

1 Trauma theory

Sandra L Bloom

Introduction

Across the millennia, the human brain has evolved to function as an integrated whole, with mind and body acting in concert, constantly adapting to a wide range of ecological challenges. The complex physiological mechanisms that have developed to accommodate this enormous flexibility are generically known as the human stress response. In the last several decades, the study of traumatic stress – capturing the most extreme mobilisation of the stress response – has garnered a significant body of knowledge and research.

For many years, the word “homeostasis” has been used to describe the exquisite balancing act that keeps human bodies functioning within an optimal range and in a state of equilibrium. This primarily involves the autonomic nervous system as it constantly responds to demands for activation or relaxation. More recently, researchers have been substituting the word “allostasis”, a term that indicates variability in this balancing responsiveness. The sympathetic nervous system is activated as a stressor indicates the need for greater response, including an increased utilisation of energy. Powerful neurochemicals and neurohormones released by the brain stimulate end organs in turn to release adrenaline, cortisol, beta-endorphin, glucagon and others. When the need to respond to the stressor has passed, the parasympathetic nervous system calms that response down, so the organism can return to restoring energy and growth, and to repair any damage. The variable response to a stressor is influenced by the three levels of the brain: automatic responses to survival threats in the brainstem, emotionally-based responses originating in the limbic system, and more complex and even conscious responses that originate in the cortex.

Inadvertently, a linguistic problem has developed in that the word “trauma” is being used to describe reactions and results that emanate from events that may not be routinely understood as traumatic. It is not possible to coherently understand traumatic stress and the complex problems associated with it without also considering the other gradations of the stress response: positive stress, tolerable stress, relentless stress (increased allostatic load), and toxic stress. Positive stress is characterised by moderate, short-lived increases in heart rate, blood pressure, serum glucose and circulating levels of stress hormones, and occurs

when the body adapts to any change, such as leaving home and getting into a car to drive to work. Tolerable stress refers to responses that could affect brain architecture, but generally occur for briefer periods that allow time for the brain to recover and thereby reverse potentially harmful effects. An increased allostatic load, or relentless stress, are the terms being used to describe the wear-and-tear on the body and brain resulting from chronic over-activity of the same physiological systems that are normally involved in adaptation to environmental challenge (McEwen, 2012). Toxic stress is the term employed to describe the strong and prolonged activation of the body's stress management systems that becomes particularly problematic when it occurs during critical developmental periods, because of the multiple ways that this activation affects the progressive unfolding of basic brain architecture (Shonkoff et al., 2012b).

This extensive variation in control mechanisms tells us a great deal about the problems that can arise for human beings in our modern world. We are still quite capable of responding as our ancestors did to survival threats. But we respond similarly to anything we perceive as emotionally threatening as well as threats to our status, our individual and group identities, and our ideological frameworks. Therefore, to understand the multiple ways in which stress affects people, there is a need to simultaneously understand basic physiology, human development, emotional processing, and cognitive processing, as well as group behaviour and moral systems, and the way each of these critical components of human existence interact with each other. This complexity requires the need for a more thorough understanding of stress, trauma, and human physiology in health and disease or dysfunction.

Stress, adversity, and trauma affects everyone, and the earlier it starts in life, the longer it lasts, the more frequently it happens, and the more distrust develops, the more challenging and long-lasting the effects will be. It is because of this complexity and the intersection with so many other dimensions of science and the humanities that it has become possible for a unified field theory of human behaviour to begin to emerge. A paradigm shift is finally occurring after several hundred years of advancing knowledge that can integrate and unite the varied schools of thought about trauma and the human condition.

Physical responses

Fight-flight

The physical response to danger referred to above is best known as the “fight-flight-freeze” response, the basic mammalian survival response. “The sympathetic nervous system kicks into action during emergencies, or what you think are emergencies. It helps mediate vigilance, arousal, activation, mobilization” (Sapolsky, 1998: p.22). This results in increases in blood pressure, heart rate, breathing, accelerated delivery of nutrients to muscles, blunted pain perception, increased blood clotting, activation of the immune system, and a brain that is

on alert. At the same time, long-term digestion, growth, tissue repair, and reproduction are all turned off.

The amygdala, an almond-shaped structure found in both the right and left temporal lobes of the brain, is like a “central switchboard” for danger, so that when threat is perceived, the amygdala is activated and sends signals that trigger the full fight–flight response, all of which occurs at an unconscious level. As a result, the amygdala can be “hijacked”, so that a response to non-dangerous stimuli can occur before there is a chance to think or evaluate a situation (Goleman, 1995). The right amygdala appears to be more influenced by early childhood experiences than the left.

Joseph LeDoux has described a “low road” and a “high road” of arousal, demonstrating that the low road from perception of potential danger to immediate arousal of the autonomic nervous system is unconscious and fast, while the high road, involving the appraisal process of the cortex, takes twice as long to be activated (LeDoux, 2002). Anyone who drives is aware of this: braking occurs before any conscious decisions can be made.

Chronic stress can result from living in chronically dangerous situations: war zones, domestic violence, incarceration, refugee status, child abuse. But chronic stress can also occur under conditions that are not actually physically dangerous but that are psychologically threatening, including events that are anticipated to happen. It is the generalisation of the stress response that sets humans apart from other animals; humans can elicit a fight–flight–freeze response in situations that are not physically threatening.

Chronic hyperarousal

Under conditions of chronic stress, something goes wrong as the body repeatedly attempts to mount the necessary physiological responses. The effectiveness of the response diminishes, and the body becomes desensitised to the effects of some neurohormones, and hypersensitive to others. The entire system can become dysregulated in multiple ways. This results in a set of highly dysfunctional and maladaptive brain activities (Perry and Pate, 1994). The person experiences this as a state of chronic hyperarousal – a hallmark characteristic of Posttraumatic Stress Disorder (PTSD). Essentially, the baseline level of arousal for the person has changed, with a loss of control of their own responses to stimuli.

Once severely or repeatedly traumatised, people lose the capacity to modulate their level of arousal, they stay hyper-aroused and guarded, and they are unable to calm themselves down, even when there is no danger. They may feel embarrassed by their response, while at the same time they may also be irritable, angry, and frightened for no apparent reason. They may still be prepared to fight or to flee and they may also become flooded with memories, images, and sensations that are overwhelming. As a result, they are likely to feel that they are “going crazy.” These reactions can be triggered by internal or external cues.

Fear-conditioning

Once a fear-evoking stimulus has been experienced, “fear-conditioning” occurs; a state that is very powerful and difficult for the logical centres of the brain to override (LeDoux, 1992, 1994). Because of the vast associational network of the human brain, fear can pair with virtually any stimulus. This happens very quickly at the time of the frightening event, and beyond conscious control. Later, the person is usually not consciously aware of the connection between the fear-provoking stimulus, since the fear-response has become completely automatic. Each episode of danger connects to every other episode of danger, so that the more danger a person is exposed to, the more sensitised that person becomes. This hypersensitivity is known as “kindling” and has been associated with not only PTSD but also with episodes of mania and depression (Monroe and Harkness, 2005). With each fight-or-flight experience, the mind forms a new network of connections that is triggered by every subsequent threatening experience or stimulus.

Since most individual cell growth and specialisation in the brain occurs after birth in response to complex and critical neurohormonal cues, chronic hyperarousal in childhood means that children are more likely to develop a panoply of destructive symptoms and behaviours in attempts to diminish this unsupported state. Failure to provide children with sufficient protection from overwhelming stress appears to cause actual impairment in normal brain development. A growing body of evidence suggests that this exposure has long-term detrimental effects on basic brain architecture as well as cognitive, emotional, and social function, as well as moral development. Researchers studying childhood posttraumatic stress and adversity believe that childhood stress and trauma may be the common link between many medical and psychiatric conditions related to the immune system, the cardiovascular system, and the neuroendocrine system. These findings have been strongly supported by the landmark Adverse Childhood Experiences study (Anda et al., 2010).

Freeze and dissociation

The freeze component of the stress response is strikingly different. If there is no chance for survival by either fight or by flight, the freeze response may automatically occur. The freeze response activates a very different sequence of autonomic nervous system arousal, slowing the heart rate, preserving blood flow, and even simulating death so that a predator loses interest, since predatory behaviour is triggered by movement (Levine, 1997). The dissociative response, the “temporary breakdown in continuous, interrelated processes of perception, memory, or identity” (Brewin, 2011: p.211), has much in common with the freeze component of the stress response, although the difference between what happens to prey animals in the wild who do not get caught, and what happens to humans who dissociate at the time of a trauma is significant. Animals who enter the freeze state and who come out of that state of immobility spontaneously are far

more likely to survive than animals who are forced to come out of that state. Apparently, the spontaneous recovery of the animal, often through repetitive almost seizure-like motor discharge, is associated with survival after the immediate source of danger has passed (Scaer, 2001). But humans frequently do not spontaneously come out of the acute dissociative state known as “shock”, and, instead, fragments of the experience may become locked into that dissociative state, unavailable to full biographical narrative. These become the substrates for flashbacks, nightmares, and behavioural re-enactments.

Similarly, animals exposed to inescapable shock “learn” to be helpless so that even when they could escape they do not do so. This phenomenon of uncontrollability has been used as a model for chronic dissociation and the freeze response in humans who cannot control the trauma they are experiencing. A viable hypothesis is that the failure of the person to adequately discharge the state of immobility and the dissociative state accompanying it may lie at the heart of the memory disturbances and arousal symptoms of PTSD (Levine, 1997); it is well established that people who dissociate at the time of a traumatic event are more likely to develop PTSD (Van der Kolk and Van der Hart, 1989).

Tend and befriend

More recently, a different form of the human stress response has been captured in the phrase, “tend and befriend”. It has been proposed that one of the most striking aspects of the human stress response is the tendency to affiliate, that is, to come together in groups to provide and receive joint protection in threatening times. This form of the stress response would have supported survival by arousing the need, particularly in females, to tend to the young and vulnerable, and could be served by circuitry involving the parasympathetic system with the release of oxytocin that then triggers the release of serotonin and dopamine, all of which supports affiliation (Taylor et al., 2000; Taylor, 2006). Differing gender-based strategies would have served evolutionary needs but may now help to explain gender differences in longer-term physical outcomes (Verma et al., 2011; Wang et al., 2007).

Cognitive responses to danger

Information processing

Human beings have two distinct ways of processing information: one under calm, low-arousal states termed “rational-thinking mode”, and the other occurring during high stress and high arousal, given the term “the experiential-thinking mode”. The experiential-thinking mode is automatic, rapid, occurs outside of conscious awareness, and takes precedence under life-threatening

conditions. When danger is perceived, humans are physiologically geared to act, not to ponder and deliberate. In situations of acute danger, it is better that humans respond immediately without taking the time for complicated mental processing, so that responses can be more immediate, to save lives and to protect family. Calm rational thinking takes time and when faced with, for instance, a hungry predator, the deliberate and time-consuming nature of rational thought processes can cost one's life (Epstein, 1994).

As a result, under conditions of danger, perceptions are radically altered. As heart rate goes up, cognitive processes change radically (Grossman and Christiansen, 2008). First, there is a narrowing of the perceptual field, so that only information relevant to the immediate threat can be absorbed. Diminished or altered sound, tunnel vision or the loss of peripheral vision may also be experienced. Heightened visual clarity about some details of the event may occur, along with a sense of temporary muscle paralysis. There may also be perceptual distortion of time so that everything seems to be in slow motion, and intrusive or distracting thoughts about loved ones or other personal matters may occur. Similarly, flashbulb memories may be experienced, where the individual has a series of vivid images burned into memory, with the rest of the event somewhat confused, out of order, or even missing. Distance distortions, colour distortions, face recognition distortions and lighting distortions may also occur (Artwhol, 2002). These perceptual distortions and fragmentary memories later manifest through the intrusive flashback experiences that are so characteristic of PTSD.

Hemispheric specialisation

Another dimension of the challenges posed by information processing is the fact that the two cerebral hemispheres are functionally very different from each other, and these differences probably have significant implications for understanding what goes wrong in the processing of traumatic events, while supplying keys to understanding innovative forms of treatment (Joseph, 1992, 2012; McGilchrist, 2009, 2012).

Consciousness, language, and linguistic thought are intimately interrelated, and are supported and maintained by the left hemisphere of the brain. It is the left brain that generally controls the ability to talk and think in words, and it is the left brain that analyses spoken and written language. This is the brain that is associated with linguistic consciousness.

In contrast, the right brain cannot generally read, spell, or write, and cannot understand many aspects of human speech except for a few simple words, particularly those which are emotional. However, it can vocally express itself through singing, swearing, crying, praying, mimicking, or cooing sounds of love and sorrow. The right brain subserves a different kind of intelligence and may be the site of what is historically referred to as the "unconscious mind". The right brain is thought to be the antecedent of the left, an ancient form of consciousness that dominated millions of years of human hunter-gatherer

existence (Joseph, 2012). The right brain communicates through feelings, valuation, and actions, and is the undercurrent of all human social interaction.

The structure that connects the two hemispheres is the corpus callosum. These large interconnected fibre tracts are not matured until age ten, and even in young adults the corpus callosum is only partially myelinated. This may be the reason that makes childhood memories, and most importantly, traumatic childhood memories, so difficult to put into words and to fully integrate into narrative form. Children are quite likely to dissociate in the face of overwhelming negative emotion, which deactivates the right hemisphere and interferes with right hemisphere processing (Lanius et al., 2005). The right hemisphere is vital in attention, maintaining a coherent sense of our bodies, pain processing, and ultimately a coherent, continuous, and unified sense of self, so events that interfere with interhemispheric communication are likely to interfere significantly with healthy brain development (Schore, 2017). Recent research has shown that there is diminished corpus callosum volume in adults with PTSD, suggesting that this may be at least one of the impairments in posttraumatic integration of verbal and nonverbal information (Saar-Ashkenazy et al., 2014).

This growing body of evidence suggests that the unliquitated memories, images, sensations, and bodily experiences associated with the intrusive symptoms of PTSD and other dissociative disorders may be related to deficits in interhemispheric communication (Teicher et al., 1997, 2000; Schiffer, Teicher and Papanicoau, 1995). Such an understanding helps to explain why many kinds of nonverbal approaches may be key to helping the survivor fully integrate their experience into a biographical narrative that allows it to be part of the past, rather than the living present.

Attention and focus

During a threatening situation, attention is riveted on the threat. But after the threat goes away, attentional problems may continue, and, in fact, research has shown that combat veterans with PTSD have attentional deficits. It has also been demonstrated that general memory and attention provide the best predictors of PTSD symptoms (Gilbertson et al., 2001). It is thought that attentional changes are related to exposure to extreme stress and the tendency to be biased from that point on toward threat stimuli. If this happens in childhood, children's capacities to study, to pay attention in the classroom, and to achieve academically may be severely compromised (Shonkoff et al., 2012b). Perceptual problems extend to the social environment as well. Child maltreatment teaches children – and the adults they become – to attend to environmental cues that indicate the possibility of danger, and systematically ignore those that do not. As a result, such children may develop what one investigator has called “negative social maps”, so that they become hypersensitive to negative social cues and oblivious to positive social cues (Garbarino, 1999).

Decision-making and judgment

Decision-making and judgment can become very impaired under conditions of chronic stress. Cognition is likely to become overly simplistic, making it difficult to think about little else other than the immediate present, impairing the ability to consider the long-range consequences of an action. In such a state, decisions tend to be based on impulse and the need to self-protect (Janis, 1982). Many of those who have been traumatised have long-term problems with various aspects of thinking that impede decision-making and the exercise of good judgment. An intolerance of mistakes, denial of personal difficulties, anger as a problem-solving strategy, hypervigilance, and absolutistic thinking are other problematic thought patterns that have been identified (Alford et al., 1988).

State-dependent learning

Given the problems with attention, it is not surprising that learning is also affected by acute and chronic stress. Learning is dependent on the ability to categorise incoming material, but this can only happen optimally in a state of calm attentiveness. Learning is dependent on the state that one is in when the learning occurs, and fear creates a very special state of consciousness. Fear conditioning happens very rapidly in animals and humans – a single pairing is sufficient – and once established, the fearful reaction is relatively permanent. Higher brain centres may inhibit and control the fear response, but the “emotional memory” remains (LeDoux, 1994).

Once fear is learned, it is likely that it can never be “unlearned” at a basic physiological level. Later, when people are triggered by reminders of past trauma, they become hyper-aroused, and only the learning gained during past experiences with hyperarousal and danger will be available to them. Because of this, state-dependent learning can interfere with the efforts of others to help the victim. Strategies designed in the calm surroundings of a therapist’s office may bear little relationship to the level of arousal the same person is in when confronted by a perceived danger. State-dependent learning combined with learned helplessness and experienced lack of control over one’s own physiological states associated with a traumatic experience leads then to a diminished sense of self-efficacy, so that even when the person could take constructive action to prevent further harm, they seem unable to do so.

Memory

Memory is often profoundly altered by overwhelming stress. There are at least two different kinds of memory. Memory for details and events is called declarative or explicit memory. This memory system is grounded in the use of language. The human brain automatically categorises every new experience. This process begins at birth and continues making new categories of

information throughout life. These categories comprise a system of mental schemata that are verbally encoded and become integrated into the already existing knowledge base. Most of this activity occurs in the part of the brain known as the hippocampus. The declarative memory system is open to change and distortion, both by previous experience, by new information, and by the state of arousal that the person is in at the time of recall.

The non-declarative, implicit, or procedural memory system does not require words or even thoughts (Southwick et al., 1994; Squire, 1987; Van der Kolk, 1994, 1996b; Van der Kolk et al., 1997). This is the memory of habits, skills, conditioned emotional and sensorimotor responses, intuition and “gut” responses. This is the memory automatically drawn upon when driving a car, or when riding a bicycle, even if not practised for many years. This memory system is not language-based and appears to be controlled largely by areas of the brain separate from normal memory, most importantly by the right hemisphere. The implicit memory system developed earlier in evolution than the more recently evolved verbal, explicit memory system, and may also be operational far earlier in development than the verbal system which does not become available until the child begins to understand speech (Van der Kolk, 1994; LeDoux, 1994). Children may, in fact, have nonverbal memories long before they have memories that can be given any kind of verbal form. The implicit memory system also functions much faster than the verbally based memory system and has been called a “quick and dirty” reaction mechanism (LeDoux, 1994).

It is the amygdala that appears to attach emotional meaning to experience, even before it can recognise what the reaction is in response to, or even what feelings are being experienced. It is only later that the higher cortical areas elaborate that experience and imbue it with meaning. This aspect of memory is especially important in the processing of “fear conditioning”, and how fear is managed. This is important because many psychiatric disorders, including PTSD, appear to involve some malfunction in the brain’s ability to control fear (LeDoux, 1994).

Under normal conditions, both memory systems are available for optimal functioning. Individuals can freely access information and draw upon biographical material. Emotional experience is attached to these memories, but day-to-day life is not dominated by powerfully emotionally charged memories or intrusive experiences from the past; the past remains in the past, and it is not experienced as the present. These two memory systems work in parallel, and their activities are seamlessly interconnected. There is a conscious awareness of the information held within the hippocampal system, but the implicit system remains unconscious, and is always exerting a powerful influence (LeDoux, 1994).

For the past century, many observers have noticed that the imprint of traumatic experiences is very different from the memories of normal events. Bremner and his colleagues reviewed the differences between “normal forgetting” and traumatic amnesia (Bremner et al., 1995). They point out that, from

an evolutionary point of view, the efficient recall of memories associated with previous danger is crucial for survival. But it is difficult to explain how the over-remembering of danger associated with PTSD is adaptive, or why so many people develop under-remembering, or amnesia, in the face of danger. People who have experienced a variety of differing traumas are noted to have a wide range of memory problems with vivid intrusive memories of a past event, or flashbacks, often alternating with partial or total amnesia for the traumatic events. These intrusive experiences appear to be triggered in the present by emotions and sensations that are associated with the traumatic past, and the person often has amnesia for both the flashbacks and the original trauma.

People under severe stress also secrete neurohormones that affect the way their memories are stored. In animals and humans, high levels of glucocorticoids secreted during stress impair the functioning of the hippocampus. Neuroimaging techniques indicate that changes in the structure of the hippocampus may be secondary to prolonged stress (Bremner et al., 1995; Van der Kolk et al., 1997). This may partially or totally disable the ability of the brain to verbally categorise incoming information. At the same time, during states of high fear, the amygdala is extremely active, and interferes with hippocampal functioning (Van der Kolk, 1996b). The result is a partial or complete loss of the ability to assign words to incoming experience, the biological equivalent of “speechless terror” (Van der Kolk, 2000). Dependent upon words, the capacity to logically think through a problem is diminished or entirely shut down, and the mind shifts to a mode of consciousness that is characterised by visual, auditory, kinaesthetic images, and physical sensations, as well as strong feelings.

Evidence also exists that the over-secretion of neurohormones at the time of the trauma may deeply imprint the traumatic memory (Van der Kolk, 1996b, 1994). LeDoux has termed this “emotional memory” (LeDoux, 1992). In studying the influence of fear, he has shown that emotional memory appears to be permanent and quite difficult, if not impossible, to eliminate, although it can be suppressed by higher centres in the brain. This “engraving” of trauma has been noted by many researchers studying various survivor groups (Van der Kolk and Van der Hart, 1991; Van der Kolk, 1994).

Traumatic memory often poses the greatest problem for people who have suffered repeated or severe traumatic experiences. The intrusive symptoms of PTSD – nightmares, and the sensory, emotional, and physical flashbacks – all appear to be a result of disordered memory functioning. The alternation between flashbacks and amnesia is one of the most problematic aspects of stress disorders. Traumatic memories are vivid, state-dependent, do not fade, nor do they seem to be altered by ordinary experiences. Flashbacks are likely to occur when people are upset, stressed, frightened, or aroused, or when triggered by any association to the traumatic event (Van der Kolk, 1996b).

There are now data available from positron emission tomography (PET) scanning that provide more information about these intrusive phenomena. Traumatic memories “happen” principally in the emotional areas of the brain’s right hemisphere, and are accompanied by an increase in activity in the visual

areas of the brain, signifying that people with PTSD actually “see” their flashbacks, while there is a decrease in the area of the brain responsible for the translation of emotional states into language (Rauch et al., 1996; Van der Kolk et al., 1997; Van der Kolk and Fisler, 1995). This is experienced by the person as a total or partial reliving of the traumatic experience. It can be a sensory fragment of the trauma or the entire traumatic sequence, running like a virtual reality movie. In such a state, the traumatised person has difficulties distinguishing reality from flashback. The sensory experience is often quite vivid, feeding a vicious cycle of autonomic arousal that increases the sense of reality of the flashback even more. When people experience intrusive flashbacks as visual, olfactory, affective, auditory, or kinaesthetic sensations, it bears little if any relationship to the normal process of remembering.

Emotional responses to danger

The role of emotion

Under normal conditions, emotions serve as a “sensitive mental radar”, alerting people to the significance of things around them (Harber and Pennebaker, 1992). Individuals cease having an emotional response when they have realigned their expectations of what is supposed to happen with what is actually happening, either by taking action that adjusts the given situation to their expectations, or by changing their expectations to fit better with what is happening. Traumatized individuals cannot predictably rely on their emotions to provide accurate evaluative information (Van der Kolk, 1996a). Incoming information is given emotional meaning by the amygdala. The amygdala mediates both inborn and acquired emotional responses and appears to be involved in mediating both conscious and unconscious emotional feeling.

This kind of emotional memory is likely to function completely outside of conscious awareness and be stored in the right hemisphere. When the event is recalled, or triggered by some association, the cognitive memories in the left hemisphere may be recalled in parallel with the emotional memories, not as a recognised memory but as a state of being, sensations in the body or feeling states that the person may not consciously connect to the cognitive memories of something from the past (LeDoux, 1994). When this has occurred, those who have been traumatised can no longer use their emotional states as directional signals or as warning signals to take adaptive action (Krystal, 1978).

In PTSD, emotional arousal and goal-directed action are often disconnected from each other. People with PTSD either have too much emotional arousal, inappropriate to the circumstances they are in, or they develop a sense of emotional numbness, an under-reactivity that leaves them feeling depressed, empty, unable to relate to other people and even to life. They respond to reminders of a previous traumatic event as if it were happening in the present, not the past, with increases in heart rate, skin conductance, and blood pressure (Van der Kolk, 1996a). People who have been traumatised lose the capacity to

“modulate arousal”. They tend to stay irritable, jumpy, and on-edge. This loss of the ability to modulate internal emotional states means that people may become very labile, with rapidly shifting, easily triggered, and powerful negative emotions that are beyond their control.

These changes are particularly problematic when the traumatic exposure begins in childhood. Over the course of normal development and with the responsive and protective care of adults, the child’s brain develops the ability to modulate the level of emotional arousal based on the importance or relevance of the stimulus. The capacity of adults to soothe frightened children is essential to their development: they cannot soothe themselves until they have been soothed by adults. In the absence of such soothing, as many as 80 per cent of abused infants and children develop disorganised attachment patterns which are associated with an inability to utilise care givers for soothing, resulting in pathological self-regulatory behaviours (Carlson et al., 1989). A substantial body of research has shown that early and prolonged trauma in childhood affects the capacity to regulate the intensity of emotional responses, problems that continue into adolescence and adulthood (Shonkoff et al., 2012a).

Emotional numbing and avoidance

Under conditions of extreme stress, dissociation spontaneously and unconsciously occurs, serving to buffer the central nervous system against the life-threatening aspects of overwhelming arousal. One common form of dissociation is the splitting off or separation of feelings from the actual experience. Alexithymia, the inability to identify specific emotions and put those emotions into words that can be shared, was first described in concentration camp survivors (Krystal, 1988). The incomplete emotional processing that is typical of PTSD and manifested by alexithymia appears to be closely associated with the somatisation that is a typical accompaniment of PTSD and Complex PTSD (Lumley and Norman, 1996). Engaging the emotions has been shown to be a vital ingredient in the successful emotional processing of traumatic experiences, while emotional numbing and alexithymia may interfere with the success of treatment (Harber and Pennebaker, 1992; LeDoux, 1996).

Those who have been traumatised will also try to avoid traumatic reminders, which may substantially limit the activities they undertake, the experiences they allow themselves to have, the places they go, and the relationships they engage in. There is often a gradual withdrawal from everyday life that has been variously called, “dead to the world”, “a deterioration not dissimilar to that in schizophrenia”, and “posttraumatic decline”, so that any stimuli pleasant or unpleasant are avoided (Van der Kolk, 1996a).

Emotional contagion and social rejection

People who have been traumatised often have extreme difficulties with emotional control and they frequently give disturbing signals to others. They either signal too much emotion, too little, or emotion that is inappropriate to the

given situation. Internally numbed, they may maintain an external mask of blankness that is confusing to the observer. Often, however, this confusion on the part of the other is not conscious. Most of what is registered about another's emotional state occurs at a level below consciousness, although it profoundly affects interactions. Since this experience is unconscious, it is not usually open to spontaneous exchange, which could at least lead to the possibility of explanation and understanding on the part of both persons.

Instead, the signals given off by the traumatised person have a strong tendency to evoke unconscious distancing and rejecting responses on the part of others. Researchers have studied listeners' responses to the disclosures of those who have been traumatised. What they found is very disturbing: listeners just "don't want to hear it". They tend to disrupt trauma stories by switching the topic of conversation away from the trauma, they attempt to press their own perspective of the trauma upon the victims, or they simply avoid contact with the person altogether. It is proposed that listeners have a difficult time listening because the stories of the victims' traumas threaten the listeners' assumptive world views about justice. Therefore, they tend to exaggerate the role of personal responsibility, and often end up blaming the person for a traumatic experience that they could not avoid (Coates et al., 1979).

Ultimately, those who have been traumatised recognise that people are withdrawing from them or avoiding them, and consequently begin to inhibit their own emotional expression and avoid discussion of the trauma. This presents powerful negative consequences, since the tendency to avoid disclosure of emotions is associated with increased risks for physical illness, impaired information processing, and a loss of social support, and therefore opportunities for healing and recovery.

Behavioural responses to danger

Traumatic re-enactment and the compulsion to repeat

Why do we repeat the past, particularly when the patterns of behaviour that we are repeating are, at best, unfulfilling and often traumatic? The philosopher Santayana observed that, "Those who cannot remember the past are condemned to repeat it" (Santayana, 2017: p.188), and this is as true in the lives of individual trauma survivors as it is for societies. Both Janet and Freud claimed that the crucial factor that determines the repetition of trauma is the presence of mute, unsymbolised, and unintegrated experiences (Van der Kolk and Ducey, 1989). Freud termed this the "repetition-compulsion" and wrote that in order for feelings to be experienced and become conscious, words had to be linked to them. It was the linkage with word representations that allowed the affect to cross the repression barrier and become conscious (Sashin, 1993).

Human beings are designed to function at a maximal level of integration, and any barrier to this integration will produce some innate compensatory mechanism to overcome it. Splitting off traumatic memories and feelings into

nonverbal images and sensations by the mechanism of dissociation is life-saving in the short-term, but a barrier to full integration in the long-term. The memories of the traumatic experience remain dissociated, nonverbal, and unintegrated, possibly lodged in the right hemisphere. Traumatic re-enactment occurs when people repeatedly find themselves in situations that recapitulate earlier trauma, lacking any awareness of how this occurred or how to prevent it from recurring. The lack of conscious awareness may be secondary to the dissociative blockade between the left and right hemisphere integration that places the behaviour out of context of the left hemisphere's verbal, linear and conscious control. Since words are not available to sufficiently explain the experience, rational mode thinking cannot occur.

People will usually develop explanations for their strange behaviour, because the rational part of their mind is struggling to make sense of the situation. But without access to the dissociated material, the rational mind interprets behaviour in a simplistic, often naïve and punitive way, while the person helplessly re-exposes himself or herself to further trauma. This represents the psychodynamic idea that symptoms are nonverbal “cries for help” from the right hemisphere, that can only communicate with actions. It is this level of communication that underlies all modern cultures and forms the most basic medium of human communication, and is central to all the arts (Donald, 1991; Bloom, 2010, 2011).

The communication that the right hemisphere is attempting with the left hemisphere and the representatives of the social group – including the therapist – become the intermediary translators helping to overcome the left hemisphere's unwillingness or resistance to incorporate the entire story of the past, a story that may severely contradict the left hemisphere's previous definitions of reality and self. The re-enactment behaviour cannot stop until the meaning in the message is heard, responded to, and integrated.

Self-harming behaviour and addiction

Traumatic re-enactment is often disguised by a wide variety of self-harming and addictive behaviours. Since the “language” of the right brain is concrete, metaphorical, and emotional, the signs and behaviours that are frequently noted as symptoms are actually “cries for help” from the right brain. Intrusive memories and flashbacks are likely to disrupt the emotional numbing that has become protective. Under such circumstances, people frequently turn to substances, like drugs or alcohol, or behaviours like sex, over-eating, gambling, engagement in violence, and self-injury, all of which help them to calm down, at least temporarily in part because of the major, self-induced shift in internal body chemistry that accompanies substance abuse and self-harming behaviour. There are very good reasons why PTSD and chronic substance abuse often appear simultaneously in the same individual and diagnosis may depend entirely on the level of expertise of the diagnostician or the system to which they present. Similarly, it is important to consider what a person might be re-enacting with sexually compulsive behaviour but is unable to have close supportive and intimate relationships.

Addiction to drugs, alcohol, food, sex, and other compulsive behaviours may also be more comprehensible if seen as unconscious strategies to manage internal distress arising from the split-off and un-metabolised traumatic experiences. Individuals exposed to repetitive stress are more likely to abuse alcohol and other drugs and to relapse. This is supported by research with animals showing that stress increases the tendency of animals to self-administer drugs that are defined as illicit substances for humans. Research has shown that there is an overlap between the neurocircuitry that responds to drugs and those that respond to stress, and that it is these same neurocircuits that are involved in the development of PTSD and related syndromes (National Institute on Drug Abuse, 2002).

Those who are addicted to alcohol or other drugs also may be more sensitive than those who are not. This hypersensitivity may exist before the use of drugs, and may contribute to their initial drug use, or could result from the impact of chronic drug abuse on the brain. Studies have demonstrated that the nervous system of those who are addicted is hypersensitive to chemically-induced stress and, therefore, an addict may use drugs like heroin, morphine, and cocaine to alleviate the noxious aspects of the stress experience. But the constant on-and-off switching of the stress systems in the body when withdrawal begins heightens any hypersensitivity the person already may have had before starting to take drugs (Stocker, 1999).

In the case of self-mutilation, it is important to consider what part of the body the person is hurting and why that might be. As a form of traumatic re-enactment, those who have been traumatised frequently wound themselves at the same real or symbolic place that their perpetrator hurt them. The visible gashes, burns and scars are bodily expressions of a much deeper inward pain that is visible only to the sufferer, but for whom any association with the experiences of the past is not usually consciously available. In their desperate and largely unconscious attempt to communicate their distress to the world that lies beyond the boundary of their skin, they re-enact the trauma by inflicting more trauma upon themselves. They have learned that if they hurt their bodies they will experience a temporary relief from a noxious state of hyperarousal and acute distress, or numbed emptiness, probably mediated chemically by the endorphins that are released whenever the stress response is mobilised.

Clinical reports consistently show that those who self-harm and suffer from addictions have childhood histories of physical or sexual abuse and/or other kinds of trauma, and that the earlier and more extensive the abuse or neglect, the more likely their aggression would be turned toward self-harming behaviour. In circumstances of betrayal trauma, when children are violated by the same person upon whom they are dependent for survival, it creates for many children and adults a major barrier to recovery (Freyd, 1996).

Risky behaviour and addiction to trauma

The endorphins produced by human bodies are not just painkillers. They reduce anxiety, rage, depression, and fear. They are vital to attachment behaviour from birth to death. They increase when social support increases and decrease when social support is withdrawn. Lack of early care in animals

effectively reduces endorphins and may do so in people as well. Not surprisingly, given their powerful analgesic and calming effects, large amounts of endorphins are released as an integral part of the fight-or-flight response (Bremner et al., 1993; Van der Kolk, 1996b; Van der Kolk et al., 1985; Van der Kolk and Greenberg, 1987). It is particularly important to understand what happens to the normal endorphin response when people are exposed to chronic and repeated stress, when brains and bodies are repeatedly exposed to these powerful agents. Along with the other components of the flight–fight–freeze response, stress-induced analgesia has been described in animals following exposure to inescapable shock. In severely stressed animals, signs of opiate withdrawal can be triggered by stopping the stress or by giving the animal a drug that counteracts the effects of the endorphins.

One theory is that some chronically stressed people may become addicted to their own circulating endorphins because of overexposure and impaired regulation of the endorphins because of chronic stress. Whenever the stress is relieved, they feel worse, not better. They go into an opiate withdrawal syndrome that is like heroin withdrawal. They feel anxious, irritable, depressed, and miserable (Van der Kolk et al., 1985). To feel better, they must do something to get their endorphin level back up, and that means doing something stressful. What they end up doing is determined by what works, their own experience, and their own inclinations (Stanley et al., 2010).

Violence is “exciting” and stressful, and repeated violent acting out, gang behaviour, fighting, bullying, stealing, breaking and entering, and many other forms of criminal activity have the additional side effect of producing high levels of stress in people who have grown addicted to such risk-taking behaviour. Many people appear to seek out high-risk jobs or forms of recreation and talk about the “high” they feel, even while risking their lives. Others become addicted to sexual behaviours, some of which may involve potentially dangerous sadistic or masochistic behaviours. An important element of risk-taking involves control: whilst undertaking these behaviours, people can overcome and defeat helplessness by taking control.

Revictimisation and trauma-bonding

One of the two key survival strategies common to the human species are caretaking and attachment (Valent, 2007). When the person to whom one has become attached is also the source of danger, the result is increased attachment to the abusing person. This is called “trauma-bonding” and is part of the complicated picture for battered spouses, abused children, prisoners and victims of torture, hostages, and any other situation in which the abuse is prolonged and repeated (Herman, 1992).

As a result, highly untrustworthy and destructive relationships come to be considered normal (Dutton and Painter, 1981; Herman, 1992; James, 1994; Van der Kolk, 1989). The natural, innate protective mechanism of turning to people to whom an individual is attached for safety is reversed. If these same

persecutors also provide intermittent nurturance in the form of food, shelter, relief from pain, or even affection, then the situation is even more confusing, cognitively, emotionally, and at a basic biological adaptive level. The combined effects of chronic hyperarousal, dissociation, and tend-and-befriend can help make sense of the otherwise confusing signs associated with captivity and the likelihood that captives will affiliate with their captors, known as the “Stockholm Syndrome”. It has become clear that the traumatised person’s pre-existing personality is not a major factor in explaining this behaviour, it is instead a result of the experience of helpless, prolonged captivity (LaViolette and Barnett, 2000; Bloom, 2009).

From victimisation to victimiser

Many perpetrators of criminal violence have had serious childhood traumatic experiences. This population is less well-studied because they do not present frequently to psychiatric services, they do not elicit sympathy from others, and they do not tend to be compliant with treatment or research. Gilligan, after spending much of his professional career working with violent offenders, has stated, “The violent criminals I have known have been objects of violence from early childhood” (Gilligan, 1996: p.45). In such cases, their early experiences have done such damage to them that they have become detached from other humans, and they have become incapable of empathy, often on a permanent basis. Because they are so severely impaired in their capacity to form and maintain attachment bonds, they are unable to attach to other people, or to a civilised system of laws and beliefs. They are unable to love and care for life other than their own, and even their capacity to love and respect themselves is severely impaired or missing on all levels other than that of pure survival (Strueber et al., 2007). It is very possible, and by clinical experience probable, that the damage done to some of these children in early childhood is irreversible by any means presently known to psychiatric science.

The challenge of habits

Traumatised people cope as best they can, as in the multiple ways described above, and the immediate survival responses can pose problems of their own. People are, after all, creatures of habit. Much of what is done each day is based on habits. Life would be unendurable if every day, in every way, all was brand-new. This tendency to form habits easily, to repeat behaviours and thought patterns that have guaranteed survival, constitute a way to order existence and make sense of the world. Forming habits is the brain’s way of calming itself down. Making behavioural routines automatically save valuable energy. The problem is that once a behavioural routine becomes a habit, it is governed by a part of the brain that is beyond conscious control known as the basal ganglia (Duhigg, 2012).

This may be the reason why changing habits is so difficult, and why habit change is so clinically challenging. The more powerfully life-saving the reason for the habit, the more anxiety victims experience if they try to alter that habit. Any attempt to alter or eradicate habits can lead people to re-experience the initial fear that created the need for the habitual routine in the first place. The strength of the fear will influence the strength of the habit. This creates the seemingly paradoxical symptom of hurt people who are unable to stop hurting themselves.

Personality distortions in response to trauma

To early workers such as Freud and Janet, it became obvious that traumatic experience had the effect of halting development.

Unable to integrate the traumatic memories, they seem to have lost their capacity to assimilate new experiences as well. It is ... as if their personality definitely stopped at a certain point and cannot enlarge any more by the addition or assimilation of new elements.

(Van der Kolk and Van der Hart, 1989: p.1533)

The personality development of those who have been traumatised does not really stop, but it can certainly become distorted, veered away from a healthy trajectory and onto a new and often more destructive course. This change in life trajectory can occur to virtually anyone if the circumstances are sufficiently injurious. But when the traumatic experience occurs in childhood or adolescence, before the personality has fully developed, the person is more likely to develop severe personality problems; this might lead to the development of any of the personality disorders, or even Multiple Personality Disorder (Herman et al., 1989; Herman, 1992; Perry et al., 1990), now referred to as Dissociative Identity Disorder. The complexity of posttraumatic developmental challenges in these cases is best understood as Complex PTSD characterised by: alterations in ability to modulate emotions, alterations of identity and sense of self, alterations in ongoing consciousness and memory, alterations in relations with the perpetrator, alterations in relations with others, alterations in physical and medical status, and alterations in systems of meaning (Cloitre et al., 2011, 2013; Courtois and Ford, 2013; Ford and Courtois, 2013, 2014; Herman, 1992).

Intergenerational transmission and epigenetics

Intergenerational trauma has been best studied in research on the offspring of Holocaust survivors (Danieli, 1997; Freyberg, 1980; Kestenberg, 1980; Sigal, 1989). The effect has been concisely summarised in these words, “The children of survivors show symptoms which would be expected if they actually lived through the Holocaust” (Barocas and Barocas, 1979: p.331). War experience has also shown to be problematic for the next generation. It has been noted

repeatedly that many of the symptoms of PTSD have a severe, ongoing, and disruptive effect on marital and family life (Figley and Sprenkle, 1978; Matsakis, 1988; Rosenheck, 1986). Studies on the intergenerational transmission of child maltreatment show extensive evidence that parents who were maltreated are more likely than non-maltreated parents to abuse their own children. About one-third of parents who were abused as children continue a pattern of seriously inept, neglectful, or abusive parenting. One-third do not. Another third remains vulnerable to the effects of social stress and are more likely to become abusive under such influences (Oliver, 1993).

This intergenerational transmission happens in various ways. A growing body of evidence demonstrates that one mechanism is through the attachment relationship. Mothers who have been rejected by their mothers tend to be rejecting of their own infants (Main and Goldwyn, 1984). In a large study of the intergenerational transmission of corporal punishment, social learning, passed from one generation to the next, appeared to be the most important factor (Muller et al., 1995), although the effect of establishing a family norm which then gets passed on from one generation to the next may also play a role (Simons and Wurtele, 2010). Other research focuses on the damage that child abuse does to the brain which interferes with normal parenting of the next generation (Teicher et al., 1993).

It is now thought that there are two modes of genetic change. One is slow and a result of natural selection, and another is more rapid and responsive to environmental changes. The epigenetic markers serve the latter system and are thought to influence the intergenerational transmission of trauma in ways that science is only just beginning to understand (National Scientific Council on the Developing Child, 2010). Research is now beginning to accumulate evidence showing how environmental cues can stimulate epigenetic changes that could contribute to many medical and psychiatric problems (Steinberg, 2006). There is a growing scientific consensus that the nature versus nurture controversy is over, and that nature and nurture are complexly interactive.

Moral and group responses to danger

Destroying the assumptive world

People who suffer profound trauma may no longer feel that they are alive. Instead, they feel like, “Zombies, the walking dead wandering in the wilderness”. Trauma sets people outside the bounds of the normal human community (Bloom, 2013: p.76). Most people can get out of bed and leave the house in the morning because they make basic and unconscious assumptions that the world is safe and meaningful, and that one can function adequately in it (Janoff-Bulman, 1992). They assume that there is benevolence in the world around justice and meaning, and comfort from others allows people to go through their daily lives, do their work, tend to their families, and have reasonable expectations of what tomorrow will bring. Most people rarely if ever

think about these underlying assumptions because they are premises that are just taken for granted.

Trauma shatters these assumptions upon which people's sense of safety and freedom in the world is based. The world may be perceived as no longer meaningful, or kind, and themselves as worthless, helpless, and hopeless (Janoff-Bulman, 1992). If this happens when one is a child it may sabotage the development of moral intelligence, which is the central intelligence for all human beings that binds us to our social group, culture, and moral system, and defines how our other forms of intelligence are used to give our lives purpose and meaning (Lennick and Kiel, 2005).

Many victims of trauma also come to believe that they are not worthy, because if they were, the trauma would not have occurred. They become deeply ashamed of whatever imagined fault has caused the trauma to have befallen them and stolen from them a sense of mastery. When other people scapegoat them it is a further confirmation of their blameworthiness. Burdened by such a sense of shame, sufferers often cast themselves into the wilderness, outside of the realm of human community.

For people who have held firm religious or spiritual beliefs, traumatic experiences may also shatter their faith. Abuse suffered at the hands of others may pose significant difficulties with the issues of forgiveness, particularly if there is no real remorse on the part of the perpetrator. Whatever a person's belief system is preceding a traumatic event, they will inevitably question the previous foundations of their moral existence and must search for meaning to make some sense of what has happened to them.

Group affiliation, xenophobia, and moral injury

Humans are the most social of all species, and our individual existence emerged out of our primary group identities. There is then a social response to danger that historically preceded our individual responses. When danger is signalled, people who are attached to each other feel compelled to draw together. This makes sense from an evolutionary perspective, because human safety is so dependent on the protection of the group. This behaviour originates in the infant–mother bond, and proximity-seeking behaviour on the part of both is innate. This increased attachment behaviour in the face of danger or threat and in the service of survival has been noted in all social species. As children, the only safety is to be found in the protection of others and, therefore, whenever fear is aroused, children seek protection from others – even in adulthood. But under such circumstances, humans also become more obedient and more open to suggestion, including the suggestions of charismatic leaders (Eibl-Eibesfeldt, 1989; Schumaker, 1995).

In situations of danger, the sense of stranger anxiety also increases, and bonding to an “in-group” escalates, along with the perception of threat from an out-group, a phenomenon known as xenophobia. The behaviour of other people has a significant effect on the behavioural responses of everyone to situations of danger. This relational aspect of dangerous situations has been studied

intensively by the military. It is well-recognised that people tend to come together to seek aid and comfort. This finding has been borne out in field studies of infantry platoons, air crews, and disaster control teams, as well as through social psychological experiments with college students (Janis, 1972). This heightened need for affiliation leads to greater dependency on the group and an enhanced tendency to conform to group norms, even when they contradict one's own individual norms. In seminal work on World War II, it was noted that,

The impersonal threat of injury from the enemy, affecting all alike, produces a high degree of cohesion so that personal attachments throughout the unit become intensified. Friendships are easily made by those who might never have been compatible at home and are cemented under fire. Out of the mutually shared hardships and dangers are born an altruism and generosity that transcend ordinary individual selfish interest.

(Grinker and Spiegel, 1945: p.21)

This group affiliative behaviour may however place people in highly compromising moral situations. The term “moral injury” was first used by Shay as a descriptor for some of the profound experiences of combat veterans who experience a betrayal of what is right in a high-stakes situation by someone who holds power (Shay, 2003). But all people who have been intentionally hurt by others upon whom they must depend contend with the abuse of power that inevitably is a part of the sense of fundamental betrayal, while their normal need to affiliate may lead them to be influenced by highly destructive and even dangerous groups. Moral injury when it occurs in childhood may influence moral preferences away from altruism and mutuality and toward self-protection and self-interest (Bloom, 2017).

Conclusion – posttraumatic growth, the survivor mission, and trauma transformation

A traumatic experience, by definition, changes people. What is inspiring about the human species is how so many survivors struggle to make sense out of violence, transcending its effects, and transforming the energy of violence into something powerfully good for themselves and for their communities, developing what Herman has called “a survivor mission” (Herman, 1992). It is often a mission that encompasses the remainder of one's life. Confrontation with the spiritual, philosophical, and/or religious context – and conflicts – of human experience is impossible to avoid if recovery is to be ascertained.

With so much trauma worldwide and the innate human tendency toward xenophobia and violence, and the enormously complex problems that face humans as a species, there is a need to think about ways that larger groups of people can have transformative experiences. The author Tina Rosenberg has studied traumatised populations in Latin American and Eastern Europe and has stated, “Nations, like individuals, need to face up to and understand traumatic past

events before they can put them aside and move on to normal life” (Rosenberg, 1995: p.xviii). But how does a group overcome the powerful dynamic pull of traumatic re-enactment to transform the trauma into something better for the group and the individuals within the group? Individuals and groups have searched throughout time for the means to turn adversity into strength. An individual’s personal traumatic experience can serve as the basis for the creation and transformation of a group when the traumatised individual serves as the inspirational leader for the group. Alternatively, a group trauma occurs and must be transformed for the group-as-a-whole, frequently through the mediation or inspiration of a leader who arises out of the group and becomes the delegate for the group, giving voice to the conscious and unconscious aspirations of the group. Additionally, the witnessed traumatising of others can cause a group response, even when the trauma has not been experienced directly by the group members. The interaction between the individual and the group, the leader and the led, is an interactive, dynamic one in which all of these elements can be found (Bloom, 1998).

There are many ways that human groups, led by inspiring leaders, have transformed traumatic personal and political experience into movements that change the world for the better, whether they are bearing witness to awful events and seeking justice; or rescuing people, animals, or the Earth; or providing mutual self-help; or doing what they can to educate and prevent more tragedy; or taking political action to stop extremist and destructive political behaviour: they all represent examples of positive transformation. But they all appear to have at least one thing in common – a sense of moral commitment, a sense that personal and group trauma must be converted into a community asset, not just a personal asset or catastrophe.

From such traumatic origins springs the co-construction or reconstruction of civilisation. In this sense, there is a “moral maturity” about these transformations. Trauma transformations hinge upon a moral position that is often implicit, but which is the guiding hand in such social transformations, and individuals who epitomise this moral position become the “moral exemplars” for entire cultural systems (Damon and Colby, 2015). This moral position hinges on a generalised sense of respect, compassion, and concern for all life, and a willingness to risk one’s self-interest for the sake of these values. Ultimately, all positive transformation is rooted in the attempt to make sense out of inherently senseless acts of violence. The transformation of trauma is not a possible option; it is a moral necessity, and we cannot heal as individuals or as groups, or as a species, without striving for something more whole, more loving, and more ethically coherent than our individual selves.

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