selecting the tool used by the majority, children appeared to choose a tool at random. We are currently planning experiments to examine this further. Overall, our study suggests that while children follow the majority in some respects, they do not do so blindly. The children had a preference toward copying what the majority did, but they overcame this preference when the majority was unsuccessful.

Are 4-year-olds Good Helpers?

The aim of this study was to examine 4-year-olds' prosocial tendencies. From a very young age, children begin to exhibit prosocial behaviours, usually by helping others with a task, or by providing helpful information.

We were specifically interested to see whether young children will still help another person, even if there is cost incurred to them for doing so.

Our experiment involved children having the opportunity to help a person by showing them how to retrieve stickers out of a locked box. The person pretended they did not know how to get the stickers out. Children were in either the 'cost' condition, the 'benefit' condition, or the 'control' condition. In the cost condition, helping the person would be costly for the child as he/she would lose out on the stickers that they helped the person retrieve.

In the benefit condition, children would be immediately rewarded by helping the person as they got to keep any stickers that they helped the person retrieve. In the control condition, there was neither cost nor benefit incurred to the child for helping. We expected that children would help the least in the cost condition, and the most in the benefit condition, as presumably their motivations to help in each condition would differ.

Our results showed that in fact children helped at the same rates across all conditions. Furthermore, there was no difference in the time children took to help the person between each of the conditions. This means that regardless of whether children were rewarded for helping, or actually incurred a cost for helping, they still seemed motivated to help the person, and did so without hesitation.

This demonstrates that children at 4 years old have a strong tendency to provide help to others, even when it is not in their own interests to do so.

This is an interesting finding as it suggests that young children are completely other-regarding and altruistic.

However we identified some alternative explanations for these results. Audience effects and social pressures could have influenced children's behaviour, so much so that children continued helping even though it was costly.

"Children at 4 years old have a strong tendency to provide help to others, even when it is not in their own interests to do so."

Do 1½- to 2-year-olds Share their Toys with an Adult?

Imitation is a ubiquitous and important element of human social interaction.

In a course project for 3rd year *PSYC3162 Development in Infancy* course, students investigated whether or not 1½-to 2-year-olds were more likely to share toys with a social partner who imitated them, versus one who did not.

Infants took part in three familiarisation trials, in which they played with a toy while one adult experimenter imitated everything they did and another simultaneously performed actions that were similar but not imitative.

Next, infants were given the opportunity to share toys with both experimenters.

We found that infants more rapidly shared with the non-imitating experimenter, suggesting perhaps that they were trying to establish a social connection where one wasn't already evident.

"1 ½ - 2-year-olds are more likely to share with the non-imitating experimenter."

What do 18-month-olds Understand about Counting?

"Counting in front of your infants can increase their ability to recognise correct counting."

Being able to understand the logic of counting is an important skill that must be acquired before children learn more advanced mathematical knowledge. Our *Infant Counting* project addresses the question of whether or not infants recognise the difference between correct and incorrect counting.

Following on from some of our previous work, we created a new test to find out if infants understand that when counting is done properly, the count words are always recited in the same invariable order.

We created a Magic Buttons Game with two different buttons controlling a TV screen. When one button was pressed, the TV played a video in which six fish were counted accurately. When the other button was pressed, the video portrayed incorrect counting in which the number words were mixed up every time: "three, six, one, four" etc. When allowed to press the buttons on their own, we found that 18-month-olds significantly preferred to press the button that activated correct counting videos.

This finding shows that even before they can reliably count by themselves, infants readily differentiate between these correct and incorrect count sequences.

Interestingly, parents who engaged in more counting with their infants at home, had infants who were more likely to prefer the correct counting video. This suggests that counting in front of your infants can increase their ability to recognise correct counting.

We are now in the process of conducting an additional condition in this study. Now that we know that infants prefer correct counting in their native language, we are testing whether or not they show the same preference for counting recited in an unfamiliar language.

This will help us determine whether 18-month-olds' preference for correct counting is simply due to its familiarity ("one, two, three…") or whether they have a deeper understanding that correct counting—in any language—entails reciting the count words in the same order each time.

What are 18-month-olds' Reactions to Sharks?

"We need to establish whether infants are prepared to learn to fear sharks."

Evolution has made us more wary of animals that are potentially threatening to our safety and survival.

Previous studies have found that we learn to fear these dangerous animals, such as snakes and spiders, very quickly. For instance, one study found that infants tended to look longer at snake videos, compared to images of non-predatory animals, when simultaneously hearing a frightened human voice. So, we tested whether infants would react in the same way toward aquatic predatory animals, namely, sharks.

We presented 18-month-old infants two side-by-side videos of sharks and other aquatic and semi-aquatic animals, such as swan, beaver, stingray and turtle.

These videos were accompanied by a happy- or frightened-sounding human voice, which played in the background. We then observed which of the two videos infants looked at longer when also hearing the different voices.

We predicted that infants would look longer at videos of sharks when they heard a voice expressing fear.

However, we found that infants preferred watching the non-predatory animals regardless of whether they heard a frightened or happy human voice. This means that we need to do additional studies, to equate the "interestingness" of our shark and non-shark videos. Then we can try again to establish whether or not infants are prepared to learn to fear sharks.

Do 2-year-olds Quickly Learn to Use the Functional Properties of Tools?

Young children are competent tool users from a young age. Even toddlers learn quickly about the functions of tools and have expectations that objects have specific functions.

But at what age do young children start to attend to the functional properties of tools and objects?

For instance, does a toddler understand that the weight and shape of a hammer is what makes it so appropriate for hitting things, and do they select tools based on these functional properties?

This study examined whether children pay attention to the functional properties of stick tools by the age of 2 years of age. Specifically, we were looking at whether children pay attention to the functional property of object connectivity – whether objects are connected to one another.

Children who participated in this study were aged 22-27 months old. They played a fishing game in which they were asked to retrieve a fish from a box using one of two "fishing" sticks. One of the sticks was functional, while the other was broken and the two broken pieces were separated by an 8 cm gap.

We wanted to see whether children looked at both sticks, and selected the functional stick after noticing the gap in the non-functional stick. If they weren't attending to the gap, their selection of the functional stick would be at chance level (50%).

We also wanted to investigate whether children's attention to this functional property changed depending on the setup of the sticks; specifically, whether setting up the stick tools closer to or further from the target object altered children's success at selecting the functional stick tool.

Previous research indicates that 1-year-olds are less successful in using tools to retrieve an out-of-reach object the further from the target object that the tool is placed.

We therefore thought that children's attention to the properties of the tools may deteriorate the further from the target object that the stick was placed.

To test this, we presented children with three different conditions: one in which the stick was already attached to the target object, one in which the stick lay beside the target object, and one in which the sticks were presented about 25 cm in front of the target object.

Contrary to our expectations, we found that children performed equally well across all three conditions.

This informs us that, by the age of 2 years, children quickly learn to look at both sticks and make selections based on their functional properties, and that their success in doing so is not limited by the distance between the tools and target objects.

It also shows us that their success is not limited by tool-using behaviour; that children perform just as well when they have to use the stick as a tool to pick up the object as when they merely have to pull a stick that has the reward object already attached.

There were no differences in performance between boys and girls. There was also no effect of age, such that younger children were performing as well as older children, suggesting that the ability to attend to functional properties of tools may develop at an even younger age in children.

"It may be suggested that the ability to attend to functional properties of tools develops at an even younger age than 2-years-old in children."

Newborns Imitate, but only Tongue Poking

"Imitation of tongue poking may serve a social function such as enhanced bonding between infant and the primary caregiver in the newborn period."

Over the past 4 years, Janine has been working on her PhD project investigating whether or not newborn babies can imitate the gestures of others, and if so, what might be the reason for infants imitating.

In September, Janine submitted her PhD thesis for examination, and is currently waiting for the examiners' reports! The main finding of her thesis was that of all the facial, hand and vocal gestures that were modelled to the infants, only tongue protrusion was reliably copied in the newborn period. This was an exciting finding, as why would infants only copy tongue protrusion and not the other gestures? Janine investigated this, and found that it was not a reflexive response (some of you may know that newborns display many reflexes after they are born), or a response driven by general arousal. Infants' copying of tongue protrusion was also not related to temperament or gender. So what is the reason for infants' copying tongue protrusion? Janine's thesis concluded that the imitation of tongue protrusion may serve a social-affiliative function such as enhanced bonding between infant and the primary caregiver in the newborn period, or alternatively, may help in the establishment of breastfeeding. These ideas prompted two projects carried out by Honours students mentioned below. A big thank you to the 62 mums and babies who participated in Janine's project - your involvement has sparked new directions for research in this field!

Why do Newborns Imitate Adults Poking their Tongues?

"Newborn imitation of adults' with tongue poking doesn't appear to be linked to the breastfeeding process, nor to early parental bonding as we hypothesised."

Our longitudinal imitation study has demonstrated that newborn infants will poke out there tongue when they see an adult doing the same. In a new project we tried to establish why infants are more likely to copy tongue poking as opposed to other gestures.

In one study we tested the idea that the imitation of tongue poking might facilitate breastfeeding, given the important role the tongue plays. We asked some mothers in our longitudinal study to fill out a questionnaire about their breastfeeding experience. We then matched these breastfeeding responses to their baby's imitation abilities at one week of age. We failed to find evidence of a relationship between these two measures.

Because mothers in our longitudinal study were answering questions about their early breastfeeding experience up to two years after their baby was born, we also ran the same study with a new sample of mothers and infants. These mothers filled out the same questionnaire, but this time when their baby was one week old. Again, we found nothing to suggest that imitation functions to aid the breastfeeding process.

We also conducted another study to see whether infant imitation of tongue poking was related to early parental experiences. We asked some of the mothers in our longitudinal study to think back to the first week of their baby's life, and answer a few questions about how they felt towards their baby at that time. We then matched these responses to infant imitation responses at one week of age. We found no evidence to suggest that there was any link between infant imitation and the development of maternal confidence or bonding with the newborn.

In a follow up study we also recruited some new families, and, this time, had both mothers and fathers tell us about their experiences in the first week of their newborn's life. Importantly, the questions about the early parental experience were answered at the time the baby was one week old, so memories were recent and clear. We matched these responses to infant imitation, and found no statistical relationship between imitation and the parental experience. However, our results indicated that there is a potential association between infant imitation and how confident mothers and fathers feel in their parental roles, though the scope of our study was too limited for this possible effect to be substantiated.

Finally, our results tentatively suggested that the father's bond with the newborn may be more influenced by the presence of infant imitation than the mother's bond, though more research is needed to investigate this possibility.

Do Children with Autism Socially Respond to Imitators?

How do we attract the attention of children with autism?

Not at all alien to parents of children with autism, is the situation that children with autism are too engrossed in their toys to take notice of their social surroundings. Their lack of interest in the social world is also apparent in their lack of social initiation, such as making eye contact with another, being physically close with others and so on. Children with autism also tend not to share their experiences with others via actions such as pointing and showing.

Despite that, previous studies have shown that imitating the play actions of children with autism increases their social responsiveness towards the imitating experimenter, which includes being closer to the adult, smiling and gazing more towards the adult and so on. We investigated whether this effect would be influenced by the familiarity of the imitating partner, where one was very familiar to the child (parent) and another was a total stranger (experimenter).

To examine this, we recruited nine children with autism and their main caregiver for the study. Each child with autism was imitated by their parent and imitated by an unfamiliar experimenter. This occurred in separate sessions, in two different rooms.

We compared the child's social responsiveness before and after the imitation session, in both the parent and the experimenter condition.

The results indicated that children with autism increased their eye contact towards the adult, increased their vocalization directed to the adult, displayed more social behaviors such as pointing, imitating and showing, and also engaged in more reciprocal play after being imitated, and this effect was equally strong for their parent and for the unfamiliar experimenter.

However we also found that children with autism showed more proximal behaviors, such as touching, hugging, caressing and staying physically close, and also decreased the time they spent playing alone, after being imitated by their parent. These effects were not seen after imitation by the experimenter. This indicates that children with autism respond especially strongly to being imitated by their parent.

This study confirms that imitation is an effective way to capture the attention of children with autism. Although we need to replicate these results with a larger sample, the findings suggest that parents in particular may find that imitating their children with autism is an effective way to engage them socially.

"Children with autism showed a higher level of social responses after being imitated by their parents or the unfamiliar experimenter."

Do Children Overimitate in a Helping Context?

"Children were just as likely to perform the unnecessary actions when engaged in helping a naive adult regardless of whether they were originally shown from a teaching scenario or from a helping scenario."

Research has demonstrated that children learn a great deal about the world around them by imitating the actions of others. Imitation is a social learning strategy that allows children to acquire important knowledge and behaviours from those in their social group. When someone imitates, they are copying a specific behavioural strategy, or learning about exactly *how* a goal is achieved. Not only will children imitate actions that have been modelled to them with extremely high fidelity, they will also reliably copy actions that are completely irrelevant to achieving the goal at hand. This puzzling pattern of behaviour is termed overimitation.

Consider a child who watches an adult open a very simple box to retrieve a toy. Instead of opening it using her hand (the most efficient method), the model picks up a tool, taps it three times to the top of the box and uses the tool to open the lid (a clearly inefficient method). What we find is that children will carry out all of the actions modelled to them, even those that played no causal role whatsoever in getting the box open.

Children's tendency to overimitate has been credited as one reason for the complexity and cumulative nature of human culture. Overimitation not only enables children to acquire a huge range of adaptive behaviours, but also allows them to learn the shared methods and traditions that are specific to their cultural group. In addition, close imitation of the actions of others is considered to be a mechanism through which children promote shared experience and affiliation with others in their social group.

Thus, it is likely that children imitate to fulfil socially-based motivations in addition to learning functional skills.

Few studies have investigated overimitation behaviour without engaging children in a direct teaching context. However, children do not always learn cultural behaviours through direct instruction. We wanted to understand whether children would pass on unnecessary actions when engaged in helping a naïve adult to retrieve a toy from a box. In other words, we were interested to determine whether children would play a role in transferring a 'ritualistic' method of achieving a goal, or whether they would omit these actions in favour of showing the adult a more efficient method.

We compared children's imitative behaviour in a helping situation to their behaviour in a direct teaching situation. What we found was that children were just as likely to perform the unnecessary actions when engaged in helping as they were when engaged in direct teaching scenario.

In addition, we found that children placed great emphasis upon showing the naïve adult components of the box-opening demonstration that were entirely arbitrary. Thus, it seems that children will play an active role in transferring 'cultural' methods and rituals to others, and that they do not need to be engaged in a direct teaching context in order to show overimitation behaviour.

We currently have studies in progress involving children aged from newborn to 5 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 aged from newborn to 5 years who might like to get involved, we would appreciate it if you would refer us to them.

For more information, please call us on (07) 3365 6323. You can also register your interest on our website below: