

# Babies exposed to stimulation get brain boost

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According to NTNU professor Audrey van der Meer, nerve cells in very young children build up to a thousand new synaptic connections per second. She researches babies' brain development. Credit: Lena Knutli

Many new parents still think that babies should develop at their own pace, and that they shouldn't be challenged to do things that they're not yet ready for. Infants should learn to roll around under their own power, without any "helpful" nudges, and they shouldn't support their weight before they can stand or walk on their own. They mustn't be potty trained before they are ready for it.

According to neuroscientist Audrey van der Meer, a professor at the Norwegian University of Science and Technology (NTNU) this mindset can be traced back to the early 1900s, when professionals were convinced that our genes determine who we are, and that child development occurred independently of the stimulation that a baby is exposed to. They believed it was harmful to hasten development, because development would and should happen naturally.

Early stimulation in the form of baby gym activities and early potty training play a central role in Asia and Africa. The old development theory also contrasts with modern brain research that shows that early stimulation contributes to brain development gains even in the wee ones among us.

Using the body and senses

Van der Meer is a professor of neuropsychology and has used advanced EEG technology for many years to study the brain activity of hundreds of babies.

The results show that the neurons in the brains of [young children](#) quickly increase in both number and specialization as the baby learns new skills and becomes more mobile. Neurons in very young children form up to a thousand new connections per second.

Van der Meer's research also shows that the development of our brain, sensory perception and motor skills happen in sync. She believes that

even the smallest babies must be challenged and stimulated at their level from birth onward. They need to engage their entire body and senses by exploring their world and different materials, both indoors and out and in all types of weather. She emphasizes that the experiences must be self-produced; it is not enough for children merely to be carried or pushed in a stroller.

#### Unused brain synapses disappear

"Many people believe that children up to three years old only need cuddles and nappy changes, but studies show that rats raised in cages have less dendritic branching in the brain than rats raised in an environment with climbing and hiding places and tunnels. Research also shows that children born into cultures where early stimulation is considered important, develop earlier than Western children do," van der Meer says.

She adds that the brains of young children are very malleable, and can therefore adapt to what is happening around them. If the new synapses that are formed in the brain are not being used, they disappear as the child grows up and the brain loses some of its plasticity.

Van der Meer mentions the fact that Chinese babies hear a difference between the R and L sounds when they are four months old, but not when they get older. Since Chinese children do not need to distinguish between these sounds to learn their mother tongue, the brain synapses that carry this knowledge disappear when they are not used.

#### Loses the ability to distinguish between sounds

Babies actually manage to distinguish between the sounds of any language in the world when they are four months old, but by the time they are eight months old they have lost this ability, according to van der Meer.

In the 1970s, it was believed that children could only learn one language properly. Foreign parents were advised not to speak their native language to their children, because it could impede the child's language development. Today we think completely differently, and there are examples of children who speak three, four or five languages fluently without suffering language confusion or delays.

Brain research suggests that in these cases the native language area in the brain is activated when children speak the languages. If we study a foreign language after the age of seven, other areas of the brain are used when we speak the language, explains Van der Meer.

She adds that it is important that children learn languages by interacting with real people.

"Research shows that children don't learn language by watching someone talk on a screen, it has to be real people who expose them to the language," says van der Meer.

## **Early intervention with the very young**

Since a lot is happening in the brain during the first years of life, van der Meer says that it is easier to promote learning and prevent problems when children are very young.

The term "early intervention" keeps popping up in discussions of kindergartens and schools, teaching and learning. Early intervention is about helping children as early as possible to ensure that as many children as possible succeed in their education and on into adulthood – precisely because the brain has the greatest ability to change under the influence of the ambient conditions early in life.

"When I talk about [early intervention](#), I'm not thinking of six-year-olds,

but even younger children from newborns to age three. Today, 98 per cent of Norwegian children attend kindergarten, so the quality of the time that children spend there is especially important. I believe that kindergarten should be more than just a holding place – it should be a learning arena – and by that I mean that play is learning," says van der Meer.

#### Too many untrained staff

She adds that a two-year old can easily learn to read or swim, as long as the child has access to letters or water. However, she does not want kindergarten to be a preschool, but rather a place where children can have varied experiences through play.

"This applies to both healthy children and those with different challenges. When it comes to children with motor challenges or children with impaired vision and hearing, we have to really work to bring the world to them," says van der Meer.

"One-year-olds can't be responsible for their own learning, so it's up to the adults to see to it. Today untrained temporary staff tend to be assigned to the infant and toddler rooms, because it's 'less dangerous' with the youngest ones since they only need cuddles and nappy changes. I believe that all children deserve teachers who understand how the brains of young children work. Today, Norway is the only one of 25 surveyed OECD countries where kindergarten teachers do not constitute 50 per cent of kindergarten staffing," she said.

#### More children with special needs

Lars Adde is a specialist in paediatric physical therapy at St. Olavs Hospital and a researcher at NTNU's Department of Laboratory Medicine, Children's and Women's Health. He works with young children who have special needs, in both his clinical practice and research.

He believes it is important that all children are stimulated and get to explore the world, but this is especially important for children who have special challenges. He points out that a greater proportion of children that are now coming into the world in Norway have special needs.

"This is due to the rapid development in medical technology, which enables us to save many more children – like extremely premature babies and infants who get cancer. These children would have died 50 years ago, and today they survive – but often with a number of subsequent difficulties," says Adde.

New knowledge offers better treatment

Adde says that the new understanding of brain development that has been established since the 1970s has given these children far better treatment and care options.

For example, the knowledge that some synapses in the brain are strengthened while others disappear has led to the understanding that we have to work at what we want to be good at – like walking. According to the old mindset, any general movement would provide good general motor function.

Babies who are born very prematurely at St. Olavs Hospital receive follow-up by an interdisciplinary team at the hospital and a municipal physiotherapist in their early years. Kindergarten staff where the child attends receive training in exactly how this child should be stimulated and challenged at the appropriate level. The follow-up enables a child with developmental delays to catch up quickly, so that measures can be implemented early – while the child's brain is still very plastic.

A child may, for example, have a small brain injury that causes him to use his arms differently. Now we know that the brain connections that govern this arm become weaker when it is used less, which reinforces

the reduced function.

"Parents may then be asked to put a sock on the "good" hand when their child uses his hands to play. Then the child is stimulated and the [brain](#) is challenged to start using the other arm," says Adde.

Shouldn't always rush development

Adde stresses that it is not always advisable to speed up the development of children with special needs who initially struggle with their motor skills.

A one-year old learning to walk first has to learn to find her balance. If the child is helped to standing position, she will eventually learn to stand – but before she has learned how to sit down again. If the child loses her balance, she'll fall like a stiff cane, which can be both scary and counterproductive.

In that situation, "we might then ask the parents to instead help their child up to kneeling position while it holds onto something. Then the child will learn to stand up on its own. If the child falls, it will bend in the legs and tumble on its bum. Healthy children figure this out on their own, but [children](#) with special challenges don't necessarily do this," says Adde.

Provided by Norwegian University of Science and Technology

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