



Why Love Matters: How Affection Shapes a Baby's Brain

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The case that I want to make is that babyhood is much more important to our lives than many people realize. A lot of the behavior that worries us in later childhood, such as aggression, hyperactivity, obesity, depression, and poor school performance, has already been shaped by children's experiences in babyhood. For those of you who have not studied the scientific literature, this might seem a bit far-fetched. I was rather amazed at just how significant babyhood is when I first undertook the research for my book *Why Love Matters*.

But over and over again, as people look into it, they discover that this really is the case. Just to take one recent example, the World Health Organisation recently published a report from their Commission on the social determinants of health which stated: "Research now shows that many challenges in adult society—mental health problems, obesity/stunting, heart disease, criminality, competence in literacy and numeracy—have their roots in early childhood." They went on to say: "Economists now assert on the basis of the available evidence that investment in early childhood is the most powerful investment a country can make, with returns over the life course many times the amount of the original investment."

The Over-Riding Importance of Early Conditions

The strange fact is that very often the early conditions of our lives have a profound impact on the whole of our development. Let me start by describing how this works with regard to the body and physical health, which might seem more obvious because we can see that nutrition affects the body. The body grows or it does not. It develops healthy organs or it does not. And, actually, the

early development of the body's organs and other systems are affected by the nutrition available at that time. There is a lot of evidence to suggest that birth weight and early nutrition have a big influence on later health such as susceptibility to heart disease, obesity, and Type 2 diabetes. Much of the early research was done by David Barker from Southampton University. He explains the process in terms of the fetus or baby adapting to the conditions in which it finds itself. If those conditions are of under-nourishment, the growing body has to adapt the way it handles sugar and fat, or the way the heart manages blood pressure. These adaptations, as he put it, "tend to have permanent effects on the body's structure and functioning—a phenomenon referred to as 'programming'." The poorly nourished babies have also been found by other researchers to have higher cortisol levels throughout adult life, suggesting that their stress response had been programmed in the womb or in infancy (Seckl & Meaney 2004). As Barker explains, these early adaptations allow the fetus and the baby to survive the immediate dangers of their situation, but have long term consequences—often at the price of a shortened lifespan.

The links between infancy and later health and longevity are already being taken seriously by the European Union (EU). For some years the European Union has been funding an Early Nutrition Programming Project based in Munich (coordinated by Professor Koletzko of the Children's Hospital, University of Munich, Germany), which has been looking at these links. Other major organizations recognize the links too. The World Health Organisation recommends at least six months of breastfeeding to protect the development of a child's immune system.

But my focus is on emotional health, and in particular how the brain systems that manage our *emotional* responses are just as much shaped by early events. They too are “programmed” in a very similar way. Not by food input—although that plays its part in nurturing our biochemical systems—but by the way that a baby adapts to the relationship environment and structures his brain accordingly, in order to survive in the situation in which he finds himself. Just as the baby's body adapts to a shortage of nutrition, so the brain adapts to inadequate emotional input.

The Human Brain

The human brain is unique. It shares many of the same features as animals' brains, but it is a kind of extended version. It starts off with a basic reptilian brain based around the brain stem—this is what supports the basic life functions, and this is the first part of our brain to develop, too. Then, as with other mammals, it adds various new capacities (based in the center of the brain) including nurturing abilities. But what really makes humans human is basically the massive post-natal development of the outer layers of the brain, the cerebral cortex. One of the first parts of this layer to develop is the pre-frontal section, which grows extremely rapidly in the first year or two of life. It is an area which is not fully formed at birth but which connects up in response to social stimulation in infancy.

Brain development, or learning, is actually the process of creating, strengthening, and discarding connections among the neurons. These connections are called synapses. There are not many at birth but they sprout rapidly in the first year of life and eventually form neural pathways that connect the different parts of the brain and organize its functions.

The pre-frontal cortex is the area of the brain I am most concerned with. It is what I call the social

brain, which is a shorthand way of referring to a range of areas in and around the pre-frontal cortex. We know from scientific research that this social brain area is activated when we are involved in controlling our emotions, paying close attention to other people and their social signals, thinking about feelings, and having empathy for others. It is the area of the brain that extends out of the more basic instinctive ways of behaving—such as fight or flight reactions—which are based in the amygdala and hypothalamus.

The social brain's job is basically to organize and supervise those more basic responses. But this human emotional control center does not develop automatically. The social brain develops in response

to the social experiences that a baby actually has. Neural pathways get laid down as a result of actual experiences, so, for example, the baby needs someone to give her an experience of emotions being managed helpfully before she can learn to do these things for herself and manage her own feelings well. Basically, babies learn how to do things through their experiences with other people, not through words or instructions.

They learn how to cope with stress by having an experience of someone being with them and helping them to cope. But they need to have these experiences consistently, over and over again, to lay down the pathways, during the first and second years of life.

As I mentioned earlier, the first year of life is about making connections in the brain. But during the second and third years of childhood that huge tangled mass of connections starts to get “pruned,” on a “use it or lose it” basis. Basically, we keep the pathways that are most used and most useful in our particular social environment—and lose those pathways that have not been used that much. In other words, if as babies and young children we

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live with angry, aggressive people, we will keep pathways that help us to be alert to anger and aggression, and if we live with people who are attentive to other people, we will keep the pathways that help us to be attentive.

Biochemical Systems—the Stress Response and the Soothing System

Some of the first pathways to be established in babyhood are the biochemical ones. These biochemical pathways, which I think of as a sort of liquid “grease,” assisting the flow of information around the brain, help the baby to react to his environment quickly and appropriately. In particular, I want to mention *two biochemical systems that are really important for emotional well-being*—I refer to them as the *stress response* and the *soothing system*.

The *stress response* is a very important biochemical system which develops in infancy. It releases the hormone cortisol to generate extra short-term energy to cope with stresses and dangers of all kinds. Once the objective has been achieved, and safety and social equilibrium are restored, the cortisol is dispersed. But in early babyhood, the stress response is not yet fully functional; babies are very vulnerable and easily stressed—particularly by situations that feel unsafe, such as being separated from their mother or a familiar person, or being physically hurt. Babies cannot protect themselves from stress or danger nor can they calm themselves down. They are dependent on an adult to protect and calm them, to quickly disperse their cortisol for them and to help them get back to a stable state. If the adults taking care of them do not manage their states for them, they can become flooded with cortisol without having any way of getting rid of it. Even in toddlerhood, they are still vulnerable, and need to feel that their world is safe and predictable, and that they can rely on others for help when they need it. If babies or toddlers end up being flooded with cortisol on a chronic basis, because the adults looking after them do not respond quickly, do not resolve problems for them, or are, in fact,

perhaps emotionally frightening themselves, the stress system will adapt to that particular human environment, and the baby may develop an unusual cortisol response—high or low baseline levels of cortisol—which can have some very negative effects on him/her.

Let me give you a glimpse of how this might be passed on from parent to child in practice. I had a client who was a violent offender. He had just come out of prison and was building a relationship with his son, wanting desperately to be a good father. However, the way he interacted with his baby son—unpredictably shouting at the baby or laughing at the baby’s distress—was frightening to the baby. If this had continued, the father would have passed on to his son a feeling of not being safe, having to be vigilant and alert to others’ aggression.

When experiences like this go on day after day, they can have lasting effects on the child’s biochemical systems. A child who experiences rough treatment, humiliation, aggression, shouting, and so on, has to adapt psychologically. But this is also happening at a biological level. It is thought that high levels of the stress hormone cortisol are eventually down-regulated and children like this end up with a low baseline cortisol level which has been found to be associated with later aggressive behavior.¹

Most people probably develop a healthy stress response if they have a normal childhood. This gives them a good chance of being able to bounce back after difficulties. It means that they have built resilience to stress. Even though they might be temporarily overwhelmed and start to forget things or lose the ability to pay attention, if they have established a healthy stress response in infancy, they are likely to be able to get back to normal quickly.

It takes quite a lot of stress over a very long period to create any permanent damage in a basically resilient adult (although it can happen). However, when babies are chronically stressed, this can create permanent damage to their systems so that they grow into adults who are not able to

recover quickly from stressful events. They become more vulnerable and sensitive to stress as adults and may seek help in regulating themselves through drugs and alcohol. When adults like my client ignore their children's feelings, laugh at them or punish them, the children basically are not going to be learning how to manage feelings or to regulate their feelings. Another aspect of too much cortisol early on is that it can have a knock-on effect on other biochemical systems—such as the *soothing system* which is based on the neurotransmitter serotonin. When this system is not in good shape, the baby can grow up finding it difficult to stay calm under stress and may become prone to impulsive outbursts and aggression. Low serotonin levels are part of the picture of mood and anxiety disorders, sleep disturbance, and aggression on into adulthood.

I think of these biochemical imbalances as a bit like a physical handicap, a vulnerability which is not necessarily immediately visible, but which can play itself out in later life, even after decades. High levels of cortisol are connected to physical health problems too; in particular research is now demonstrating links with later obesity and heart disease.²

Prefrontal Development

Too much cortisol early on—especially during the first three years when the daily pattern of cortisol is established—can even affect brain structure. In particular, it can damage those areas of the brain that are developing rapidly in the early years because it can be toxic to the development of neural connections just at the time when the connections are being made and the pathways established. Children who are traumatized early on often have reduced brain volumes in a number of areas, especially the prefrontal cortex: Literally, they have smaller brains. In other words, the volume of a child's brain can be shaped by experience; scientific research has shown that a child who is severely neglected physically as well as emotionally can have a dramatically reduced brain size.³

Neglect or stress can seriously affect the social brain, as well as other areas such as the amygdala, the cingulate, and the hippocampus, which are all important for emotional life. The crucial age for prefrontal emotional development is the period from the second part of the first year through toddlerhood, when the medial prefrontal cortex is developing most rapidly and is most susceptible to influence. It becomes functional at around 18 months to two years, by which time the child has become a self—that is, she can recognize herself in the mirror and has acquired the basic capacities for self-awareness and self-control.

The Importance of Positive Experiences

It is just as important to make sure that babies receive positive experiences as it is that they avoid negative ones. The whole process of developing a social brain and developing a strong sense of self is based on the quality of social attention the baby receives. The more pleasurable social experiences the baby has, the *more* this part of the brain connects. The less attention a baby receives, the *less* this part of the brain connects. In the worst cases, for instance some of the most abused Romanian orphans, this area of the brain was virtually a black hole, according to one researcher, Harry Chugani.

Basically, humans have to pass on a social brain. It does not develop automatically, but only as the result of an adult's investing attention in the baby. Babies learn to notice their own feelings when they receive a lot of responses to their feelings from the adults looking after them. Then, in turn, once they have that self-awareness, they can use it to become aware of other people's feelings and to have empathy for others.

It is the same with self-control. The social brain has the potential to influence and control our impulsive reactions arising via the amygdala, reactions such as wanting to hit someone when we are angry with him. However, these inhibitory brain pathways are only laid down if the toddler has the *experience* of adults making firm but kind demands on him to restrain his inappropriate behaviors, and

doing so consistently, over and over again. These capacities are also established very early on indeed. A researcher in the U.S.A., Grazyna Kochanska, has shown that self-control measured at 22 months predicts its presence at ages three and four, and another researcher showed that early self-control is linked to later empathy at age eight (Guthrie 1997). It is a central aspect of social behavior.

In fact, it is not only important for managing behavior, but interesting recent research by Clancy Blair (at Pennsylvania State University) is suggesting that it is this same self-control and self-regulation which underpins academic ability, over and above the child's intelligence. These learned social and emotional abilities make it possible later on in school for children to pay attention to teachers and to learn in other ways.

Basically, the brain is built up through actual experiences. What you put in is more or less what you get out. If we want to produce children who are calm, resilient, capable of empathy and foresight, we need to help parents pass on these qualities by providing a lot of support for early parenting, by which I mean helping parents who are not confident in their parenting, for instance my client. We also need to make it possible for parents to spend a lot of time with their babies and small children, paying lots of attention to their feelings and helping them to manage their behavior.

Poor Early Care Leads to Problems

I cannot include here everything that I talk about more fully in *Why Love Matters*. But I am not just talking about providing the optimum conditions for children's brain development. I also see early development as the key to preventing future social problems. Often, I feel that there is a lack of awareness about the early roots of problems.

For example, I recently read a piece suggesting that bullying at school led to later mental health problems—low self-esteem, depression, and anti-social behavior. Yet the writer assumed that these problems had all started in school with the bullying. He did not seem to be asking why particular children are bullied or how this might be the effect of patterns of behavior established much earlier in life. Actually, bullies rarely target children who have high self-esteem and confidence. They are more likely to target those who already show anxiety and vulnerability.

I would like to briefly outline a few of the ways in which poor early development can play out in later life: For example, babies who live with a depressed mother are at risk of growing up to be depressed themselves; they may develop a hypersensitive stress response and a less active left brain. This is not true of those whose mothers are depressed when their children are older.

Mental health problems such as personality disorders are, in many ways, a manifestation of inadequate early emotional care: people who have not been taught how to manage feelings well or to think about them, who have extreme emotional reactions and who often display a lack of empathy for others.

A similar story lies behind anti-social behavior. Children whose parents express hostility, who fail to model how to resolve conflicts or how to maintain self-control often become the offenders of tomorrow. A lack of a warm bond at the age of two tends to predict later anti-social problems (Belsky 1998), whilst, as I have said, a lack of self-control at age two tends to predict it at subsequent ages (Kochanska). Without a warm attentive early relationship, the prefrontal brain is less likely to develop well.

(W)hen babies are chronically stressed, this can create permanent damage to their systems and they grow into adults who are not able to recover quickly

Endnotes

1. For a summary of this research, see Megan Gunnar et al., *Development and Psychopathology* 18, pp. 651–677, 2006.
2. Shonkoff et al. *JAMA*, 2009.
3. Editor's note: Images of brains subjected to emotional stress or neglect can be found at:
<http://www.ecswe.com/publications.php>

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