

Topic 4

Early Brain Development and Maltreatment

Key messages

- Early childhood neglect and abuse can have an impact on brain development.
- Not all children respond to maltreatment in the same way – individual children have different susceptibilities and resilience.
- Changes to the way in which the brain functions can be seen as adaptations to adverse experiences in the environment.
- The plasticity of the brain means that recovery is possible – this requires sensitive nurturing care interacting with other influences and resources.

The developing brain

Babies' brains are made up of millions of neurons. Neurons are connected by synapses, which allow information to pass from one neuron to another. The synapses present in the brains of newborn babies mainly govern bodily functions such as heart rate, breathing, eating and sleeping. From birth onwards the baby's experiences and interactions with other people help to build billions of new synaptic connections. Our experience and environment dictates which connections grow stronger and more permanent through repeated use. The baby's brain is very versatile, allowing them the potential to adapt to the diversity of human cultures (Brown and Ward, 2013).

The following video provides information on the development of neural connections in the brain. Simpler circuits come first and more complex brain circuits build on them later.

[Experiences Build Brain Architecture](#) – Center on the Developing Child

By the age of two a child's brain has developed many more synapses than they will ever need. From around this time synapses that are used are strengthened, while those that are not used are discarded. This is called 'pruning' – a process that continues until adolescence and beyond and enables the brain's circuits to work more efficiently. This is the brain's means of learning and is referred to as 'plasticity'. Plasticity is the term used to indicate the brain's ability to change in response to repeated stimulation (Brown and Ward, 2013).

The following video provides further information about pruning of synapses:

[Baby Synapse Connection](#) – Robert Winston

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Sensitive and critical periods in brain development

The brain is genetically predisposed to expect certain experiences and forms neural pathways to respond to them. The more a child is exposed to those experiences, the stronger the connections will be. For example, babies are genetically predisposed to respond to voices and faces. When a baby is spoken to, the neural systems that are responsible for speech and language are stimulated and strengthened. Without this stimulation, the pre-programmed pathways that have developed in anticipation of the exposure will be discarded (Brown and Ward, 2013).

The following video provides an example of this process:

[Serve and Return Interaction Shapes Brain Circuitry](#) – Center on the Developing Child

There are specific periods when brain development is more strongly affected by certain experiences than at other times. These are known as 'sensitive periods'. A special class of sensitive period is referred to as a 'critical period'. This refers to the irreversible impact of experience on development. There is some evidence of windows of opportunity closing (e.g. some aspects of vision and speech), but in many areas of functioning the brain retains some plasticity. It might be harder to respond to new positive experiences after the age of three, but it is not impossible (Brown and Ward, 2013; Woolgar, 2013).

Further information on children's brain development can be found in Brown and Ward (2013). See page 46 for a [Summary of key timeframes for child development](#)

Sue White and Dave Wastell have written a critical response to the conclusions drawn by Brown and Ward (2013) which can be found here: [A response to Brown and Ward 'Decision-making within the child's timeframe'](#) (White and Wastell 2013). The article argues that some of Brown and Ward's arguments are unbalanced and do not draw fully on all the scientific evidence.

Response to neglect and abuse

A child's early experiences have a powerful impact on how they see themselves and the world around them. Children growing up with abuse or neglect will adapt to those circumstances and are likely to anticipate a world of threats and stressors (Child Welfare Information Gateway, 2009).

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Infants need to have a relationship with one or more consistent, emotionally available caregivers. Such care comforts and reassures the child when distressed or anxious and enables the infant to feel safe enough to relax, play and learn. The presence or absence of sensitive caregiving has an impact on the infant's stress response and subsequent brain development and attachment (Schofield and Simmonds, 2011).

The following video illustrates what happens when a parent does not respond positively to her baby during even a brief period of disrupted interaction:

[The Still Face Experiment](#) – Dr Edward Tronick

The majority of changes to the brain that are observed in response to neglect and abuse are adaptations to adverse environments rather than irreparable damage. For example, children who have been physically abused show greater brain activity for stimuli with angry faces or voices than they do for other emotions. This leads to a hyper-vigilance to potential or actual threat. This is a maladaptive skill that has been developed to cope with their threatening environment (Woolgar, 2013).

Different parts of the brain are susceptible to specific environmental events at different ages. Individuals also have different susceptibilities and resilience to adverse environments. It is not possible, therefore, to make definitive predictions about changes to the brain as a result of different types of abuse at different ages (Woolgar, 2013).

There is increasing evidence to suggest that children's maladaptive responses to neglect and abuse may be factors in increased levels of emotional and behavioural problems found in looked after children, even when compared to those growing up in conditions of significant social disadvantage. Evidence from animal studies shows that baby monkeys who had no contact with adults and were cared for by inexperienced peers showed increased levels of anxiety and were more impulsive and aggressive (Woolgar, 2013). However, when the infant monkeys were fostered to more competent mothers their outcomes improved.

On page 6 of the briefing [Supporting Brain Development in Traumatized Children and Youth](#) there is a checklist on child development, parenting strategies and causes for concern from 0 to 18 years

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The stress system response to maltreatment

One physiological response to exposure to stress is the release of the 'stress hormone' cortisol, which prepares the body to take urgent action – the 'fight or flight' response. A certain amount of stress is normal for all children in their daily lives and their inbuilt systems for managing physical, emotional and social stress will be further developed through actual experience. However, acute stress experienced over a prolonged period can have a negative impact on the physiology of the brain (Woolgar, 2013).

When a critical level of cortisol is reached a feedback loop (known as the HPA axis) is activated. This decreases the activity of the stress system in order to protect the body (Woolgar, 2013). In maltreated children, the system can be either chronically elevated or chronically suppressed. The former is associated with anxiety and fearfulness, preparing the child for further threats, while the latter prepares the child for functioning as well as they can in an adverse environment.

Three linked areas of the brain are particularly sensitive to chronic stress: the amygdala, the hippocampus and the prefrontal cortex. The amygdala is associated with emotion. A newborn baby has little or no emotional regulation, so the caregiver helps their baby learn to self-soothe by offering reassurance. If the amygdala is overstimulated by repeated stress, however, it can become overactive so that the child perceives threat everywhere and responds in a highly emotional way to minor incidents (Brown and Ward, 2013).

The hippocampus and prefrontal cortex develop throughout childhood and are involved in governing higher cognitive functions, such as planning and reasoning, as well as self-regulation and mood and impulse control. Damage to the prefrontal cortex caused by chronic stress can impede the development of these skills and has consequences for future learning, behaviour and health (Brown and Ward, 2013)

These changes are a form of adaptation to poor caregiving environments. The adaptations may be unhelpful if the child moves to a safer environment, where they may misinterpret nurturing behaviour in an anxious or threatening way. However, there is evidence that moving to such an environment can help to stabilise this dysregulation (Woolgar, 2013).

The following video illustrates the 'toxic' effects of the prolonged activation of the stress system:

[Toxic Stress Derails Healthy Development](#) – Center on the Developing Child

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Further information on toxic stress can be found here: [Toxic Stress – Facts](#)

It is important for practitioners and carers not to feel disempowered by the evidence on the impact of abuse and neglect on brain development, and to understand that high-quality nurturing care and other positive experiences can help repair earlier damage (Woolgar, 2013; Schofield and Simmonds, 2011).

Differential susceptibility to maltreatment

Some children are more genetically susceptible to poor caregiving environments than their peers, while some children are more resilient (Woolgar, 2013). This is an example of differential susceptibility. It shows how genes can influence the extent to which negative environments affect children and, similarly, how children respond differently to improvements in care.

Earlier environments can influence the extent to which genes are activated over the life course. For example, research has shown that being exposed to maltreatment in early childhood can 'switch on' certain genes that increase the risk for antisocial behaviour later in later life (Woolgar, 2013).

Differential susceptibility also has implications for interventions. Some children may recover following fostering or other interventions. Others are more susceptible at the biological level, which may moderate the success of such interventions (Woolgar, 2013). Children are individuals first and foremost, and they need individualised parenting and support to help them overcome their earlier adversities.

A number of everyday tasks can be used to reinforce positive pathways and help build connections in the child's brain (see the Briefing 5 on 'Early childhood trauma and therapeutic parenting' for further information):

- Make sure the child has a secure relationship with at least one important person.
- Establish nurturing routines and boundaries to help children begin to learn that the world is predictable and safe.
- Provide lots of opportunities for talking – this helps children learn to begin to name and manage their feelings.
- Messy and sensory play also helps – for example, play involving sandpits, water and bubbles. Children who have been maltreated often need to be cared for like a much younger child, so they can revisit earlier stages of play and interaction and catch up on what they have missed.

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- Adolescents need support to help them organise tasks, set priorities and practise making decisions, and to follow healthy lifestyles (Child Welfare Information Gateway, 2011; Research in Practice, 2013).

The [Five to Thrive](#) programme has a range of resources for parents and practitioners on the science of brain development. The organisation supports creative, individualised work with families as well as offering a range of suggestions to meet the needs of children at different ages.

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Neurons

- Babies are born with millions of neurons
- Neurons are connected by synapses, which allow information to pass from one neuron to another
- Newborn babies' brains have very few synapses
- From birth onwards experiences and interactions with other people help to build synaptic connections

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Synaptic Pruning

- By the age of two a child's brain has developed more synapses than are needed
- Synapses that are used are strengthened, while those that are not used are discarded – we 'use it or lose it'
- This is called 'pruning'
- It continues until adolescence and beyond and enables the brain's circuits to work more efficiently.
- This process is the brain's means of learning and is referred to as 'plasticity'.

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Sensitive and critical periods

- The brain is genetically predisposed to expect certain experiences
- The more a child is exposed to these experiences the stronger the connections
- 'Sensitive periods' are when brain development is more strongly affected by experiences
- A 'critical period' refers to the irreversible impact of experience on development. There is some evidence of windows of opportunity closing, but overall the brain retains remarkable plasticity – i.e. potential for both positive and negative change

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The Brain and Maltreatment

- Infants need a relationship with a consistent, emotionally available caregiver
- The presence or absence of sensitive care has an impact on the infant's stress response and brain development
- The majority of changes to the brain following abuse and neglect are adaptations to adverse environments rather than irreparable damage

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The bodies' stress system

- Exposure to stress results in release of the 'stress hormone' cortisol
- Cortisol prepares the body to take urgent action- the 'fight or flight' response
- A certain amount of stress is normal
- Acute stress can have a negative impact on the physiology of the brain- 'toxic stress'

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Maltreatment and stress system

- A feedback loop is activated when a critical level of cortisol is reached
- This decreases the activity of the stress system to protect the body
- In maltreated children the system can be
 - chronically elevated (associated with fearfulness, prepares child for threat)
 - chronically suppressed (prepares the child for functioning in an adverse environment)

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Differential Susceptibility

- Some children are more susceptible to poor care-giving than others (differential susceptibility)
- This is because of their genes
- Genes can influence the extent to which negative environments affect children
- Genes can also influence children's response to improvements in care.

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Helping Children who Have Been Maltreated

- Reinforce positive pathways to build connections in the child's brain
- Ensure the child has a secure relationship with at least one person
- Establish nurturing routines and boundaries
- Talking helps children learn to name and manage their feelings
- Children who have been maltreated often need to be cared for like a younger child
- Adolescents need support to organise tasks, set priorities, practice making decisions and healthy lifestyles

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Video clips

- [Experiences Build Brain Architecture](#)
- [Baby Synapse Connection](#)
- [Serve and Return Interaction Shapes Brain Circuitry](#)
- [The Still Face Experiment](#)
- [Toxic Stress Derails Healthy Development](#)

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References

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[Research in Practice \(2013\) Early brain development. Workshop materials for foster carers](#)

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Key questions for the child's social worker

Methods

Suitable for self-directed learning or reflection with a colleague or supervisor.

Learning Outcome

Review your understanding of early brain development and identify actions you can take to support a child's healthy development.

Time Required

Two sessions of 45 minutes

Process

Thinking of your current approach, answer the following questions:

- Do you have an appropriate level of knowledge and understanding of child development (see Briefing 3 on Child development)
- How do you recognise potentially maladaptive behaviours? (see [Supporting Brain Development in Traumatized Children and Youth](#) – Child Welfare Information Gateway)
- How do you ensure that you carry out a comprehensive and analytical assessment of each child's individual needs? (see Briefing 11 on Analysing and using information)
- How do you and your supervisor monitor timely decision making with reference to individual children's developmental timeframes? (see [Decision-making within a Child's Timeframe](#) – Brown and Ward, 2013)
 - How are these decisions quality assured as defensible and evidence informed?
- What steps do you follow to ensure that matching processes are sufficiently robust to ensure that children are placed with carers who can meet their needs and minimise the risk of placement disruption?
- What systems are in place to facilitate co-ordinated working between multi-agency services (particularly CAMHS) to address children's needs?
 - How can you keep up to date with them?
- What intensive interventions and other therapeutic support are available when needed (see the [Parenting Interventions](#) listed by the Department for Education – all have been evaluated by researchers at King's College, London)?
 - How can you access these?

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Key questions for the supervising social worker

Methods

Suitable for self-directed learning or reflection with a colleague or supervisor.

Learning Outcome

Review current provision of information and support for foster carers and prospective adopters and identify actions that you can take to improve them.

Time Required

Two sessions of 45 minutes

Process

Thinking of your current approach, answer the following questions.

- How do you provide foster carers and prospective adopters with relevant information about individual children and their experiences?
- How do you prepare foster carers and adopters to provide appropriate care for the child?
- How do you help foster carers and adopters to understand and respond to the child's behaviour to support healthy brain development?
- How do you signpost and facilitate access to support and interventions to help foster carers and adopters manage the child's behaviour?
- How do you encourage and support foster carers (and adopters) to access specialist learning and development opportunities?
- How do you keep in close contact with foster carers and adopters, including listening when they talk about their own experiences? Regular supervision helps carers to cope with the painful effects of being repeatedly rejected by a child and makes it less likely that they will take it personally.
- Based on your answers, what actions can you take to improve the support and information you give foster carers and adopters?

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Key questions for foster carers and adopters

Methods

Suitable for self-directed learning or reflection with a colleague or supervisor.

Learning Outcome

Review your understanding of attachment theory and identify actions you can take to support a child.

Time Required

Two sessions of 45 minutes

Process

Thinking of your current approach, answer the following questions.

- Have you received detailed information about the child's history in a timely manner and in a format that you can understand?
- Have you received sufficient training on child development and the impact of maltreatment on behaviour?
- Are your expectations of the child realistic? For example, do you provide care according to their emotional age rather than their chronological age?
- Are you visited regularly by your social worker?
- Are you provided with sufficient support and training to address the needs of the child and to manage their behaviour?
- Do you have access to intensive or specialist support for the child?
- Are you aware of different ways to help children with their earlier adversities (see the BAAF resources: [Parenting a Child with Emotional and Behavioural Difficulties](#) – Hughes, 2012; and [Attachment, Trauma and Resilience](#) – Cairns, 2006)?

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Case study – Sereta, Tia and Paulo

For social workers

Methods

Suitable for a small group discussion in a team meeting or as part of a facilitated workshop. Individuals will need a copy of the case study for Sereta, Tia and Paulo.

Learning Outcomes

To identify the impact of early brain development and maltreatment and assess the support that Sereta, Tia and Paulo may require.

Time Required

30 minutes for discussion plus 15 minutes for feedback

Process

Give each group a hand-out of the case study for Sereta, Tia and Paulo and ask each group to appoint someone to feedback their ideas.

Ask the group to read the case study and answer the following questions.

1. What is the likely impact of the children's experiences on their brain development?
2. What behaviours might you see in these children to indicate that their stress response has been compromised? Are these behaviours 'typical' across the children in your care?
3. What advice would you give the children's foster carers about how best to look after them day to day in order to repair the harm they have suffered?

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Case study – Sereta, Tia and Paulo

For foster carers and adopters

Methods

Suitable for a small group discussion. Individuals will need a copy of the case study for Sereta, Tia and Paulo.

Learning Outcome

To identify the impact of early brain development and maltreatment and assess the support that Sereta, Tia and Paulo may require.

Time Required

30 minutes for discussion plus 15 minutes for feedback

Process

Give each group a hand-out of the case study for Sereta, Tia and Paulo and ask each group to appoint someone to feedback their ideas.

Ask the group to read the case study and answer the following questions.

1. What is the likely impact of the children's experiences on their brain development?
2. What behaviours might you see in these children to indicate that their stress response has been compromised? Are these behaviours 'typical' across the children in your care?
3. How would you care for these children to repair the harm they have suffered?