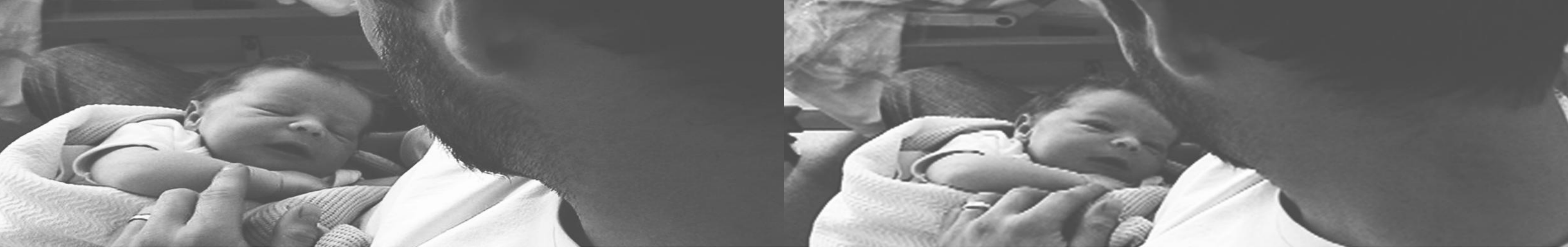




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## Aims of the film

The way that human development occurs is a complex interaction between what we bring into the world - our genetic inheritance - and the experiences we encounter as we live within it. It is not a question of nature or nurture but rather nature *and* nurture combined together. All learning takes place from the beginning by a combining of all the sensory information received from all our experiences.

The developmental change and learning that takes place in the first year is huge for babies and this film highlights just how important these changes are by travelling with Orson on his journey throughout his first year. We watch him as he makes his first great transition from life in the womb to life outside with his family. We see how every aspect of development links and influences every other part and this 'holistic' nature of development is illustrated clearly. We discover how he begins to find out about the very special people around him - his Mum and Dad and his brother. We see how he begins to find out about the world around him and, very importantly, how Orson starts to learn about himself as a unique and special child.

Throughout the film, links are made to how Orson's brain is growing and being shaped by all of his experiences. It shows how his understanding of himself as an individual begins to emerge by the end of this magical year.

The film looks in detail at some of Orson's experiences. In particular it shows how incredibly important his close relationships are in helping him feel safe and secure. You see how feeling safe gives him the confidence to explore his environment and the more secure he feels, the more he is able to explore. His relationship with his Mum and Dad are fundamental to his well-being and this film also shows how a particular type of relationship known as 'attachment' - which is closely bound up with these feelings of security - is built up over time.

In this film Orson is with his parents, but all the information about the importance of early relationships, how Orson learns to feel safe and secure, applies just as much to anyone who is involved in the care of young babies. Positive relationships are built up by adults being responsive, caring and sensitive to their needs.

In order to help highlight the important changes that occur in this first year, Orson's journey has been divided into sections 0-3 months, 4-7 months and then 8 months to a year. However, it must be emphasised that each baby will develop at their own particular rate. But at the same time there is a remarkable similarity in human babies as to when they usually begin to achieve certain skills and abilities. To help you examine particular aspects of development the three sections are further divided into smaller sections.

Interspersed with the documentary are brief interviews with Maria Robinson, adviser, author and lecturer in early care and development, and these highlight, discuss or explain a particular topic a little further.

## Using the Film

The film has been made to:

- ♦ Identify the main shifts in skills and abilities that are common to babies during the first year
- ♦ Highlight the importance of relationships and the making of attachments
- ♦ Support and enhance understanding of the needs of a baby during this time
- ♦ Illustrate that development is holistic
- ♦ Emphasise that brain development and experience are closely linked
- ♦ Illustrate that early development provides the framework for the quality of later emerging skills and abilities, including that of forming other relationships, communication, learning and play.

It can be watched as a whole but as it has also been divided into sections, this makes it versatile and flexible to meet your particular needs. Some suggestions are given below.

### Tutors

The division into the three main sections, and then further smaller sections, will allow you to use the film dependent on your various student groups and their level of training and/or experience. You may wish to go through the whole film (time permitting) without comment and then ask the students what their main impression was about Orson's development. Each section could then be looked at in turn to show how development slowly builds on the baby's opportunities for repetition, imitation and familiar routines. The smaller sections could also be used individually as specific areas for further discussion and to extend knowledge and understanding in greater depth.

### Early Years Practitioners, Childminders, Health Visitors, Social Workers, Teachers/Trainees – all those working in the early years field

You may be utilising this video as part of your own training or continuing professional development. For example if you are a teacher familiar with the Foundation Stage Curriculum (3-5 years) you may wish to enhance your knowledge to comply with the new Early Years Foundation Stage and find



out more about very early development. Again, the film can be viewed as a whole simply to 'get a picture' of development and linked with the notes and/or specific sections can be used to support understanding of individual children or to reflect on the precursors to any particular behaviours you may be encountering in your work.

About the accompanying notes

The notes have two functions – firstly to support what you can see on the film and also to provide you with more detailed information about some of the exciting and interesting topics you will encounter. The notes will include an overview of the development within the three main sections and then further information on some of those topics identified in the smaller sections. Some notes will have more general aspects such as 'communication' as this will link across all the sections. A summary of the development that can be seen in many babies during these phases will be given at the end of each main section.



Contents & timings of film

Introducing Orson

0 to 3 months

What can Orson do at birth?	1:45
How does experience help to shape the brain?	5:00
Early experiences, care routines & socialising	7:00
Communicating, babbling, smiling & copying	15:30
What have we seen so far	21:00

Reaching Out

4 to 7 months

22:40

Strength, co-ordination, space & movement	23:00
Interest in objects, reaching & grasping	26:00
Feeding, new tastes & textures	29:00
New noises, laughing, games & gestures	32:00
Attachment, feeling safe & secure	39:30
What have we seen so far	42:50

Exploring from a Safe Base

8 to 12 months

44:00

Myelination, emotions & learning	44:30
Communication, joint attention & gesturing	48:15
Object permanence & separation anxiety	51:45
Gestures, social referencing & empathy	56:45
Problem solving & schemas	61:30
What have we seen so far	64:15
End	67:00





## Introducing Orson

### 0 to 3 months

This section welcomes Orson into his family, emphasising his complete dependence on his parents as well as letting us see that he enters the world equipped with a basic 'tool box' of skills. These provide him with a 'kick start' in making sure that he gets the care he needs.

### What can Orson do at birth?

This 'tool box' includes vision, which although limited, permits seeing at just the right distance to examine a carer's face when held. Orson, like other babies, will not have much colour vision – they don't really need it in the womb. However, in the first three months, Orson's ability to see colours will gradually improve as the receptors in the eyes that deal with colour, migrate to the particular area in the eye where they need to be. Babies can hear and are already familiar with the sound of their mother's voices from having heard it in the womb. They are sensitive to touch, taste, heat, cold and pain. Touch is especially important and it is the first sense to develop.

In addition, Orson has a set of reflexes, which are responses not in his control but are simple reactions to some specific experiences. However, it is important to emphasise that Orson's reflexes have not arisen from nothing, but emerge from the experiences he has already had in the womb where babies have been found to also blink, suck their thumbs and show expression on their faces to various stimuli including reacting to loud noises. Sucking their thumbs in the womb helps a baby learn about the shape of their fingers and so the sucking 'reflex' has already been 'practiced' in the womb. Research has also indicated that in the womb, babies show regular patterns of spontaneous movement from 12-16 weeks emphasising that Orson's 'stepping reflex', where he lifts his feet alternately when held with his feet on a hard surface, may also have its roots in pre-birth activity. This and his other reflexes, such as sucking, 'rooting' and 'startle' (which are seen in the film) and grasping all ensure his survival as he clings to his mother and is able to find the breast and feed. All these interactions ensure that Orson and his mother get to know one another. Orson is already familiar with her voice and soon becomes familiar with her smell and possibly taste. Babies have been shown to recognise the smell of their mother's breast milk from that of other mothers, even if they are bottle fed. It is also suggested that the same processes that 'flavour' breast milk, 'flavour' amniotic fluid too, so breast milk itself may have a familiar taste!

When babies are held closely by both mothers and fathers, it has been found that their heart rates 'synchronise' in their rhythm. This means that the baby's heart rate gradually is calmer. If you notice, babies are often instinctively held on the left side of the adults body allowing easier access to this 'heart to heart' connection. Mother's voice too supports the 'calming' of the baby's heart rate. Mother's voice helps the baby in another way too. When they listen to her voice, babies start to

move their limbs in a more co-ordinated way and so, over time, this allows bodily movements to become more purposeful and smoother. All in all, talking to babies encourages a 'bath' of good feelings. Orson is also soothed by the voice of Dad who also adjusts his pitch and tempo (how loud/soft and speed of speaking) to match how Mum speaks. No-one tells him to – it is just instinctive! See infant directed speech below.

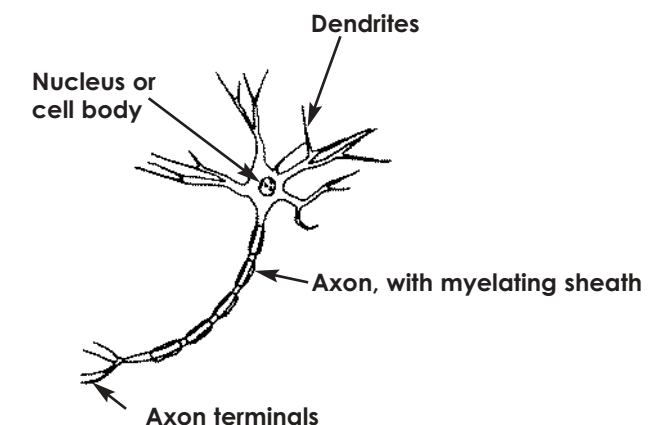
### New faces

Babies like faces and research strongly indicates that even new born babies prefer to look at faces or objects that resemble faces from the very beginning of life. There seems to be magic in the fact that the baby's vision is just right to see a face when held in their carer's arms – while everything else is rather blurry! There is a finding that in the first 3 months of life, babies have difficulty in turning attention to a stimulus on the periphery of their vision and this is termed 'sticky fixation'. A particularly interesting aspect of this difficulty is that it may actually support the child's ability to familiarise its self with another's face, by minimising any surrounding visual distractions.

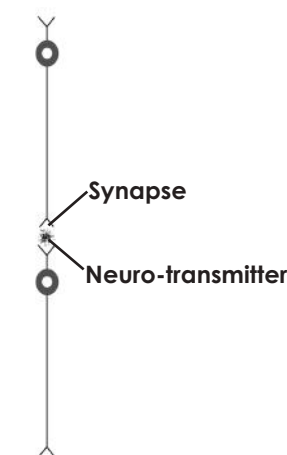
### How does experience help to shape the brain?

Our brains, at birth, are really a 'brain in waiting'. Although we are born with all the neurons (the special cells in the brain that communicate with each other) that we will need, it is our experiences which influence the way in which our brains grow and develop. There are two types of cells, the ones you will hear most about are the neurons and these are the ones that 'talk' to each other. We have about 100 billion of these and nearly all of them are present at birth. These neurons are special in that

they both receive and send information. The parts of the cell that receive information are called dendrites and the cell also has an extension or 'tail' called the axon, which is the sender of information. While there can be lots of dendrites and neurons can have different shapes, they each only have one axon. Information received enters the cell via the dendrites and then is passed down the axon to its 'end feet' where sit little sacs of chemicals – neurotransmitters. All sensory information is transformed into an electrical impulse and when this reaches the end of the axon, it is the neurotransmitters that carry the message across a tiny space, called a synapse, to the dendrites of the next axon.



**A neuron**



**Two neurons, one sending, the other receiving information**



**Glia cells & myelination**

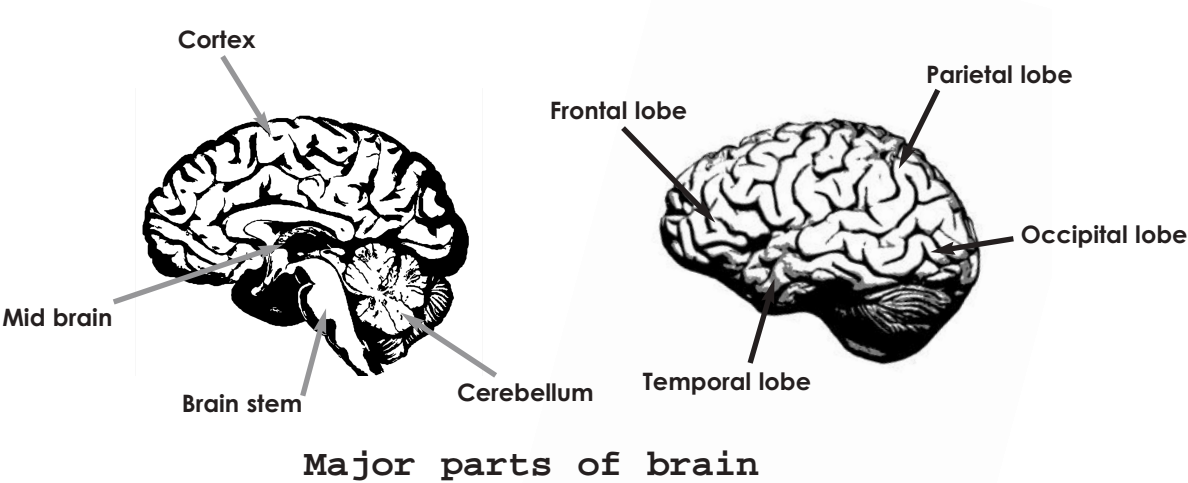
The other type of cells are called 'glia' and there are even more of these than there are neurons. A particular type of glial cell plays a very important function in that, over time, they produce a fatty sheath called 'myelin' which covers the axon and this allows the information to pass along the axon much quicker. The important thing to remember is that this process starts at birth but takes many years. Infants process information about 16 times less efficiently than adults. This is why, for example, a baby takes some moments to respond when they are in a 'conversation' with you or why children can seem to take so long to answer a question.

**The value of experience**

Our brains will grow whatever our experiences are – but it is the type and quality of the experiences which establish what particular pathways are laid down . When sensory information (from outside our body through what we see, hear, touch, etc. and inside from heart rate, breathing, tummy rumbles etc which often alter in response to 'outside' information) reaches the brain, lots of connections are made between different groups of neurons. If the experience is repeated often enough, this makes a pattern between those connections that are most used. Other connections, which may have been made in the first place, but not used again or very rarely, wither away. You can imagine that when a baby is first born there is lots of information coming to the baby's brain and somehow he has to make sense of it. The connections which fire repeatedly are strengthened, allowing them to fire more quickly, while those that are not used get pruned away. This is why providing the baby with consistent responses and familiar routines allow these patterns to emerge. The baby needs familiarity and repetition to begin to sort out his world, organizing his brain.

**The brain stem, the middle brain and the cortex**

The oldest part of our brain, the brain stem (sometimes called the reptilian brain) has two main functions. It acts partly as a 'relay station' of information with outputs spread widely across the brain both to and from the two hemispheres and cerebel-



lum. The brain stem contains the sites of vital bodily functions such as breathing, being awake and conscious, attention and the control of bodily temperature and although fragile, it is fully developed at birth. Other parts of Orson's brain are working well, like the structures that deal with his emotions, which are in the middle part of his brain. We share these structures with all other mammals such as dogs, dolphins and elephants etc. The 'newest' part of the brain, in evolutionary terms, the cerebral cortex is the outer surface of the brain and is the most complex part. It is made up of different areas which have overlapping functions and each area develops at different times. For example the frontal lobe, the 'thinking' part of the brain, develops much later than the occipital lobe, which deals with vision. All the parts of the brain are closely connected together but the oldest parts of the brain can be the strongest especially when we feel unsafe, physically or emotionally.

**Some important points about our brains and our emotions:**

During this first year, development of the emotional parts of the brain are fundamental as they determine how the baby acts - whether he goes towards things or goes away from them.

❖	the structures in our brain which process our emotions lie in the deeper, older areas
❖	the different parts of our brain develop at different rates with the 'older parts' being mature before the 'newer' areas of the cortex
❖	'control' of emotions comes through consistent, comforting interactions which help, over time - to develop the essential brain pathways between these deeper parts of the brain and the frontal cortex - areas of which act as a 'brake' on the strength of our emotions so that we may curb a response

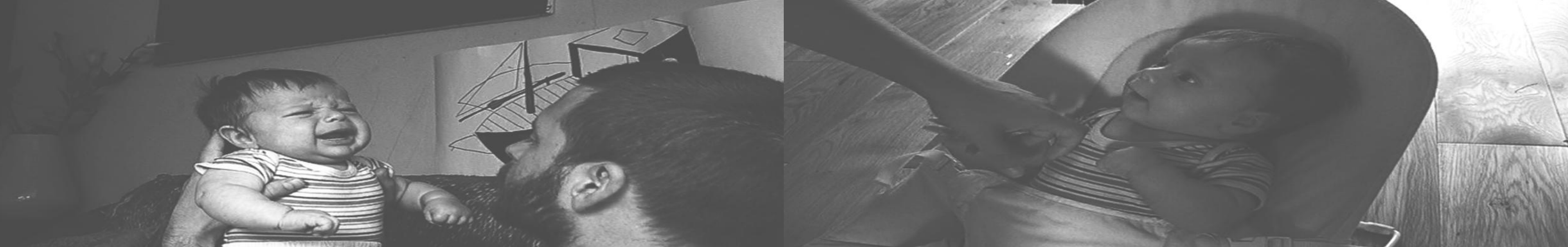
**Note – let us not forget the cerebellum!** This structure is situated behind the brain-stem at the back of the brain and will be very active during movement and also with balance, timing and learning familiar routines.

**Early experiences, care routines & socialising**

When Orson is with his parents, they are both beginning to get to know each other. In particular, his mother is beginning to understand what his facial expressions and body movements might mean and interprets them in order to try to meet his needs. Interpreting a baby's signals appropriately for most of the time is very important. No-one can get it right every time but so long as a baby's needs are met most of the time, then baby learns that someone is there and he will be cared for. In the film, Dad misinterprets Orson's signals and Orson gets distressed but Dad soon gets it right.

Crying is a baby's first signal and it is really important that babies learn that they will be quickly soothed and comforted. This doesn't mean that a slight delay is harmful – but a baby needs to learn with confidence that someone will come and that





those horrible feelings will go away. However, sometimes, parents and other carers may not respond in an appropriate way to the baby's 'signals' for attention – for example leaving a baby in a state of prolonged distress or not responding to the baby's smiles or playful gestures. This means that the baby will become increasingly frustrated and upset which is not good for the baby's long term well being. All in all, it is through the type and quality of our early interactions with our parents/family, that we, as babies, begin to experience the basic range of emotions. In their responses to us, our parents will unconsciously (or consciously) encourage or discourage the way in which we show our feelings.

Care routines such as feeding and nappy changing, bathing etc. are wonderful times for babies like Orson to learn familiar routines. Together with the emotions that come with such experiences, the repeated actions help to organise these experiences so Orson is able to 'predict' in a very simple way what is going to happen – his brain is getting organised.

Sleep is profoundly important and babies need a soothing routine to help them make that transition from waking to sleeping. It takes time for a baby's main 'body clock' to establish a rhythm that matches day and night. As Margot Sunderland (2006) says, a baby is 'highly dependent' on the parent to 'regulate her brain chemistry in a way that prepares her for sleep'. (P.67)

**Emotional Regulation**

At this time in his life, Orson, like other babies, cannot manage his own feelings – he just feels. For example, if he is distressed he needs to learn that he can be soothed and calmed. When he is distressed his arms and legs move in much more spasmodic ways and being calmed allows his whole body to be more regulated and co-ordinated. Orson needs his parents to help him manage his emotions before he can learn to manage them himself and this takes time. Look at the chart below to see how this ability to control our own emotions and behaviour takes place over time.

0-3 m	Regulation of feelings, activation of organised patterns of behaviour – e.g. mother's voice will help calm and soothe baby, rhythmic kicking in tandem with rhythm of carer's voice
3-9 m	Change ongoing behaviour in response to events and stimuli such as reaching for a toy, responding to a stranger
9-12 m	Emergence of 'shared attention' -and beginning to point to objects of interest as well as pointing to what baby wants
12-18m	Compliance and self-initiated monitoring – beginnings of responding to simple requests, e.g. 'no', 'stop', 'come here'
24 m+	Child may also begin to inhibit an action themselves, such as stopping half way through reaching for something
36 m+	Behave according to social expectations in absence of external monitors – e.g. child may not touch a desired or attractive treat even if no-one is watching

**Communicating, babbling, smiling & copying**

**Imitation, communication and Infant Directed Speech (IDS)**

During the everyday care and feeding interactions that Orson has with Mum and Dad, Orson is also finding out that they will copy his actions and he will try to copy theirs. This is really important for Orson and all babies as it is a means of communication and also a 'connection' between babies and their carers. Its importance is highlighted by the existence in the brain of mirror neurons – see section on the brain below – and their existence may help to explain why babies can and do sometimes copy the expressions and mouth movements of the carers with them.

However, Kugiumutzkis (1993), in a big study of interactions between mothers and babies, noted that mothers generally tended to imitate infants more than the other way around until the babies reached the age of approximately 8-9 months when babies began to imitate more actions. From the extensive studies on which Kugiumutzkis draws, as well as his own, it would seem that mothers tended to imitate vowel sounds most frequently. Mothers also naturally built on the infant's sounds, imitating, responding and providing the sounds with a meaning – e.g. the baby is 'saying' that they are upset, tired etc. When mothers or fathers are imitating the infant's sounds, as well as providing meaning and context, they are also providing a visual and auditory feedback for mouth movements, sound production, localisation of sound and the rhythms of speech. In addition, imitation of the infant's sounds also draws attention to the production of sound and also involves, by implication, the infant and carer in mutual face to face interaction.

Illustrating how all aspects link together, when a baby is feeding, they don't just feed non-stop but do pause – and these pauses allow time for the baby to gaze at their carer and for them to talk to the baby. These 'gaps' in feeding allow time for more interaction and they also are the beginnings of 'taking turns' in a conversation as the carer waits for the baby's action, responds and then waits again for the baby's 'reply'.

Trevarthen (2007) says: *'Infants are ready at birth to take turns in a 'dialogue' of movements with a loving parent. They are attracted to extended engagement with human gestures, and sympathetic to many emotions -- resonating to the impulses and qualities of movement; imitating, seeking to play an active part in proto-conversations or playful duets of agency'* In other words, Orson and his parents are engaged right from the beginning in a harmonious 'conversation' which allows Orson - like all babies - to discover what it is like to be with someone else and thereby what they feel like 'inside'. Through talking, gazing, imitating and responding with voice and facial expressions, parents and carers are behaving towards the baby as someone with feelings and needs of their own – that the baby has a 'mind'. From this sensitive beginning of understanding the individual needs of the baby, there is also born the beginnings for the baby to have a mind of their own and the knowledge of whether they are loved.



### Brain links – mirror neurons

The accidental discovery in primates of 'mirror neurons' was a breakthrough in considering if there was a 'brain basis' for imitation. These particular cells 'fired' when the monkey watched someone – or another monkey – picking up a peanut for example or eating an ice cream. The crucial point is that these brain cells did NOT react if a tool was used for the same action or if the hand/paw did not come into contact with the object, in other words they were specific to animal/human paw/hand activity on an object. Similar mirror neurons have been found in the human cortex, which respond to vision, the senses and movement.

### Exaggerated faces

Humans love faces and as Orson's mother responds by copying his facial expressions in an exaggerated way, he is helped to 'pull together' what his inner feelings and the feelings he gets from his facial expressions in response to her all mean. The brain organises and stores away these sensations so that when we do them again, they feel familiar. We begin to know what they are. We seem to have six basic emotional states: fear, anger, joy, surprise, sadness and disgust and we also seem to react and respond to them very quickly – in fact we process the emotion on a person's face quicker than we do that it is a face we are seeing and whose face it is! By 10-12 weeks babies can recognise their parents but are still a long way from realising that they exist when out of sight – which also shows how important it is that parents respond to babies!

## Summary 1 to 3 months

- ♦ **Newborns 1 to 5 days old have demonstrated an ability to tell the difference between different speech rates**
- ♦ **Rapid brain growth especially in visual and auditory systems**
- ♦ **Babies can imitate but enjoy and welcome imitation of their actions**
- ♦ **Will respond to familiar sounds by shifting eye gaze and head movements**
- ♦ **Vocalisation in response to speech**
- ♦ **First experiences of and reactions to the emotional quality of their experience/environment – how carers respond to their needs especially distress**
- ♦ **Visual interest for faces moves from outline of face to centre and from mouth to eyes**
- ♦ **Colour vision is in place by 3 months although still needs 'fine tuning'**
- ♦ **Very young infants are noted to have long periods of 'staring' – a period of 'sticky fixation' – see notes above**
- ♦ **Establishment of physiological rhythms (sleeping, feeding, temperature control, heart rate)**
- ♦ **Sensory experiences gradually become more refined**
- ♦ **Behaviour reflexes gradually integrated into more pro-active behaviours e.g. – startle reflex absent by 3-5m and replaced by adult type 'startle'**

## Reaching Out

### 4 to 7 months

This is a lovely phase for babies – they have begun to settle down into a broad routine. They are learning that their needs are being met and they are stronger physically, holding up their heads and being able to co-ordinate their movements much more smoothly. They are now confident to reach out both physically and mentally. Vision is more acute, they can see in colour, and the baby's repertoire of signals is increasing. They can also begin to reach for an object rather than having it handed to them and as Robinson (2003) says, the 'world is expanding for our new baby'. As the months go by, the baby is learning to co-ordinate mouth and tongue movements and gradually reach, grasp and bang objects. There is frequently a real shift in both sleep and crying patterns too. As the baby's physiological needs have adjusted to life outside the womb, it can now get on with finding out more about what's out there!

### Strength, co-ordination, space & movement Interest in objects, reaching & grasping

The co-ordination that the baby is achieving is really spectacular from those unco-ordinated movements in the first weeks. Babies like Orson can now smile, reach and listen all at the same time. By about 15-17 weeks a baby can reach for a moving object and make adjustments to their movements to where the object might be. By around 6 months, babies are great 'explorers' and will want to reach for almost anything they can. They will turn objects around, taste, smell and feel with delicate hand movements.

In addition, babies are also finding out about their bodies because as they move more, reach and grasp, including beginning to grasp their feet – their brains are 'wiring up' a map or 'representation' of their body. There is a 'representation' of the body in the brain but we still have to find out for ourselves the association of each bit with every other bit. The basic sensory/body map in the brain adapts to the kind of experience each baby will have. If we play finger games or toe games with babies we are also helping this mapping. As babies watch their own hands and feel their feet, they are also getting the sensation of 'my hands', and 'my feet'. The latter is especially important for walking as when baby takes its first steps in a few months time, the baby will need to feel its feet and the brain will recognise it as 'my feet on this ground'.

From about 4 months onwards, some babies will be able to find a partly hidden object but not if it is totally hidden – not yet!





## Feeding, new tastes & textures

Weaning is one of the big landmarks of this phase as babies learn to use their tongue and swallow differently. Changing from liquid to more solid food is a delicate process, which takes time and careful observation of the baby's needs. Babies often reject a new taste but a re-introduction of a taste later on will help the baby get used to a variety of textures and flavours. Babies find feeding time exciting and stimulating and will want to feel as well as taste these new foods and it will be a time when a baby's increasing vocal ability will be well to the fore.

Of course, sometimes it is difficult for parents when babies want to take their time with their feeds and as they get older, want to explore those textures in very messy ways. It is always easy to say, but it is important that as much as possible, meal times do not become 'power struggles' between baby and parent/carer. Babies don't understand time nor your needs to get onto something else or be somewhere else soon. In fact the more stressed you become, the more stressed they are and so a vicious circle gets established. As far as humanly possible in today's rushed lifestyles, parents and carers need to see meal times as part of the day where time is needed and that it is important and worthwhile, not something simply to be 'got through'. Easy to say – not so easy to do...

How successful weaning/mealtimes will be will depend on how parents and carers respond to the baby's cues. By 3-4 months most babies will take an interest in what others are eating and also want to communicate with the adults around them. Babies like communication, they like human voices and being responded to. Meal times are a wonderful opportunity for communication and for baby to practice these skills of reaching and grasping, holding and tasting.

## New noises, laughing, games & gestures

Communication is the stuff of life for babies and all the care routines and feeding times are all golden opportunities for such communication as are games combined with singing or just singing to baby on its own. An important point to remember is that a baby only knows how the adult is responding to them at that time – a baby cannot rationalise why an adult may not be responding to them by talking to them, smiling or playing. They only know what they experience and it is their experience that is shaping their brains and their emotional world. It is through these first interactions that a baby's first view of the world is shaped and as the weeks go by their opportunities further this exploration by being given cuddles, being talked to, played with, provided with things to bang, shake, feel, taste, grasp, new textures and tastes, being rocked, lifted and held. These are all the pre-cursors to later development, their future learning and ways of relating.

## Attachment, feeling safe & secure

According to John Bowlby, the 'father' of attachment theory, the formation of 'attachments' is primarily a biological necessity, common to many animals. It is fundamentally a child needing to be close to their carer in order to provide a 'secure base'. Attachment behaviour is activated by 'internal/external stressors', e.g. feeling lost, lonely, afraid or being physically separated from the carer and as babies

approach the 7-8 month mark, they are firmly establishing who are their 'familiar people' and also who is the most important to them when distressed.

The particular quality of attachment of any child to their carers will depend on all the interactions that the baby has experienced from birth but ultimately the function of the formation of attachments to primary carers is to help the child construct their 'internal working model' to use Bowlby's term. It is this internal working model which provides the child with their first understandings of safety and security, closely linked to the child's internal feeling state, i.e. one of general contentment versus general anxiety or fear or distress – which is the type of feeling we all try to avoid.

## Summary

- ◆ **Emergence and development of selective attention with emergence at 3-4 months of controlled 'scanning'**
- ◆ **Ability to more easily switch attention from one focus of interest to another emerges between 3-4m and vision at 3m also more acute.**
- ◆ **Greater upper body control - can hold head up when in prone position and by six months when in this position takes weight on the hands and is almost ready for crawling**
- ◆ **Rhythmical kicking when supine and can begin to weight bear at around 3 months when held in standing position (emergence of first postural reflex)**
- ◆ **General inhibition of early 'primitive' reflexes, e.g. rooting reflex usually diminished by 4 months**
- ◆ **3-4 m emergence of laughter – often combined with rhythmic leg movements**
- ◆ **Rolling from lying on back begins to appear between 3-5m**
- ◆ **Ongoing brain maturation/surge in synapse formation in some brain areas e.g. vision – 4m appears to refine depth perception and binocular vision**
- ◆ **Emergence and development of turn taking/'proto conversations' and cycles of activity**
- ◆ **Specific emotions become clearer with joy differentiating from contentment and sadness and anger from general distress**
- ◆ **Increasing sociability and expression of feeling states through facial expression, bodily movements, vocalisations**
- ◆ **Increasing curiosity allied with growing motor and visual co-ordination**
- ◆ **Turns to familiar sounds and can match pitch by 6 months**
- ◆ **Shouts to get attention from 6m**
- ◆ **Expects mouth movements and sounds to synchronise**
- ◆ **Shows signs of understanding words at 7-8months**
- ◆ **Episode of 'compulsive reaching' between 6-9m and child uses a 'raking' motion to bring objects into the hand – prior to the development of the pincer grasp**





## Exploring from a Safe Base

### 8–12 months

This final part of the first year of a baby's life sees some of the most exciting, fascinating and important emerging skills and abilities in most babies. Many babies are beginning to be mobile by either crawling, shuffling or even trying to walk and this means that their safe and secure person(s) becomes even more important as they gradually extend how far they are prepared to travel. For a baby moving from kitchen to hall is an exciting and novel prospect.

#### Object permanence, social referencing, stranger anxiety, pointing, firming of attachment

The emergence of shared interactions and social referencing is closely linked and timely with the emergence of the baby's ability to point. In the early weeks and months of life, the baby is in virtually constant contact with its carers. During this time the baby will not only have strengthened the **attachment** relationships with its carers but the carers will also, instinctively and naturally, have been pointing out objects of interest, calling the baby's attention to events, other people and pets etc. In the meantime the baby is gradually gaining more control over gross and fine motor movements, vision, working out where sounds come from and general mobility.

During this particular phase, there is also a surge in brain activity and all these factors combine to produce a truly wondrous shift in the baby's understanding of themselves and other people. The baby realises that it can draw someone's attention to something that it is interested in and uses its new found skill of **pointing**. It points in one of two ways. The first is *imperative* pointing which means 'I want' and the second is *declarative* pointing whereby the child points to something of interest in order to draw another's attention to it such as a pet, bird, balloon etc.

This ability to point to something the baby wants to share with another is also linked to **social referencing**. This is when the child looks to the carer to assess their response to a new person, toy, event and so on. This provides a link between what the carer feels and what the child then might feel. The child's sense of self is beginning to emerge and it is a sense of self which is changing because it is not only built on the type and quality of the relationship between the baby and carer, but also of a growing sense of a separate identity. It is perhaps no accident that this shift towards social referencing and sharing of information also occurs with the emergence of '**stranger anxiety**' which incidentally appears to relate more to adult strangers than other babies or children. At the same time 'language' is emerging through tuneful babbling which is in the rhythm of the home language.

All this also coincides with infants beginning to develop the concept of '**object permanence**', i.e. something out of sight still exists. This is when babies enjoy the endless

game of throwing things out of their pram or high chair and begin to look for it and wait for you to give it back to them, over and over again. This is how a baby practices a new found understanding – repeating an action over and over helps form the particular wiring pattern for that activity. Repeating these patterns of behaviour in different situations is often termed a '**schema**'.

Another shift which began around 6 months of age, is towards much more purposeful action and babies like Orson seem to begin to understand that there is a goal or intention to people's actions. This ties in very closely to all these other really important shifts in development which also imply a surge in brain growth and memory. Even something as simple as the game of 'peek a boo', with its links with something being there when out of sight – and being the same object, is one which provides, through this simple procedure, a link between emotions and the learning of concepts.

### Summary

- ◆ **Recognising faces is much better now**
- ◆ **Babies babble in the rhythm of their own language**
- ◆ **'parachute reflex' usually appears around 8-9m and fully present by 12m – the last 'postural reflex' to occur.**
- ◆ **Earliest emergence of 'mark making' i.e. through hand movements on tables with available resource, e.g. food!**
- ◆ **Expansion of sensory world through greater mobility and introduction of new tastes, smells via weaning**
- ◆ **Able to localise source of sounds from behind**
- ◆ **Can cross midline of body, i.e. able to transfer objects from one hand to the other, and thumb/finger pincer grasp develops between 7-9m**
- ◆ **Emergence and development of shared interaction/social referencing**
- ◆ **Emergence of declarative (Look) and imperative pointing (I want) – often linked with vocalisations which appear important for later development of speech**
- ◆ **Imitation becomes more pro-active and baby relates some gestures to appropriate context e.g. raising arms to be picked up, waving bye, bye**
- ◆ **Ongoing brain maturation – evidence of ability to remember location of hidden objects – beginning of concept of object permanence**
- ◆ **Emergence of stranger anxiety and discrimination of attachments**
- ◆ **Increase in mobility – crawling, pulling to stand, first steps (for some)**
- ◆ **Increasing sociability and expression of feeling states through facial expression, bodily movements, vocalisations**
- ◆ **Increasing curiosity allied with growing motor and visual co-ordination**



## Discussion points and Questions

What might be the effect on a baby if he is not soothed when crying?

Do you think a baby can feel lonely?

Is a bed time routine important for a baby and why?

Why do adults change the way they speak when talking to babies?

Why might imitation be important for a baby?

Why might someone ask you to 'smile' when you are feeling sad – what might this action do to your feelings?

What do you understand by 'attachment'?

Why is responding to babies important?

Why is talking to babies important?

What sort of experiences might a baby need to help them explore when aged around 8 months?

What kind of games can you play with a baby around 6 months?

What is 'declarative pointing'? What might this mean for a baby's development?

What is 'joint attention'? Why might this be important?

What is 'social referencing'?



## Transcript of film commentary

The interview with Maria Robinson is in italics

### Introduction

This film follows the journey of Orson during his first year of life. It is a fascinating journey and shows just what an amazing amount of change and growth occurs during this special time. While we humans continue to change, grow and develop in all sorts of ways throughout our lives, the change in our earliest years is the most profound and rapid. It is the time when we begin to find out who we are, about relationships, to move and explore, to discover our environment – and what we will also find out, is that the greatest support for all our learning is the loving attention of our caregivers.

Now, let's meet Orson, who's just arrived in this world. As we follow him on this special journey we'll show you how Orson and his family learn about one another, how he learns about his world and – most magically, how his experiences will literally and uniquely shape his brain.

*'Why are we as babies born so helpless and vulnerable, and one of the answers that's sometimes given is a physiological one which is that if our heads were any bigger then we wouldn't actually be born the way we are naturally. But that still doesn't answer why, over the millennia of evolution, do we remain so helpless and vulnerable when we're born, and perhaps the answer lies in the fact that we are such social beings, because that ensures that we do have a relationship right from the very beginning with someone that's going to talk to us and be with us and help us.'*

### What can Orson do at birth? - Reflexes, new faces & familiar voices

Although he is totally dependent on Mum and Dad, he's born with behaviours that help to ensure his survival. Part of the brain, the brain stem, is already wired and although fragile, it allows Orson to react automatically. It regulates core bodily functions like breathing, heart rate and temperature. Orson also has a number of reflexes. Look how he reacts to mum when she strokes his cheek. He turns towards her breast and opens his mouth. This is the routing reflex. Orson flings out both of his arms when he feels like he's going to be dropped. This is a reaction to danger called the startle reflex. He can suck strongly. Along with other reflexes they are all basic survival mechanisms and arise from when Orson was in the womb as various neural pathways were being laid down in the brain. He just reacts automatically to information he receives from his senses.

His five senses are how he experiences the world. He can already differentiate tastes and his sense of smell is very well developed. He's very sensitive to touch and can feel pain. Loving touch actually helps his development. When he's held in dad's arms it's safe and warm, he can relax, his breathing deepens and their heart rates even synchronise.

This is Orson's brother, Seb. Humans are social beings and babies are born with preferences that help ensure they have social interactions right from the start. Orson can hear well and likes the sound of human voices, he prefers the frequency of the female voice the best. He's become familiar with his family's voices in the womb, especially mum's. He also has visual preferences, he likes moving objects and loves looking at faces and making eye contact. Orson is perfectly able to focus on Dad's face at this distance. He is absolutely transfixed. Dad is equally interested in Orson's face. So babies are born with inbuilt behaviours and are primed for social interaction and as long as he has mum and dad to help him he has the means to survive.

### How experience helps shape his brain

Lets find out a bit about how the human brain develops. Unlike the wrinkled cortex of an adult brain, a newborn's cortex is relatively smooth. And then the baby's experiences shape the brain in the first three years to the extent that the early cortex is not big enough to contain all this growth so it has to crinkle up to be able to fit in the expansion; consequently the head grows rapidly in size as well.

So how do experiences shape the brain?

*'Now the thing about our brains is that they're made up of a hundred billion brain cells that are called neurons and when a baby's born we have all these in place but not many connections between them. When the baby's getting all*





*this information from its senses what happens is that the neurons start to get this information from their receivers – its gets transferred into an electrical impulse and then the information gets passed down the axon - it gets sent to the next neuron by chemical messengers because there's a tiny little gap between each of the neurons called a synapse and then the next neuron gets this information. Those connections that we don't use seem to actually get pruned away. The experiences dictate how the brain itself is organised. Those familiar experiences become like well worn pathways through a wood so the brain cells start firing more strongly because they've had that information before so it helps the baby to begin to sort out what's happening in its world through this chaos of information, through all its senses.'*

#### **Early experiences, care routines & socialising**

Physically Orson has little control over his body, he's totally dependent on his mum and dad to feed, change and make him comfortable. His head is floppy and he moves his arms and legs constantly. Because he's so helpless he needs a lot of looking after and it is the every day care routines that provide perfect opportunities for learning to communicate and socialise.

Feeding times are filled with rich experiences for Orson. As well as satisfying his hunger, the sucking action soothes him. All of his senses are stimulated - he is touched, he can taste and smell mum's milk, he can see her and make eye contact, she talks to him. All of these experiences are linked with his mum and the repetitive nature of feeding, and all care routines, means that strong connections are being made in Orson's brain.

*' Everyday routines are really crucial for babies because they provide a way for the baby to sort out the information that's coming in an almost chaotic fashion. So when the baby gets a routine that happens over and over again it becomes familiar. They're wonderful opportunities to reinforce those relationships as well as sorting out the physical care that the baby needs as well.'*

Here's a reflex smile. He's feeling full, warm, comfortable and secure. His muscles relax. Mum responds immediately smiling back, sharing the moment.

She's really beginning to understand some of his signals. She's found that when he's dirtied his nappy he wriggles and squirms with discomfort. All babies are different and working out their signals means that mum can interpret these and give babies what they need. In this way, babies like Orson will begin to trust that when they are uncomfortable, distressed or bored someone will sort it out quickly.

Watch closely here: Orson rubs his eyes, a signal for being tired. Dad misinterprets the signal and Orson starts getting distressed. There are only short periods at this early stage where Orson's calm and alert and ready for interaction. Babies can easily become over stimulated and attempting to interact with him when he's not in this calm and alert state just distresses him more. Dad soon works it out. He cuddles him securely and Orson relaxes.

Sleeping takes up most of Orson's time at first. At this age he's sleeping about 19 hours a day. He doesn't sleep through the night yet and only gradually will he be able to. He is born with a biological internal clock that is affected by light and temperature. This 24-hour body clock gradually synchronises with day and night and he begins to sleep more when it's dark and cool. His sleeping routine will be encouraged by his parents helping him go to sleep by using soothing routines like, holding or rocking. He will also be sensitive to the sleeping routine of the rest of the family. If he has a regular night time routine, it will help him to establish a good sleeping pattern. His brain will make strong connections and fire along certain pathways associating soothing with sleep. He's learning, sorting out his experiences through consistency and repetition.

Crying is the most obvious means of the baby's communication. Most adults want to stop the crying immediately so it's a very effective way of getting help. Crying increases from birth to about two months and then gradually decreases at three to four months. The more quickly Orson's cries are responded to the easier it is for him to learn that he will have things sorted out for him. Babies who have their cries responded to quickly tend to cry less in the second six months of life.

As soon as Orson hears mum's voice he stops crying. He's already learning that mum's voice means he will get what he needs.

*'We're born with feelings. Babies feel; they can feel sad and I'm fairly sure that they can feel lonely. They can certainly*

*feel cross, distressed and of course the important thing is that they just feel and they can't actually manage their own emotions at all. They need their adult carers to do that for them.'*

When babies' cries are responded to quickly and their needs are met, they get used to having their stress and emotions regulated for them. There is a biological response that's triggered by fear, anxiety, or hunger for example. The body instinctively releases a chemical called cortisol that increases the heart rate and blood pressure so that it's ready to respond to difficult situations. At the same time as increasing the heart rate cortisol shuts down functions that are not needed in a crisis. This is good in small doses to get you out of danger but if the brain is exposed to high levels of cortisol over an extended period of time it causes stress. So when babies' cries are responded to quickly their cortisol levels can return to normal and the parts of the brain that were temporarily out of action can start working again. How they are responded to at these times shapes the developing brain, programming the way they will interpret and respond to stress in the future. At this stage Orson's mum and dad are vital to him for regulating his emotions. Slowly, as his brain develops, Orson will be able to use this experience as a model to start regulating his own emotions.

#### **Communicating, babbling, smiling & copying**

Orson's beginning to get involved with the family's routine. They all sit around the table at mealtimes and Orson can listen to the family talking. From birth Orson has sought out the sound of mum's voice. This combination of hearing her voice and looking towards her face has encouraged each of his eyes to work together and this tracking behaviour enables his vision to become more accurate.

He turns away when she stops talking to him and he immediately turn to her when she calls his name. When mum talks to him they look at each other on the mid line, or face to face. Looking at her face straight on helps his brain locate where sounds are coming from because the sound is coming to both of his ears simultaneously. He's now ready to communicate in more complex ways. He's recently discovered he can smile and make new noises. It gets a great response. Mum loves it and smiles and chats back. This positive response to his actions encourages him to do it again. Mum pauses to let Orson reply and a turn taking conversation has begun. This is the beginning of language development. Being spoken to and listened to is vitally important but even more important is being responded to. It's not just about talking to the baby but rather responding to the baby's cues.

Now Orson's eyes can focus further he can look more carefully at the objects he's interested in. Mum responds recognising how he has a mind with interests, so she talks for him.

*'One of the wonderful things that adults do when they talk to babies is they almost instinctively seem to adjust their voices to this musical way of talking to babies. For example, it's like "hello – how are you? – aren't you gorgeous? – look at you – aren't you the most beautiful baby?"' if you listen it's like " hello how are you . What you can hear is that you start to exaggerate the vowel sounds.'*

These things make it easier for Orson to pick out individual sounds and the vowel sounds are the first sounds that Orson will master.

A similar thing happens with the face.

*'What you probably noticed as well when we were talking about the wonderfully exaggerated way of speaking is that you also exaggerate the facial expressions when you're doing it, so what you find is you'll say "hello " and your eyebrows will go up and your eyes widen and any smiles that you do will also be really exaggerated and this of course helps babies begin to copy and they begin to start to get a sense of the feeling with their own facial expressions because if the baby smiles for example, the carer smiles as well in a more exaggerated way. The baby will smile and they'll go "oh look at that", so you get the whole exaggerated voice, exaggerated facial expression, which really helps link the facial expressions and the feeling inside as well.'*

So mum doesn't just talk to Orson - she listens, looks and then responds, helping them become attuned to each other. They are entirely synchronised in vocalisation, mimicry and emotion. This is also the fundamentals for reciprocal love. So Orson learns that he is lovable and that his mum appreciates his love for her too. He's getting an idea of what it feels like to be with mum and what she's like. When he smiles she smiles back, when he chats she chats back. If he's uncomfortable she'll make him comfortable. Mum and dad's warmth and their consistent positive responses to him are incorporated into his brain, so the sense of "being him" and that this means being secure and loved, will be something he will retain for the rest of his life.



### What have we seen so far

In these first four months Orson's brain is growing very quickly. His reflexes have helped his start in the world and his brain has been busy soaking up information through his interactions with his close family. It is because of this type of learning by experience that Orson can develop the skills necessary for his survival as a social being. The neurons have made millions of new connections and groups of neurons that have fired repeatedly will begin to lay the foundations of strong pathways. These pathways are laid down as Orson makes connection about the way things happen as they are repeated over and over again. His experiences so far have been mainly from interactions with his mum and dad as they have changed, fed, soothed and played with him. His needs have been met when he behaved in certain ways, he has had frequent face-to-face interactions and he's now gradually experiencing what emotions feel like. He's been cared for lovingly, kept safe and secure. He's learning to trust that his needs will be met. He's slowly learning that he can affect what happens to him. He's also developing physically and these new skills, together with his increasing brain function means that he can begin to learn from new sorts of experiences.

### Reaching Out

#### 3 to 7 months

What happens during the first few months of life is that the baby is settling down to life out side the womb. He's learning that his basic needs will be met by the people around him. If we think of Maslow's hierarchy of needs it's as if his physiological and safety needs have been met and so now he can start reaching out further into the wider world and explore his surroundings and get to know his carers even better.

### Strength, co-ordination, space & movement

By 4 months Orson's movements are becoming more co-ordinated. Physical development has a strong innate biological time frame. But each milestone depends upon the previous one being in place. For instance to be able to lift his upper body he must be able to hold his head up. So mum gives him lots of encouragement and opportunity to practice.

Dad copies Orson's movements. By playing games he's learning about the different parts of his body so that he knows where bits are in relation to each other.

Orson is now really confident at keeping his head and upper body up and can now start concentrating on physical skills further down the body. Sitting up involves balancing and he'll have a few tumbles before he can manage it confidently. Gradually his actions are becoming more integrated. Here he can look at his mum, pull his body up and smile all very smoothly. Now he has more control of his upper body he can combine this with leg movements to start moving around. He needs repetition to learn about muscle sense, joint position and movement. The constant repetition of a task co-ordinates his sensory motor development. The density of neuron connections increases. It's this sort of learning through repetition that strengthens the memory for the task, and has a direct effect on the anatomy of the brain's neurons and structure.

### Interest in objects, reaching & grasping

Orson's fine motor skills are also developing and he's beginning to make movements that show a greater degree of hand eye coordination. This is linked to an increasing interest in objects. His vision has also become more sophisticated, so together with muscular developments he's able to start acting on his new found interest. Previously it was the human face that preoccupied him. Now he starts to work on finding out about objects. Choosing what he's interested in is one thing. Trying to co-ordinate what he sees with controlling his hand is an extremely difficult task and again it's through repetition that his visual and motor development will become more accurate.

*'The cells in the brain start to make all these connections and the more familiar anything becomes the more efficient that actually happens and we can see that in the film with Orson as he's beginning to reach out you can see what hard work it is for him. As he starts to grab hold of a toy or something and then over time we begin to see that this becomes much more smooth as he's able to reach out and grasp things and this is because what's happening in the brain is that when you're starting to do something, lots and lots of connections are made and then gradually, as you become more efficient, all the connections that are not needed start to get pruned away because they're not used and they're not needed. So that phrase 'use it or loose it' is actually quite true because those connections that we*

*don't need wither away.'*

As you can see, there's much to learn about objects and Orson will spend increasing amounts of time investigating them. They often go straight to his mouth, as this is the area with the most sensitive receptors.

While he's trying to manipulate objects they often get dropped. When they disappear, as far as Orson's concerned they cease to exist, so he doesn't look for them. At this age he can't understand that he just can't see them. He has a lot to learn about objects yet.

### Feeding, new tastes & textures

Now he's about to start trying new foods with different textures. He's already shown an interest in what other people are eating as he sits, watching family meals. First he has to learn to use his tongue to swallow differently. The success of enjoyable meal times both now and in the future will depend a lot on the approach to feeding and meal times. Happily for Orson, it is a relaxed time where he has opportunity to feel and taste the food in his mouth.

Babies are born with likes and dislikes when it comes to taste. This can be from being exposed to certain tastes in the womb, but also because the number of taste buds can vary from person to person. Some people will happily eat anything, while others are very sensitive to strong tastes and certain textures. Babies can't be forced to eat but a relaxed approach to feeding introducing new tastes and textures sensitively will help enjoyable mealtimes.

A month later and Orson's getting used to eating solid food.

He grasps the spoon "I can do it myself!" Feeding time can often become a power struggle when the parent can't contain their anxiety about mess or stress about the length of time feeding can take for a little baby.

We've seen how important feeding has been to Orson for social interactions. It's much more involved than just being fed - it involves eye contact, talking and communication in general. Being sensitive to the baby's signals when feeding will make it easier to work out when they are full.

Mealtime will continue to be a rich and powerful source of experience for his emotional and social well being, as well as for his senses and levels of nutrition.

### Communication, new noises, laughing, games & gestures

Orson's relationships and communications are advancing rapidly and this is affecting his developing brain. The interactions he has influence the neural connections made and these are now being made at a massive rate, particularly in a part of the brain called the pre-frontal cortex. This area of the brain deals with more advanced behaviours including managing emotional behaviours and responding to the emotional cues of others. So it's really important for social situations allowing Orson to understand others more clearly and to adjust his behaviour to fit the situation. Its development is most rapid from about 6 months to 2 years and is almost entirely dependent on experience.

Mum's interpretation of his expressions and vocalisations really help the development of this prefrontal cortex. The way she interprets his behaviour influences his response. Rather than smiling at any adults face, smiling has now become specific and personal and is now a response to communicate a pleasurable emotion. Orson can now laugh. It begins as a cross between a frightened cry and a smile. When mum throws him in the air, he sees that she's smiling and is to be trusted. So the wail combines with smiling to produce a laugh.

The game of peek-a-boo involves mums disappearance and sudden reappearance. The suspense and surprise can be both exciting and upsetting. Orson squeals with delight. The repetitive nature of the game encourages turn taking mum hides and appears, Orson responds and then they repeat the sequence. This is also the way conversations work. Playing games is an excellent way for Orson to learn.

Watch how mum copies Orson's position so letting him know that she's very interested in what he's doing, at the same time as smiling and talking about it. She's mirroring him physically and emotionally. As Orson struggles to stand, mum's voice goes lower, then raises when he succeeds. Her sensitive reactions to him, corresponding with his own behaviour, help make him feel understood.





*'Through interactions, through playing games, babies can have these lovely feelings. The chemicals in the brain that are to do with positive feelings almost bathes the whole brain in it and actually it helps forge these really positive connections through all the parts of Orson's brain and for any baby really these particular sorts of interactions are so important to them so they get to know the feelings which are positive feelings and they're the ones that they begin to relate to their experiences and helps them begin to understand what their world is like. It's not going to be all positive of course, but what you hope is that most of the time Orson, and other babies, are going to be receiving positive communications in response to the way they're reaching out to their carers.'*

As well as hearing the sounds and intonations that mum makes he's now experimenting with more sounds himself. As we've seen, his babbling started with vowel sounds, now he's beginning to use consonants. He makes BA BA sounds and mum repeats them. At this age there's lots of games that mum can play with Orson to encourage his communication further. He likes musical rhymes and this together with his increasing control over his body makes this very exciting for Orson. He's enjoying the way mum plays with him so much that he's learned how to tell mum that he'd like to do it all over again. She gives him plenty of time to answer and take the initiative.

It's the repetition, rhythm and rhymes of the games, the pitch of mum's voice and her expressions, the excitement and anticipation of what's coming next that makes these interactions interesting to Orson, motivating him to listen and join in. The linking of all modes of communication - vocalisations, eye contact, gestures, facial expressions and actions all come together for Orson as he takes in the emotional feel of the interaction. Information from all of these experiences arrives in the brain at different speeds, emotional information being processed faster than cognitive. These games are helping him to get the whole picture and understand how more complex interactions work. The connections Orson makes, help him to bring together his own modes of communication. When Orson lifts to sitting he remembers a game he's played before. He moves back and forth and mum realises what he wants.

#### **Attachment, feeling safe & secure**

*'A crucial thing that happens with a baby's development is that they begin to make a very special relationship with their carers and that's known as attachment and attachment has got a great deal to do with how we feel safe and secure in our environment and it begins right back in these early months of our lives when we begin to make those relationships with our carers and it's specifically about how our carers respond to us and in particular how they deal with our distress. They get to know that someone at some point is going to come and sort them out, soothe them and comfort them and that's how attachment, a biological process really, which is to do with closeness and security, actually begins to form.'*

This secure attachment relationship and advancing development in the brain helps Orson begin to manage his emotions himself. Through the consistent and sensitive responsiveness of the parents Orson learns that it's all right to show his feelings when he's distressed, frightened or angry and that his parents will help him regulate these feelings if they overwhelm him. His pre-frontal cortex learns to control the emotional impulses in a balanced way, so that he can feel his feelings but they won't run away with him. He cries while sitting with his family, they try to comfort him, but he manages it on his own by sucking his finger. Most of the time he's now able to get him self off to sleep. Of course he'll still need a lot of help and support for along time but slowly he'll become more independent and be able to manage more and more situations himself.

At six months although Orson's has a preference for mum he's generally sociable with other people and is happy to be left with a stranger. When mum returns Orson's still happy to sit and play with Alison.

#### **What have we seen so far**

The way Orson is learning about the world is largely mediated by communication from and with his mum and dad. They're communicating with each other in a rich holistic way. This is enabling him to make sense of the varied experiences they've provided for him. They've given him objects to find out about, sensations to experience and varied games to be involved in. He can now sit up, can grasp and is investigating objects and their properties. He's eating solid food, experiencing new textures and tastes. He's forming an attachment to his mum and dad because of their sensitivity to his needs and their caring responses giving him a sense of emotional security. It's the repeated day-to-day experiences we've seen with mum and dad that enables the brain to gradually put together all the physical and psychological messages in an integrated way.

#### **Exploring from a safe base**

##### **8 to 12 months**

In the latter part of the first year we're going to see some really special skills and abilities emerging - some very fundamental changes are going to happen. But it's important to remember that all these changes are built on what's gone before. The changes we will see are related to further growth in the brain.

#### **Myelination, emotions & learning**

*'The neurons work on electrical impulses and they are designed in a very special way. They have receivers at the top of them and they have what's like a tail which is the sender of information. What happens over time, at different rates in different parts of the brain, is that those tails - those axons start to develop a little fatty sheath that helps the information go down them much much faster. This means that information is processed more quickly and it takes time for this process to happen. This explains why it takes children and babies often a long times sometimes to actually process information that they're receiving - and then respond.'*

A surge in this myelination process means Orson is beginning to react and learn more quickly. But his emotional state also influences his reactions. Emotions are intrinsically linked to learning. We heard earlier about the chemical used in the brain called cortisol and that in a crisis it shuts down functions that are not needed. Well this includes rational thinking and memory, so when your feeling stressed it's much harder to take in new things. You have to be in the right state of mind to play and learn. So regulating emotions is vital for enabling positive learning.

Orson's positive and happy here and in a good state to concentrate and learn. He's now able to sit unaided. He's starting to be able to grasp much more easily and is becoming highly motivated to find out about objects. He spends much time experimenting to find out about the physical world around him. His basket is filled with everyday household objects. He's still using his sensitive mouth together with his hands to find out all he can about the objects. That makes a good noise. This doesn't make a noise, lets put it down. This makes a crackly noise. It looks interesting. It feels smooth in my mouth. That ones soft. The other end's hard. He uses his eyes, hands and mouth to compare their properties, and work out what can be done with them.

#### **Communication, joint attention & gesturing**

Communication between mum and Orson is getting more complex. Because she knows him so well she picks up on all of his movements and notices the way he uses his hands to indicate his interests. Orson sees and hears the way mum points out and names things. He's getting to enjoy looking at books with her.

Orson is now nine months and he's just acquired an important new skill. Previously he could only concentrate on one thing at a time. When he was looking at the book he couldn't turn and glance at mum - now he can divide his attention. Mum talks about and looks at dad. Orson follows her gaze and checks back with mum - this is called joint attention. He's realised that mum can be looking at the same thing as him. The developing cortex is processing information from the eyes allowing Orson to follow another's gaze.

As both Orson and dad look at the ball he's now able to ask him to do more bouncing by gesturing with his hands.

Gesturing with hands will be crucial in learning the names of things. His hand out gesture has developed into proper pointing. At first he uses this to point at things for himself. When he points to the sponge mum names it, shows him what it can do and then gives it to him. He'll use pointing increasingly to get what he wants and find out the name of things. He's getting the hang of some of mum's gestures. In the past his brain has become used to her hands out gesture leading to him being picked up. Now it's a sign that Orson understands and can reply to.

#### **Object permanence & separation anxiety**

As we've already seen babies often use repeated behaviours when they're playing and experimenting. Orson would often grasp and mouth things to find out about them. He'd repeat the same grasp and mouth action with different objects. Piaget called these basic patterns of movement schemas.

*'A schema seems to be a pattern of behaviour that children do over and over again often in slightly different ways in*



*order to help them really understand a concept that they're trying to learn to get hold of. For example one thing that happens in this particular age range is that children suddenly realise that something out of sight still exists so that what you find is that they'll drop something out of their pram say, or the highchair, and they will actually start to look for it. And then somebody will pick it up and then they'll do it again and look again. And they'll do this over and over again because they're beginning to try to establish that the thing they dropped and the thing that comes back on to their table is actually the same thing.'*

Orson's begun to grasp that when things are out of sight they do still exist. As we've seen before it is the repetition of skills that builds the brain and prunes out the now unused sections and strengthens others. Here, just a month ago, as he watched mum hide his ball, he had no concept of where it had gone. Now it's clear that he's worked out that objects are permanent. Piaget called this concept object permanence.

This expands as Orson realises that it also applies to people. This cognitive development is strongly linked to his attachment behaviour. Orson is starting to show separation anxiety. Mum's disappearance here is a clear illustration of his strong attachment to her as he now shows separation anxiety when left with a stranger. He knows now that when mum goes out of sight she still exists and he wants her back now, she makes him feel really safe and secure. He has built up a memory of mum as a familiar and safe person and is able to distinguish an unfamiliar face.

*'Babies actually begin to realize that they've established who they feel safe and comfortable with, who's their familiar person that makes them feel good inside and they're beginning to discriminate between those people that they know very well and people that they perhaps don't know quite so well. They start to react to those unfamiliar people – perhaps crying, or a bit of distress or a show of anxiety which doesn't settle until they're held in the arms of the person that they feel comfortable with, and then when they feel safe again, they can perhaps turn to that person and start to interact with them. They're beginning to realize who they know and who they don't know.'*

As the secure attachment relationship between Orson and his mum becomes solidified the connections in the pre-frontal cortex reach their highest density. This brain maturation coincides with physical advances. Now that Orson is fully mobile and knows that mum always exists he's at a stage when he's often reluctant to let her out of his sight. She's very much his secure base from which he explores and learns. She helps him calm down so that he can play and concentrate again.

Even here, when he's left with dad to whom he is also attached, he cries when mum, his primary attachment figure, leaves him. There's a hierarchy of attachments and at the moment if she's around he wants mum, who's top of the tree.

#### **Gestures, social referencing & empathy**

In just a month Orson's use of gestures has become more sophisticated. He's using his hands to gesture in increasingly conventional ways. He knows that when dad leaves and waves goodbye that he should use his hand to wave back to him. At around six months, when Orson put his hand out to reach for something, it let mum know what he was interested in. She could then help him get what he wanted. Orson has now modified that hands out gesture into a point. It's much more precise and mum gets him what he wants.

Now that Orson knows that mum can attend to the same thing as him, he is able to use his gaze to check with mum that what he is doing is OK.

He looks at mum to check how he should respond. This is called social referencing. When he explores, he uses mum as a safe base checking back to see whether it's safe.

He's beginning to learn what 'no' means. He throws down the leaf and looks at mum to check her reaction. Looking at a book together, he points and follows mum's points as she names things. He looks at mum to check what she thinks.

All these skills are practiced in the context of games and everyday activities. Bath time and bedtime have become familiar routines to Orson and he's able now to identify and transfer his knowledge, making connections with past experiences.

Mum still feeds his facial expressions and moods back to him, and the connections he makes linking a particular facial

expression with a feeling will be getting stronger. By acknowledging and naming Orson's feelings Mum tunes into him making him feel understood and loved. Gradually this enables his brain to create a kind of visual library of facial expressions, which are connected to the emotional feelings and what they're called.

Orson is becoming increasingly responsive to other's expressions. Here they are all happy and laughing, then Seb bangs his face on the guitar. The mood changes. When Orson turns round to look at James he sees his concerned expression and mirrors it, turning to looking at Seb much more carefully. Watch again as these facial expressions are often fleeting. Although his reaction is still much slower than Dad's he 's starting to be able to adjust his behaviour to fit the situation. This process may help to explain how Orson can become influenced by the moods of others. If those around him have a happy face he will feel the same. If he sees they're frightened for example this mood will transfer to him. This also works the other way round as people are influenced by Orson's expressions.

#### **Problem solving & schemas**

Orson's behaviour is becoming increasingly purposeful. He can keep two ideas in his mind at once and is able to work out a sequence of events in order to get what he wants. He wants the dog but he can't reach it and mum isn't getting it for him. He deliberately pulls the cloth that the dog is sitting on to achieve his aim. He's solving problems. Orson is learning and making connections all the time. As we've already seen, babies often use repeated behaviours, what Piaget called schemas. Chris Athey followed up this idea and applied it to the way young children experiment and play. Children will focus on a particular theme of actions which are repeated in many ways in the world around them. Orson has become fascinated with a schema of transferring. He's transferring the cotton reels in and out of different containers. He's totally absorbed and working hard. Later he's put himself in the box, then he transfers a smaller box in and out. . Outside in the sandpit he transfers the sand into different cups So schemas seem to be a repeated pattern of behaviours in order to help the child learn a new concept. They begin to get the idea of consistency across contexts. They start to understand that something happens here - and 'ah' it's the same if it happens over there. Here Orson is learning through playing where the central process is comparison, this is the same, this is different, this is inside, this is outside. This constant process of comparison seems to be what underpins the development of cognitive schemas.

#### **What have we seen so far**

During these last few months Orson's internal and external world has become much more complex. All of his developments come together in a rather evolutionary way. He knows now that objects always exist and has been learning about their properties through repeated experimentation and play. He's been learning about his close family from their faces, emotional reactions and behaviour. His brain has been soaking up information, sorting and categorising all of his experiences, helping him to anticipate what's going to happen next. He's linking feelings with behaviour and the emerging realisation that interests can be shared with others, leads to the beginnings of an awareness that there is a 'me' and a 'you'. Because he now knows who's familiar and can be trusted he's become wary of strangers. This happens at the same time as he's become mobile, leading to more exploration and new or maybe dangerous situations. During these times he knows he can look to his attachment figures for cues on how to react. This trust in his attachment figures means he is able to explore further and take in new experiences with confidence. We need our carers desperately in order to learn about our selves and our world.

*'We talk about the individual needs of every child which is absolutely true, but there's still a remarkable similarity between the experiences and the development that we see in each child that every child seems to display at round similar times. So it does seem as if we have this sequence of development which starts off absolutely with babies getting to know about their world outside the womb, getting to know their carers, getting to know their first primary relationships and then they begin to know more about the world around them. We saw Orson reaching out and exploring, and then you begin to see that he was able to be much more sophisticated in how he communicates with his carers. But it's almost as if we need to get that first bit established about how our needs are met first before we can actually move on.'*





## Glossary

<b>Amygdala</b>	An almond shaped structure deep inside the temporal lobe and a few inches from either ear and plays a critical role in processing emotions. Has very strong links with memory and 'higher' regions in the brain
<b>Auditory cortex</b>	This is concerned with processing sounds and is situated in the temporal lobe
<b>Axon</b>	An extension of the brain cell (neuron) that carries messages to the next cell
<b>Basal ganglia</b>	A group of nuclei situated in the mid brain and receives connections from wide ranging areas of the brain
<b>Brain stem</b>	The brainstem is located at the juncture of the cerebrum and the spinal column. The brain stem plays a vital role in basic attention, arousal, and consciousness. All information to and from our body passes through the brain stem on the way to or from the brain
<b>Broca's area</b>	Very important in speech production and lies in the area of the left frontal cortex close to the temporal cortex
<b>Cerebral cortex</b>	The cerebral cortex is the outer surface of the brain and is divided into four lobes, frontal, parietal, temporal and occipital
<b>Cortisol</b>	Cortisol, sometimes called "the stress hormone," is a hormone produced by the adrenal glands which helps to regulate blood pressure and heart function. Cortisol secretion increases in response to physical and psychological stress
<b>Cingulate cortex</b>	Situated in the middle of the brain and to a great extent, surrounds the corpus callosum. Different areas of this structure are connected with emotions, cognition and bodily functions such as heart rate and blood pressure thereby linking thoughts, feelings and bodily responses
<b>Corpus callosum</b>	Is the 'large body' that connects the two halves of the brain and is both a bridge and a 'highway' for information

<b>Dendrites</b>	The tree like extensions of a neuron which are the 'receivers' of information
<b>EEG</b>	Electroencephalographahy is a measurement of the electrical activity in the brain
<b>Emotional regulation</b>	This is the term used to describe how we support babies and young children to 'regulate' their emotions when they are distressed or during play and other interactions to ensure that they do not become overwhelmed by their feelings. With older children the term can be used when supporting children in their learning to deal with their emotions in different situations.
<b>Hippocampus</b>	It is situated in the medial (middle) of the temporal lobes. Strongly linked with memory and has strong connections to the amygdala
<b>Homeostasis</b>	The tendency for the body to want to remain in psychological and physiological stability and much of our unconscious processing of information works towards keeping us in a 'stable' state – although what that is psychologically can vary from person to person. Physiologically it is much clearer (e.g. think of blood pressure ranges, heart rate and human body temperature)
<b>Hypothalamus</b>	It is about the size of an almond and is located just below the thalamus and just above the brain stem – it is involved with the production of hormones and is also involved with sleep cycles, temperature, hunger and thirst
<b>Glia</b>	A type of cell that surrounds nerve cells and holds them in place. Glial cells also insulate nerve cells
<b>Gyrus (Gyri)</b>	The 'hill' on the outer surface of the brain made by the folding of the cortex
<b>Joint Attention</b>	When baby and carer (or any two people) are looking at and interested in the same person or object
<b>Kinetic</b>	Relating to movement
<b>Lateral Geniculate Nucleus</b>	Is part of the thalamus and is the primary processor of information received from the retina
<b>Limbic system</b>	Generally thought of as a group of interconnected structures associated with emotions, behaviour, sensory information



**Mid-brain**

The part of the brain above the pons and below the thalamus, it is the uppermost part of the brainstem, and is involved in basic, unconscious body function. Reference to the 'middle' part of the brain is a less technical reference to those deep structures which lie above the brain stem, enfolded by the cortex

**Myelin**

Fatty substance produced by glial cells in the brain

**Myelination**

The process of producing insulating envelope of myelin that surrounds the core of a nerve fibre or axon and facilitates the transmission of nerve impulses

**Neuron**

A brain cell

**Neurotransmitter(s)**

This is a chemical 'messenger' that carries information from one neuron to the next. Examples include dopamine and serotonin

**Object permanence**

The realisation that something out of sight still exists

**Orbital frontal cortex**

The name is based on its location, which is the very front part of the brain resting on the orbits of the eyes. It is connected with sensory integration, decision making and planning and is still probably one of the least understood parts of the brain

**Pituitary**

It is about the size of a pea and is situated just at the base of the skull. It releases hormones particularly involved with homeostasis and is connected to the hypothalamus

**Pre-frontal cortex**

This is the area of the cortex which is the lobe at the very front

**Reticular activating system**

Situated in the brain stem, this is the name given to the structure involved in motivation and arousal in animals (and humans)

**Schema**

A cognitive framework or concept that helps organize and interpret information.

**Synapse**

The tiny space between neurons

**Social referencing**

A term used to describe how children will look to or 'refer' to their parent or carer in new situations, e.g. if a stranger approaches them, they will look to the parent to see their reaction to the new person

**Stranger Anxiety**

The anxiety or watchfulness that babies show from around 7 months when someone they are unfamiliar with comes near. Note – babies show this with unfamiliar adults rather than unfamiliar babies or children.

**Somatosensory cortex**

Area of the brain that deals with sensory information such as touch, pressure, heat etc. It lies next to the motor cortex. Both sit like a 'hair band' at the top of the brain

**Superior Temporal Sulcus**

Main landmark on the outside of the temporal cortex (of the brain)

**Sulcus**

A furrow on the brain's surface

**Thalamus**

Sits deep within the brain, above the brain stem, and is the 'relay station' for all sensory information (apart from smell)

**Wernicke's area**

Very important for understanding spoken language. Strong connections to Broca's area and is situated in a part of the brain (left) called the Sylvian fissure where the temporal lobe and the parietal lobe meet





## Rerences & further reading

This is a range of reading to reflect different levels of interest.

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