UK TRAUMA COUNCIL

THE GUIDEBOOK TO

CHILDHOOD TRAUMA AND THE BRAIN

WELCOME

A very warm welcome to this short guide to Childhood Trauma and the Brain. As a neuroscientist and clinician, I have seen first-hand how hard it can be for frontline carers and professionals to access accurate and up-do-date information from neuroscience research on abuse and neglect. This seems a great shame given the painstaking work being undertaken by many research groups across the world. Much of the valuable knowledge they produce often ends up locked away in scientific journals.

This book, with the accompanying animation and materials, aims to address this gap. I am very grateful for the help and support of many colleagues in my effort to create an accessible guide to what we currently know from neuroscience research. In particular, what we understand about the link between childhood trauma and mental health problems. What can neuroscience tell us? What are the current theories? What are the implications for practice? From the outset, I should stress that the answer to the last question is: 'very limited indeed'. While we are learning a great deal about how specific brain systems are impacted by abuse and neglect, there is much work still to do in linking this learning to interventions for individual children.

However, neuroscience research has taught us two important lessons. First, that brain alterations associated with mental health vulnerability are measurable well before a child shows a mental health problem. This finding sends a compelling message to policy makers, funders and commissioners: we need to move much more towards a model of preventative help. That is, providing intervention and support to prevent mental health problems emerging in the first place. Second, neuroscience research can help us reframe our understanding of childhood trauma. A child's behaviour that can otherwise seem challenging or confusing can begin to make sense in the context of early brain adaptation, giving us a new lens through which to understand – and help – the children in our care.

Building a bridge between neuroscience and practice will take time. It will mean all of us – social workers, foster carers, adoptive parents, teachers and researchers – working together to develop better, more effective and evidence-based models of help. Hopefully this guide contributes one small step in that collective effort.

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CONTENTS

VISIT OUR WEBSITE

You can find the Childhood Trauma and the Brain animation and additional resources to support your learning on our website: **www.uktraumacouncil.org**.

This includes this animation guide, explainer videos, a PowerPoint presentation, and articles on the research. The animation is also available with Welsh subtitles.

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INTRODUCING JON AND JASMINE

Jon and Jasmine are fictional characters featured in the 'Childhood Trauma and the Brain' animation.
By explaining science with stories about children, we hope to build a bridge between research and practice. Jon and Jasmine's stories will be familiar to many people. They are designed to prompt reflection and discussion on how professionals and carers can reframe their understanding of a child's behaviour and perhaps modify their response.
Case studies, even if fictional, provide a useful jumping-off point for considering the potential role and impact of everyone involved in a child's life.

JON

Jon was a happy baby, at least until his mum got a new boyfriend and the violence began. As a young child, he could tell when trouble was brewing and get out of the way. But sometimes he couldn't hide in time. He was sometimes the victim. Worse was the feeling of helplessness watching his mother being hit. One day, shortly after his 10th birthday there was a serious incident which meant his mum had to be taken into hospital. Things began to change soon after that. Doctors and other adults began to speak to him. It was confusing and scary. He was worried about losing his mum, who was often sad and withdrawn. Jon felt angry and powerless.

As he grew older, Jon began to really enjoy sport. Naturally athletic, it was one thing he felt he might be able to do well. When he was 15 years old, his teacher suggested he join the school's senior swim team. What should have been a fun experience became incredibly challenging for Jon to manage. He struggled to see himself as talented. Maybe he didn't deserve to be on the team? One day, when he was messing around in the pool with his teammate Alex, he felt attacked. The anger he had bottled up inside came out. His coach faced a difficult decision: how should she respond?

JASMINE

As a young child Jasmine experienced considerable neglect and often missed school. She was often left to fend for herself at home. Eventually, it was decided that she should go into foster care. Now 8 years old, Jasmine was recently placed with a new carer and had to move to a different area. This meant a new school. For Jasmine this was scary and she tried everything possible to avoid going. Her new foster carer explained why it was important to get an education and make friends. She walked Jasmine to the school gates every day, and spoke to her teachers about her needs.

The children at her new school were friendly, but Jasmine didn't feel like she fitted in. When a group of her classmates approached her, she worried that they wanted to make fun of her. Instead, they showed her a cool new toy. She was not sure what to do or say, so she looked down and stepped away. She felt like she wasn't good enough. Her classmates found her behaviour sometimes strange and confusing. In other words, Jasmine's past experiences started to play out in ways that risked creating new difficulties for her in her life now.

LINKING **CHILDHOOD TRAUMA** TO **MENTAL HEALTH**

We can think of a child with Latent Vulnerability as being on a path through life that is more precarious. The path may have more gaps and bumps, making it easier to trip up and fall. Importantly, Latent Vulnerability refers to an increased risk. It does not determine anyone's future. With the right support, children can be helped to successfully negotiate their path through life.

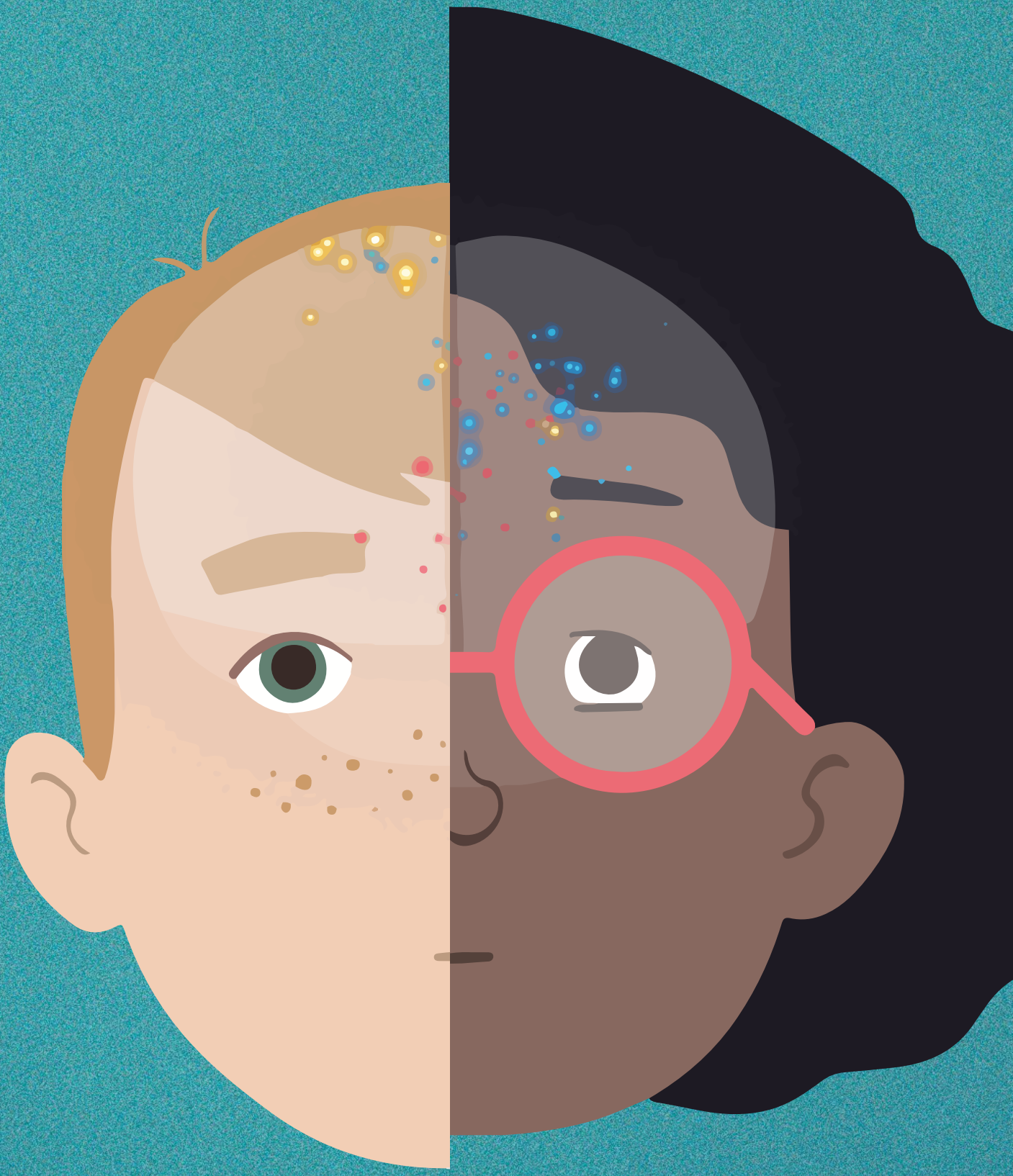
Children – and their brains – adapt to survive. When a child grows up in an environment where there is abuse and neglect, their brains will be shaped by those experiences. These brain changes may not lead to an immediate mental health problem. Rather, they may help the child survive in that adverse environment. However, these same changes may make a child more vulnerable to developing mental health problems in future everyday environments. In part, this is because the brain changes can affect a child's ability – and opportunities – to cultivate and maintain social relationships with others.

LATENT VULNERABILITY

This unseen link between childhood trauma and later mental health problems is called Latent Vulnerability. The word latent refers to something that exists but is not yet obvious, while the word vulnerability means more likely to be harmed. So Latent Vulnerability means that a child is at greater risk of harm than may be immediately obvious to carers or professionals. However, while Latent Vulnerability is cause for concern, it does not determine anyone's future. Brain changes are not fixed, and nor is a child's destiny. Moreover, it is not helpful to think of these changes as 'damage'. While childhood trauma puts children on a more risky path, many show resilient outcomes in adulthood.

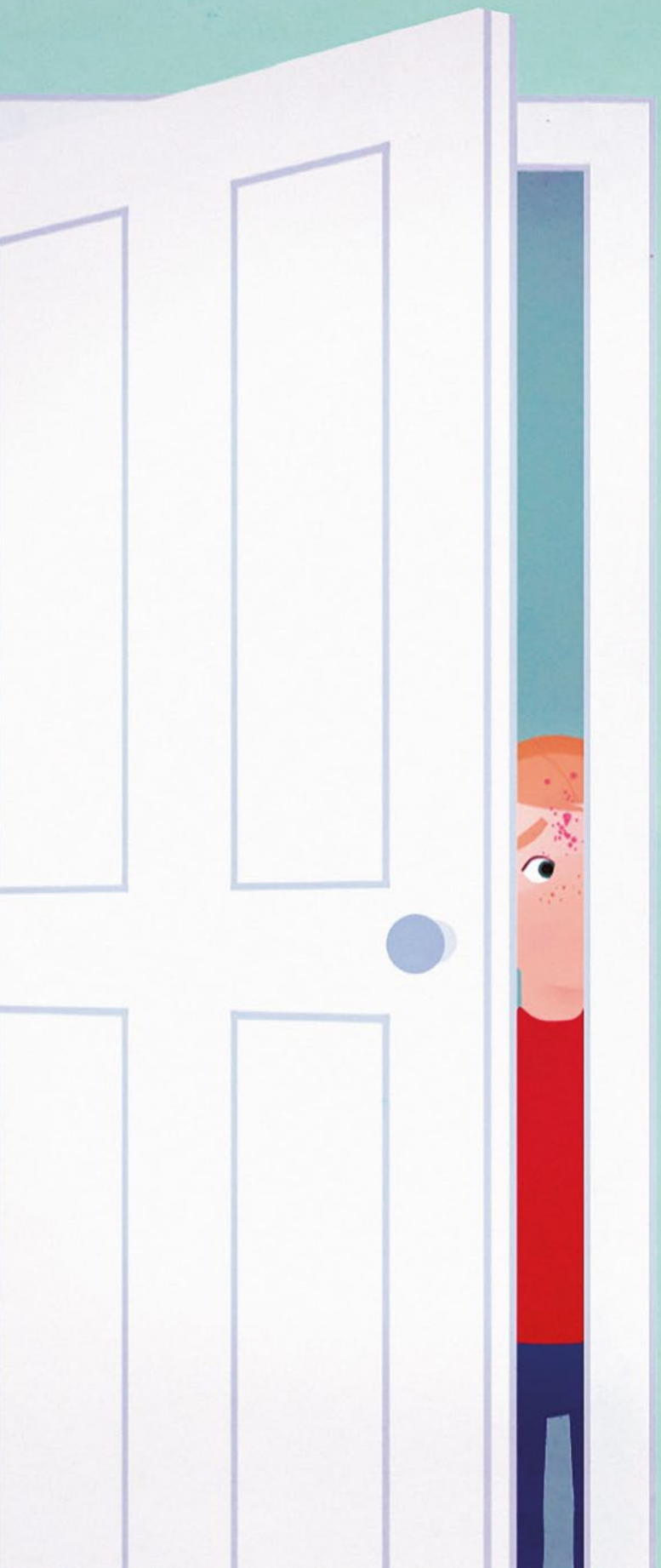
THE ROLE OF THE BRAIN

Brain adaptations may help a child survive or cope in an abusive or neglectful home environment. These adaptations might, for example, help a child spot danger early, avoid disappointment, or push away negative memories. How this happens in the brain and what it means for the child is explained on the following pages (p. 6–13). But they also may make it harder for a child to learn, as well as navigate more predictable and ordinary environments, such as a stable and safe foster placement. Importantly, a child may be less well equipped to cope with everyday challenges and social demands, such as making friends in a new school.



CHILDHOOD TRAUMA AND THE BRAIN

We can think of the brain as a collection of interdependent brain systems. Each system has a particular role or function. Together, these brain systems allow us to navigate a complex physical and social world. The brain is also a learning organ. This means that prior experiences shape brain development in ways that can help us with future challenges. When children face traumatic experiences, like abuse and neglect, the brain can adapt to help them cope. Neuroscientists have observed these brain changes in a number of brain systems. Here we focus on those that have received particular attention from researchers: the threat, reward and memory systems.



Jon experienced abuse and witnessed domestic violence as a young child. We see the threat system in his brain (shown in red) has adapted to this dangerous home environment. Over time, it has become more reactive to threat. As an adolescent, this hypervigilance to threat leads Jon to misinterpret a playful nudge and start a fight. This is an example of how early adaptation of the brain's threat system can impact later behaviour and social functioning.

THE THREAT SYSTEM

The threat system in the brain allows us to detect and respond to danger. It helps us step back instantly from a speeding car or avoid an angry dog in the park. In other words, stress and threat are a normal part of life for everyone. We all need to activate a fight-or-flight response at times to keep us safe. But abuse and neglect create a world where danger is frequent and unpredictable, and punishment can be extreme. Exposure to ongoing domestic violence, neglect, and physical abuse can lead to long-lasting changes in how the brain responds to perceived danger. This can lead to hypervigilance to threat and/or excessive avoidance.

WHAT CAN SCIENCE TELL US?

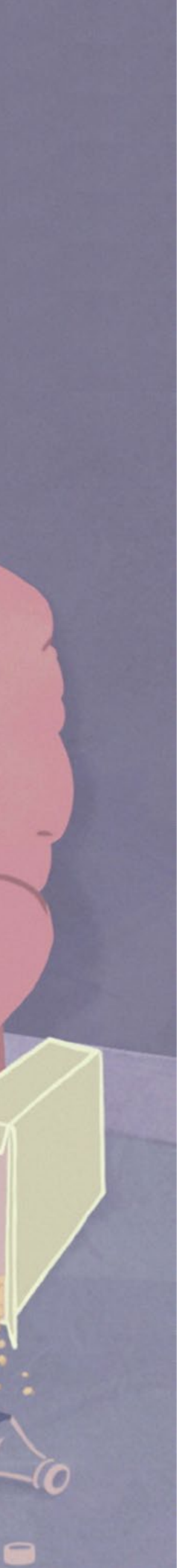
Childhood trauma is associated with a heightened response to threat cues in the amygdala. The amygdala is a small almond-shaped structure deep inside the brain that responds to salient aspects of our environment. Changes in the threat system may reflect adaptation to childhood trauma. Equally, abuse and neglect may accelerate the maturation of the threat system in childhood – a concept known as the stress acceleration model. Scientists believe exposure to childhood abuse, compared to experiences of neglect or deprivation, has the greatest impact on the threat system. This is known as the dimensional model of adversity. The story is not so simple, however. Studies have also linked experiences of more severe or chronic abuse to unusually low brain activation in the threat system. This may be understood as threat avoidance. Clinically this might be seen as 'cutting off' or dissociation.

WHAT DOES THIS MEAN?

These brain changes can lead a child to become hypervigilant, or highly alert, to threat around them. This can create a number of difficulties for children, including:

- Struggling to pay attention to other things – making it harder to learn, and develop other important skills.
- An increased intensity in their interactions with others.
- Reduced ability to regulate emotions.
- Finding everyday challenges and stressful events harder to manage than their peers.
- Increased reactivity to social rejection.
- Withdrawing or feeling anxious even in safe environments, reducing opportunities to learn new things and build relationships.
- An increased risk of symptoms of anxiety and depression.

As a child Jasmine experienced neglect. This had an impact on the development of the reward system in her brain. Later in the animation we see that she struggles to navigate a new school and make positive social relationships. In other words, early adaptation of the brain's reward system to a neglectful and chaotic home influences her social functioning many years later.



THE REWARD SYSTEM

The reward system helps us learn about positive aspects of our environment, motivates behaviour, and guides decision-making. From the earliest years, our brain is able to learn what is rewarding and how to elicit rewards – a carer's smile, a cuddle, as well as basic rewards such as food. Abuse and neglect create a world where rewards such as these are inconsistent or absent. This may reduce the brain's responsiveness to rewards.

WHAT CAN SCIENCE TELL US?

The brain regions that comprise the reward system include the brainstem, striatum and frontal regions. These brain regions use dopamine, an important chemical in the brain, to communicate when processing reward. Research shows that children who have experienced abuse and neglect have reduced sensitivity in these regions compared to their peers when processing reward cues, possibly reflecting adaptation to a world where reward is infrequent or unpredictable. One interpretation is that such adaptation might help them manage the likelihood of constant disappointment. Other studies have demonstrated that our reward system is important in depression. This is not surprising given how important reward is in motivating our behaviour and exerting effort in our everyday life.

WHAT DOES THIS MEAN?

What might these brain changes in the reward system mean for a child's everyday life? We are not yet sure of the answer. However, scientists have suggested that changes may be associated with:

- An increased risk of depression, particularly in adolescence.
- Difficulty in successfully negotiating everyday social interactions and maintaining stable social support networks.
- Problems in reward learning – that is, learning about new sources of reward.
- Reduced motivation to pursue daily activities.
- Reduced ability to experience pleasure.

We also see Jasmine trying to draw on past experience to negotiate a new social situation. However, uncertain what to do or say, she withdraws from a group of peers. We are learning that differences in the brain's memory system following abuse and neglect might have an impact on how children like Jasmine solve social problems.

THE MEMORY SYSTEM

The memory system allows us to learn new things, and store information about our past to help us with new challenges in the future. All of us rely on our memory of past experiences to deal with the situations we face in our daily lives – this is our autobiographical memory. We also rely on the ability to learn associations between new things – this is our associative memory. Memory is important for our ability to plan, solve problems, make decisions, regulate our emotions and develop a positive sense of self. Experiences of neglect and physical abuse can create negative memories that can be overwhelming and also influence how we create new memories.

WHAT CAN SCIENCE TELL US?

The memory system is distributed across a network of brain regions, including the temporal and frontal areas. This includes the hippocampus, a key brain structure involved in storing memories. Research shows that abuse and neglect are associated with differences in autobiographical memory. A pattern of 'over-general memory' has been observed. This is where everyday memories are less detailed. Everyday negative memories are thought to become more prominent than positive ones. Several studies have pointed to differences in the function of the hippocampus in children who have experienced abuse and neglect. There is decreased activation of the hippocampus during positive autobiographical memory recall. There is also decreased hippocampal activation during associative learning. This is where children have to learn and remember new relationships between unrelated items.

WHAT DOES THIS MEAN?

Scientists have speculated what the brain changes in the memory system might mean for children in their everyday lives. They have suggested that changes may be associated with:

- Problems recalling the details of everyday positive and negative personal memories.
- Changes to emotional learning mechanisms, including how children learn about threat and reward in their environments. These changes may increase the risk of mental health problems over time.
- Difficulties with planning, making decisions and social problem solving compared to peers.
- A tendency to focus on negative memories and thoughts. This may increase the risk of developing a negative self-concept.

THREE PATHWAYS TO MENTAL HEALTH DIFFICULTIES

Research tells us that mental health problems after abuse and neglect are not inevitable. Many children show a resilient outcome. Yet a substantial number do not. Why are some children more at risk? We know that a child doesn't suddenly wake up one day with a mental health problem. Rather, risk and resilience are created over time and maintained through our everyday experiences and relationships. The interaction of protective as well as risk factors – especially the relationships around us – shapes our development and how we think and feel about ourselves, other people, and the world around us. Stress susceptibility, stress generation, and social thinning are three pathways by which mental health problems can be understood to develop over time following abuse and neglect.

Jasmine grew up experiencing significant neglect. We learn how these early experiences may make her more susceptible to stress when she arrives at a new school. This is daunting for any child, but is particularly challenging for Jasmine. The experience of feeling stressed can manifest in different ways, including acting out as well as withdrawing from others.

STRESS SUSCEPTIBILITY

Everyday challenges or stressors – such as taking an exam, moving to a new school, or even making new friends – can be difficult for anyone. However, a child who experienced abuse and neglect may find these situations even more difficult to manage. This in part might be because of a heightened response to stressors, as well as a poorer ability to deal with stressors when they occur. Scientists call this stress susceptibility.

WHAT CAN SCIENCE TELL US?

Abuse and neglect can be understood as forms of 'toxic stress'. Toxic stress refers to experiences of significant adversity that are frequent and/or enduring, where a child does not have adequate adult support. This may speed up the maturation of the threat system (the Stress Acceleration Model) and lead to adaptation in other brain systems. The resulting changes in the threat, reward, and memory systems may mean everyday life takes a greater toll. Over time it can lead to heightened stress responses in the body and may even affect the immune system. Reduced response to reward and more focus on negative memories can make life feel more challenging and threatening.

WHAT DOES THIS MEAN?

Scientists and clinicians have considered what stress susceptibility might mean for a child in their everyday lives. Importantly, they have reflected on how it might contribute to the risk of mental health problems over time. They have found that:

- Brain systems may adapt to cope with a threatening or unpredictable world in ways that are not helpful in more ordinary environments.
- A child may expect the world to be dangerous, and other people to be untrustworthy. This is taxing and can contribute to ongoing stress.
- Even spending time with a group of friends or joining a new sport club, can create anxiety.
- Over time, toxic stress can also impact the immune system and a child's physical health.

Jon's exposure to domestic violence has altered how he experiences and responds to his teammate's playful nudge. We see how his coach's response can either create new stressful events for Jon or create an opportunity for him to learn and still maintain his relationships with his peers. In other words, we see an example of the key role played by adults in stress generation.

STRESS GENERATION

Children who have experienced abuse and neglect have already experienced significant stress in childhood. However, we are learning that these children continue to experience new stressful events more frequently than their peers, even into adulthood. We call this stress generation. One possibility is that changes in the brain's threat, reward, and memory systems lead children to behave in ways that we may find challenging. How peers and adults respond to this behaviour influences whether new stressful experiences are created for the child.

WHAT CAN SCIENCE TELL US?

Studies of children who have experienced abuse and neglect show that they are more likely to experience stressful events than their peers. For example, we know that they are more likely to be bullied and are more likely to be excluded from school. These stressful experiences can in turn impact a child's mental health. How stress generation happens is not clear. Scientists are working to understand a complex process, involving a child's genetic make-up, alterations in brain systems and their social interactions. This last part – daily social interactions– means that stressful experiences are not always inevitable. How adults choose to respond can change the outcome for a child.

WHAT DOES THIS MEAN?

Scientists and clinicians have considered what stress generation might mean for a child in their everyday lives. Importantly, they have reflected on how it might contribute to the risk of mental health problems over time. They have found that:

- A child who has experienced abuse and neglect is likely to experience more stressful events than their peers. Small difficulties can escalate, sometimes leading to conflict.
- One possibility is that brain changes may be associated with misinterpreting or over-reacting to situations, compromising social skills or increasing difficulty in regulating emotions.
- There is an increased risk of bullying, experiencing relationship problems or being excluded from school.
- Experiencing stressful events is associated with an increased risk of anxiety and depression symptoms.
- Adults' ability to step back and reflect and consider how to respond is crucial as they may contribute to generating new stressful events.

When Jon begins a fight with his teammate in the pool, his coach's first reaction is to exclude him from the swim team. This is an example of stress generation where one outcome is social thinning. If Jon is excluded, he will lose out on opportunities to socialise and learn, as he is forced to break off valuable relationships with his peers.

SOCIAL THINNING

We know that supportive relationships are key to our well-being. They help us regulate our emotions and think through our everyday worries and problems. Adults also have a key role to play in creating opportunities for learning and growth for children. Studies have shown that abuse and neglect in childhood can lead to reduced social support over time – even into adulthood. This has been termed 'social thinning'. With fewer friends and relationships with adults who can support them, children become more vulnerable to mental health problems.

WHAT CAN SCIENCE TELL US?

Following childhood trauma, children can find it harder to build and maintain relationships. Scientists believe brain changes may impact the way a child experiences and actively shapes the social world around them. For example, a child may focus on danger while missing out on other more positive social cues, such as a friendly nudge. They may also be less able to draw on past experiences to solve social problems or conflicts. This may lead to being excluded from a friendship group, or a breakdown in a foster placement.
Crucially, the outcome of any social interaction also depends on how other people, like carers and professionals, respond.

WHAT DOES THIS MEAN?

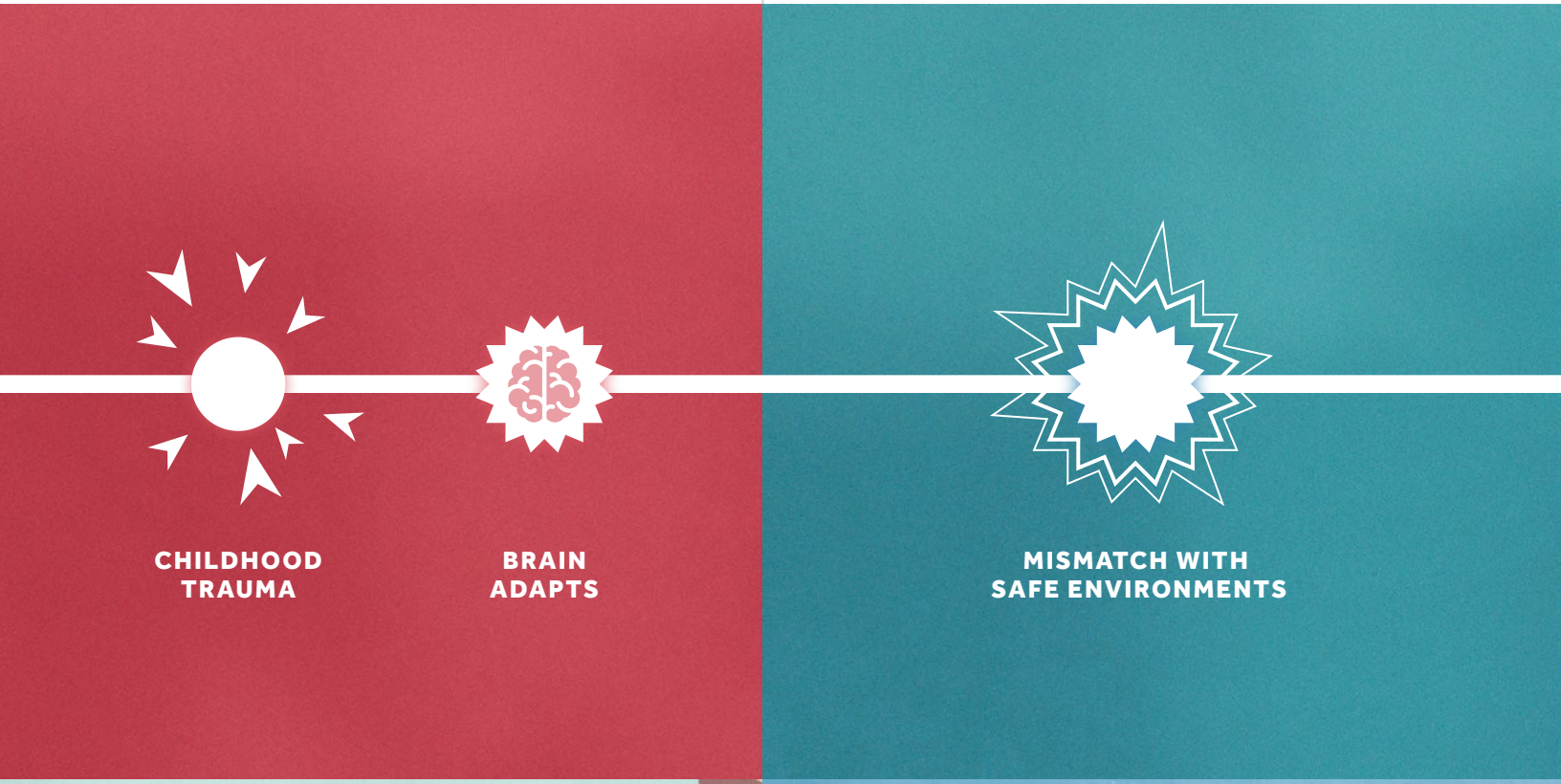
While evidence points to social thinning for some children following abuse and neglect, the precise ways in which this might contribute to mental health vulnerability is less clear. It is thought that:

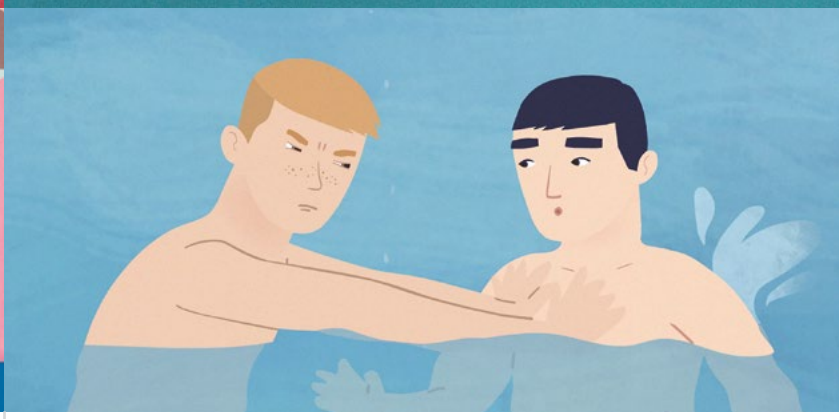
- Over time, a child who experienced abuse and neglect is at greater risk of losing friends and relationships with supportive peers and adults. This social thinning reduces access to sources of support when they experience future stressor events.
- Social thinning can also lead to fewer opportunities for a child to develop new skills and competencies.
- The development of self-confidence and a sense of agency, both of which are particularly important during adolescence, are dependent on healthy social relationships.
- Helping a child to develop skills and confidence in their social functioning, especially in relation to resolving social and relationship difficulties, is an important task for intervention and prevention programmes.

LATENT VULNERABILITY

HOSTILE ENVIRONMENT

SAFE ENVIRONMENT



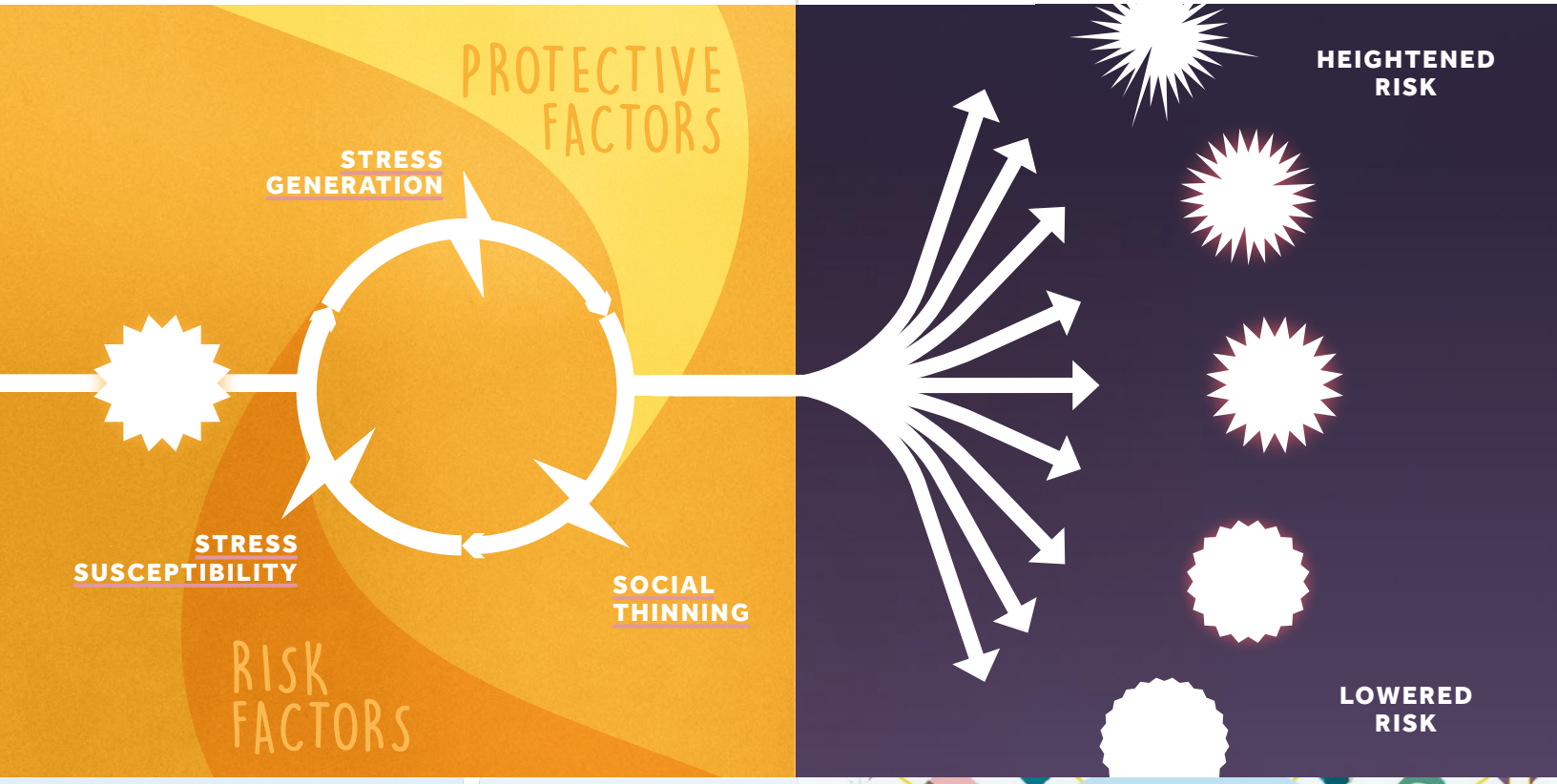


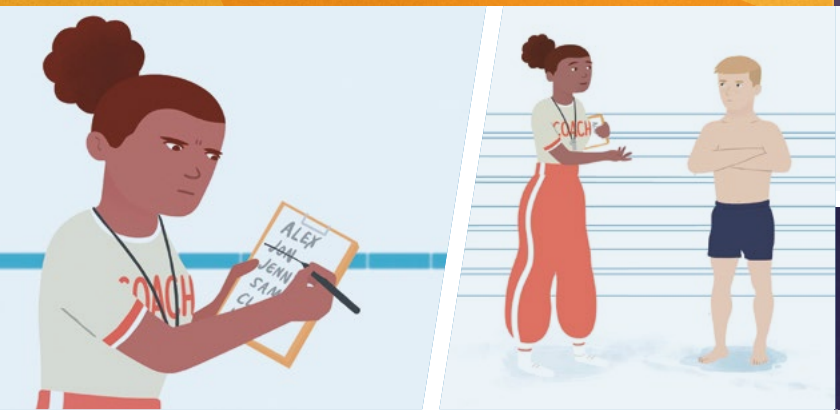
Emotionally and biologically, we are programmed to expect care and protection from our caregivers. When this fails to happen, a child – and their brain – adapts to cope. They may have to deal with a hostile external world characterised by danger and neglect. They also have to manage an internal world, where emotions such as anxiety or fear can be overwhelming. Scientists have identified changes in the threat, reward and memory systems in the brains of these children.

Brain adaptations helpful in a neglectful or abusive home environment may not work so well in a safe environment, such as school or a foster placement. For example, they may lead a child to interpret an everyday interaction as hostile and make it harder to learn from new experiences. This can make conflict with peers more likely. Equally, social situations may seem more scary and confusing, making it harder to build and maintain relationships.

PATHWAYS TO...

...MANY POSSIBLE FUTURES





Latent Vulnerability is something that plays out over a child's life in everyday situations at home and at school. In other words, it is a dynamic process. As adults we have a key role to play in enhancing the protective factors around a child. This includes supporting their social competencies, their relationships with peers and adults, and their access to new opportunities to grow and develop. It can be challenging, and takes patience and time.

Childhood experiences of abuse and neglect – what has been called 'toxic stress' – don't determine a child's future. Destiny is not fixed in early childhood. The brain adapts and responds equally to new positive experiences. Indeed, scientists have shown that our brain continues to mature and develop well into early adulthood. This means there are many windows of opportunity for us to help children move onto a resilient path.

PRINCIPLES TO GUIDE US IN PROMOTING RESILIENCE AND RECOVERY

How we can effectively promote resilience and recovery? There is no easy answer to this question. There is no quick fix, especially given the fact that every child is different. However, over the past decade, science and clinical practice have converged in highlighting a number of important principles that can guide us as professionals and carers. Some of these may already be very familiar to you.

1. THE BRAIN IS A PLASTIC, LEARNING ORGAN

As a species we are remarkably good at learning from day-to-day experiences throughout our lives. This helps to ensure our survival in a continuously changing environment. We have this ability because our brain is 'plastic' or able to adapt and change. While the brain's 'plasticity' is greatest in the early years of life, it is capable of learning and change throughout the lifespan. Research has shown that the frontal lobes in the brain don't even mature until our early 20s. We know that early experiences of abuse and neglect can influence brain system development in unhelpful ways. Equally, the brain can adapt again in response to new positive experiences. Exploration, play, and relationships can create opportunities for the brain to keep learning. This does not mean that the impact of early experiences disappear. This new learning may need particular kinds of support and help from adults.

2. THE BRAIN LEARNS THROUGH TRUSTING RELATIONSHIPS

If we are with people we know and trust then our minds are more open to new experiences. We are open to trying something new or to changing our beliefs about the world and other people. The capacity of the brain to learn in everyday life depends on relationships with trusted others. A lack of trust can make us feel isolated and disengaged – even if we are with others – and make us less able to learn. For children who have experienced abuse and neglect, a lack of trust may be one factor that explains their greater difficulty in learning. A child who does not trust those around them needs to be vigilant and wary. They may not be able to focus their attention on what excites and engages them in the classroom or at home.

3. BRAIN ADAPTATIONS MAY CONTRIBUTE TO BEHAVIOUR WE FIND CHALLENGING

Sometimes a child behaves in ways that are not typical or expected. This can make it hard to know how to help them because we can feel rejected or pushed away. We may also feel guilty or angry and the result can be the very opposite of what makes relationships work well. Early traumatic experiences can mean that the child in our care may not experience the world in the way that we do. Their brains may have adapted to survive a dangerous or unpredictable world. This can mean that they may find it more difficult to regulate and manage their emotions. Having insight into how early experiences influence brain development can help us adopt a more open and curious mindset in our relationships with children who have experienced trauma.

4. STEPPING BACK TO REFLECT CAN CREATE NEW WAYS OF THINKING

There is great value in the simple act of pausing. Stepping back for a moment, rather than reacting instinctively and jumping in to respond. Pausing gives us time to reflect, creating a space for new

ways of thinking. An opportunity to make sense of something that didn't quite add up. Such reflection may in turn lead to a different action. It can create the opportunity for us to ask questions, be curious, and become open to the possibility of an entirely different sequence of events. The result could be a response that positively impacts relationships under strain, one that has a positive impact on a child's long-term outcome.

5. Behaviour as communication: what does it mean?

When a child or young person behaves in a way that we find challenging, we need to look beneath the surface. The behaviour may have had an adaptive value for the child's survival in the past, or it may be a coping mechanism for them now. When a child acts aggressively we can choose to read their behaviour at a surface level. As professionals and carers we may think: 'This is becoming a real problem. Do I leave them out of team? Why can't this young person appreciate everything I am trying to do for them? This child is so sullen and resentful...it is hard to like them'. These kinds of responses may lead us down a path of escalating conflict and contribute to relationship breakdown. But, if we can uncover the worries, fears or doubts hiding beneath their behaviour, it is easier to make a connection with the child.

6. By responding differently we can create a different outcome

Stress generation frequently occurs because of new stressful experiences for a child can be created because of how we respond to their behaviour. All children need appropriate limits and boundaries. The way we respond to a child's behaviour should allow them to feel hopeful rather than a failure. Our responses should make them feel that relationships can be repaired and are not destined to fracture. It is important to remember that we bring our own emotions and past experiences to our relationships, including traumatic experiences that we ourselves may have had as children. Sometimes the best intentions can lead to new stressful experiences. This is why stepping back and reflecting can help us respond differently. Create for the child the experience of another mind that is genuinely interested in understanding them. This will open up opportunities for new learning and nurture relationships that have the potential to build a child's sense of achievement and self-worth.

7. Helping a child make sense of their experience

Exposure to childhood trauma can lead to alterations in the memory system. This may impact on how a child is able to make sense of the world. We all create narratives or stories that help us make sense of our everyday experience, usually through talking to friends and family. In a very ordinary way a story is constructed that we believe captures what happened. A foster carer – like any parent - by being curious, can play an important role in helping a child create stories about their experience. This allows them to develop understanding. If the school communicates to the foster parent, they are able to think with the child about things that happen: What triggered

that reaction? How were you feeling? What do you think the other child / coach thought was happening? Do you think what happened is like what happened in the playground last month? This can help the child knit together what can feel like a fragmented social experience. The conversation creates learning and understanding they can take forward. It can also help create strategies to deal with such situations in the future. Knowing that there's someone available to try and make sense of an experience and create a memory can make a real difference.

8. HELPING OURSELVES HELP OTHERS

If we are facing behaviour that we find challenging on a daily basis it can be hard to stay open – to maintain the ability to step back and reflect. We need to attend to our own needs. How do we keep ourselves going? It is important to connect with people who can be open and engaged in thinking with us when the going gets tough. We need to remember who our friends and colleagues are. We need to prioritise time with other people who can support us. People who can take up the same role for us as we do for the young person we are supporting. Unless there are people around us that help us with the challenges we are facing, we will be much less of a help to others.

9. HELPING (AND WELL-BEING) IS A TEAM EFFORT

We learn about ourselves and other people through our experiences with the people around us. How other people think, feel, and behave towards us shapes the way we go on to think and feel about other people. The same principle applies when we are helping a child or young person who has experienced trauma. If we feel we're the only person that understands them, it's a reminder to check who's supporting us. We need to work together to build a team – teachers, foster carers, social workers, family, neighbours – with a shared understanding of the child. If we start to feel we're the only person that understands this young person, it's a reminder to check who's supporting us. We need to be part of a connection of minds to be helpful to a vulnerable young mind.

FROM THE FIELD: NEUROSCIENCE EXPERIMENTS

To improve our understanding of children, neuroscientists across the world have been looking at the brain in tightly controlled experiments. These experiments address very specific questions and are designed to be as fun and stress-free as possible for young volunteers. Each one helps shed a little more light on a complex puzzle. Here are brief summaries of several key experiments by different researchers that have revealed some of the hidden links between childhood experiences of abuse and neglect and brain function.

THREAT SYSTEM

HEIGHTENED NEURAL REACTIVITY TO THREAT IN CHILD VICTIMS OF FAMILY VIOLENCE.

Children in this study decided if a series of neutral, sad or angry faces presented on a screen inside an MRI scanner were male or female. They weren't asked to focus on the emotional expression. Compared to a group of peers who had not experienced childhood trauma, the group of children who had been exposed to domestic violence / physical abuse showed a pattern of increased neural reactivity in the amygdala and insula while viewing angry faces. This pattern is similar to that observed in soldiers before and after they were exposed to combat, suggesting this is an adaptive pattern of hypervigilance and heighted sensitivity to potential danger following maltreatment. A follow-up study (McCrory et al., 2013) found that this heightened response in the amygdala was observed even when children were presented with angry faces subliminally – that is, for less than two hundredths of a second. This suggested that increased hypervigilance to danger following abuse and neglect may even occur outside a child's conscious awareness and control.

McCrory, E, De Brito, S. A., Sebastian, C.L., Mechelli, A., Bird, G., Kelly, P. & Viding, E. (2011). Heightened neural reactivity to threat in child victims of family violence. Current Biology, 21, R947-948.

McCrory, E. J., De Brito, S., Kelly, P.A., Bird, G., Sebastian, C. & Viding, E. (2013). Amygdala activation in maltreated children during pre-attentive emotional processing. The British Journal of Psychiatry, 202 (4), 269-276.

HEIGHTENED AMYGDALA REACTIVITY AND INCREASED STRESS GENERATION PREDICT INTERNALIZING SYMPTOMS IN ADULTS FOLLOWING CHILDHOOD MALTREATMENT.

In this study a large sample of young adults self-reported experiences of childhood abuse and neglect. Two closely matched groups were identified. As expected, those with high levels of childhood trauma showed higher brain activation in the amygdala to threat cues compared to those with no such history. This partly mediated the level of anxiety and depression symptoms one year later. That is, greater amygdala reactivity associated with abuse and neglect was a vulnerability factor for future mental health problems. This study also showed that those young adults with childhood trauma experienced more stressful life events than their peers, even when baseline levels of mental health symptoms were taken into account. The greater the number of these stressful events, the greater level of mental health symptoms one year later. This study provides compelling evidence for stress generation – that experiencing childhood trauma increases propensity to experience stressful life events that in turn increases the risk of future mental health symptoms.

Gerin, M. I., Viding, E., Pingault, J. B., Puetz, V. B., Knodt, A. R., Radtke, S. R., ... & McCrory, E. J. (2019). Heightened amygdala reactivity and increased stress generation predict internalizing symptoms in adults following childhood maltreatment. Journal of Child Psychology and Psychiatry, 60(7), 752-761

EARLY DEVELOPMENTAL EMERGENCE OF HUMAN AMYGDALA–PREFRONTAL CONNECTIVITY AFTER MATERNAL DEPRIVATION.

This study provides convincing evidence for the Stress Acceleration model. The researchers investigated the impact of institutionalisation – which included maternal deprivation - on a group of children and adolescents. They found that this group relative to peers showed a pattern of amygdala hyper-reactivity as well as an altered trajectory of amygdala and prefrontal cortex connectivity. Connectivity refers to how these two brain regions worked together. Surprisingly, children with a history of maternal deprivation displayed a pattern of connectivity that resembled what was seen in older adolescents. This suggests a pattern of accelerated maturation of this brain system that may reflect adaptation to early adversity.

Gee, D. G., Gabard-Durnam, L. J., Flannery, J., Goff, B., Humphreys, K. L., Telzer, E. H., ... & Tottenham, N. (2013). Early developmental emergence of human amygdala–prefrontal connectivity after maternal deprivation. Proceedings of the National Academy of Sciences, 110(39), 15638-15643.

MEMORY SYSTEM

ALTERED DEVELOPMENT OF HIPPOCAMPUS-DEPENDENT ASSOCIATIVE LEARNING FOLLOWING EARLY-LIFE ADVERSITY.

Children and young people exposed to different kinds of violence (sexual, physical and witnessing domestic violence) were compared to a control group who had not had these experiences. Children were asked to engage in a simple learning task in the scanner. Those who had been exposed to violence showed memory difficulties (particularly in relation to threat cues) that became more pronounced with age. These difficulties were associated with reduced activation of the hippocampus – a key region involved in learning and memory. It is suggested that this difficulty in learning new information, particularly in relation to emotion, may contribute to poorer outcomes for these children in respect of academic attainment and mental health.

Lambert, H. K., Peverill, M., Sambrook, K. A., Rosen, M. L., Sheridan, M. A., & McLaughlin, K. A. (2019). Altered development of hippocampus-dependent associative learning following early-life adversity. Developmental Cognitive Neuroscience, 38, 100666.

REWARD SYSTEM

AUTOBIOGRAPHICAL MEMORY: A CANDIDATE LATENT VULNERABILITY MECHANISM FOR PSYCHIATRIC DISORDER FOLLOWING CHILDHOOD MALTREATMENT.

Children with and without documented abuse and neglect recalled positive and negative personal memories while their brain activity was being measured. Maltreatment experience was associated with reduced neural activation in several brain regions, including the hippocampus when children recalled positive memories. There was also an increased engagement of the amygdala and other brain regions signalling salience while remembering negative memories. This suggests that the experience of maltreatment can bias how the brain processes memories, making negative past personal experiences more detailed and arousing, and positive ones less prominent.

McCrory, E. J., Puetz, V., Maguire, E. A., Mechelli, A., Palmer, A., Gerin, M. I., ...Viding, E. (2017). Autobiographical memory: a candidate latent vulnerability mechanism for psychiatric disorder following childhood maltreatment. The British Journal of Psychiatry, 211(4), 216-222.

NEUROBEHAVIORAL MARKERS OF RESILIENCE TO DEPRESSION AMONGST ADOLESCENTS EXPOSED TO CHILD ABUSE.

Studies have linked altered reward processing and risk of depression. In this study, reactivity to reward was assessed in a task where adolescents viewed facial expressions, including positive facial expressions and neutral facial expressions. Those with histories of abuse and neglect who had low reactivity for reward (positive vs. neutral facial expressions) were found to have had higher symptoms of depression two years later. Although the sample size was small for this group, this finding suggests that greater reactivity to positive and rewarding environmental cues may be associated with resilience to depression among adolescents who have experienced abuse and neglect in the past.

Dennison, M. J., Sheridan, M. A., Busso, D. S., Jenness, J. L., Peverill, M., Rosen, M. L., & McLaughlin, K. A. (2016). Neurobehavioral markers of resilience to depression amongst adolescents exposed to child abuse. Journal of Abnormal Psychology, 125(8), 1201.

A NEUROCOMPUTATIONAL INVESTIGATION OF REINFORCEMENT-BASED DECISION MAKING AS A CANDIDATE LATENT VULNERABILITY MECHANISM IN MALTREATED CHILDREN.

Children with and without documented exposure to abuse and neglect performed a decision-making task during an MRI brain scan. They had to learn what stimuli presented on the screen were associated with a higher likelihood of winning points (i.e. reward). Children exposed to abuse and neglect showed decreased activity in brain regions such as the striatum and the orbitofrontal cortex, which are important to predict and process reward. This suggests that children exposed to maltreatment may not respond in the same way as non-maltreated peers to rewarding events, activities and relationships. This may increase the risk of several mental health problems, such as depression and addiction.

Gerin, M. I., Puetz, V. B., Blair, R. J. R., White, S., Sethi, A., Hoffmann, F., ...McCrory, E. J. (2017). A neurocomputational investigation of reinforcement-based decision making as a candidate latent vulnerability mechanism in maltreated children. Development and Psychopathology, 29, 1689-1705.

FURTHER READING

For those of you who have an interest in learning more about this field, we list here a series of articles that address different questions in the field. Typically these are review articles that summarise particular areas of research. Note that these are not typically written with a lay audience in mind! All of the articles are available by clicking the associated link.

Annual research review: childhood maltreatment, latent vulnerability and the shift to preventative psychiatry – the contribution of functional brain imaging.

This is a comprehensive review of functional brain imaging studies (i.e. brain scanning studies) in children who have experienced abuse, neglect or institutionalisation. The review covers threat and reward processing, emotion regulation and executive functioning. There is also a more detailed description of the theory of latent vulnerability and why it is so important in moving toward a preventative model of help. That is, it makes the argument that neuroscience evidence supports a compelling case to help children before mental health problems emerge.

McCrory, E. J., Gerin, M. I., & Viding, E. (2017). Journal of Child psychology and Psychiatry, 58(4), 338-357.

Childhood Adversity and Neural Development: A Systematic Review.

This paper presents an extensive review of the literature on childhood adversity and neurodevelopment. In addition, two conceptual models of adversity and neurodevelopment not covered in depth in this animation guide are explored — the dimensional model of adversity and stress acceleration model. These models consider the differential impact of abuse and neglect on the brain (the dimensional model), as well as the evidence for accelerated development in threat circuits in children exposed to adversity (the stress acceleration model).

McLaughlin, K. A., Weissman, D., & Bitrán, D. (2019). Annual Review of Developmental Psychology, 1.

Mechanisms linking childhood adversity with psychopathology: Learning as an intervention target.

This article makes a compelling case for more translation of what we are learning from the science of early adversity so that research findings can inform intervention and prevention approaches. Three domains are highlighted: (i) threat-related social information processing; (ii) emotional reactivity and emotion regulation; (iii) reward processing. The importance of learning mechanisms across these domains is highlighted, particularly for behavioural interventions. A case is also made for the prevention of the onset of mental health problems in children who have experienced adversity.

McLaughlin, K. A., DeCross, S. N., Jovanovic, T., & Tottenham, N. (2019). Behaviour Research and Therapy, 118, 101-109.

The Brain's Emotional Development.

An excellent short introduction to the brain and emotional development. It covers a range of key topics, including the roles of the amygdala and prefrontal cortex, emotion regulation, and what is meant by sensitive periods. It helpfully includes reference to the role and influence of parenting, drawing on human and animal research.

Tottenham, N. (2017). Cerebrum, 17, 55-60.

Neurocognitive adaptation and mental health vulnerability following maltreatment: the role of social functioning.

This is also a review paper. The focus here is on key findings from the psychological, epidemiological and neuroscience literatures. It is suggested that these findings support the view that early maltreatment experience compromises social functioning in children exposed to abuse and neglect in ways that increase mental health vulnerability. The model of latent vulnerability is described as are the concepts of stress susceptibility and stress generation.

McCrory, E., Ogle, J. R., Gerin, M. I., & Viding, E. (2019). Child Maltreatment, 24(4), 435-451.

Child maltreatment and developmental psychopathology: A multilevel perspective.

This is a comprehensive chapter providing a valuable overview of many key concepts related to the field of childhood trauma – including developmental theory, emotion processing attachment, peer relationships, gene-environment interaction, brain imaging, resilience, intervention and social policy to name but few. The chapter isn't available as a direct download but it can be requested from the author.

Cicchetti, D., & Toth, S. L. (2016). In D. Cicchetti (Ed.), Developmental Psychopathology, 3rd Ed. (Vol. 3, Maladaptation and Psychopathology) (pp. 457-512). New York: Wiley.

Assessment of the harmful psychiatric and behavioral effects of different forms of child maltreatment.

This seminal paper provides compelling evidence that different types of child abuse have equivalent, broad, and universal effects. That is, in terms of mental health outcomes, physical, sexual, and emotional abuse and neglect have similar outcomes for children. As such, effective treatments for maltreatment of any sort are likely to have comprehensive psychological benefits. The authors argue for population-level prevention and intervention strategies particularly in relation to emotional abuse, which occurs with high frequency but tends to be less punishable than other types of child maltreatment.

Vachon, D. D., Krueger, R. F., Rogosch, F. A., & Cicchetti, D. (2015). JAMA Psychiatry, 72(11), 1135-1142.

GLOSSARY

AUTOBIOGRAPHICAL MEMORY SYSTEM
A distributed brain network of regions that allows us to store information about our past so we can more effectively negotiate new challenges and social situations. Over-general autobiographical memory refers to a difficulty in recalling personal memories in a detailed and vivid way.

BRAIN DEVELOPMENT
The processes that generate and shape the nervous system from the earliest stages of embryonic development to adulthood.

BRAIN SYSTEMS
A group of brain regions which work together to give rise to a specific function, such as memory processing, perception, emotion regulation, movement, or regulation of body temperature.

CHILDHOOD ABUSE
A subtype of childhood maltreatment/ childhood trauma. It encompasses all acts of commission (or threat), including physical abuse, sexual abuse, emotional abuse and witnessing domestic violence.

CHILDHOOD NEGLECT
A subtype of childhood maltreatment/ childhood trauma. It encompasses all acts of omission (or deprivation), including physical neglect and emotional neglect.

DIMENSIONAL MODEL OF ADVERSITY
A conceptual model that argues that threat-related exposures have the strongest impact on the amygdala salience network, whereas deprivation or neglect have the strongest impact on the frontoparietal network.

HYPERVIGILANCE
A heightened state of sensory sensitivity, increased alertness and exaggerated emotional and behavioural reactions to actual or perceived danger.

LATENT VULNERABILITY
Children (and their brains) adapt in response to abusive or neglectful environments in ways that may help in the short term but increase risk of mental health problems in the future.

MENTAL HEALTH PROBLEMS
Difficulties in thinking, feeling and behaviour that impede a person (or those around them) to cope and live their life in the way that they need or want. They can include symptoms of diagnostic categories such as depression, anxiety and conduct disorder.

NEUROSCIENCE
All of the sciences (e.g. psychology, biochemistry, psychiatry) which deal with the structure or function of the nervous system, including the brain.

RESILIENCE
Resilience is not a quality in the child. It emerges through the interaction of risk and protective factors, inside and outside the child. It can be thought of as a relatively positive outcome despite a given set of adverse experiences.

REWARD SYSTEM
Associated with the mesolimbic dopamine pathway, this brain system helps us learn about positive aspects of our environment, motivates behaviour, and guides decision-making.

SALIENT
Something noticeable or important.

SOCIAL CUES
These encompass verbal and non-verbal forms of communication. They include facial expression, vocal tone, body language, proximity and gestures. Neuroscience studies have tended to focus on facial expressions.

SOCIAL THINNING
A concept that refers to the gradual reduction over time of social support (e.g. friends and family). This may reflect the number as well as quality of relationships.

STRESS ACCELERATION MODEL
A conceptual model that proposes that caregiver deprivation and other forms of early-life stress accelerate the maturation of the amygdala-medial prefrontal circuit compared to typically developing children.

STRESS GENERATION
The phenomena where stressful life events occur more frequently than expected for some individuals. This is likely through the interaction of risk and protective factors.

STRESS SUSCEPTIBILITY
Individual differences in the perception and ability to adapt and cope with stressful events.

THREAT CUES
An example of a social cue. Mostly non-verbal signals indicating potential danger (e.g. an angry facial expression).

THREAT SYSTEM
Located in the temporal and frontal areas of the brain, this brain system allows us to detect and respond to danger. This is commonly referred to as a fight-or-flight response.

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Prof. Eamon McCrory

THE GUIDEBOOK TO

CHILDHOOD TRAUMA AND THE BRAIN

UK TRAUMA COUNCIL