

Your Baby's Developing Brain

Dr Jane Williams

Birth is an important and exciting time for new parents. At birth infants are perfectly formed human beings, but their brains and nervous system are very immature. How well an infant develops depends on the type and number of experiences a growing brain receives. Genetics, nutrition, emotional security and the opportunity given to the inbuilt reflexes are essential components of healthy brain development. But brain development is orderly and sequential, so the timing of different types of opportunities and stimulation are also important. Just as you can't teach a newborn baby to read, you cannot teach a five year old to read if they have not had the opportunity to develop the foundational skills of learning in infancy and early childhood. At GymbaROO we believe that parents who understand their children's developmental needs are more likely to provide an environment that is conducive to healthy development. Understanding how the brain develops is an important part of this knowledge.

At birth, babies see, but they do not understand. They have no control over their eye muscles, so they cannot fix upon an object or bring it into focus. They hear, but know little of the source or meaning of the sounds that reach their ears. They feel, but have no idea of their body shape. They taste and smell, but have yet to learn the meaning or significance of these senses.

Their bodily responses and movements are dominated by involuntary, inbuilt reflexes. For example, an infant easily startles, arms fly out, they cry, and as they do, they take a deep breath. Some say this is the first time the infant becomes aware that those things on the end of their arms are theirs! These responses provide our infants with survival mechanisms and early

movement patterns, reflecting the level at which the brain is functioning.

The Medulla

At birth the infant is operating at the lowest level of brain function – in the brain stem, or the medulla. This is a reflex stage, which nature has provided to ensure the survival of the infant.

As can be seen on the illustration, this infant is in what is called the fencing position; this is a reflex position, which occurs when the infant's head is turned to one side. Head movement triggers most of the early reflexes. These reflexes are called primitive reflexes and are automatic – involuntary. These movements come under voluntary control during the early months after birth. For example, a reflex that enables an infant to suck also stimulates the opening and closing of their fists, so tightly shut after birth except when sucking. In time and with experience, the infant learns to suck at will and open and close fists when desired.

Early vision is a reflex to light. Infants cannot see at near point at first but this develops through experience and movement. Light and movement stimulate vision. For this reason visual specialists often recommend a light be left on in an infant's room low on the floor and within their sight.

Babies have no idea of touch, they can feel, but do not know where! Slowly as the messages from their reflex movements and through feeling, light, sound, taste and smell, they gain

more voluntary control and enter a higher brain stem level of development aided by the input generated by the cerebellum, which feeds information into the brain stem, primarily into the medulla and pons stages.

The cerebellum is situated at the side of the brain stem, at the back of the brain. This area is responsible for regulating the reflexes and muscle tone, thus maintaining the body's coordination and balance. It also plays an important role in the control of the muscles of the eyes.

The Cerebellum

Stimulation of the cerebellum occurs as infants are rolled, bounced, tumbled, spun and generally moved about by their parents, stimulating the tiny hairs in the inner ear, which send 'bulk' messages to the cerebellum about where their body is in relation to space and gravity. This is often called vestibular stimulation.

The cerebellum interacts with both the medulla and the pons areas of the brain stem. Its greatest period of growth is from birth to 15 months of age and at a slower rate in the seven – eight years of age group.

Between five and eight months, infants gain control over the reflexes and they begin to move forward in a sort of 'crocodile' crawl. This occurs at the pons level of the brain.

The Pons

As infants can now get that toy by themselves their eyes are learning to focus at differing



distances. They also receive touch and position information as they learn to move in coordination. Think of the work out their feet and hands are getting in preparation for later fine motor tasks.

Body awareness is quickly improving as a result of the stimulation of the many touch and movement receptors in their muscles and ligaments as they move across the room. They are also gaining further 3D awareness through their vision and hearing. This is a tremendous time for exploration and learning about themselves and their world through sensory input.

The Mid Brain

The mid brain comes next up this orderly, predictable, sequential child development ladder. It controls all the messages coming into the brain from the body and further stimulates the development of perception and 3D awareness through creeping.

Creeping on the hands and knees is the hall mark of this period of development. Both sides of the brain – called the hemispheres – are now working in coordination, this is called 'cross pattern'. Right arm and hand forward and at the same time the bent left leg moves forward. All this is reflex driven and does not appear again until the two hemispheres of the brain begin to work independently and in support of one another, during the third year of life.

Think of the muscle development of the shoulders, arms and hands, while the infant is creeping. This is so important to later writing. The distance also between the eyes and the hands of a creeping infant, are the same as between the eyes and a book at school age. Think of the sensory messages bombarding an infant's brain as they creep. This is a very dramatic period of development.

The Cortex

The cortex sits over the brain stem and is responsible for comprehension of and response to the sensory messages coming in from the body. It forms the bulk of the left and right hemispheres, with a mass of nerves interconnecting the two.

As an infant begins to push into an upright position, the

cortex begins to play a more important role, usually in the early months of the second year of life. Initially, each half of the brain does the same thing, almost as if it needs to reinforce each hemisphere. For example, our toddlers push along with both feet in the same pattern when riding a push along car. Early speech appears and the slow transition to independent control of the two hemispheres begins to develop.

The later postural reflexes now develop and exist for the remainder of life. These reflexes are important for posture and balance. Coordination and balance improve in order for the next important stage of development – cortical or sensory integration – to fully develop. This is a period of important consolidation.

Cortical/Sensory Integration

Somewhere between 2½ or 3½ years of age, the brain matures and there is a separation of controls for specific tasks by the two hemispheres. This allows independent movement of the limbs such as standing on one foot, and cutting out with one hand while holding the paper with the other.

Children prior to this stage worked both hands or both feet together. Now children can learn to ride the tricycle, which requires the feet to push in opposite directions to one another and the arms to work in coordination to steer.

Independent hand skills allow the emergence of recognisable drawing (mainly!) They still draw as they see – for instance a three year old drawing of a man will be a big head with arms and legs coming out from the head – this is how they see an adult as they look up. The four year old with better body awareness, knows he has a body and draws people accordingly.

It is often also said that a child enters this stage in nappies and leaves it in pants! In other words, the child now has a better tactile system. It is another dramatic year in a child's development.

Finally, the most recent brain acquisition in evolution, the neo cortex, begins to mature. This part of the brain is only present in humans.

The Neo Cortex

The neo cortex is the top section of the brain. It is responsible for the highest level of information processing as a result of all the information relayed to the brain up through the brain stem and other complex neural circuits.

Children by now are automatically cross patterned in their movements (arm on one side and the leg on the other side being forward). This is seen in their running, walking, throwing, etc. This automatic function improves balance and enables many new skills such as hopping, skipping, going up and down stairs unaided, throwing more accurately with a preferred hand, speaking more fluently and drawing.

Thus with growing independence and understanding, children feel more in control of themselves and their world. "I can do it myself" is the catch cry of this age! This is also a tremendous time for language development and an understanding of the things in their world, in preparation for a great time at school!

Helping your child's developing brain

Child rearing is one of the most important tasks in life. Parents need to be aware that they are their child's first and most important teacher and that they can assist in their children's healthy development. Recognising that brain development occurs in a natural, orderly and sequential pattern is an important component of understanding how to best help children achieve. Providing experiences and opportunities that best match the requirements and capabilities of the developing brain is a great start!

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