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These days, most expecting parents are very well prepared for the birth of their baby, thanks to the excellent childbirth classes usually on offer. However, the next stage of parenting is often something they are not so well trained for.

It is not uncommon for brand-new parents to experience a feeling of helplessness, even fear, at the moment they realize that their tiny, fragile baby is now totally dependent on them. Even those parenting for the second or third time can be daunted by the task ahead.

At this moment, there is often a question that, if not verbalised, is something almost every new parent thinks about. It usually goes something like this:

*“What should we do to make sure that our baby reaches his or her developmental milestones at the correct time?”*

Or: *“How do we help our baby reach his or her full potential?”*

Often without realising it, what they are really saying is:

***“We hope that our baby’s brain will develop normally”.***

Are these concerns unfounded? Is it just a temporary panic that parents experience as they settle into their new role?

When a baby is born and appears to be normal, we tend to take for granted that this newborn will continue to grow and develop the way he or she should. Since the majority of babies seem to follow the normal developmental pathway, we assume that all babies will automatically do so. Unfortunately, this is not always the case, as statistics show.

In the United States, the National Center on Birth Defects and Developmental Disabilities, a part of the Center for Disease Control and Prevention (CDC), estimates about 17 percent of children in the United States have some form of developmental disability, and that \$36 billion is spent each year on treating these disabilities. This does not take into account the many children who simply struggle to keep up with their peers as the months progress. Their problems usually go undiagnosed because they are not severe enough to attract either medical attention or therapeutic intervention.

Many of these children will eventually catch up, but some will continue to struggle, and later in life may have problems in critical areas such as coordination and balance, school work and fine-motor skills. The number of children who cannot keep up with their peers in school work is surprisingly high. In 1996, an Australian Bureau of Statistics survey found that 34 percent of Year 5

primary school boys and 24 percent of Year 5 girls failed the fifth grade literacy test.

### Human brain immature at birth

Why is it that we usually assume normal development is something that “just happens”, and yet so many children seem to have difficulties keeping up? The answer may lie in the way the human brain develops.

Humans are born with a relatively immature brain and spend a significantly longer time after birth developing it, when compared to most animals. The human brain at birth is only 25 percent of its adult size. As obvious as it may seem, it's worth noting that this means that 75 percent of its growth occurs after birth. And 90 percent of this growth occurs by the age of 10.

Think about animals not known for their intelligence, and how long they spend in development. A lamb is usually on its feet and walking within an hour of birth, and by this time it has already achieved one of its most significant neurological milestones. It will continue to grow physically and learn the ways of its flock, but neurologically, its first hour may indeed be its finest. You don't need to be an expert on sheep neuro-anatomy to realise that when compared to the human brain, the sheep's brain is very simple. So simple that a significant portion of its development occurs in the womb before the lamb is born.

The human brain is different. Even though humans spend a lot longer in the womb than sheep (average pregnancy of 270 days compared to 147 days for a sheep), it still takes the average human eight to nine months to become mobile

on hands and knees, and twelve to fourteen months to walk. This is obviously quite slow when compared to the sheep's mobility within its first hour.

### A longer pregnancy?

Perhaps the human pregnancy is not long enough? Could it be that, with a longer gestation, humans would be walking within an hour of being born, just like the lamb? Women can rest easy. The good news for them is that there is no benefit from a longer gestation time. Given the human brain's incredible complexity, it is impossible for all or most of its wiring and organisation to occur inside the womb, and nine months is long enough for the initial, pre-birth stage of brain development. In fact, the human baby needs to leave the womb after nine months so it can begin the next crucial stage of neurological growth.

At birth, most of the human brain cells are non-specific or dormant, waiting to be stimulated into action. The environmental stimulation that, from the moment of birth, constantly bombards the brain through the five senses, starts the ball rolling. Initiated by this sensory input, the brain begins to develop, and the baby starts to learn new skills. Then the constant practice and repetition of these skills further enhances brain growth. In the ideal situation, a marvellous symphony of reception and motion is performed over and over again, and slowly but surely the human brain becomes better organised and more capable.

At the same time, the brain begins its dramatic post-birth physical growth in the following ways:

- the size of some of the cells increase as they are stimulated and change from a dormant or non-specific state and become functioning neurons.
- as more and more cells are stimulated, the vast network of nerve fibres that connects these cells together grows accordingly.
- at the same time the network of blood vessels that supplies essential nutrients to these brain cells also increases in size.

### Requirements for brain growth

However, for all this to happen, certain conditions must be met:

- the baby needs to be placed in an environment where its senses are going to be appropriately stimulated, and where there is space and opportunity to practice and repeat its gradually developing motor skills
- its basic needs must be met – including nutrition, love, and health.
- the sensory pathways into the brain – sight, hearing, touch, taste and smell – need to be capable of constantly sending messages to the brain about the surrounding world from the moment the baby is born, and indeed, before birth, since research has shown that these senses begin to function in the womb. These sensory pathways need to be functioning without any

impediment, as any restrictions to the amount of information that is sent to the brain can have drastic consequences.

- likewise, there should be no impediments to the developing motor functions, either in restrictions to normal physical movements, or in time and opportunity. The constant practice and repetition of movement, speech and hand function leads to the refinement and acquisition of gradually more complex skills.

It is the post-birth, environmentally-driven development period that enhances the human brain and, at the same time, increases the risk of the brain not developing to its fullest potential. If a brain is well developed at birth, it is not as vulnerable to outside influences after birth.

Therefore, if animals such as a sheep are born with a “normal” brain, not a lot can go wrong with their development after birth, unless they suffer some kind of post-birth traumatic brain injury or are subjected to extended periods of severe environmental deprivation.

But the same cannot be said for the human brain. At birth it is still in its early stages of development. It is therefore much more open to manipulation and control, both positive and negative, and is more dependent on the environment it is exposed to for its development to be completed.

What is important to consider is that the continuation of brain development after birth is not a completely automatic process. There are no pre-set alarm clocks

that go off at certain times during development to remind the baby to keep up with his or her peers. A bell does not ring at nine months to say:

"OK kid, you are now nine months old and according to all the experts it's time to get up on your hands and knees and start crawling".

Or on the baby's first birthday:

"Twelve months have now passed and it's time to get up on your feet and walk".

A certain amount of pre-determined or intrinsic growth occurs regardless of the circumstances, but this alone does not guarantee that the brain will continue its development after birth.

### Rate and amount of brain growth

It is essential to understand that the rate and amount of growth that occurs in the brain after birth is neither constant nor pre-determined, nor is it protected from outside influences. It can be speeded up and increased, or slowed down and decreased. There is now a vast amount of scientific research that shows that increased stimulation generally results in increased brain growth and improved neurological function. There is equally compelling evidence to show that if a baby is placed in a deprived environment and left there for an extended period of time, it is almost certain that its brain's function and growth will be adversely affected.

There are many animal studies which show that environmental deprivation can have drastic consequences. Unfortunately, there are also tragic human circumstances that also demonstrate this. For example, when the Ceausescu

dictatorship in Romania ended in 1989, children were discovered living in extremely deprived conditions in institutions, some spending most of their lives in bed. The scientists who studied these children after they were discovered concluded that abandoned children confined to institutions displayed impaired cognitive, emotional and social development.

The overwhelming message coming from the scientific world is that it is possible to exert influences, both positive and negative, over the growth and development of the human brain and its resultant milestones. Although most of this research has been performed on animals rather than humans, for obvious ethical reasons, there are strong indications that the results have important implications for the human brain.

Imagine that you are the parent of a just-born baby, and in the minutes after the birth a scientist approaches you with an offer that seems to be too good to be true, and from a financial point of view, hard to resist. The scientist's offer goes something like this:

“I'm doing research into brain growth and development, and I want to use your baby as part of this research. In return, I will pay you \$1 million. I want to take her from you now and keep her for the next 12 months. I will make sure she stays healthy and well nourished, but she will be kept in an environment devoid of all stimulation. She will be in a dark room, there will be no noise, and she will not be touched or stimulated in any way. But I will guarantee to give her back to you alive.”

Not interested? Too much at stake? How about \$5 million, \$10 million, \$20 million, \$100 million? At what price would you say “yes”, or would you keep saying “no”? Although you may be tempted as the dollar value gets higher, the wise decision would be to say “no” regardless of the price, as there certainly is too much at stake.

Your child may be returned to you alive, but there is no doubt that she would be suffering serious neurological deficits. The simple fact is that the human brain needs stimulation after birth for it to continue to develop correctly, and a severely deprived environment will have drastic consequences on brain development.

The other thing to consider when weighing up the scientist’s offer is its timing. Without doubt, the most important year of your life as far as your brain's development is concerned is the first year.

Think about what a baby achieves in its first 12 months. The development of speech from barely being able to utter a sound, crawling and possibly walking from not being able to move, the understanding of speech from only being able to respond to sounds. No matter how long you may live, your brain will always be most indebted to its first year.

### Building foundations

Think of those first 12 months as the equivalent of the foundation stage of building a house. No matter how much money you spend on building materials, your most important investment when constructing a house is the foundations. How long your house remains standing will depend to a great deal on the

strength of its foundations. If you skimp on the foundations, you run the risk of severe structural problems developing over time.

You don't need to hire a builder to construct the foundations in your baby's brain - one of the truly marvellous things about normal development is that your baby can do this by him- or herself. It could be said that normal development is so simple even a baby can do it! The normal developmental stages that babies achieve in the first 12 months of life are the building blocks of the brain's foundations. That is why the first 12 months are so important; and the second 12 months, and the third, since the second and third years are critical for the ongoing establishment of new milestones, and the reinforcement of the milestones achieved in the first 12 months.

The basic premise of *Developing Childhood* is that the normal development of the human brain should not be left to chance. Instead, parents should take the initiative and help influence the course of their baby's development, rather than wait until things happen, or rather don't happen, and then react.

The exciting news, and the central theme of *Developing Childhood*, is that the means by which parents can assist in the development of their child's brain are incredibly simple.

By ensuring that their child is exposed to a rich sensory environment and is given every opportunity to pass through all of the appropriate developmental stages, parents will be directly influencing the brain growth of their child. Its simplicity lies in the fact that all they need to do is to assist in the normal developmental process that should be happening anyway.

They do not need to reinvent the wheel, for nature has devised a proven and most effective method of developing the human brain after birth – the normal developmental process itself. They just have to make sure that the wheel starts to move and that it keeps rolling in the right direction.

### Normal development is not a race

This does not mean that babies need to be pushed or rushed through development. Normal development is not a race. In fact, rather than trying to accelerate the normal developmental process, babies should be encouraged to spend as long as possible in each of the developmental stages that they pass through. It is a classic example of the old saying “practice makes perfect”.

For example, there is no need to hurry the normally developing baby to walk – he or she is going to be doing that for the rest of his life. Developing Childhood does not advocate that parents teach their baby new skills before they are ready, but simply to encourage all aspects of development at the appropriate time.

Even though all babies are individuals and develop at their own pace, there are average times when milestones are usually achieved. These milestones can be a useful guide to each child’s development. They should not be used to determine whether a baby is “passing or failing”, but rather can help parents foster developmental skills at appropriate times, thereby ensuring that their baby is given every opportunity to pass through development without hindrance or delay.

The main purpose of Developing Childhood is to ensure that all babies are given the opportunity to develop normally, thereby giving the brain all the stimulation it

needs to function as it should. Developing Childhood does not promote the idea of creating geniuses by force-feeding information from the moment a baby is born, nor does it suggest that babies should be running around as soon as possible, joining the ranks of the high achievers before they are toilet trained.

### Created from a unique perspective

It has been created from a unique perspective, by a leading brain injury therapist who has spent 35 years working with children who have struggled to develop. It is perhaps unusual that a program on normal development has been created by an expert in the field of abnormal development.

However, as in most aspects of science and medicine, the study of pathology results in a greater understanding of normal physiology. And applying the principles of normal development to children with developmental difficulties has demonstrated the value and importance of the achievement of normal developmental milestones to the overall development of the brain.