

From Hopeless Solitude to the Sense of Being-With: Functions and Dysfunctions of Mirror Neurons in Post Traumatic Syndromes

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Abstract

Here the focus is on the therapeutic relationship: the trauma of abuse is a relational trauma. It must be said that abused people are sensitive to gestures, sensory and motor fragments, etc. This work attempts to repair the relationship texture, as the person has lost the sense of *being-with* and feels desperately alone. The work of mirroring, the joined repetition of the key gesture, and the search for gesture-word connections help the patient to repair that breach. This methodology can promote the recovery of the functionality of the mirror neuron system, and the reactivation of the insula and the amygdala, thus restoring the previously lost ability to communicate.

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Keywords: relational trauma, mirror neurons, key-gesture, being-with

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The body of the subject and the subject of the body

A body psychotherapist, even if he is accustomed to the various reactions of his patients, may sometimes encounter unsettling or unexplainable physical sensations when treating a person with a history of trauma, such as sexual abuse. One patient may in fact report that experiencing the unpleasant feeling that their arm belongs to another person or that it belongs to them only up to the wrist. Another patient could report the inability to raise his voice in situations requiring it, even when he is emotionally loaded. By using a higher pitch or even by trying to scream, the patient may then come to realize that he's terribly frightened by his own voice, as if it came from someone else, inside or beside him.

In these cases, the body, when it moves in an unfamiliar way or is highly activated, is perceived as foreign. From a phenomenological point of view one may be tempted to say that the body contains more than one subject, and that there is a certain relationship between the subjects themselves. While it is obvious that the Other felt within is related to the story of abuse, it is not so obvious as to how to alleviate this sense of otherness and restore a minimum sense of identity.

What is clear, though, is the fact that *the body, in its way, is a carrier of meanings and is able to set up scenarios that outline the traumatic history of the subject*. We are inhabited by the Other, which may be the condition required for us to encounter the Others: “the fact that I carry an Other in me, that I am dual, plural and not monocentric in consciousness, is the condition of having awareness of the Other itself.” One may interpret this conjecture, that the body, the highest representative of individuality that reveals the origin and the relational nature of our existence, as paradoxical; we could almost venture that in these cases consciousness is always bad consciousness, but alas, Freud had already said this.

This is how the body reveals its “open” nature, its interface to the world, to let in, through its inner folds, the world itself, winds of a flow that suddenly change polarity like a Möbius strip: what a moment ago was the Self now is suddenly the Other-World. It is a play on words which becomes drama when ‘Self’ is not just a word, but a certificate of existence: this is what happens to people who survive very traumatic experiences.

The words of Merleau-Ponty have never been so pertinent as in this case: “The body is the only means that I have to get to the heart of things. “The phenomenological approach and the progression of neuroscience both seem to promote a return of the conception of human being as “one entity.”

It is in this direction that the neurophenomenology of Francisco Varela is moving. According to Varela, the attempt to look for the places or the neuronal correlates of consciousness (NCC: neuronal correlates of consciousness) is a problem without a solution.

Consciousness appears in an organism; it is an emergence, a distributed phenomenon. It isn’t “in the head” and the brain itself isn’t a bundle of neurons; it exists, rather, inside an organism concerned essentially with its own regulation and conservation. Naturally, the brain has a central role to play because it is the enabling condition of consciousness.

In other words, we can say that we are facing a complexity: not only does there exist a top-down connection of the phenomenon (from the cortex to the deepest layers of the brain) that corresponds, in a non-metaphorical way, to the body-brain relationship, but we also have a continuum of feedback generated by this opposite causal process, extending from sensory-motor to cortical processing. These two different directions, *top-down* and *bottom-up*, coexisting in a continuous mutual feedback loop, are the reasons for the complexity of the phenomena.

What I want to discuss in this article is the phenomenon of radical fragmentation inside traumatized and/or abused individuals. My hypothesis here is that mirror neurons constitute the neuro-biological basis for empathy and of the subsequent possibility of *being-with*.

Trauma

There are events that go beyond the usual classifications, events that break the continuity of a person’s life, creating an indelible line of separation between the before and the after; they are experiences that transcend the individual’s ability to cope and thus produce a radical disruption in emotional and cognitive functioning: this is trauma.

Let’s start from the definition: with ‘trauma’ we mean an event, or series of events, related to a subjective experience of helpless impotence or inability to avoid the danger within it. In the words of Henry Krystal, “catastrophic psychic trauma is defined as a surrender to what is lived as an inevitable external or internal danger. It is the psychic reality of surrender to what is experienced as an intolerable situation with no way out that generates the abandonment of lifeguarding activities. Considering a situation as extremely dangerous and surrendering to it starts the traumatic process” (Krystal H., 2007, p. 200).

It is a widely shared opinion that the psychoanalytic treatment of cases of trauma can often face insurmountable difficulties. Therefore, many analysts agree on the fact that these patients “are not fit for true psychoanalytic treatment. If the trauma was severe or early enough it could have disrupted the development of the ego enough to preclude the capabilities needed for analytic work.

The patient may lack the capacity to establish a minimum therapeutic alliance; he may lack access to inner subjective experiences and emotions, as well as the ability to translate them into words; he may lack an introspective ability which involves a separation between an observer Ego and an action Ego; he may lack the will to confine his impulses within the verbal expression rather than extend them to action; and there could be an Ego that is not strong enough to prevent serious regression in the midst of powerful feelings, memories, or desires that will be evoked by such procedures” (Sugarman A., 1999, p. 14).

The words to say it

“In those moments I’m paralyzed ... and words don’t come out ... I wish I could at least scream but I can’t do that either.”

“Sometimes I fall into an abyss for no reason ... I’m so tired that I can’t raise an arm ... and it seems that I could stay there, without speaking, forever! “

These are some of the quotes that express the state of sudden word interruption in people who have experienced traumatic events.

The question which arises concerns therapeutic intervention: how can psychotherapy work in such cases, when most of it cures through the act of speech? It is a crucial question, because abuse confronts us with sudden flashbacks, with out of context feelings, with moments of silent terror, etc.: with anything but a coherent narrative or contextualized memories.

It is natural to think that a verbal acknowledgement of the traumatic past is exactly what it takes for a patient of this type. This is absolutely true, because only a recovery of the stream of consciousness, of memory, and speech can heal these deep fractures. But the words are missing, and clinical evidence tells us that the use of exclusively verbal work is seriously insufficient.

Many cases show that the re-emergence of these experiences results from events in which the body, in using gestures and postures has a primary role; and that perhaps without these experiences some access to the trauma (memories) would remain unattainable. There is also scientific evidence from recent neurophysiological studies confirming what daily clinical experience shows us. One research study used PET techniques on patients with PTSD who were exposed to dramatic stories they had written about their traumatic experiences. The most significant result of the study is that during these moments of great intensity, a part of the brain, Broca’s area, which is in charge of the translation of personal experiences into communicable language, stops operating (Rauch, et al, 1996).

We shall conclude that this is reflected by the “silent terror” experienced by these patients, and as evidenced in their tendency to feel emotions as physical states rather than as verbally encoded experiences. These results suggest that the difficulties faced by patients with PTSD in generating words for their feelings is related to real changes in cerebral activity.

Another series of studies, in which the activation of traumatic memories is observed through *neuroimaging* techniques, seems to be largely consistent with the previous study cited. The overall picture is that during the activation of traumatic memories there is a simultaneous hyper-activation of the amygdala, a decrease in inhibitory top-down action on it by the ventral anterior cingulate cortex, the medial prefrontal and the dorsolateral cortex (with problem

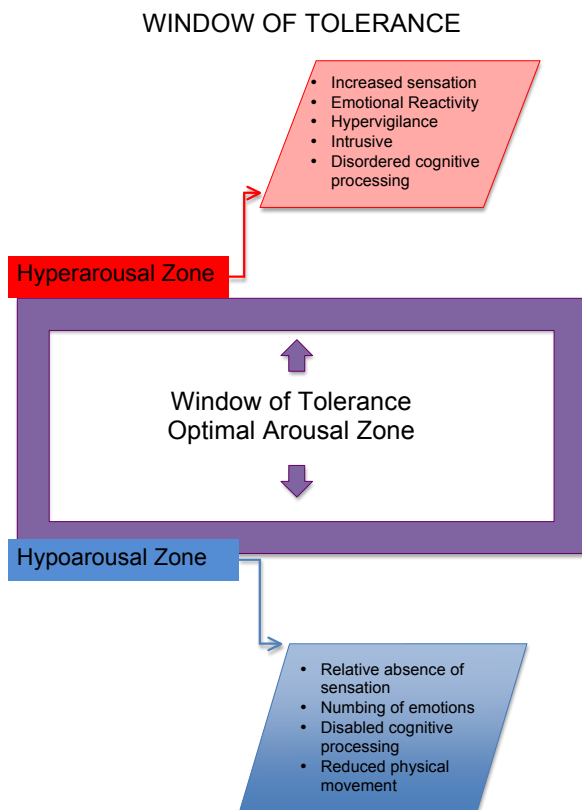
solving, answer selection, reflection functions), hyper-activation of the right cerebral hemisphere and, moreover, a hypo-activation of Broca's area. The person finds himself reliving the trauma as if it were re-occurring now, in the present having intense emotional experiences without being able to label them, regulate and control them adequately. He is also unable to elaborate on them in an effective verbal manner (Bremner, 1995).

The window of tolerance

The critical importance of the ability to verbalize the event in cases of trauma is also confirmed by two other authors who are involved in the attempt to understand the complex phenomenon of emotional regulation: Daniel Siegel and Pat Ogden.

Daniel Siegel proposes the concept of a "Window of Tolerance" and places it among the essential components of emotional regulation. According to Siegel, "everyone has a 'window of tolerance'," a space in which emotional states of different intensity can be processed without jeopardizing the functioning of the system as a whole.

This means that, "states of arousal that exceed the limit of the window of tolerance can cause disorganized thinking and behavior." We can explain this in terms of the activity of the autonomous nervous system. When we enter a state of excessive sympathetic activity, we experience an increase in breathing and heart rate, culminating in a sense of generalized tension. This means that the subject has gone beyond the upper limit of his window of tolerance.



Adapted from Pat Ogden, *Trauma and the Body*, and W.W. Norton & Company.

Conversely, when the lower limit of the “window of tolerance” is reached, the parasympathetic system produces the opposite effect, creating a sense of numbness and a reduced responsiveness of the mind instead.

“In these conditions, higher cognitive functions such as self-reflection and abstract thinking are impaired; the circuits that connect these cortical processes to the hyperactive centers of the limbic system are functionally blocked, and rational thinking becomes impossible. The mind generates unorganized activities that can reinforce the maladaptive pattern: this is a state of emotional dis-regulation.”

Siegel’s work is of great importance for us because it shows exactly what happens in cases of traumatic experience, regardless of when the event is occurring in the moment or being relived. But we have to take another step. The last link in this elucidating chain is given by the considerations of Pat Ogden, who uses the concept of the window of tolerance to observe and treat patients with post-traumatic disorder.

Ogden notes that, in fact, traumatized people display behavior that overflows the limits of their window of tolerance in two possible directions: there are people who remain in a chronic state of hyper-arousal, resulting in excessive habitual alertness, aggressiveness, hyper-vigilance, responsiveness and motor agitation; or people who take the way of hypo-arousal, and therefore show a background of defensive passivity, characterized by chronic patterns of submission, inability to structure personal boundaries, a deep feeling of inadequacy, automatic obedience, and a tendency to repeat their role as a victim. Then there are people, probably the majority, who alternate between one state and another. In all these cases, rational thinking is likely to become disorganized and consequently the ability of verbal communication is seriously compromised.

The traumatized body

It is the body that can give us more knowledge about what happens during these catastrophic experiences.

First we start with a basic assumption: the body’s first reaction to a situation involving a serious threat to its safety is primarily a response of “fear”. The neurophysiological correlates of this emotion are crucial for understanding the psycho-corporeal reaction of the human being to a traumatic event.

Fear is coordinated by a small sub-cortical gland called the amygdala. Some research suggests that many anxiety disorders may be associated with abnormal activation of this gland. Studies by Van der Kolk (2004) and Le Doux (1992) help us understand the neurophysiology of trauma and the role of the amygdala in PTSD. Sensory information arrives to the central nervous system via the sense organs and is transmitted to the thalamus where a partial integration occurs. The thalamus then transfers this semi-integrated information to the amygdala and to the prefrontal cortex, where processing activity continues.

Some information, however, travels through the amygdala before passing through the cortex. According to Le Doux this “early” sensory information allows the amygdala to process the experience at a higher rate than the cortex and to interpret its emotional significance. Thus, the emotional evaluation of a stimulus seems to precede the conscious experience of it. The information evaluated by the amygdala is then transferred to the pre-frontal cortex and to the hippocampus, the area anatomically adjacent to the amygdala and involved in organizing and storing long-term memory.

The hippocampal system contributes to the evaluation of the space - time relationship (where and when) between the new, incoming information and the previous information that has already been stored.

The thalamus, the amygdala, the prefrontal cortex and the hippocampus are all involved in the integration, interpretation and storage of sensory information. This integration, however, seems to be disturbed by high levels of neurophysiological activation (arousal), like those that are activated by fear while exposed to a traumatic event. While a moderate activation of the amygdala increases the declarative memory (verbal) mediated by the hippocampus, a high excitatory level disturbs its activity, facilitating a mainly visual or auditory sensory storage.

An excessive excitation of the amygdala generates emotional responses and sensory impressions based on fragmented information processing, rather than on a complete perception of the stimuli. The memories of traumatic events can thus be stored vividly as emotional states, in a sensory-motor mode, or as somatic sensations and visual images, but they are not properly integrated as a semantic memory.

From a strictly neurophysiological point of view this phenomenon can be explained by the role of a neurotransmitter essential for understanding stress: cortisol (or hydrocortisone). Levels of cortisol in stress situations are lower than normal, while those of adrenaline and noradrenaline (norepinephrine) are higher than normal. As one of the functions of noradrenaline is to activate the hippocampus, this may explain why we can remember emotional events better than others: under the extreme stress of trauma, noradrenaline, no longer inhibited by cortisol, might activate the hippocampus more intensively and for longer, facilitating excessively live memories which are re-experienced as flashbacks or intrusions. Thus, low levels of cortisol may represent a risk factor for PTSD.

Neuroimaging studies provide further evidence for understanding how information processing can be disrupted by trauma. While recalling a traumatic memory, the right brain hemisphere increases its activity in the areas involved in emotional excitement, i.e. in the parts of the limbic system more closely linked to the amygdala (Rausch, et al. 1996). These areas are more related to the experience of anxiety, and they have been named "the circuit of concern." In addition, while recalling the traumatic memory, Broca's area, the part of the left hemisphere responsible for the verbalization of personal experience, seems to be turned "off". As a result, the traumatized patient, instead of translating the experience into words, feels a "silent terror," that inscribed into the sensory memory as a somatic rather than a mental state.

Traumatic information is stored as sensory fragments and emotions are felt as physical states, rather than being verbally coded (Van der Kolk, 1995). To understand the "feeling" after a trauma more fully, we should also remember that when people are in danger they produce high levels of endogenous opioids, which can deaden the pain. Some people with PTSD continue to produce high levels of opiates even after the danger has ceased, and this may cause the sensation of dulled emotion associated with post traumatic syndrome. The important role of the hippocampus in processing traumatic memories is testified to by many studies that have revealed alterations in the right and/or left hippocampal volume and/or lower neuronal hippocampal density in people with extended trauma. However, it is unclear whether these reductions in hippocampal volume are a cause or a consequence of the development of PTSD. Gurvits and colleagues (1996) found that in individuals exposed to trauma, but who did not develop PTSD, the size of the hippocampus was not reduced. Abnormalities in the circuits of the prefrontal cortex and cingulate gyrus have also been highlighted with PET in both patients with PTSD and with major depression (Bremner, 2002).

A crucial issue is the correlation between these studies. The first hypothesis is that stress hormones might have caused the neurological disorders. Some data, however, do not seem to support the idea that these hormones are particularly high in those who develop PTSD (Orr, Pitman, 1999). An alternative hypothesis is that the reduced size of the hippocampus might be a risk factor for PTSD (Gilbertson et al., 2002). These authors, even though they found a 10% reduction of hippocampal volume in the brains of war veterans with severe PTSD, noted the same hippocampal volume in monozygotic twins of patients not exposed to war.

Furthermore, the severity of PTSD does not appear to be associated with the severity of the traumatic experiences, but rather with the reduction in hippocampal volume.

This dispute, however, doesn't change the most important aspect of a psychocorporeal therapeutic approach to trauma, i.e., that the neurophysiological aspects of trauma correlate to the traumatic experience inscribed predominantly within the sensory-motor component of emotion in addition to the cognitive-verbal one.

Since traumatic experiences seem to be initially stored as body sensations and emotional states, they are more difficult to access through semantic elaboration and therefore therapies based on verbal processes may be less effective. Traumatic memories, in fact, seem to be reflected primarily in the right hemisphere and processed in the emotional limbic brain.

Most psychotherapeutic approaches facilitate a cognitive processing of emotions that can significantly relieve the symptoms of trauma. However, when the posttraumatic psychopathological picture displays somatic symptoms (McFarlane, 1996), the effectiveness of treatment can be considerably increased by sensory-motor interventions. This does not mean that the sensory-motor processing alone can be enough to manage post-traumatic symptoms, but that it is an essential contribution to this process (Ogden and Minton, 2000).

Hopeless solitude

So far we have seen the difficult cohabitation between narrative plots and emotional memory and the frequent separation of words and experience; now we have to emphasize a further complication: the breaking of connection with other people, the radical relationship separation.

Cases of trauma, and particularly cases of abuse, defined as "relational trauma" since it usually occurs within significant human relationships, generally show a crucial sense of extreme loneliness and sense of bleak alienation from the rest of mankind: the abused person does not perceive himself as belonging to the rest of the human community, but rather as ruled out, different or even dangerous to the peace of others. A therapist listening to a person who has experienced such events is impressed by the profound destruction of trust in human relationships, with a resulting sense of isolation which apparently dampens the constant feeling of imminent threat. We witness an experience of "expulsion" from the social world and an "invisible segregation" which emerges forcefully when someone decides to get closer than usual to the traumatized person.

The clinical example I want to present exhibits this sense of hopeless solitude, highlighting what we have just outlined. It is the case of a patient, Anna. I will recount a sequence of three short phases of the care process based in an individual setting.

Anna is a person with a history of sexual abuse perpetrated by her father and repeated for years, with the mother's tacit collusion. Her brother and her sister (both younger) remained unaware until the day that Anna decided to reveal to them the facts of her experience. This happened while she was being treated by a psychotherapist. This therapy, which lasted for about

two and a half years, ended abruptly and in a negative way, because, as she says, “I felt betrayed and abandoned by his behavior.” After this therapy, “which however has been very useful and important,” Anna turned to me because she found out that I had written a book about therapy techniques in sexual abuse cases. Although she hadn’t read it she decided to consult me anyway.

The three fragments, extracted from the long work of therapy, while far from being a complete documentation, serve to illustrate the specific issue that is frequent in abused people, the sense of extreme loneliness, almost of isolation, which becomes a heavy feeling of being totally different from the rest of human beings. The feeling of being in what I term ‘hopeless solitude’.

Very often abused people feel “rotten inside”, “like a fruit gone bad” that everyone can see and judge. Anna also described feeling this existential state of being. This case shows a way of working through the methods of mirroring, imitation and key-gestures used to get deeply in touch with the patient while simultaneously maintaining an obvious sense of respect for their boundaries. The therapist attempts to capture a significant gesture of the patient and repeats it with her. It happens that Anna calms down, goes into a state of relaxation, develops a positive image, and then shows a change in her primary theme of loneliness.

Anna had consulted me asking for help with her relational problems: she wasn’t able to have a lasting love relationship that would give her a sense of confidence and well-being. In the first two sessions she had been able to tell me much of her dramatic story, composed of terrible events, a disturbing ambience and moods close to madness. I could understand her feeling of total exclusion from the world of human beings, the constant feeling of not being understood and the ice of her eternal loneliness. With this deep sense of isolation it was obvious that she could not build an on-going relationship and that she always felt driven back into the depths of her terrible solitude.

First fragment (third session)

A few minutes into the session this dialogue begins:

Anna: “I feel as if I don’t have the *ability* to sustain a relationship.”

While saying this, Anna makes a particular gesture with her hands joined and the fingertips touching each other and moving from bottom to top, as a blooming flower or an erupting volcano.

Therapist: “The *ability*. . . (T. repeats the keyword and reproduces the gesture of the patient showing it to her, leaving the sentence suspended without adding his own words) “What is this? (indicating the gesture) How is it? Did you notice that you made this gesture?”

A: Yes, It is true I did that, I don’t know why. I don’t know. . . I would say that. . . I don’t have the ability to feel inside and come out. . . to live. . . to let it in. . . I don’t know how to say it. Yes, maybe it is just like this movement (Anna makes the gesture again and watches it).

At this point the therapist explains the meaning of working on the gesture: “It may be important to pay attention to the gestures and movements that accompany our speech, because sometimes they open us to deeper dimensions of our being, they reveal intentions or aspects we’re not aware of, and reveal ideas and personal meanings that can show us a possibility and a way to new solutions.”

Anna listens and confirms with subtle nods, then she takes a breath and says: “Usually I try to live a relationship with a man externally, as someone aloof who sees things from the outside. I don’t even call the men I know by name: I call them with abstract nicknames:

the engineer, the Roman, the restless, and so on. . . . I got used to the distance, even mental, from them.”

T: “But this (repeating gesture) is something different, right? It is different because it comes from yourself. . . it comes from within and it emerges. It is not external like men. . . this is the ability to. . . as if it was born from within, right? . . . How do you feel seeing this?”

A: “Well, I wish it were like that.”

T : “Can we repeat this gesture together?”

Anna doesn’t answer, but nods her head and immediately begins to move her fingers searching for the movement and the feeling; she dives instantly and completely into the movement, not just her hands, but also her arms, her shoulders and torso, they all move as if they were emerging, floating from a remote underground cave.

T: How do you feel while you’re doing this?

A: I do not know, it is weird. . . is beautiful. . . it is. . . like Christmas with my family. I really like Christmas with my family. It gives me a feeling of warmth and affection.

T: And the feeling in your body?

A: Relaxed. I feel...I feel my body!

T: I am impressed by your voice right now. It seems different than a few minutes ago. Do you realize the difference too?

A: I feel cozy. . . I see myself as if I were immersed in a cloud.

Second fragment (fourth session)

Session opening dialogue:

T: How are you?

A: Very well after the last session, because I was impressed by your gesture along with mine, and this gave me a strong sense of relief. I felt like not being alone. I didn’t feel that extreme solitude. . .

For three or four days I recalled your gesture with mine, and this relieved me and almost moved me. By contacting this gesture that expresses a form of solitude, I felt that now there is a person who can accompany me. I moved this feeling of loneliness away for a few days and I was fine. I haven’t felt so good in a long time.

Third fragment (one month later)

Dialogue at the end of the session:

A: I feel a great pain. But I don’t feel it only because it is here right now: It has always been here. I denied it for some kind of survival.

T: A great pain?

A: Yes....and I’m almost happy to feel it. There are many of us suffering like this.

T: This is important. Sometimes you told me about a sense of loneliness, of isolation.

A: I’m coming up with an idea that it is not true that we’re different from the others. “You’re not like the others” they always told me, especially my mother: a sense of “being different” is certain for those affected by trauma in childhood. When you’re growing you’re not like the others, so It is a huge imprint, but what I begin to feel now is that we’re not different from the others.

And as she speaks, something very interesting happens: Anna remakes exactly the same gesture from which this whole process started, but this time she doesn’t stop, she goes on and

she produces a new sequence: her hands, after describing that flower or that volcano, separate, and vibrating gently, they lay on her own cheeks. Anna stops, as if suspended; she opens her eyes slowly and sighs. She looks at me and with my eyes I show her the new position of her hands, and I don't even have to say anything and she nods saying, "Yes, I see. . . I did a new thing. . . a new gesture for me, I usually never stroke myself. I would say that. . . now I'm here with you, Anna!" Here the last part is unclear who is speaking.

Later, Anna remembered that portion of her therapy, that phase of work she described as "getting out of the well", and with great surprise she thought about the simplicity and almost banality of our interactions, which had so impressed and changed her. She was incredulous about the fact that a simple gesture repeated and reflected upon could have produced such an effect; and even more surprising to her was the resulting feeling of gradually regaining a body, her body, "as if a beneficial water had begun to soak her, waking her up."

The key gesture

How is it possible to contact an experiential core theme so quickly and deeply in order to reorganize its sense by using an involuntary and almost unconscious gesture?

Here we need to describe in detail the steps we made utilizing support from the latest discoveries in neurophysiology, in order to build a meaningful and coherent hypothesis that can justify what is now evident in the clinical experience.

Let's start with some recent studies that investigate how the brain works while performing certain functions. The act of learning what we call "motor skills", such as cycling, skiing or other activities of this kind, makes this clear to us. Larry Squire and Eric Kandel (2000) have studied the issue for a long time and have clearly shown that there are various forms of memory, which are represented in different areas of the brain.

An important conclusion has been reached, which is that motor skills don't refer to explicit or declarative memory, the one with conscious awareness of remembrance, but that they are part of the broader field of implicit or procedural memory.

Motor skills or habits, once they are learned consciously with the participation of the prefrontal and parietal cortex and of the cerebellum, gradually become more and more automatic, since the control of the action is made by other brain areas such as the motor cortex and the neostriatum. The brain areas involved in attention and awareness seem essential at the beginning of learning, but they gradually decrease their activity when a task is repeated for the benefit of deeper brain areas, such as the motor cortex, the caudal nucleus and the putamen (which constitute the neostriatum). More simply, our conscious part occurs only at the time of the original skill learning, while routine repetition de-activates our awareness and activates our automatic and unconscious areas. After having understood how to do it, we no longer need to think and reason how to do it anymore.

Packard, Hirsh & White (1989) have gone further and have shown through some brilliant experiments how the hippocampus is involved in those exploratory tasks that use information related to events which occur occasionally, that is, events that can't be categorized as frequent or routine. On the contrary, in tasks involving the routine repetition of certain experiences, the caudate nucleus is involved, and no function is affected by a possible lesion of the hippocampus.

In short, we can conclude that routine physical activities initially involve the higher brain centers, leaving them right afterward to be stored in circuits that don't have any contact with certain cortical areas and especially with the hippocampus.

This last detail is very important regarding the impact of trauma on hippocampal

connections and the consequent memory disorders. We have already mentioned the fact that trauma, disconnecting the hippocampus from the amygdala, can produce an isolation and dissociation of traumatic memory, resulting in a range of symptoms that have no cognitive connection with the event. Sensations and movements, therefore, have partial autonomy.

The following steps are utilized in the Biosystemic approach:

- Highlight the gesture
- Reflect the patient
- Make the patient repeat
- Increase and / or amplify
- Allow to develop and transform.

We need to comment briefly on these steps. For example, why should we highlight one gesture rather than another? What makes us decide? After years of clinical work I can say that we need to refer to the principle of salience, according to which something is significant and important when it emerges from the background and differs from the basic continuum. Anna's gesture impressed me because it was slightly discordant with the verbal content of her speech.

Sometimes certain gestures are concordant with the context, but shift the center of the speech. For example, a person is talking about something and suddenly his hand unconsciously settles on a part of his body, like pointing out something related to the words. This is a key gesture.

The second step is simple but extremely important. It represents the sense of "doing things together" suggested by the therapist, that diminishes any possible sense of ridiculousness that a person may feel while directing his attention to that gesture. It is also the first step in which the patient observes something of his own; It is the beginning of the activation of an observing and aware consciousness.

The third step leads us directly into the heart of the work. Here we must be careful that the person doesn't stop repeating the gesture, otherwise the deep brain areas won't activate and everything risks remaining technical and flat. Therefore, it is important for the therapist to follow the patient, reflecting in part the related movement or sound.

The fourth step is the most delicate because it connects directly to the memory archive, and can trigger strong and surprising emotions and reactions. Here it is necessary for the therapist to follow the patient staying a bit lower, as to strength, rhythm and intensity.

The fifth and final step is the most creative, because it is totally unpredictable; we don't know what new plot will develop. Thus it is necessary to pay attention to those micro-gestures that precede the different directions of the movement, and that open up new horizons of sensation.

We have seen Anna passing through her initial gesture and arriving to do, feel and stay in an emotional position that was unpredictable at the beginning of the session. We started with a gesture, which we call "key-gesture," and highlighted it, repeated it, amplified it and followed it in its own spontaneous transformation: this procedure has revealed an experience that has led to a completion of the bodily expression and to a proper verbal narration. The crucial question is: why does a series of apparently common gestures make something so significant come out?

If we think of Levine's idea of trauma (1997) as "an incomplete biological response", and remember that the traumatized person is in a state of chronic tension, due to an action started and never completed, we can add that this person may also express a series of actions and motor patterns that constantly "start" and never finish. These are physiological attempts to respond to trauma that have remained trapped in the terror of menace. Moreover, if we observe that even here there is a disconnection of the hippocampus, we have a very strong analogy with the structure of routine and established motor skills: disconnected from consciousness, stored outside the hippocampus, identical in repetition.

Summing up and simplifying, we can say that the incomplete responses to trauma “behave” as our most ordinary motor skills: skiing, cycling, etc. The fundamental difference is that the first are never complete, and are often dysfunctional and cause agitation and discomfort. Both are the result of a disconnection from the areas of consciousness, but whereas the second carry along with it all the advantages of this step, the first are the result of a life failure.

Exemplifying more, we assume that the traumatized person consciously begins to produce motor responses to the threatening event, but then, overwhelmed, the person undergoes a disconnection of consciousness (hippocampus and cortex) but continues to produce fragments of actions that are never completed and are stored in deep brain cells that subsequently become unconscious.

At this point the work technique adopted with Anna is clearer. It is basically an attempt to go through the traumatic process again: highlighting the gesture allows conscious and vigilant attention to become involved; repeating the movement knowingly and voluntarily connects the higher brain centers (cortex and hippocampus) to the deep ones (caudal nucleus and putamen) again; amplifying the action helps to reconnect with the level of activation present at the time of trauma (state-dependent memory); and following the free development of the gestures it helps to find the interrupted motor frame and build a new narrative.

It is also interesting to note that the word “narrative” contains in itself the idea of the development of a story, and at the same time it contains the sense of the recovery and repair of a fabric.

Autistic isolation and mirror neurons

However, there is a further theoretical element to add in trying to understand Anna's process of reconstructing her sense of *being-with* the other as an outcome from desolating isolation.

While many methods of intervention operate primarily on the patient, here the focus is on the therapeutic relationship: the trauma of abuse is a relational trauma. The intention of the therapist is to restore harmony in a safe environment, through a consistent attitude and, above all, through the restoration of body tuning.

It must be said that abused people are sensitive to gestures, sensory and motor fragments, etc. This work attempts to repair the relationship texture as the person has lost the sense of *being-with* and feels desperately alone. The work of mirroring, the joint repetition of the key gesture, and the search for gesture-word connections help the patient to repair the breach. Another useful study is linked to the discovery of mirror neurons and to recent hypotheses on neurological defects in autism cases.

Mirror neurons are adjacent to motor neurons and are activated when the subject merely observes the intentional behavior of another person. The pattern of excitation induced in the observer imitates exactly the same motor pattern that he would activate to reach that object. In other words, the visual information we receive when we observe the actions of others is summarized in our brain, in equivalent motor representations thanks to the activity of these mirror neurons.

This allows us to participate directly in the actions of others. We experience the other as if we were doing his action, feeling his emotion, expressing his voice or feeling his own physical contact. Through this “participation” in the mental life of others we can “understand” and “feel” it in ourselves, with particular regard to his intentions and his feelings.

Vittorio Gallese (2005), one of the discoverers of mirror neurons, sums it up in a very impressive concept: “the embodied simulation”. Mirror neurons could therefore be the basis of

the phenomenon of empathy and social liaison that we experience in our lifetime. But things don't always work. In many cases the capacity for empathy and the feeling of connection with others may be lost: an extreme example is provided by autistic people, who live in a world deeply separated from contact and from relationships with others. And we now know that "high-functioning autism subjects" are able to recognize and imitate the expression of some basic emotions, but they do so using different brain circuits than those activated in people without autism.

Individuals with autism show a complete lack of activation of the pre-motor mirror neuron and an under-activation of the amygdala and the insula, but a hyper-activation of the visual cortices. (Dapretto *et al.*, 2006). Thus, we can hypothesize that empathy deficits in people with autism depend on dysfunctions of the mechanisms of embodied simulation, as determined by a malfunction of the mirror neurons system. (Gallese, 2006; Nishitani *et al.* 2005; Oberman *et al.* 2005; Theoret *et al.* 2005) While traumatized patients are clearly not autistic, we can define them as patients who generally operate with some portion of an autistic core (F.Tustin, 1990).

We can then assume that when we observe the phenomena of progressive social seclusion, isolation, feelings of extreme loneliness, relationship fracture (a situation that recalls autism), the function of the mirror neurons decreases. It should also be noted that the amygdala and insula activity decreases in these cases, and this coincides with Pat Ogden's observations on post-traumatic submission behavior where the amygdala is inhibited and the individual functions below the limit of the window of tolerance.

In people with dissociative PTSD, the insula is de-regulated, since the insula is necessary for perceiving and mapping the internal sensations of the body, functioning as a bridge between the motor areas of the mirror neuron system and the amygdala (Lanius 2006).

From this point of view, it is important to focus on the functioning of the therapeutic relationship in its global, psycho-corporeal dimension: the methodology of mirroring, key gestures and body tuning can act to promote the recovery of the functionality of the MIRROR NEURON system, the reactivation of the insula and the amygdala, and thus restore the previously lost ability to communicate.

Therefore given this various research on the brain and how we store and experience traumatic events, we conclude that when the therapist imitates the patient through key gestures, he creates the possibility for activation of the mirror neuron system, which can help the patient to literally see himself. (M. Iacoboni 2008)

Audio-visual mirror neurons

The latest developments of the research of mirror neurons are consistent with the considerations taken so far, because they always obtain more numerous experimental confirmation, and because they expand and multiply the application fields. In fact, we have Mirror Neurons system based therapy for emotional disorders (T. Yuan, R. Hoff, 2008). These methodologies provide a non-invasive approach to the treatment of emotional disorders observed in autism patients, post-stroke patients with depression, and other mood dysregulation conditions.

In the last few years we have discovered that some mirror neurons may respond to sounds that correspond to certain actions— these have been termed "audio-visual" mirror neurons. This suggests that hybrid therapies that employ both visual and auditory stimulation would maximize clinical efficacy. Furthermore, virtual reality may create such an environment. Recent neuroimaging studies indicate that music, like language, involves an intimate coupling

between the perception and production of hierarchically organized sequential information, which links meaning to emotion via the mirror neuron. We believe that music could be a potent component in mirror neuron-based therapies, as recent findings in the domain of stroke rehabilitation have shown.

In conclusion, as therapists, we have seen that the treatment of trauma involves large areas of resistance to mere verbal therapies, which are in part due to the peculiar characteristics of how trauma is originally experienced in the non-verbal area of the brain and later integrated, interpreted and stored in a sensory-motor mode, as somatic sensations and visual images.

Traumatic memories often seem “encapsulated” within the psycho-corporeal structure of the individual, and when they emerge they tend to escape from a narrative plot, coming out suddenly in the form of intrusive sensory fragments.

In addition, after a traumatic event, we note that the emotional system of the victim can collapse, jeopardizing the three basic dimensions of its existence. Subsequently, we observe:

- A loss of self-esteem and confidence (psychological dimension)
- A state of neurophysiological hyper or hypo-activation (body dimension) as discussed using the window of tolerance.
- Difficulty seeking and accepting (relational dimension), thus feeling forever trapped in what I refer to as hopeless solitude.

The treatment should pay extra attention to the corporeal and the relational dimensions, thereby not making the mistake that some therapists make by ignoring and not approaching the problem with intervention techniques that may allow for better access and expression of deeply traumatic events.

The aforementioned authors offer conceptual tools that therapists can use to “open the black box” of the patient in order to help them regain an important part of themselves, and ultimately, an essential portion of the Self. Used together, these tools can help the patient overcome their sense of hopeless solitude.

As Siegel says (2001, p.225) the scope of the work is to widen the limits of the Window of Tolerance, “to allow the system’s self-organization process to return to a stream of states that move in a balanced way towards a greater complexity, avoiding, at the two extremes, an overly restrictive or an overly random and chaotic activation”.

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