



## Facts Sheet 2, The Early Years. Learning from Experience



### What's this about?

Welcome to Part 2 of 4 articles that examine how brains and minds grow in specific ways during the infant and pre-school years. In this article, we continue our examination of the infant brain and begin to present ideas for sensibly nurturing your child's growth during the early years.

**"The extent of the brain's capabilities is unknown, but it is the most complex living structure known in the universe." Society for Neuroscience**

### How do neurons learn from experience?

The magic we call learning happens at the microscopic level. It is laughable to think that anyone completely understands the process, yet piece by piece, year after year, neuroscientists add to the emerging picture. I find it exciting to be part of the greatest discovery of our time.

### Key Points



**Kids, too, LOVE learning about their brains.**

Neurons look a little like uprooted trees. There's the branches at the top (dendrites) the longish trunk where the body of the cell is located (axons) and the roots (terminals) which branch out of the axons to make contact with other neurons or muscle cells.

At its most basic level, the terminals of one neuron connect with the dendrites of another neuron. The connection, known as a synapse, is a tiny gap where the brain chemicals (neurotransmitters) flow from terminals on axons to receptor points on dendrites.

It is at those points that our experiences become flesh. The synapse has both pre-connection points (transmitters) and bulb-like post-connection points (receptors). As neurotransmitters flow into the synapses, due to making or retrieving memories, the tiny receptors they latch onto cause

electrical or biochemical messages in the receiving neuron.

Thus the input to a neuron occurs at the synapse and the output is a series of electrical blips firing down its axon in pre-determined (or learnt) patterns.

Within thousandths of a second, neurons which are part of sending and receiving networks can make sense of our world, and remarkably, remember the patterns of inputs and outputs so we can recall the memory later. This is the magic we call learning. What we say and do as parents affects the learning process.

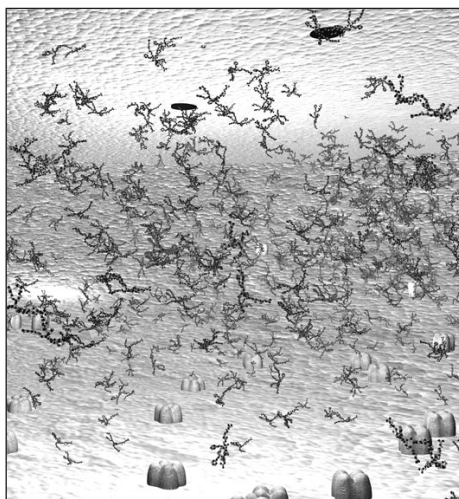


Figure.1 The interior of a single synapse showing terminal neurotransmitters and receptors.

### Why are some things easier to learn than other things?

The human brain is born with a pre-programmed expectation to learn a whole array of skills such as eating, walking, talking, simple number facts, toileting, bonding and so on.

The human brain, however, does not expect to learn certain other things and therefore requires intense coaching and long periods of practise. Such learning includes reading, writing, complex mathematics, playing sports, driving a car and so on. Whatever the brain learns, it needs experiences to build interconnections between neurons to enable the construction of memories. Scientists call these interconnections, synapses and the

growth of new synapses to enable the construction of more memory networks, synaptogenesis. We now know that synaptogenesis occurs throughout life, a feature known as brain plasticity.

### What is experience expectant learning?

Neuroscientists have divided synaptogenesis (the growth of new synapses) into two major categories. Category 1, is experience expectant plasticity, which is characterised by learning that occurs species-wide and within predictable periods. Category 2, is experience dependent plasticity, which is not constrained by age or time but does require relatively high degrees of motivation and effort to master. This latter type of learning is undertaken by pre-schools and schools and requires a structured curriculum and regular, specific feedback. We address experience dependent learning as it relates to reading in next week's article.

Most experience expectant learning occurs within the early years of life and with little formal instruction and is typically the learning associated with parenting infants. Most young children learn to talk and walk easily (experience expectant) compared to learning to write their names (experience dependent). A young child masters the grammar of a language more easily during the early years while the vocabulary of the same language is subject to life-long modification. Therefore, second language learners need exposure to the grammar of the language early on if they are to speak it without an accent.

Experience expectant learning occurs when the brain encounters the relevant experience and motivation at the appropriate time (OECD, 2002). A vocabulary of 50 or so words by around age one, learnt primarily by pointing, labelling and naming items blooms into perhaps 2,500 words by age five. Wide-spread, stiff-legged movements of the toddler mature in the 2nd year of life into running, jumping, hopping, kicking, climbing and riding. During the 3rd year of life many children learn to tip-toe, balance on a narrow beam, catch items and even make rudimentary-looking drawings that represent people and environments.

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To develop these skills, young children require play-time, rather than the more passive, television viewing. Children love hearing their parents communicating encouragement during these times as they seek to master a range of cognitive and motor skills. Because young children are so active and curious, a parent who provides lots of emotional support (as opposed to fear of all that might go wrong) love, and of course, time, will create the conditions for a tremendous explosion of dendritic branching on neurons (Diamond and Hopson 1998).

### Key Points

**Children love hearing their parents communicating encouragement during these times as they seek to master a range of cognitive and motor skills.**

By around age four, most children have already developed awareness of their own minds and those of others. The child can, for example, invent the personalities for two dolls – one that acts mean and another that acts nice – then enact a scene between them (Diamond and Hopson 1998). This awareness of other people's lives and influences is crucial to children because they will model their attitudes, dispositions and behaviour on the significant adults and children with whom they regularly interact. Imaginative play is the hallmark of the 4-year-old. Supply lots of toys where your child can invent personalities and possibilities. Listen in to their conversations. You will often hear your own words being applied to the imagined situations your child has created.

By around age six, most children can count to 30 or more, name several colours, write their own name, understand the meaning of prepositions (in, on, above, over, around, under) and many comparative states (biggest, smallest, tallest, widest). Running, laughing, chattering, exploratory young children require little formal instruction to master such learning. But, they do require high levels of interactions with loving, caring adults and the scope to explore and make mistakes without criticism. This is the main reason why working on children's concepts is more beneficial than trying to manage their behaviour because the former is based on encouragement while the latter is based on power. The emotions associated with punishment weaken relationships to the point where punishment itself has virtually no effect on behaviour. Punishment reduces risk-taking and risk-taking is a critical factor in learning during the early years.

### Key Points

**But, children do require high levels of interactions with loving, caring adults and the scope to explore and make mistakes without criticism.**



### Key Points

**Your child is more likely to attempt learning when encouraged and guided, than when threatened, constrained or punished when things didn't work out so well.**

Your child is more likely to attempt learning when encouraged and guided, than when threatened, constrained or punished when things didn't work out so well. In fact, children's emotional states are far more significant in their intellectual development than previously thought (OECD, 2002). Emotion creates the shifting sands for the development of new concepts. The feeling of satisfaction accompanies successful mastery of learning. It's an emotion that strengthens children and feeds into the brain's natural disposition for learning. The early years requires, above all else, the development of emotional competencies – to be self-aware, to have self-control, the ability to resolve conflicts, to cooperate with others, to delay gratification and to seek satisfaction.

### Key Points

**When you stop learning, you stop.**



### Summary

#### The least I need to know

Many scientists assert that young children have brains that learn better than at any other time in their lives. Add high motivation to this wonderful window for learning, time-frames that reflect actual development rather than norms, and learning based on encouragement and sensory experiences to ensure an unbeatable combination for every child's growth and development.

### References

(Items marked \* are available from Mind Webs).  
Log on to [www.mindwebs.com.au](http://www.mindwebs.com.au) or call Cathy Joseph for a catalogue (08) 8358 6993.

*Brainy Parents, Brainy Kids*, John Joseph\*.

*OECD (2002) Understanding the Brain: Towards a New Science of Learning*, OECD Publications.

*Magic Trees of the Mind*, Marian Diamond and Janet Hopson\*.

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*The Scientist in the Crib – Minds, Brains and How Children Learn*, Alison Gopnik, et al.

**Next Issue - part three: Challenging and novel ways to support Early Years learning.**