
The Neurosequential Model of Therapeutics: An Interview with Bruce Perry

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In this interview with Bruce Perry, MD, PhD, Senior Fellow of The Child Trauma Academy, Laurie MacKinnon discusses with Dr Perry developmental trauma and the Neurosequential Model of Therapeutics, an approach to clinical problem solving that utilises a developmental lens and incorporates advances in neurobiological development. Dr Perry gives his perspective on the causal connection between childhood abuse and later psychiatric diagnosis, the child's contact with a violent parent post-separation, the importance of interventions that address the organisation and functioning of lower parts of the brain and his perspective on the use and limitations of psychotropic medications, cognitive behaviour therapy and family therapy.

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As a rare class of researcher who is also truly a clinician, Dr Perry mixes outstanding intellect and curiosity with profound insight and empathy. He has conducted research about neuroscience and trauma, in particular examining the effects on young children of trauma and neglect. His work has culminated in an innovative approach, the Neurosequential Model of Therapeutics (NMT) that has been integrated into an extensive range of clinical and child protection settings. He has published widely — more than 300 articles and book chapters. His two books, *The Boy Who Was Raised as a Dog* and *Born for Love: Why Empathy is Essential — and Endangered* are accessible and fascinating accounts of his work and ideas.

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Laurie MacKinnon: What is the Neurosequential Model of Therapeutics model and how does it contribute to understanding children and their development?

Bruce Perry:

The Neurosequential Model of Therapeutics (NMT) is essentially an approach to clinical problem solving. The specific goal of this approach is to ensure that the clinician is thinking about the client through a developmental lens and incorporating advances in neurobiology that tell us important principles about how individuals respond to threat and how this influences development. This neurodevelopmental lens allows a perspective that compliments other theoretical frameworks. It is not meant to replace but to compliment.

The primary advantage of this perspective is that it allows the development of a treatment plan that incorporates what we currently know about how the brain changes best. After all, isn't that what therapy, education, and parenting are all about? They are all trying to change the brain. Therefore, this neurodevelopmental perspective allows us to use emerging knowledge of neurobiology and child development to understand the client's current functioning and appreciate the developmental route to that functioning.

What we know about complex human behaviour is there are several determinants making a significant contribution in every domain of functioning. Genetic, epigenetic, intrauterine, early attachment experiences and developmental adverse experiences as well as relational buffers all contribute to current functioning. The NMT process asks the clinician to attempt to reconstruct the individual's route to the present. We believe that this can help us better understand the unique strengths and vulnerabilities of an individual.

Laurie MacKinnon: When working with children, a clinician working within the NMT model obtains a detailed developmental history. When assessing a traumatised adult, how similar is the framework? Does the clinician take similarly detailed developmental history looking for the deficits in neurological development?

Bruce Perry:

We use the NMT with adults as well as with children. The same neurodevelopmental rules that influence the functioning of the child are also true for the adult. Indeed, this approach frequently involves the creation of an NMT developmental history and brain map for the adults living with the child (typically parents or grandparents). It is remarkable to see how similar the brain map of many impaired parents is to the map of their struggling child. As all of us know many of these adults grew up in similar chaotic and trauma permeated environments.

Laurie MacKinnon: I can see how the NMT approach can be implemented with children who have been neglected but are currently living with nurturing and supportive foster parents. As family therapists, we are often working with the biological or stepparents and children. In some of these families, the parents' care of the children is poor. They are neglectful or verbally and emotionally abusive but they are 'good enough', in that child-protection authorities would not consider removing the children. What is the best way of applying the NMT model with families like these?

Bruce Perry:

The NMT is an approach that attempts to consider this. Indeed, one of the major elements of this approach is a teaching and capacity building component. The family, whether foster or biological, is included in this capacity building process. We believe it is important to create a respectful and honest relationship with the family. Frequently, impaired parents eagerly engage with the recommended therapeutic activities, mostly because the activities also help them become better regulated. As often as possible, we create a set of recommendations that address the mutual needs of parent and child. Sometimes these are somatosensory activities such as mutual hand massage, dancing, singing, sport, or other activities that have both somatosensory and relational elements.

It is true then many families are so impaired that they cannot engage in this process and when this is the case, we work hard to provide the fundamental supports and therapeutic services that would finally allow that parent to be more engaged with their child.

Laurie MacKinnon: Family therapy had its beginnings in the study of families with a schizophrenic member. Over the last two decades, however, family therapy moved toward the illness model of schizophrenic and family psycho-education. It is now common to view earlier research as 'mother blaming' and naïve in light of later information about the biological differences in the brains of people with mental disorders. In 2001, you wrote a compelling argument about how schizophrenia is not merely a biological illness, providing evidence of a causal connection between childhood abuse and later psychiatric diagnosis of schizophrenia. Can you describe how early childhood experiences can change the developing brain in a way that can result in a later diagnosis of schizophrenia?

Bruce Perry:

Dr John Read from New Zealand has been a leader in this area. For the last 15 years, he has carefully examined the relationship between early developmental abuse and psychotic symptoms. He was gracious enough to include me in a review article that outlined his perspective on potential mechanisms that may underlie the observation that individuals with schizophrenia have a much higher likelihood of having had developmental trauma. At the time, this was controversial but over the years the developmental nature of schizophrenia has become clearer and is now well accepted. The contributing role of trauma and abuse remains a continuing area of investigation but clearly, John was right — schizophrenia is a neurodevelopmental disorder. All neuropathology indicates that disruption of processes that take place during the intrauterine and perinatal period are involved in schizophrenia. The actual 'source' of these disruptions is not completely understood — but clearly, childhood trauma seems to increase the risk for expressing these vulnerabilities.

The neurobiology that may be involved in this has been well studied in animal models. We know that the development of dopaminergic neural networks, which seem to be involved in schizophrenia depend on appropriate timing and sequence of key signals during development. We also know that intrauterine and early perinatal insults will disrupt these signals and lead to altered development (and functioning) of these dopaminergic (and related) systems. The actual mechanisms are, as with all complex behaviour clusters, multifactorial and likely different from individual to individual. It is highly likely that genetic factors play a role, clearly, there are epigenetic factors,

and, as mentioned above, developmental experiences of risk (adverse experiences and trauma) and resilience (relational buffers, strong community, and cultural anchors) seem associated with the risk for development of schizophrenia.

Laurie MacKinnon: Is there evidence to show that other 'disorders' often considered biological such as obsessive-compulsive disorder (OCD), bipolar disorder, depression and attention deficit hyperactivity disorder (ADHD) are also the result of adverse early childhood experiences?

Bruce Perry:

There is certainly evidence that developmental experiences contribute to risk for the expression of these 'disorders'. With that said, it is important to acknowledge that our current diagnostic labelling system is flawed. A major challenge for our field will be developing a labelling process that actually connects pathophysiology to a disorder. Currently we are merely describing symptoms. These symptoms are complex and might have several neurobiological determinants. Therefore, to study ADHD and look for genetic or biological markers that may be associated with this 'disorder', one is essentially looking at a heterogeneous cluster of problems rather than a homogeneous disorder. This complicates the research and confuses the field. Until we have the ability to look at and follow neurophysiology at the same time that we are following functioning, we will remain at an immature level of development as a field.

Laurie MacKinnon: An interesting aspect of your model is the differentiation of the four levels of the brain and how therapeutic intervention must be tailored to each of those levels according to the age of the child when traumatised. Can you tell us about interventions targeting the brainstem, and why these are important? What neurobiological explanation is there for the effectiveness of sensorimotor interventions such as Eye Movement Desensitisation and Reprocessing (EMDR) and tapping?

Bruce Perry:

This is a frequently misunderstood aspect of our approach. The human brain does have four major developmental and anatomical structures: the brainstem, diencephalon, limbic and cortical areas. Functions that are brain mediated are created through activity in neural networks. These networks typically span many areas of the brain: so it is an oversimplification to localise function to any specific area of the brain. It is true, however, that the final mediating parts of the brain for any function can be localised. So you can look at a variety of brain mediated functions to give you a snapshot of how a specific area of the brain appears organised. The NMT gathers data about these various functions and organises them into a 'representation' of the brain. This gives us a picture of how an individual's brain appears organised. Taking this information we will then estimate how well specific fundamental domains such as sensory integration, self-regulation, relational and cognitive functioning appear to be working compared with same age peers and compared with a fully organised mature adult brain. This gives the clinician an estimate of where to start in the sequential therapeutic or educational process.

In children who have had significant developmental trauma there will be a high likelihood of poor organization and functioning in lower parts of the brain, the brainstem and diencephalon (one of the best-known effects of trauma is to alter the

functioning of the brain's stress-response systems, which originate in the brainstem and diencephalon). Further, we know that to change any neural network in the brain we need to provide some form of patterned, repetitive activity. One of the fundamentals of neural change is activity- or use-dependence. Any neural network that is activated in a repetitive way will change. Therefore, if we want to provide reorganising, patterned, repetitive input to reach the dysregulated or poorly organised neural networks involved in the stress response, we can provide patterned repetitive rhythmic somatosensory activity. Music, dance, drumming, grooming a horse, jumping on a trampoline, swinging, massage and a host of other everyday activities can be structured to help do this.

The rhythm of these experiences matter. The brainstem and diencephalon contain several powerful associations to rhythmic somatosensory activity created in utero and reinforced in early in life. The brain makes associations between patterns of neural activity that co-occur. One of the most powerful sets of associations created in utero is the association between patterned repetitive rhythmic activity from maternal heart rate and all the neural patterns of activity associated with not being hungry, not been thirsty, and feeling 'safe'. In other words, patterned, repetitive and rhythmic somatosensory activity becomes an evocative cue that elicits a sensation of safety. Rhythm is regulating.

All cultures have some form of patterned, repetitive rhythmic activity as part of their healing and mourning rituals — dancing, drumming, and davening (swaying slightly while reciting liturgical prayers). EMDR and bilateral tapping are essentially variations of this patterned repetitive rhythmic somatosensory activity. By tapping into these strong 'regulatory' memories while you are re-creating the cognitive image and affective memory of the traumatic event, you are able to short-circuit the 'trauma' memory.

Many interesting programs have developed around the use of pattern repetitive motor activity, drumming, rhythmic breathing (as in yoga), and a variety of other somatosensory activities as simple as walking that turn out to be effective with dysregulated children, youth and adults. We believe that they are regulating in part because they are tapping into the deeply ingrained, powerful permeating associations created in utero.

Laurie MacKinnon: In Australia, there is pressure on therapists is to adopt evidence-based, brief therapy and Cognitive Behaviour Therapy (CBT) has become a dominant paradigm. From within the NMT framework, it seems that CBT involves the fourth level of the brain (neocortex) and I wonder what effect it has on disturbances at lower brain levels. What is a neurobiological perspective on the use of CBT?

Bruce Perry:

We actually believe that Cognitive Behaviour Therapy can be tremendously helpful for individuals affected by trauma. It is our experience, however, and the experience of many other practitioners of Trauma focused CBT (TF-CBT) with high-risk populations (such as the juvenile justice population and the child protective systems population), that there is relatively inefficient efficacy in the real world. We believe many individuals who receive CBT are extremely dysregulated and not yet capable of optimally benefiting from this approach. TF-CBT, itself, incorporates a regulatory phase, essentially acknowledging what we are talking about. We find, however, that

there are other ways to regulate extremely dysregulated children, youth, and adults more effectively and quickly.

Individuals can self regulate themselves in three ways. The first is through bottom-up somatosensory regulatory routes: children rock themselves, suck their thumbs, walk around, and hum to themselves. These are the pathways through which the primary caregiver regulates the infant early in life: touch, rock, gaze, and sing. All sensory input from the outside world and from the inside world (the body) has its first stop (synaptic connections) low in the brain, either in the brainstem or diencephalon. Patterned repetitive rhythmic activity over these sensory routes has the effect of regulating and to some degree calming and organising a set of important neural networks that originate in these lower parts of the brain and are essential to the stress response (including norepinephrine, dopamine and serotonin).

The second major self-regulatory mechanism is to dissociate. We use this daily. When you daydream during a boring lecture, you are using dissociation to regulate.

The third mechanism for self-regulation is a top-down, cortically mediated modulation of the stress response, arousal, attention, impulsivity, and so forth. During development, the cortex becomes more mature and 'stronger'. This is caused by exposure to patterned repetitive cognitive processes such as relationally-mediated conversation, the acquisition of language, learning how to read, complex social interactions, hearing, and making music and a range of repetitive motor activities that are part of healthy developmental experiences. All of this organises and strengthens the cortex. As the cortex matures and we develop 'executive function' capabilities, we are more able to modulate the lower and more reactive parts of our brain.

It is through this top-down mechanism that cognitive behavioural therapy works. And it can be tremendously powerful. Thoughts, beliefs, frames of reference, personal narrative and a host of other cognitive factors are important in helping contextualise, interpret, and cope with trauma. The capacity, however, to use these capabilities is impaired when somebody is extremely distressed. All functioning of the brain is state dependent and when one is highly aroused all these cortical capabilities are compromised. Further, when someone grows up in a chaotic, neglectful environment, they will frequently have fewer and more disorganised experiences that would normally organise the cortex. Therefore, in children who have had complex trauma, there will be a combination of high arousal and reactivity — which impairs cortically mediated, 'top-down' regulation — and a history of developmental experiences (for example, neglect, chaos, poverty of relationships) that result in a poorly organised cortex. The combination (immature dysfunctional cortex and over-reactive lower brain) leads to poor cortical modulation and these individuals will be poor candidates for traditional CBT. An advantage of the NMT is that you can identify the individuals more likely to benefit from CBT and the individuals requiring some form of somatosensory regulation.

Laurie MacKinnon: What role do you see for psychotropic medications when working with traumatised children or adults?

Bruce Perry:

The use of psychotropic medication and maltreated children has become a national disgrace in the United States. Foster children in the US with mental health problems

received between three and eight times more psychotropic medications than children with the same neuropsychiatric problems but not in the foster-care system. Polypharmacy, overprescribing of antipsychotic medications, poor monitoring of side effects, all contribute to a mess. There are times, however, when careful empirically driven psychopharmacology can be helpful for severely dysregulated children. When a careful prescriber clearly identifies target symptoms, monitors the progress and side effects, and is working with a team providing nonpharmacological interventions, medications can be helpful. There are however no well controlled studies of the use of psychotropic medications in the population of severely maltreated children. Therefore, almost all prescribing is considered off label and traditional cautions associated with that should be observed.

Laurie MacKinnon: Some children are disruptive in the classroom because they have a difficult time sitting still and paying attention. When referred to a paediatrician, they often come away with a diagnosis of ADHD and a prescription for amphetamines. What is your neurobiological perspective on the use of psychostimulants for these children?

Bruce Perry:

The use of psychostimulants in children with attention problems has been studied in more research projects than any other medication in child psychiatry. The results are mixed. With more than 5000 studies reported, clearly there are immediate positive effects on attention for many children. However, in the best-controlled longitudinal studies psychostimulants show no superiority to nonpharmacological interventions and show significant negative effects on growth.

Personally, I am very reluctant to use psychostimulants until all other nonpharmacological interventions have failed. This is the reverse of typical practice. Most practitioners start with psychostimulants and may not even consider other nonpharmacological interventions. They often claim that there are few well-trained clinicians in the community to provide nonpharmacological evidence-based treatments — and that these are ‘expensive’ (seriously).

My major concern about the use of psychostimulants is when they are used in young children. There is evidence in animal models that influencing dopaminergic neurotransmission during development with either psychostimulants or antipsychotics changes the development of these neural networks. One potential significant consequence is the way psychotropics may alter the reward neurobiology in the brain. Certainly, in animal models this is an issue. Preliminary work in human beings is trending the same way that the animal work is, namely, that administration of medications that influence neurotransmission early in life have altered the long-term development of these neural networks and have functional consequences.

Laurie MacKinnon: In some cases after mothers have separated from violent and verbally abusive men, the parents are in conflict about arrangements for their children. Their children witnessed the abuse and lived with violence and aggression. Therapists, as well as lawyers and the courts, debate whether it is in the best interest of those children to have regular, unsupervised, overnight visits with the father (who had been violent to the mother but not directly to the children). Some argue against it while others say that children

become more damaged by not having the opportunity of a relationship with their father. What is your perspective?

Bruce Perry:

Not to sound like a politician, but this is a challenging aspect of the work that we do. In addition, this is one of the reasons that we developed the Neurosequential Model of Therapeutics. The ability to generalise in any meaningful way about removal or not removal, visit or not visit, harmful or not harmful is essentially impossible. Every child and every situation deserves a developmentally sensitive, psychologically aware deliberation of the specifics related to their current situation. There are some cases where it would clearly be destructive to have a child visit a father assaultive to the mother. In other cases it would be a positive and potentially therapeutic component while helping the child cope with and understand what had happened.

Tremendous differences and complexities would inform decision making. It is a challenge to the system to be capable of tolerating the level of flexibility that leads to good decision making. Systems like one-size-fits-all solutions. Just as one-size-fits-all is not good in therapy; it is not good in decision making about specific issues such as removal, or family reunification or visitation and so forth. Every family and every child deserves a process in which they can share their full story and the professionals working with them can come to know them in the broadest sense. It is only from this perspective that we can make the best culturally sensitive, developmentally aware and trauma informed decisions.

Laurie MacKinnon: What do you see as the limitations of family therapy as it is commonly practiced?

Bruce Perry:

Over the years, our clinical team has learned that all theoretical frameworks and all therapeutic approaches have limitations. Indeed, the NMT was developed in part to address this issue. There are many complexities and factors contributing to human functioning. No single theoretical framework can capture this complexity. Similarly, no single therapeutic technique or evidence-based practice can address all multidimensional needs of all children at all stages in development. Therefore, the NMT has attempted to take advantage of the strengths of the entire therapeutic toolkit. There are times in development when the developing child primarily needs somatosensory regulation, for example in infancy. There are times later in life when the level of somatosensory regulation appropriate for an infant (for example, rocking, or holding) would be inappropriate. In a healthy adolescent sitting in a classroom, the primary need is cognitive enrichment to master a complex concept. It is the same thing with therapeutic work. A cognitively focused therapeutic approach would be appropriate with a well-organised, cognitively mature youth traumatised by a school shooting but a waste of time for a severely maltreated, nonverbal, profoundly dysregulated five-year-old.

Therefore, my only criticism of any reasonable therapeutic approach would be in the context and timing of its application. There are times when a family approach is appropriate, indeed essential, and times when family therapy — alone — would be inefficient and wasteful.

The goal of the NMT assessment is to identify what are the most likely therapeutic, enrichment and educational activities that would help the child where he or she is currently functioning. In addition, as the child matures and improves this approach allows, in fact requires, that the therapeutic, educational and enrichment activities shift to match where the child is. A major flaw in our current mental health model (at least in the USA) is that clinicians are trained in a technique or a theoretical frame of reference and every person who walks in their door gets that treatment. Some clinicians in communities will give every child with trauma who walks through their door EMDR, others will give every child trauma-focused cognitive behavioural therapy, and even others who prescribe medication for every child walking through their door who has neuropsychiatric symptoms. The goal of the NMT is to minimise this one size fits all fantasy that in the end, often contributes to the ongoing developmental challenges in a child's life.

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