Baby genius

From the outside, babies might not seem to do much. Yet, their minds are actively engaged with the world. DR TOM WHELAN writes

MY daughter was nine months old. She had a heavy cold and so I took her to the doctor. "What seems to be the problem?" asked the doctor. Before I could answer my daughter declared, "lymph glands." The doctor and I exchanged dumbfounded looks. A thought flashed through my mind like a neon sign: baby genius. My daughter squirmed under the spotlight of our stares. Her nose oozed, she spluttered and began to cry. She was bright and adorable, but not quite a genius.

By nine months babies are well practised at imitating the speech sounds that surround them. They have also added the inflections, intonations and rhythm of normal conversation. Their utterances can sound like words, but they are unlikely to be true words where they deliberately connect a particular sound to a specific object. Usually this does not happen until they are nearer to being 12-months. Indeed, the term infancy is derived from the Latin infantia which translates as "inability to speak". Literally, the first word signals the end of babyhood and the beginning of childhood.

To some people, little of importance happens during infancy. After all, much of a baby's day is spent sleeping, crying, dribbling and feeding. Previously, psychologists described the mind of a baby as a "blank slate" or "blooming, buzzing confusion". In recent years, a very different picture has emerged. Babies might not be geniuses, but their minds are firing.

One reason for the underestimation of babies' abilities has been the difficulty in gaining access to their interior world. From birth, babies can communicate hunger, discomfort, distress and pain through different crying patterns, but of course they cannot provide a detailed description of their experience. So, rather than expecting babies to show or tell us what they know, developmental psychologists have discovered better ways of 'listening'.

One of the more effective windows to infants' minds has come through a fundamental perceptual ability. Soon after birth, infants respond selectively to their environment. In particular, they show a preference for new events over familiar ones. If something is new or unexpected they will look at it longer than if they have seen it before. This is adaptive, as the greatest learning is likely to take place when there is new information available. Innovative experiments have been designed around infants' preference for novelty and have led to the discovery of surprising perceptual and mental abilities.

For example, Karen Wynn and her colleagues from Yale University examined the mathematical skills of five-month-old infants. She found that they could do a lot more than just suck and hammer a calculator. In one experiment, infants viewed a small display area that looked like a puppet stage. On the stage was a toy Mickey Mouse. A screen would then automatically rise to conceal Mickey. As the infant watched, an identical toy would be brought onto the stage and placed behind the screen. Soon after, the screen would drop. On some occasions, as expected, two toys would be revealed. On other occasions, there would be just one. This impossible event occurred because the experimenter would use a concealed trapdoor to take one of the Mickeys away while both were hidden behind the screen. This procedure was repeated for a number of trials and the amount of time the infants spent looking at the possible or impossible outcome was recorded. Given infants' preference to look longer at unexpected than expected events, if they were able to perform the addition, they would look longer at the incorrect than the correct result. This is precisely what Wynn found. Using the same approach, it was discovered that they could work out that 1 + 1 was 2 and not 3, perform simple subtractions and deal with problems involving larger numbers. These findings suggest that we have inborn mathematical capabilities that provide a foundation for the development of more sophisticated skills.

Even the famed Swiss psychologist, Jean Piaget, underestimated infant cognition. He believed that infant thinking was largely made up of sensory experiences and physical actions. So, a baby

who puts a toy or a shoe in their mouth is actually thinking about the nature of these objects. According to this perspective, it is not until late in their first year that infants can hold things in mind well enough to think about them in an adult sense. This is demonstrated by a classic problem devised by Piaget. Try showing a baby of, say, five-months an attractive toy. Then, as they are watching, place the toy under a cloth. Even if there is a distinct bulge where the toy is covered, the child will not reach for it. Once they cannot see, taste or drop the object, they behave as though it no longer exists.

More recently work by Renee Baillargeon and her team from the University of Illinois has led to a modification of this perspective. In one of her early experiments, infants of less than four-months-old watched a screen move 180° away from them, much like a drawbridge. Next they were presented with either a possible or impossible event. In the possible event, a block was placed in the pathway of the screen so that when the screen was rotated it would stop when it hit the block. In the impossible event, the infants would see the obstructing block, the screen would rise to conceal it and then complete the full arc as though the block was not there. Similar to the Mickey Mouse experiment, the investigator would have removed the block while it was out of the child's view. Once again, as anticipated, the infants looked longer at the impossible than the possible event. Therefore, they recognised that the block should continue to exist even when behind the screen and that this would prevent the screen from completing its rotation.

Although the age when children can hold things in mind has been underestimated, initially this capacity is rudimentary and can require up to two years to take shape. If you have played hide-and-seek with a child of 18-months, you might see them hide and then cover their eyes to guarantee that you will not find them. An older child is inclined to set up the game by giving the following instructions with delight, "I'll hide in the cupboard while you count." You count, wonder out loud where they are, then find them and feign surprise. The child explains, "Now you hide in the cupboard and I'll count."

Learning to appreciate the nature of the physical world is important, but understanding how our social world operates is the key to being human. Here too, in recent years, we have come to recognise that infants are remarkably capable.

Michael Tomasello and his research group at the Max Planck Institute in Germany designed a study where one-year old infants played with two adults and two toys. One adult would then leave the room and the remaining adult would introduce a third, new toy. After they played with it for a while, the other adult would return. On returning, this adult would look at all three toys displayed on a tray, show great excitement and say, "Wow. Cool. Can you give it to me?" To retrieve the toy the adult wanted, the infants had to know that people are most interested in new things and be able to identify what was new for the adult even though it was not new for them. Most one-year olds managed to do this, successfully indicating that even at this early age, without the advantage of language, they have a sense of what is in other people's minds.

A final group of studies has identified another area where infants' abilities have been overlooked. If you were to reflect for a moment about your very first memory, you would probably not recall an experience from before you were 4 or 5-years old. In line with this, it was thought that children's recollections are faulty and infants have little, if any, memory facility. Instead, babies have an impressive recognition capacity. In an experiment conducted by Carolyn Rovee-Collier from the State University of New Jersey, three-month-old infants lying in a crib had one end of a ribbon tied to their ankle and the other end tied to a colourful mobile hanging above them. In their normal activity, the children would kick their legs and this would set off the mobile. At first the babies did not realise that they had kick-started the toy, but soon they understood and were delighted. This demonstrates a phenomenon parents have long observed - toys that do everything on their own are boring. Even basic toys are fun as long as the child can interact with them. After some serious kick action, the mobile in Rovee-Collier's study was removed from the crib for a week. When it was put back and the ribbon reattached, the young babies resumed their kicking with vigour. This demonstrated that they remembered they could control the mobile and the activity required was a kick. In fact, they could remember this for several weeks provided they were prompted to do so by seeing the mobile operate before the ribbon was tied to their leg.

From the outside, babies might not seem to do much. Yet, as shown by these studies, in terms of numerical concepts, understanding the physical and social world, and being able to remember experiences, infants are actively engaged with their world. Along with their vocal cords, babies' minds are alive. Fortunately, through closer attention and with the benefit of modern methods of investigation, we are learning to 'listen' to infants much more effectively. This is just as well, because they have so much to tell us. ■

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