

A Sensorimotor Approach to the Treatment of Trauma and Dissociation

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Psychotherapists who work with survivors of psychologic trauma recognize the almost inevitable clinical complexity of trauma-related disorders. Traumatized individuals do not just suffer memories of tragic and horrifying experiences—they demonstrate a number of complicated and debilitating signs, symptoms, and difficulties consisting primarily of bodily responses to dysregulated affects. These bodily responses often have no clear subjective connection to their fragments of narrative memory [1].

Most traumatized individuals fulfill the criteria for a number of coexisting diagnoses that usually include mood disorders, anxiety disorders, substance abuse and dependence disorders, eating disorders, somatoform disorders, and medically unexplained symptoms [2–4]. These complications are reflected in the *Diagnostic and Statistical Manual of Mental Disorders* (fourth edition, revised) by the inclusion of more than 12 associated features of post-traumatic stress disorder (PTSD) [5]. The formal diagnosis of PTSD contains three diagnostic post-traumatic symptom clusters: symptoms indicative of intrusive reliving of the trauma, avoidance and numbing symptoms, and symptoms of increased autonomic arousal. The episodic alternation between the avoidance and reliving symptoms “is the result of dissociation: traumatic events are distanced and dissociated from usual conscious awareness in the numbing phase, only to return in the intrusive phase” [6]. Triggered by stimuli reminiscent of the trauma, these dissociated fragments of past experience return unbidden in the form of psychologic symptoms (amnesia, cognitive schemas of badness or worthlessness, intrusive images,

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dysregulated emotions) and somatoform symptoms (physical pain, physical numbing, intrusive sensations, and dysregulated autonomic arousal) [7]. Despite the central involvement of somatoform symptoms in the expression of unresolved trauma, however, the autonomic and somatic components of trauma-related disorders have been relatively neglected in the treatment and understanding of these disorders [8].

Talk therapies and exposure therapy

Although there is evidence to suggest that treatments targeting the various symptoms and problems of trauma-related disorders can promote significant improvement in some patients, full remediation of these disorders is elusive [9,10]. Traditional “talk-therapy” approaches, a category that includes any method that depends on the words of the client as the primary entry point of therapy, tend to address the explicit, verbally accessible components of trauma. They emphasize the role of narrative, emotional expression, and meaning making [11,12]. Because avoidance and withdrawal compose a core diagnostic cluster in trauma-related disorders, it is increasingly recognized that in vitro or imaginal exposure to the potent elements in the patient’s experience is usually a necessary ingredient in successful trauma treatment [13]. Although exposure to episodes of past trauma is a potentially effective ingredient, this exposure in any model of therapy can exacerbate rather than resolve symptoms. As the narrative or explicit memory is retold, the implicit, somatosensory components of the memory are simultaneously activated, frequently leading to a re-experiencing of somatoform symptoms that can include autonomic dysregulation, dissociative defenses associated with hyper- and hypoarousal states, intrusive sensory experiences, and involuntary movements. This debilitating, repetitive cycle of mind-body triggering can thwart desensitization regimes and keep past trauma “alive,” prolonging rather than resolving trauma-related disorders [14–20]. A considerable number of patients drop out of exposure therapy, perhaps because they are not sufficiently stable to manage it in the face of the threat of retraumatization [21–26].

For clients who are able to sustain exposure-type treatments, two popular and well-researched treatments that address the behavioral avoidance and the reliving and hyperarousal responses in different ways are Prolonged Exposure (PE) [27] and Eye Movement Desensitization and Reprocessing [28]. Both therapies have been studied in treatment trials with patients who are relatively stable or have adult-onset, single-incident trauma. Even in well-run studies of validated treatments, however, only about 50% of patients demonstrate significant improvement. For example, in a study comparing PE versus cognitive restructuring [26], most subjects had experienced a traumatic event lasting less than 1 hour. Results demonstrated that the effects of both treatments were comparable, but at 6 months’ follow-up, half of the

treated individuals still met the criteria for PTSD and only 25% reported a return to premorbid functioning. In a similarly well-conducted study comparing relaxation training with imaginal exposure, cognitive restructuring, or a combination of both, all but the relaxation training had a beneficial effect in decreasing PTSD symptoms [29]. Although only one third of the subjects still met the criteria for PTSD at termination, less than 50% showed a marked improvement. Strict inclusion and exclusion criteria can serve to increase rates of effectiveness, as demonstrated by an effectiveness study in which PE, stress inoculation, and the combination of PE plus stress inoculation were compared [27]. Despite the superior results for PE in this study, still less than 50% of the subjects (all female assault victims) were found to have good end-state functioning at 1-year follow-up.

Top-down and bottom-up therapies

It is perhaps the sensorimotor symptoms and the autonomic dysregulation of chronic traumatic re-experiencing and avoidance that prove most difficult to ameliorate, even in the relatively straightforward PTSD clients who have single-incident traumatic experience as adults. To address these bodily based symptoms of trauma and the psychologic components, a different approach to treatment may be helpful. The authors propose that it is possible to weave sensorimotor understandings and techniques into existing psychodynamic or cognitive-behavioral models of therapy, including exposure treatments [30]. The working premise in most approaches to psychotherapy, less so with exposure techniques, is that change occurs in a “top-down” direction. That is, a significant change in a patient’s thought processes (through insight, exposure, or cognitive restructuring) in conjunction with remembering or therapeutic re-experiencing of the event resolves the problematic emotions, behaviors, and physical symptoms of the patient. Although top-down therapy is effective and necessary in helping patients with many important therapeutic tasks, the addition of “bottom-up” approaches that directly address the effects of traumatic experience on the body may be equally necessary.

Sensorimotor psychotherapy [31,32] is an approach developed to specifically address resolution of the somatic symptoms of unresolved trauma. In sensorimotor psychotherapy, bodily experience becomes the primary entry point for intervention; emotional expression and meaning making arise out of the subsequent somatic reorganization of habitual trauma-related responses. Sensorimotor approaches work from the bottom-up rather than the top-down by attending to the patient’s body directly; it becomes possible to address the more primitive, automatic, and involuntary functions of the brain that underlie traumatic and post-traumatic responses. Sensorimotor psychotherapy is founded on the premise that “the brain functions as an integrated whole but [comprises] systems that are hierarchically organized.

The ‘higher level’ [cognitive] integrative functions evolve from and are dependent [on] the integrity of ‘lower-level’ [limbic (emotional) and reptilian] structures and on sensorimotor experience” [33].

The capacity of human beings for self-awareness, interpretation, abstract thought, and feeling exists within this developmental and hierarchic relationship to the instinctual and nonconscious responses of the body. These hierarchically organized, interconnected responses range from instinctual arousal and mammalian defenses, feelings, and affective expression to thoughts, reflective self-awareness, and meaning making. Wilbur’s [34] notion of hierarchic information processing describes the evolutionary and functional hierarchy among these three levels of organizing experience: cognitive, emotional, and sensorimotor. MacLean [35] conceptualized this hierarchy as the “triune brain,” or a “brain with a brain within a brain.” In MacLean’s theory, the human brain is the product of evolutionary hierarchic development: first to develop in the human infant is the reptilian brain (comprising the brain stem and cerebellum), which governs arousal, homeostasis of the organism, reproductive drives, sensation, and instinctual movement impulses—the heart of sensorimotor experience. The “second” brain is the “paleomammalian brain,” or “limbic brain,” found in all mammals, which anatomically surrounds the reptilian brain and serves to regulate somatosensory experience, emotion, memory, some social behavior, and learning [36]. Last to develop phylogenetically is the neocortex, which enables cognitive information processing, self-awareness, executive functioning, and conceptual thinking [35]. This hierarchic organization results in two distinctly different directions of information processing (from the top-down or the bottom-up), and the interplay between them holds significant implications for the treatment of trauma [37]. Schore [38] noted that for adults, in nontraumatic circumstances, higher cortical areas act as control centers such that the orbital prefrontal cortex hierarchically dominates subcortical activity, with “veto power” over limbic responses. Thus, top-down processing enables us to outline plans, determine what to accomplish for the day, and then structure time to meet particular goals. Emotions and sensations such as feelings of frustration, fatigue, or physical discomfort may be overridden to accomplish these priorities. It is as though, most of the time, we hover just above our somatic and sensory experience, not allowing it to be the primary determinant of our actions without conscious decision making. For the traumatized individual, however, the intensity of trauma-related emotions and sensorimotor reactions often disorganizes the individual’s cognitive capacities, interfering with the ability for cognitive processing and top-down-regulation. This phenomenon has been described as “bottom-up hijacking” and is a frequent source of problems for trauma survivors [37,39].

When bottom-up hijacking occurs, as in recalling trauma, dysregulated autonomic arousal contributes to generating strong waves of body sensations and affects, which in turn are interpreted as current rather than past data that confirm the cognitive conviction of threat, exposure, or

helplessness. For example, if a body sensation such as rapid heart rate is interpreted as fear or panic, each of those aspects of the experience—sensorimotor and emotional—inflate and compound the other. If, in addition, they are interpreted as meaning, “I am not safe,” then physical sensation and emotion further intensify, and arousal can quickly escalate beyond the person’s tolerance or integrative capacity. Adaptive top-down regulation is temporarily lost, leaving the individual at the mercy of bottom-up hijacking.

The idea that “what we think” directs “how we feel” is a fundamentally important development of Cartesian theory that has informed the influential therapies of the Western world. If, however, traumatic memories largely consist of reactivated nonverbal implicit-type memories and habitual procedural responses with limited explicit memory components, then such memories may not be transformed adequately by insight alone [18,40,41]. The authors propose that sensorimotor interventions that directly address the body can work to process implicit-type memories, to challenge procedural learning, and help to regulate dysregulated autonomic arousal. Not only is what we feel a robust predictor of what we will think but it may also predict how we will interpret what we experience.

In sensorimotor psychotherapy, clients’ cognitions are engaged to evoke mindful observation of the interplay of their perceptions, emotions, movements, sensations, impulses, and thoughts. In the act of noticing their bodily experience, innate somatic regulatory capacities, or “resources,” become spontaneously available or can be evoked by the therapist: taking a breath, adjusting the spine, making a movement, or orienting perceptually and physically to the environment. For example, with the help of his therapist, “Jim” realized that the perpetual slump in his spine had served to maintain his feelings of inferiority, helplessness, and passivity. As this component of his early abusive experience was addressed somatically, his posture gradually became more erect, transformed from a physical liability to a physical resource that supported his newly found sense of well-being and competency. His thoughts correspondingly started to become less negative, his emotions more buoyant. In the hands of an informed body-oriented psychotherapist, the client’s body gradually becomes his ally rather than his enemy in the process of healing from trauma. Such somatic changes, in and of themselves, often help to resolve the habitual trauma-related responses or provide enough stability to allow more intense exposure to traumatic material.

Bottom-up dysregulation and the window of tolerance

The characteristic components of the trauma response—a poor tolerance for stress and arousal with consequent affect dysregulation—render traumatized individuals hyperaroused, experiencing “too much” activation, or hypoaroused, experiencing “too little” [42]. Information cannot be processed

effectively in either state, top-down-regulation is lost as the patient feels endangered, and meaning making becomes biased by the danger signals. The hyperaroused patient is tormented by intrusive re-experiencing of the trauma. The perceptual distortions and losses in the hypoaroused patient can involve not only a sense of separation from the self (as in derealization and depersonalization) but also motor weakness, paralysis, ataxia, numbing of inner body sensation, and cognitive abnormalities such as amnesia, fugue states, and confusional states [43]. Although hyperarousal symptoms and intrusive re-experiencing are commonly considered the hallmark symptoms of trauma, not all trauma patients respond to trauma reminders with hyperarousal. In one study, 30% of subjects responded with hypoarousal and emotional symptoms when hearing their trauma scripts read to them [44].

To put the past in the past, it is necessary to process traumatic experience in a state of “optimal arousal.” The ideal zone between the two extreme physiologic states of autonomic hyper- and hypoarousal was described by Siegel [18] as the “window of tolerance”—the range of activation within which the individual can experience psychophysiologic arousal as tolerable or manageable. In this optimal range, the patient can integrate information on cognitive, emotional, and sensorimotor levels. All of the interventions characteristic of sensorimotor psychotherapy seek to develop or to enlarge an existing stable and generous window of tolerance.

The extremes of autonomic arousal that might have been adaptive at the moment of danger ultimately become a potential source of therapeutic impasse when the patient cannot maintain arousal within the window of tolerance [45]. As a threat is first perceived, an instinctive mind/body chain reaction is set in motion, involving cascades of stress hormone responses that mobilize the sympathetic nervous system and prepare the individual for flight, fight, and freeze defenses. When adaptive responses are successful, the body uses and metabolizes the neurochemicals, and arousal may gradually return to an optimal zone when the threatening stimulus has receded or disappeared. In the wake of a traumatic experience, however, this return to baseline does not always occur. In cases of extreme or prolonged trauma or in the context of subsequent inadequacies in soothing and relational support, the individual may have difficulty recalibrating autonomic arousal [42,46–48].

Chronic hyperarousal creates a vicious cycle: a hyperaroused nervous system increases vulnerability to state-dependent memory retrieval triggered by trauma-related stimuli, which results in “increased access to traumatic memories and involuntary intrusions of the trauma, which lead in turn to even more arousal” [20]. These intrusive perceptual memories appear as symptoms such as flashbacks and nightmares, causing a rapid heart rate, elevated blood pressure, and altered skin conductance associated with hyperarousal [49–51]. Because repeated traumatic responses can result in the kindling of survival-related neural pathways, traumatized people tend to become

increasingly more vulnerable to progressively minor triggers [52]. They remain autonomically “on guard” against danger (hyperaroused and hyper-vigilant or hypoaroused and numbly passive), and they fail to notice or integrate new data from the present that tells them that the danger is over. People who have trauma-related disorders lose somatic connection to present reality: at a body level, these responses are experienced as the past event happening again and again [42]. In sensorimotor psychotherapy, connection to the present is maintained through the use of mindfulness-based techniques. By keeping the treatment focused on the patient’s here-and-now somatic experience in the session (by mindfully noticing the trauma as it manifests in changes in heart rate, breathing, and muscle tone), the individual is encouraged to experience being “here now” while acknowledging the “there and then” of traumatic experience.

Defensive subsystems

In the context of threat, hyper- and hypoarousal states are accompanied by one of two general types of defensive responses or a combination of both: mobilizing defenses (such as fight or flight) or immobilizing defenses (such as freezing or collapse/submission). No one defensive response is “better” than another; all are potentially adaptive and effective at diminishing threat, depending on the situation and the capabilities of the individual. The authors propose that inflexibility among these defensive subsystems and their overactivity in the absence of threat involves chronic dysregulated arousal and contributes to the traumatized person’s continued distress after the traumatic event is over.

Mobilization

The mobilizing defenses of fight and flight are characterized by arousal of the sympathetic nervous system and the corresponding neurochemically mediated physical reactions. Flight is probably the most common response to threat when successful escape is probable [53]. When the flight response is activated, the large muscles are primed and ready to mobilize for flight and awareness of any pain or injury is diminished. Flight can be understood not only as running away from danger but also as running toward the person or place that can provide safety [54]. Versions of the flight response can be observed in patients in a variety of additional, less obvious behaviors such as twisting, turning, or backing away from a perceived source of danger. If the chance of escape is remote and the threat closes in, the potential victim’s attempts at flight may become increasingly frantic. When flight becomes impossible, fighting may provide the alternative of self-defense [55]. The fight response is often provoked when the victim feels trapped or whenever aggression might effectively secure safety.

Mobilizing defenses also include innumerable patterns of skilled responses that are learned or spontaneous and enacted automatically in the course of safely performing physical activities. For example, the ability to drive or operate machinery requires the incorporation of complex movements that, through repetition, become action tendencies that can be executed without thought, such as putting on the brakes and turning the steering wheel to prevent an accident. Such defensive actions anticipate and correct for possible difficulties without invoking flight/fight systems and include such motor acts as engaging the righting reflexes during a near fall, raising an arm for protection from a falling object, avoiding a rock in a downhill ski run, and so on.

Immobilization

In the animal kingdom, the mobilizing defenses give way to immobilizing responses when the former are ineffective or cannot ensure survival [55,56]. For example, according to Nijenhuis and Van der Hart [55], a child who is being sexually or physically abused by a caregiver is not in a psychologic position that enables flight. In some situations, running or fighting (mobilizing defenses) would worsen the situation for the child being physically or sexually abused or who witnesses violence, increasing the danger and provoking more violence.

The authors identify three main immobilizing defenses: freezing, limp passivity or feigning death, and submissive behaviors. There seem to be several somatosensory states that have been described as freezing. These states are briefly reviewed here, although it is the last description that is most clearly aligned with the immobilizing defense. Clients who have experienced freezing frequently report that they were very aware of the environment, especially of threat cues, potential escape routes, or protective impulses; they felt energized and tense; and were ready and able to run if needed. Misslin [56, p. 58] described freezing as “alert immobility,” where there is complete cessation of movement except for respiration and movement of the eyes. This freezing appears to involve a highly engaged sympathetic system in which “muscle tone, heart rate, sensory acuity, and alertness are all high [57], with the individual waiting for more data from the threat before taking action. Freezing may be the best defense when the threat is a possibility rather than a certainty, in which case flight would be most effective. Another version of freezing occurs when the predator is still at a distance and motionless behavior may prevent detection. This kind of freezing occurs as a “preventative” measure in nature, as when baby deer are left camouflaged in tall grass while the mother is away foraging for food. For children growing up in traumatic environments, freezing behavior often accompanies hiding from threat, for example, in the closet, behind a chair, or under the stairs. Freezing promotes safety in these instances because when the child is still and quiet, it increases the likelihood that he or she will remain un-noticed.

Clients also describe a third type of freezing as feeling “paralyzed,” terrifyingly incapable of moving and unable to breathe. This version is associated with a sense of being “trapped.” There is a concurrently high level of arousal that is combined with an inability to take action [18,58]. Siegel [18] postulated that with this kind of freezing, the sympathetic and the parasympathetic systems are aroused simultaneously, which produces muscular constriction paired with a feeling of paralysis.

Freezing is accompanied by sympathetic nervous system arousal, whereas the immobilizing defenses of feigning death, behavioral shutdown, or fainting are powered by the parasympathetic dorsal branch of the vagus nerve [59]. These defensive variants (feigning death, behavioral shutdown, or fainting) of the immobilizing defensive responses are apparent states of passivity that involve the subject becoming “limp”: the muscles become flaccid rather than tense and breathing becomes shallow [58,60,61]. Patients often describe this condition as feeling “trancelike or dreamlike.” It is accompanied by a reduced capacity to simultaneously attend to the external environment and the internal phenomena. Anesthesia, analgesia, and the slowing of muscular/skeletal responses [53,58,62] often co-occur in this group of responses.

Submissive behaviors (such as crouching, avoiding eye contact, and generally appearing physically smaller and therefore nonthreatening) are also common among traumatized individuals. Submissive behaviors serve a protective and preventative function because they “aim at preventing or interrupting aggressive reactions” [56, p. 59]. Body language in these circumstances is characterized by nonaggressive movements, automatic obedience, and helpless compliance in which the eyes are lowered and the back is bowed before the perpetrator. A version of this condition, described as “robotization,” has been noted in Nazi concentration camp survivors; it includes mechanical behavior and automatic obedience, without question or thought, to the demands of others [63]. Elements of the behavior, such as downward flexion (head ducking), appear to be part of the fixed action patterns of fear. As a result of chronic abuse, it is not uncommon for patients to characteristically respond to threat cues with mechanistic compliance or resigned submission, which may be wrongly understood as collusion or agreement. This mechanistic compliance or resigned submission can be seen, for example, in the patient who perfunctorily allows a male relative into her apartment despite knowing he will rape her as he has done in the past. Predatory or abusive individuals often seek to evoke these behaviors in others, taking advantage of the instinctive defensive response to elicit automatic compliance with the abuse [12].

Incomplete mobilizing defenses

When the cascade of mobilizing and immobilizing defensive actions is evoked, some of the actions (in particular, the mobilizing defenses) that

might enable escape or the warding off of danger are rendered ineffective or interrupted and left incomplete. An automobile accident victim might have felt the impulse to turn the steering wheel but was unable to execute the action before hitting the oncoming car. The sexual abuse survivor might have wanted to fight her perpetrator but was overpowered and unable to follow through. These incomplete actions of defense may subsequently manifest as chronic symptoms. As Herman [12] stated, "each component of the ordinary response to danger, having lost its utility, tends to persist in an altered and exaggerated state long after the actual danger is over" (p. 34). When an endangered person experiences the instinct to fight back or to flee but is unable to execute these actions, this unfinished sequence of possible defensive actions may persist in distorted forms. Individuals may experience their fight and flight muscles held in a chronically tightened pattern, have heightened and unstable aggressive impulses, or have a chronic lack of tone or sensation in a particular muscle group. It is as if part of the brain does not know that the trauma is over and is still responding bodily "in the moment of the trauma." In addition, many patients come to therapy exhibiting chronic immobilizing defensive tendencies in their bodies that, in turn, profoundly influence their emotions and cognitions.

In sensorimotor psychotherapy, these patients are helped to rediscover their truncated mobilizing defensive impulses through tracking their bodily movements and sensations that emerge during the therapy session. For example, a patient who had to submit to her caregiver's sexual abuse as a child discovered her forgotten, dormant impulse to push away and flee to protect herself. As she mindfully re-experienced how her body ultimately did not resist the abuse and automatically submitted, she noticed a tightening in her jaw accompanied by muscle tension that went from the jaw down the neck into her shoulder and arm. In response to the therapist's encouragement to continue studying her tension, the tightening continued to increase and her hands curled up into a fist. Being able to observe and attend to how her body wanted to respond, she became aware of the previously aborted physical urge to not only punch at her caregiver but also to run away, reflected in a tightening and feeling of energy in her legs. These physical impulses on which she did not and could not act at the time of the abuse appeared spontaneously as she became meticulously aware of her physical sensations and impulses during recall of her abuse in therapy. She later discovered how her truncated, lost impulses to resist had become encoded not only in the praxis of submission but also as beliefs or automatic assumptions of "I don't deserve to defend myself."

The healing transformation of defensive styles

Sensorimotor psychotherapy thus addresses the failed processing of the old trauma as it is directly "found" in the present moment in the embodied

experience of the patient. The sensorimotor-informed therapist carefully observes, with the patient, how the impulses for active or mobilizing defenses are overwhelmed and how they unconsciously resort to the immobilizing defenses (freezing, submitting, or becoming hypoaroused and “floppy”). Lewis and colleagues [57] described this mammalian immobilizing defense as feigning death. By evoking somatic responses to the trauma, in the session, the therapist helps the patient transform immobilizing defenses into mobilizing defenses. The patient can feel the full, completed experience of his or her capacity to defend through physical action, within her window of tolerance, instead of repeatedly re-experiencing the truncated, aborted, active defense or the frozen, dissociated, or submissive immobilizing responses. Thus, before treatment, unresolved trauma insidiously predicts the individual’s future before the future has happened. The future has been prescribed as hopeless by the past. Under the sway of this anticipation, there is little room for living in the present. Until an abused patient can experience the satisfaction of performing her active defensive actions fully, her future seems to hold only further abuse and disappointment as she continuously fails to defend herself. As the patient consciously distinguishes her mobilizing physical defensive action from her immobilizing physical response to the original trauma, her new actions can become conscious and available to her, and as a result, the future can hold more promise. Rather than insight alone, it is the actual experience of mobilizing action with conscious intention and awareness while simultaneously addressing the cognitive distortions and emotional reactions that helps effect such change.

Sensorimotor treatment: bottom-up interventions

Thus, instead of focusing on the verbal description of traumatic events, sensorimotor treatment focuses on the re-activation of autonomic hyper- or hypoarousal and defensive action tendencies as these occur within the therapy hour. In a bottom-up approach, the narrative becomes a vehicle for activating these physiologic responses and movements so that they can be studied and ultimately transformed. The therapist and client have an opportunity to work with the implicit elements of traumatic memories by directing the client’s awareness away from the verbal components of memory to the nonverbal residue of the trauma. Somatic bottom-up interventions that address the repetitive, unbidden, physical sensations of hyperarousal and hypoarousal together with movement inhibitions can then be integrated with more traditional top-down interventions that help to transform the narrative of the trauma and facilitate the development of a reorganized somatic sense of self. The sense of self is represented not only in beliefs and emotional responses but also in physical organization, postural habits, and movements of the body. An integrated approach to soma and psyche helps these patients regulate their physical experiences so that their

corresponding sense of self feels grounded, resourced, and oriented toward present experience.

Sensorimotor psychotherapy builds on and adds to traditional, widely accepted psychotherapeutic understandings and principles. For instance, sensorimotor psychotherapy, along with talk therapies (regardless of the theoretic model), recognizes the necessity of a good therapeutic alliance between therapist and patient. The alliance in a sensorimotor treatment, however, is built bottom-up as the therapist supplements the patient's bodily sensings with another pair of eyes and thoughtful appreciation of the patient's somatic experience through careful observation of "bodily language," taking on the role of an "auxiliary cortex" for the client [64]. The therapist becomes a kind of somatosensorially attuned "affect regulator of the patient's dysregulated states to provide a growth-facilitating environment for the patient's immature affect-regulating structures" [65]. That is, as the therapist tracks the patient's sensorimotor experience, he or she notices the physiologic signs of dysregulation and applies the appropriate interventions to settle or increase arousal: adjusting voice tone, energy level, pacing, choice of vocabulary, mindful observation, movement, and the amount of emotional or cognitive content. As the patient experiences the calm and relief that accompanies optimal arousal or a return to their window of tolerance, the therapeutic alliance is strengthened. With an increase in the sense of safety, the client's exploration of his or her experiences becomes less inhibited. Alternatively stated, as the client's chronic fear subsides, the client is freer to explore both inner and outer worlds like a child with a secure attachment base.

Activating neural systems that enhance exploration

In the traumatized client, chronically activated somatic defenses and their corresponding fears tend to override and inhibit the exploratory system that is also a wired-in mammalian motivational system. Panksepp [66] maintained that the SEEKING system "drives and energizes many mental complexities that humans experience as persistent feelings of interest, curiosity, sensation seeking, and, in the presence of a sufficiently complex cortex, the search for higher meaning (p. 145)." Evoking the patient's seeking system in therapy stimulates curiosity about how they can combat or inhibit habitual fear-based survival responses. At the moment of threat, instinctual survival defenses take precedence over cognitive functions. Long after the traumatic events are over, activation of the prefrontal cortices and cognitive functions can be intermittently inhibited in response to trauma-related stimuli [20,39], hindering the capacity for successful self-observation, exploration, and new learning. The therapist's job is to "wake up" the exploratory capacities by promoting a somatic sense of safety and cultivating the capacity for observation, curiosity, and mindfulness in the client. Observation of the present

moment's experience engages the executive and observing functions of the prefrontal cortex, and the capacity to maintain this observing focus prevents clients from becoming overwhelmed by the reactivation of a traumatic event. For example, as a client discusses a traumatic motor vehicle accident in therapy, she is asked by her therapist to become interested in how she is "organizing" the experience—what is happening inside her—as she begins to talk and think about her accident. The therapist gently and empathically interrupts the story to direct the client's awareness away from their verbal dialog to her inner body sensations, movement impulses, and sensory experience. In a state of mindful observation, she notices that as she talks about the accident, she has the thought that she is going to die. Next, she observes her body tensing in response to the thought and she notes a feeling of panic. Rather than reliving this experience, as she might have if the therapist had not carefully directed her attention to the present moment's organization of it, she steps back, observes it with curiosity, and reports how it is manifesting internally now. The panic subsides, her heart rate returns to normal and she "knows" at a body level that she did not die, she survived. With this somatic differentiation of "having" an experience and exploring how she has organized it, the traumatic event is relegated to the past, it no longer causes her to have the experience again, and she experiences the felt sense that it is over: "I thought I was going to die, but I didn't."

Often, just by uncoupling trauma-related emotion from body sensation and attending exclusively to the physical sensations of the arousal (without attributing meaning or connecting emotion to it), the physiologic responses diminish and settle. This conveys at a bodily level that the danger is past and all is now safe [58]. Uncoupling emotion from sensation is critically important because it eliminates physiologic cueing for a trauma response in the presence of a sensory recollection that is a priori a somatic experience. These transformations at the sensorimotor level result in improvements in emotional and cognitive processing (ie, emotions can be better tolerated), and cognitive processing reflects the incorporation of information from the body.

"Martin," a Vietnam War veteran, came to therapy to "get rid of" nightmares and feelings of being chronically emotionally overwhelmed. In the course of sensorimotor psychotherapy, Martin learned to track his physiologic arousal as he experienced it in his body. He learned to pay active attention to his rapid heart rate and to the shaking and trembling that occurred after the original combat and that he had subsequently re-experienced intermittently over the years. Over the course of several therapy sessions, he learned to describe his inner body sensations, noting the tingling in his arms preceding the shaking, the slight accelerated heart rate, and the increase of tension in his legs. As his capacity to observe and describe bodily sensations developed, he learned to accept these sensations without trying to inhibit them. The therapist instructed him to track these sensations as they moved or changed or "sequenced." Martin noticed that as he tracked the sequence of sensations progressing through his body, the shaking gradually

became quiet, his heart rate returned to baseline, and the tension in his legs diminished. Martin's body relaxed, his arousal quieted, he was less afraid and hopeless, and he experienced a somatic feeling he described as "calm" and "safe."

Left brain cognitive functions are integrated with right brain sensorimotor experience

Thus, in sensorimotor psychotherapy, top-down, cortically mediated functions are harnessed to observe and facilitate sensorimotor processing. Clients observe and report (both of which are cognitive functions) the interplay of physical sensations, movements, and impulses and notice their internal reactions as they try out new physical actions. They also learn to observe the effects of their thoughts and emotions on their body; noticing in which part of the body they feel the impact of a particular thought or how the body organizes a particular emotion. Meaning making emerges from the observing and subsequent transformation of habitual response tendencies. For example, as Martin's body experienced the completion of the trembling and shaking, he finally achieved the somatic experience of "peacetime" decades after the end of the Vietnam War. He finally recognized that the feelings of calm and safety meant the events that had continued to torment him were in the past. For the incest survivor who was able to finally execute mobilizing defensive responses, the meaning that emerged was, "I can defend myself." Integrated meaning making was possible for these patients when they experienced a transformation of sensorimotor, emotional, and cognitive responses to their traumatic experiences.

Thoughts and emotions are viable targets of intervention that can support resolution of the traumatic experience. Top-down approaches that attempt to regulate arousal, emotions, and cognitions are a necessary part of trauma therapy, but if such interventions overmanage, ignore, or suppress body processes, then traumatic responses may not be resolved. Similarly, bottom-up interventions that reinforce bottom-up hijacking or fail to include cognitive processing can sabotage integration of the effects of trauma and may lead to endless repetitive flashbacks, hyposarousal states, retraumatization, or chronic trauma kindling.

Summary

The authors believe that the complex effects of trauma are more likely to respond to treatment when the use of insight, understanding, and somatically informed top-down management of symptoms is thoughtfully balanced with bottom-up processing of trauma-related sensations, arousal, movement, and emotions. Effective treatments for trauma involve evoking the fragmented, cognitive, emotional, and sensorimotor responses within

the patient's window of tolerance and facilitating new, adaptive responses that can lead to the integration of past and present, of belief and body, and of emotion and meaning.

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