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## Biological Processes Affecting Mental Health

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In this chapter we discuss a range of biological processes and factors which affect youth mental health including attachment, genes and inheritance, the developing brain and puberty. We think about how gaining a better understanding of children's biology can allow you to better support your children's mental health.

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### Attachment

Building strong bonds between children and their caregivers is likely to be the most important factor in protecting children's mental health and wellbeing. Nurturing children through their early years is a crucial but often under-appreciated task. Research shows that attachment difficulties underlie many mental health problems.

Attachment is the emotional bond between baby and parent or caregiver. All baby animals (including our children!) have evolved to attach to their main caregivers to protect themselves from threats. The psychoanalyst

John Bowlby developed the theory of attachment to help explain why infants become so distressed when separated from their parents.

This section on attachment gives a brief overview on the topic. *(Please note, I discuss specific difficulties with attachment in Part 3 of this book.)*

## Why Is Attachment Important?

- **A baby needs a strong and supportive relationship with at least one main caregiver for their healthy development.** The caregiver is usually the biological parent but can be another adult who takes on the parental role.
- **A caregiver meeting a baby's needs is not just about providing the baby with food: it is also about providing emotional comfort.** Important experiments with monkeys in the 1950s led by Harry Harlow, an American psychologist who pioneered work on separation anxiety, which separated baby monkeys from their mothers paved the way for humans developing a better understanding of the importance of early attachment relationships. These experiments showed it is the **sensitive response and security of the caregiver** that are more important for the baby's development than the caregiver just providing food. If the caregiver is sensitive to the baby's needs, and is consistently there for them, the baby will use the caregiver as a **secure base** from which to explore in a healthy way, and then follow a path of healthy emotional development.
- As the baby develops, **they learn they will be supported and contained when they express their emotions, rather than abandoned.** No caregiver is perfect and fully sensitive all the time; but the important thing is to be sensitive and consistent with caregiving most of the time. **Hence, a key part of this relationship is helping children to learn to regulate their emotions.**
- **A secure attachment relationship helps our children to develop emotionally and socially, including in their future relationships.** It gives the child an **internal working model of relationships**, which helps them to develop future healthy relationships.

## Is There a Biological Change in Our Bodies Which Helps Us with Attaching to Our Children?

- **There are chemical changes within our bodies in response to having children.**
- **Oxytocin is an important bonding hormone** produced in the base of brains of new parents. Mothers produce oxytocin in labour, breastfeeding and positive touch. Oxytocin helps with birth, bonding, attachment, trust and social interaction.
- **The more oxytocin produced in mothers, the more attachment behaviour a mother shows**, and the more oxytocin in turn produced by the infant.
- Fathers and adoptive mothers who show attachment behaviour towards their babies also produce oxytocin.

## Are There Different Attachment Styles or Behaviours? What Are They?

- Mary Ainsworth was a skilled researcher and colleague of John Bowlby who looked at attachment behaviours in young children (1). She set up experiments where she separated babies from mothers for a short time. She then came up with **different categories of attachment behaviours** based on how babies responded to their parent leaving the room and then reuniting with them. **She described the following main attachment styles:**
  - **Securely attached** babies got upset when their parent left the room but could still easily be comforted upon their parent's return. Ainsworth found that about 70% of babies showed a secure attachment style.
  - There were the following sub-types of **insecurely attached babies:**
    1. **Anxious** (or ambivalent) babies became extremely distressed when their parent left the room and could not easily be comforted when they returned.
    2. **Avoidant** babies didn't seem distressed when their parent left them, and actively avoided contact once the parent returned.

**3. Disorganised** babies displayed a variety of odd, unusual, contradictory or conflicted behaviour when the parent left them and returned. This style was described after the other two styles above and is more common where the parent has been abusive or neglectful in some way to the child.

- The attachment style of the babies is closely related to relationship patterns in the home. The securely attached children had parents who were responsive to their needs. The insecurely attached children had parents who didn't respond to their needs or were inconsistent in their care.

## What Happens If Attachment Is Not Secure?

- The **caregiver's sensitivity to the child** has a significant impact on the attachment relationship. However, there are also several other factors which affect this relationship, including factors within the child, the parent and the environment.
- **If attachment early in life is not secure, children are at increased risk of problem behaviours and mental health conditions.** This is an important reason why children adopted into the most loving and stable homes are still at higher risk of mental health problems and often need more specialist support to help them cope in the future than those who had experienced secure attachments.
- Attachment disorders can happen when there have been significant problems with the attachment relationship developing (*see Chapter 19 in Part 3*).
- **If a child develops a strong internal working model of relationships, they have a better chance of developing strong relationships in adult life.**

## How Do Attachment Behaviours Change with Age?

Attachment develops with **age, brain development and social experiences:**

- **Young children** gradually learn that their caregiver will return after separation. It is normal for securely attached babies and toddlers to be clingy to their caregiver and show distress on separation: hence settling into nursery can be tough.
- **As children reach early primary school age**, most of them trust that their caregiver will be there for them, but the goal is still to keep carers close. If there is a change at home – for example a new baby is born – the attachment system is disrupted, and the child may need extra support to get back on track.
- **By late primary school age**, children become more independent from caregivers and can self-regulate their emotions better, so the important thing is for caregivers to be available when needed. A child will manage longer separations if they are secure in knowing parents will be there for them when needed.
- **By teenage years**, if the attachment system is secure, children can gradually explore who they want to be and develop their independence if they have adequate caregiver support to do so. Triggers which could upset the system include an attachment figure becoming less available. Parents separating or a parent having to put energy into elderly relatives could cause this.

## How Can You Nurture Healthy Attachment with Your Child?

**The most important way you can help your children is to be consistently physically and emotionally available to them.** This availability will need to continue and adapt throughout the child's development. Here are some important principles you can follow at **different stages**:

- **With babies and young children**, you can follow their lead and play with them, and ensure they have stable and secure care. Showing you are attentive to your baby's cues and responding appropriately in a sensitive two-way interaction is known as 'serve and return'. This is a tennis analogy: the baby serves their cue, and you respond sensitively, which shows the baby they are important and that what they do counts as it is worth responding to.

- **As children get older**, it is important to show them you are always there for them and will provide them with a secure base. You should try hard to listen to them and play with them and let them know you are always there for them. Play is the way children work through their feelings, so playing with them helps strengthen our bonds.
- **In teenagers** the attachment relationship may be at threat as children grow up and develop independence. The important thing is to try and listen to what your children's changing needs are so that you can continue to nurture the relationship.

### KEY POINTS



- The attachment relationship between caregiver and child is central to a child's healthy development and is a crucial factor in supporting their positive mental health and wellbeing.
- There are different types of insecure attachment, all of which can be problematic for children's emotional development and their ability to form future relationships.
- There may be challenges to the attachment relationship as children grow up. If you try to provide your children with a secure base from which to explore, you can help them with their social and emotional development and their gradual development of independence.

## References

- (1) Ainsworth, M., Blehar, M., Waters, E. and Wall, S. 1978. *Patterns of Attachment: A Psychological Study of the Strange Situation*. Hillsdale, NJ: Erlbaum.

## Genes and Inheritance

We all inherit a set of genes, which have a significant influence on our mental health. In fact, our genes can predict about half of our longer-term health outcomes, with factors in the environment predicting the other half. But it's

not simply a question of nature (genes) or nurture (environment) affecting how we turn out. The picture is made more complicated by the fact that genes and environment can also interact. Environmental factors can change which genes are 'switched on' and at what stage in life this happens. So, how we eventually turn out is a complex mix of inheritance and environment.

When it comes to understanding our children's inheritance and our impact on their development, we can use the analogy of being their gardeners. Our children can be thought of like seeds, which already contain the genetic blueprint to become beautiful plants. We cannot change who they are or their genetic makeup, or what type of plants they will grow into, but we can nurture them and provide them with the best environment we can so they can thrive. So, we can do our best to help them make the best of whatever genetics they have inherited to positively influence their mental health.

## What Are Genes?

- **Genes are individual units of inheritance** passed down from both parents. Genes affect all sorts of characteristics from what we look like to our personality and how our brains are wired up. Even if we inherit a particular gene, it may not be switched on, so we only see the products of a small proportion of our genes.
- The Human Genome Project, which is trying to decode all the genes in human DNA, estimates that humans have up to 25,000 genes. This accounts for the huge variation between people!

## Does Nature or Nurture Have More of an Impact on Our Mental Health? Can a Fault in a Single Gene Cause Mental Illness?

- **Both nature (*inheritance*) and nurture (*environment*) are important.** The contribution of each depends on the health condition and individual circumstances. Genes and environment also interact with each other in a complex way.

- For example, many young people with depression have inherited an increased tendency to become depressed. However, trigger factors are also very important and can make a young person more likely to become depressed at a certain time, for example after a relationship break-up or bullying at school.
- Some physical health conditions such as cystic fibrosis or sickle cell disease are caused by a fault in a single gene. **In mental health, however, single gene disorders are rare.** Many different genes as well as our personality influence our susceptibility to mental health difficulties. That's one reason why mental disorders are often so complex and can vary so much between individuals.

## What Is Epigenetics and Is That Also Important?

For those who want to know more detail about how the environment can alter genes here's a basic outline:

- **Epigenetics is the study of how environmental changes can alter the physical structure of genes**, which means that genes can be turned on or off due to chemical changes that attach to genes. These chemical changes can be permanent or temporary and can even be passed on to the next generation. Life experiences, nutrition and exposure to toxic chemicals can all cause chemical changes to the structure of genes.
- **Trauma and child maltreatment can cause epigenetic changes.** For example, in one study of people with post-traumatic stress disorder, those who had experienced abuse as children had up to 12 times more epigenetic changes than non-maltreated individuals (1).
- **As the environment can alter genes, we now understand it's not just a question of nature or nurture, but also nurture's impact on nature.** This is helpful for you to know as you can see how important a positive nurturing environment is for your children and their long-term mental health.



**KEY POINTS**

- We inherit our genes from our parents. These genes affect many different processes in our bodies, for example what we look like and how we behave, including our vulnerability to mental disorders.
- Our inheritance in conjunction with a range of environmental factors influence our susceptibility to mental health disorders. Many different genes are involved in causing vulnerability to common mental conditions, as well as environmental factors.
- Environmental changes, for example life experiences, can alter the structure of genes by switching them on or off.

## References

- (1) Mehta, D., Klengel, T., Conneely, K. N., et al. 2013. Childhood Maltreatment Is Associated with Distinct Genomic and Epigenetic Profiles in Posttraumatic Stress Disorder. *Proceedings of the National Academy of Sciences of the USA* 110(20), 8302–8307.

## The Developing Brain

Our amazingly developed brains set us apart from other mammals. Although we share around 99% of our DNA with chimpanzees, the main difference between our species is in the development and size of our brains. We have many more nerve cells in our brains than chimps and other mammals. As each nerve cell can interact with many other nerve cells, we can start to understand the complexity of human brains.

As well as being the control centre for movement, sensations, vision, language and thinking, the brain is also the seat of all our mental and emotional processes, so understanding the brain helps us understand the mind and our mental health too.

In this section I explain how and when the brain develops, and I discuss how we can influence our children's brain development and their risk of mental health difficulties.

## What Is Special about Human Brains? When Do They Mature?

- **The prolonged developmental process and complexity of human brains** is what sets humans apart from other mammals.
- **Brain development goes through many stages.** The process starts early on in the developing embryo and then there are further important leaps in brain development in the first few years of life. One of the most important stages in brain development is the process of creating, strengthening and shedding connections in nerve cells.
- **Human brains don't fully mature until we are around 25 years old.** So, although we legally become adults at 18, our brains still have quite a lot of maturing left to do.

## Are Children's Brains Like Mini Adult Brains? Why Is This Important?

- **A child's brain is very different from an adult brain.** The young brain goes through considerable developmental change through childhood. This helps explain why children and young people think and behave differently from adults.
- **It's helpful to understand that children are functioning in different mental worlds from adults,** due to the huge difference in our brains. We can't expect children to behave or react similarly to adults. As adults we often forget how long it took us to learn how to self-regulate our emotional state, and hence we place unrealistic expectations on children.
- **Rather than discussing feelings, children often need to play them out** to work through them.

- **We need to take greater care when using medication in children and young people than in adults.** Children may respond differently to medicines as their bodies are immature and their brains are still developing.

## What Is the Process of Brain Development?

- **In the womb:** The brain first develops in the areas most needed for survival functions like breathing, or reflexes. The higher regions that control thinking and reasoning are still primitive.
- **In the first few years of life:** There is a huge increase in the number of connections within the brain. Some brain connections get stronger while others are discarded through a process called 'pruning'. This is like a complicated electricity station that sends extra-thick cables down commonly used routes but cuts out less-needed pathways. Children's brains have less white matter (which is the stuff that wraps around nerve cells) to ensure clear transmission, so electrical signals in children's brains are therefore slower at processing information.
- **By age 3:** The brain has almost reached adult size. The growth in each region of the brain depends on receiving stimulation, which spurs activity in that region. So, learning really does increase brain development!
- **In teenage years:** After another growth spurt, there is a second process of pruning connections paired with significant chemical changes. The front areas of the brain (involved in impulse control and planning) are underdeveloped relative to other areas. This helps explain why young people often take more risks and tend to act impulsively and hence their car insurance premiums tend to be much higher! Change also happens in the emotion centres of the brain as teenagers learn to regulate their emotions through puberty.

## Which External Factors Can Affect Brain Development?

- **Before birth:** While a baby is in the womb the brain is already developing. The **food** a pregnant woman eats will give energy to the baby's

developing brain. Various **risks and injuries in pregnancy** can affect the brain too, such as from infections, chemicals, including from smoking or alcohol, nutritional deficiencies or when pregnant mothers experience stress, trauma or mental health conditions like depression. **Premature birth** can also affect the baby's brain.

- **After birth:** Children exposed to **high stress levels, head injuries, infections or toxic chemicals** are more susceptible to mental disorders and difficulties with brain functioning. We can help protect and nurture our children's brains by giving children a stable and supportive environment.

## How Can the Brain Change in Response to the Environment?

- **The brain's ability to change in response to stimulation is known as 'plasticity'.** The extent of this ability to change depends on the part of the brain and the stage of development. So, the richer the experiences we can introduce to children, the more we can stimulate their brains to develop and grow. But we don't always need to structure learning. We can also help children learn creatively by providing them with a safe environment to explore and play.
- **The brain can keep changing and building new pathways,** as we keep learning throughout our lives. So, if we can give children the example of remaining curious and being open to learning new things, we can also keep building new connections ourselves, which is protective for our own brains.

## What Is a Growth Mindset? How Does This Fit with the Brain's Ability to Develop?

- **Growth mindset refers to the belief that you can improve intelligence, ability and performance,** as brains are constantly evolving

and adapting to challenges. It was a theory developed by Carol Dweck, an American researcher. (See the Resources section below to read more information on growth mindsets.)

- **The opposite of growth mindset is fixed mindset**, which is the belief that a person's talents are set in stone.
- **Dweck proposed that children's learning capabilities could improve** if they engage in the right behaviours for stimulating their brain and building new connections. This theory fits in with the model of an adaptive developing brain.
- **It is important to help children and young people believe they can keep learning whatever their abilities.** If children label themselves as 'no good' at something, the chances are they will not try to develop these abilities, and this will also have a negative impact on their brain development and their mental health. They will get stuck into fixed thinking patterns which will not allow for positive brain development.

## KEY POINTS

- Children's and young people's brains look and function very differently from adult brains.
- The brain keeps developing into our mid-twenties: with major 'leaps' in development happening in the first few years of life as well as adolescence.
- A teenager has a relatively underdeveloped front part of their brain, hence young people engage in more risk-taking and can be more impulsive.
- We can protect children's brains through good nutrition, healthcare and by providing them with a secure, safe and nurturing environment.
- Brains have an ability to change and adapt in response to stimulation. We can help children develop their true potential by fostering a growth mindset.



## Useful Resources

### Books

- ***Inventing Ourselves: The Secret Life of the Teenage Brain*** written by Sarah-Jayne Blakemore (Random House, London, 2018) is an excellent introduction to how teenage brains work. Prof. Blakemore is a leading UK researcher on the adolescent brain. She has many publications to her name and has also written an accessible book on the topic.
- ***Mindset – Updated Edition: Changing the Way You Think to Fulfil Your Potential*** (Robinson, London, 2017) is a helpful book written by Carol Dweck, the pioneering researcher who first wrote about growth mindsets. Her work has been extremely influential in modern educational thinking.

## Puberty

Puberty is the transformation of children's bodies into adult bodies, so they can reproduce in the future. Hormones, which are the body's chemical messengers, trigger and coordinate the process.

Puberty can often be tough for our young people due to years of swinging hormones and periods of mismatch between the brain, hormones and growth. With so many changes happening together, it's not surprising there is often a significant impact on young people's mental health and wellbeing.

## What Are Common Anxieties That Come with Puberty?

### Girls

- **Breast development** can cause anxieties as it's common to have breasts of different sizes. Girls also may worry about the 'lumps' under the nipple. It is common for early developers to be self-conscious about breasts.

- **Premenstrual syndrome** is very common and can cause several emotional and physical symptoms including mood swings, tiredness, headaches, bloating and cramping. Some girls notice their mood drops significantly before their periods, so I often ask girls with mood difficulties to track their moods along with their periods.
- **Periods** can be painful and often difficult to manage if heavy, and some girls with heavy periods can lose a lot of blood and may become anaemic, causing tiredness.

## Boys

- **Voice changes** happen as the voice box grows larger and thicker and the vocal cords lengthen. Boys can become self-conscious when their voice squeaks or 'cracks' during this process.
- **Wet dreams** are caused by ejaculation not urination and may cause embarrassment in boys. They are a normal part of maturing and aren't necessarily sexual dreams.
- **Erections** can happen spontaneously and unexpectedly during puberty, which can be quite embarrassing, especially if they happen in public.
- **Breasts** can get tender and swell in boys during the early years of puberty. This may be a worry for boys, but you can reassure them that the changes generally disappear after a few months and don't develop into true breasts.

## How Else Can Puberty Affect Children's Mental Health?

- **Puberty can be a long, painful and confusing process** over which the young person has no control, which can cause anxiety.
- **There is an increased risk of some mental health disorders** during puberty, including depression, anxiety and eating disorders. Many serious

mental health conditions also have their onset during adolescence. Roughly half of mental health problems start by age 14 and around 75% have started by the early twenties.

- **Late as well as early developers can also be at increased risk of feeling insecure** about their bodies.
- **Mood swings caused by hormone fluctuations** are common during puberty, because the body is adjusting to changing sex hormone levels.
- **Sleep disruptions** due to hormone changes can affect mood and anxiety. Early school starts that don't fit with teenagers' natural sleep rhythms can make it difficult for them to recover from disrupted sleep.
- **Emotion regulation** is often a struggle for teenagers as the brain is still emotionally immature and often out of step with all the physical body changes.

## How Can You Support Young People through Puberty?

- **Talk about puberty as a normal stage of development and discuss puberty openly before it happens.** Having several conversations from an early age tends to be more helpful than waiting to have a big talk when children may have already heard misinformation elsewhere. Remember to discuss the brain and emotional changes as well as physical changes.
- **Make sure young people get the practical help they need in advance, and they know who to go to for support at any point.** For example, a girl may need help with accessing and understanding how to use sanitary protection, keeping track of periods, and how to manage pain. This is often easiest with someone of the same gender as they can support with their personal experience, so it may be helpful for single parent households to enlist someone to mentor the young person of the other gender to the parent.



**KEY POINTS**

- Puberty is the transformation of children's bodies into adult bodies capable of reproducing. It is kickstarted by hormone cascades that affect cells throughout the body and brain.
- Puberty can be a difficult time for many young people. The physical changes can be scary and painful. It's not always easy to predict which young people will struggle the most with the changes. Supportive preparation can be very helpful.
- Puberty can affect mental health in many ways, so trying to support positive mental fitness is important. The risk of mental health difficulties increases significantly as young people develop, so it's important to be on the lookout for difficulties around this time.