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Case Report

The use of self-mirroring therapy in phase 1 treatment of a patient with other specified dissociative disorder

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1. Introduction

Dissociative disorders are often not recognized or inquired about in psychiatric and psychological assessments, and thus clients suffering from such disorders often lack adequate treatment. Various studies have found, among psychiatric inpatients, prevalence rates of 4-21% for these dissociative disorders as a whole and 1-7% for the most complex dissociative disorder, dissociative identity disorder (DID) (Sar, 2011). For the complex DSM-5 dissociative disorders (Loewenstein, 1991), i.e., DID and Other Specified Dissociative Disorder (OSDD) (OSDD corresponds to DSM-IV DDNOS subtype 1b), as well as for other complex trauma-related disorders such as complex post-traumatic stress disorder (PTSD), the standard of care is phase-oriented treatment consisting of three phases: (1) safety, stabilization, symptom reduction, and skills training; (2) treatment of traumatic memories; and (3) personality reintegration and rehabilitation (Chu, 2011; Cloitre et al., 2012; International Society for the Study of Trauma and Dissociation, 2011; Van der Hart, Nijenhuis, & Steele, 2006). The model takes the form of a spiral, in which different phases can be alternated according to the needs of the client. This standard of care has been developed based on consistent clinical observations that the majority of clients need to develop self-regulation skills prior to the arduous challenges of integrating traumatic memories and their personalities. Stabilization skills include arousal and impulse regulation, reflective mental functioning, relational skills, executive functioning, healthy relationships, and other daily life skills, in addition to the development of empathic and cooperative relationships among dissociative parts. Phase-oriented treatment requires the ability of the therapist to go back along this spiral path when the patient or client gets stuck (Herman, 1992; Van der Hart et al., 2006). The clinician must be continually engaged in the monitoring and repairing of treatment alliance ruptures, and this is considered to be a *condicio sine qua non* of therapy (Liotti & Monticelli, 2014).

Prospective studies have shown how neglect and verbal abuse along with other childhood traumatic experiences are closely related to the development of psychopathology and dissociative symptoms in adults (Dutra, Bureau, Holmes, Lyubchik, & Lyons-Ruth, 2009; Ogawa, Sroufe, Weinfield, Carlson, & Egeland, 1997). In Ogawa et al. (1997) approximately 25% of the variance in Dissociative Experiences Scale (DES) scores at age 19 was accounted for by the combination of psychological unavailability and infant disorganization; 19% of this variance was accounted for by the psychological unavailability variable alone. In the study by Dutra et al. (2009) the type of trauma that was the most important predictor of dissociative symptoms was verbal abuse severity. Other studies have shown a strong relationship between verbal abuse and DES scores. Teicher, Samson, Polcari, & McGreenery (2006), for example, found that the correlation between verbal abuse and scores on the DES was comparable and/or stronger than the correlations with other types of abuse, including physical and sexual abuse, as well as domestic violence.

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Sar, Tutkun, Alyanak, Bakim, & Baral (2000) demonstrated that emotional abuse could be a more important precursor for dissociative symptoms than sexual abuse. Furthermore, the mother's verbal abuse during childhood was associated with a higher risk of developing borderline, narcissistic, obsessive-compulsive and paranoid personality disorders. This association remained significant after controlling for temperament, physical abuse, sexual abuse, neglect, parental psychopathology and other concurrent psychiatric disorders (Johnson et al., 2001).

The polyvagal theory of Porges (2011) helps specialists to better understand physiological responses linked to this wide range of types of trauma, many of which are known to be risk factors for DID and OSDD. Porges proposed that the human body and its physiological processes must be understood in the context of the person's relationships with other human beings. According to the polyvagal theory, the evolution of the autonomic nervous system provides an organizing principle to interpret the adaptive significance of physiological responses in promoting social behavior. The theory has provided psychotherapists with a model supporting the implementation in phase-oriented treatment of different techniques focused on body work, such as Sensorimotor Psychotherapy (Ogden, Minton, & Pain, 2006). Many of these techniques are designed to down-regulate an over-active sympathetic system, while simultaneously up-regulating an under-active parasympathetic system.

Polyvagal theory has direct implications for the treatment of dissociative states, which are linked to the intrusion of traumatic memories, and are characterized by an imbalance of the autonomic nervous system in the direction of sympathetic dominance. This emotional and autonomic dysregulation requires interventions focused on down-regulation of hyper-arousal, which is designed to return the patient to sympathetic-parasympathetic balance. The state of autonomic balance is known as the "window of tolerance", which is characterized, by better self-regulation and higher-level cognitive functions. "Window of Tolerance" is a term coined by Siegel (1999), and is now widely used in understanding brain and physiological reactions to stressful events, both within trauma-informed treatment, and in the mental health field in general.

One measure of autonomic balance is heart rate variability (HRV), which is the variation in the time interval between heartbeats. HRV involves a natural variability of the heart rate in response to such factors as the rhythm of breathing, emotional states, anxiety, stress, anger, and relaxation. Under normal conditions, the heart rate responds very quickly to these factors, and a healthy person shows a good degree of HRV while adapting to a variety of situations. HRV is related to the interaction between the parasympathetic and sympathetic nervous systems and it can be used as an index of balance between the two systems (Schwartz & Zipes, 1999).

The basic human emotions have expression patterns that are universally recognized in our species (Ekman, 1984). Contemporary authors, who have studied emotions and their regulation, have focused on the sympathetic nervous system and largely ignored the vagal system, the primary component of the parasympathetic nervous system (Ekman, Levenson, & Friesen, 1983; Schachter & Singer, 1962). Although Darwin studied the two-way communication between the heart and brain and the importance of afferent and efferent vagal signals for emotional expression and regulation, the role of the vagus nerve has been neglected for a very long time. This relative neglect of the vagus nerve and the parasympathetic nervous system has limited the development of techniques in psychotherapy.

Based on these literatures on trauma, dissociation, autonomic balance and HRV, the authors developed a treatment technique of Self-Mirroring Therapy, which is designed to reduce sympathetic hyper-arousal and return a client to the window of tolerability.

Measures of dissociation and HRV were used to track treatment response.

2. Self-mirroring therapy

Besides its basis in trauma, dissociation, and autonomic system regulation, self-mirroring therapy is derived from the recent discovery of mirror neurons in the brains of primates. Rizzolatti, Fadiga, Gallese, and Fogassi (1996) discovered Mirror Neurons (MNs) in the premotor cortex of a monkey. These neurons activate when the animal moves its hand to perform an action for a purpose, or when it observes another monkey perform the same action. Based on research data, Gallese (2005) argued that MNs and other premotor neurons that connect perception and action allow monkeys to understand the intentional actions of peers through a process of "embodied simulation." Different authors have hypothesized that this process is present in humans too. We can consider the likelihood that other humans' sensations and emotions can be 'empathized', and therefore implicitly understood, through the same mirror-matching mechanism. In addition, people take advantage of their own mental states or processes represented in bodily format to attribute them to others. Functional Magnetic Resonance (fMRI), (Iacoboni et al., 1999), (Kilner, Neal, Weiskopf, Friston, & Frith 2009), Positron Emission Tomography (PET) (Decety, Chaminade, Grèzes, & Meltzoff, 2002) and Transcranial Magnetic Stimulation (TMS) studies (Avenanti, Bolognini, Maravita, & Aglioti, 2007) have proven the existence of this embodied simulation process.

Contemporary neuroscience describes a continuous interaction between lower and higher levels of the mind, using the terms top-down process (top to bottom) and bottom-up process (from bottom to top). Janet (1965, 1977), when working with his patients, spoke about "vehement emotions" referring to the intense urgency of dysregulated emotions. He considered post-traumatic dissociation to be the result of a dysregulation of emotional processes, which proceeded from the lower levels to the higher levels of mind (self-awareness). Consistent with Janet's ideas, with body-based treatments and with Mirror Neuron theory the authors shifted their attention to therapeutic processes that operate at a different level than talking therapies.

The video-feedback technique had already been used in psychotherapy to improve self-perception in people with social anxiety disorder and in parent-child psychotherapy (Clark et al., 2003; Rusconi-Serpa, Sancho Rossignol, & McDonough, 2009). Video-Based Cognitive Therapy (Vinai & Speciale, 2013), places the subject in a position to review himself in a portion of a session during which he recalled an emotionally significant event. Watching a video recording allows the patient to recognize an emotional state through the observation of his facial expression, and by exploiting the innate mechanism that we usually use in understanding other people's emotions. The ability to observe your emotional state, as well as promoting mentalization, facilitates an improvement in the metacognitive function of differentiation (Di Maggio & Semerari, 2003). Patients are able to observe their emotions and ways of thinking from a meta-position and thereby increase their metacognitive ability of mastery.

The present authors have an interest in the treatment of clients who did not respond to, or could not tolerate, more traditional methods of talk therapy without being re-traumatized. Somatic psychotherapies, such as Sensorimotor Psychotherapy, incorporate mindfulness and attention to the experiences of the body into the therapy process, by paying attention to bottom-up aspects of psychophysiology. Van der Hart et al. (2006) suggest that beginning in the phase of stabilization of symptoms, patients

should face different phobias: attachment-related phobias, and phobias of mental contents, feelings, thoughts, body sensations, desires, unconscious fantasies and dissociated parts of the personality.

This single case study reports the results of Self-Mirroring Therapy in Phase 1 of the treatment of a patient with OSDD. We anticipated a reduction of dissociative symptoms and a better heart rate variability (HRV) as a result of greater mentalization of physiological symptoms and dissociation triggers, after the procedure of observing oneself in a video of a session. Self-Mirroring Therapy is a bottom-up technique designed to return a client to a state of autonomic system balance.

3. Material and methods

The procedure is done in a face-to-face setting and involves the use of a webcam to video record the patient's face, and then using the computer to show him the different recordings. We evaluated heart rate variability (HRV) as an index of the functioning of the sympathetic-parasympathetic balance sheet (Task Force of The European Society of Cardiology and The North American Society of Pacing and Electrophysiology, 1996).

In the pre- and post-HRV tests (Heathers, 2013) we used a Cardiosport HRM Chest Strap tool. It is an elastic band that is put around the chest, with a monitor for HRV, which transmits the signal to the Ipad Apple device via an ECG receiver connected to it (www.ithlete.com). For video recording we used a 720p HD webcam connected to a PC with the therapist positioned laterally, so as not to enter the patient's attentional field.

To assess dissociative disorders we used the Dissociative Disorders Interview Schedule of Colin Ross (Italian version of DDIS, Frau, Pilloni, Boldrini, & Tagliavini, 2017). The Dissociative Disorders Interview Schedule (DDIS) is a structured interview that diagnoses all of the five DSM-5 dissociative disorders, somatic symptom disorder, major depressive episode, and borderline personality disorder. It also inquires in detail about psychotic symptoms, childhood physical and sexual abuse, paranormal/ESP experiences, and secondary features of dissociative identity disorder.

The DDIS has good reliability and validity. In a sample of 296 people with DID, the DDIS correctly identified 96% as having DID. This is well above the standard for structured interviews for other diagnoses. The false positive rate of DID is under 1% on the DDIS. Using statistical analysis, the DDIS can differentiate DID from DDNOS (Ross & Halpern, 2009). In a study by Ross, Ellason, and Duffy (2002), there was an excellent level of agreement between the clinical diagnosis, the DES-T, the DDIS, and the SCID-D. In this study, each method of diagnosis was used to categorize the study participants as having DID or DDNOS versus no dissociative disorder.

To assess dissociative experiences, the patient filled out two self-report measures: the Italian version of the Dissociation Questionnaire (DIS-Q) (Vanderlinden, Van Dyck, Vandereycken, Vertommen, &Verkes, 1993; Santonastaso, Favaro, Olivotto, & Friederici, 1997) and the Italian version of the Dissociative Experiences Scale (Bernstein & Putnam, 1986; Schimmenti, Capraro, & Caretti, 2010).

The Dissociative Experiences Scale (Bernstein & Putnam, 1986; Schimmenti et al., 2010) is a 28-item self report measure with good validity and reliability (Bernstein & Putnam, 1986; Carlson et al., 1993; Ross, 1997) that has been used in over one hundred published studies (Van Ijzendoorn & Schuengel, 1996). In its original development, the DES had a split-half reliability of 0.71 and a test-retest reliability of 0.84. For the Italian version of the DES, Schimmenti et al. (2010) found good internal

consistency, good test-retest reliability and good convergent validity in a clinical and non-clinical mixed sample of 600 subjects. An 8-item subscale called the DES-T, based on taxometric analysis (Waller & Ross, 1997) can be scored in two ways. An overall score can be generated by summing the 8 item scores and dividing by 8. Alternatively, a computer program can be used to do a taxometric analysis of the item scores. The taxometric analysis yields a conclusion as to whether an individual is in the taxon or out of the taxon. For the DES-T, in the taxon means the individual experiences pathological dissociation. Previous taxometric analyses of DES samples indicate that individuals are distributed bi-modally; they are either in the taxon or out, with very few intermediate or ambiguous cases. The DES-T items are questions 3, 5, 7, 8, 12, 13, 22 and 27 from the full scale.

The Dissociation Questionnaire (DIS-Q) (Santonastaso et al., 1997; Vanderlinden et al., 1993) is a 63-item scale based on a selection of items from three other questionnaires: the Dissociative Experiences Scale (Bernstein & Putnam, 1986), the Perceptual Alteration Scale (Sanders, 1986; Rosenberg, 1965) and the Questionnaire of Experiences of Dissociation (Riley, 1988); some additional new items were added by the authors of the DIS-Q. For this questionnaire, the respondent indicates to what extent each item is applicable to himself or herself (1 = not at all; 2 = a little bit; 3 = moderately; 4 = quite a bit; 5 = extremely). The DIS-Q consists of four factors accounting for 77% of the common variance (Vanderlinden et al., 1993): identity confusion and alteration; loss of control over behavior, thoughts, and emotions; amnesia; and absorption. The α reliability coefficient is 0.96 for the total scale and 0.94, 0.93, 0.88, and 0.69 for the four subscales, respectively. The test-retest reliability coefficient for the total scale is 0.94, which indicates that the DIS-Q produces scores that are stable over time.

When administered to a group of 752 healthy subjects (matched for age, sex, education level, and demographic status) and several subgroups of psychiatric patients, the DIS-Q was shown to have good discriminant validity and was able to distinguish between patients with dissociative disorders and other subjects. A cut-off score of 2.9 yielded an 85% sensitivity and 88% specificity for presence of a dissociative disorder (Vanderlinden et al., 1993).

There is some controversy in the literature as to whether the absorption subscales of the DES and DIS-Q should be considered to be measuring dissociation, as opposed to normal absorption experiences. However, Bernstein, Ellason, and Ross (2001) showed that, for the DES, all the DES items form a single factor when item frequency is controlled for statistically, therefore dividing out the absorption subscale items as non-dissociative is not warranted statistically. Additionally, although the absorption items on the DES and DIS-Q can be normal when they occur at a low frequency, in individuals with complex dissociative disorders they commonly occur at a high and pathological frequency and are distressing and interfere with function. By analogy, a small amount of alcohol consumption can be normal but is pathological when it occurs at a high frequency. No matter what one's views on this issue, however, MM's DIS-Q absorption subscale showed a marked reduction along with the other subscales, and therefore functioned as a treatment outcome measure, as discussed below.

MM is a 25-year old male. He lives with his parents. He asked for a psychological consultation for his tendency to isolation resulting from difficulty in leaving home. He was accompanied to the session by his parents. He expressed feelings of unworthiness, ideas of reference and displayed marked psychomotor agitation. Two years before the first interview, he was hospitalized for a suspected psychotic disorder. At that time, he was experiencing persecutory delusions. Since then he has been followed for treatment with antipsychotic medication. The section of DDIS about Schneiderian

symptoms shows consistently across studies that these symptoms are more frequent in complex dissociative disorders (DID and DDNOS) than in schizophrenia (Ross, 1997; Ross & Ellason, 2005; Ross & Halpern, 2009). Therefore, given the absence of any thought disorder, delusions, paranoid thinking, or severe negative symptoms of schizophrenia, the DDIS results, and the impression on clinical interview, we concluded that the patient's symptoms were dissociative, not psychotic. Even if this conclusion was incorrect, however, the improvement during the therapy still took place.

We believe that the patient's delusions of reference may have originated from dissociated emotional experiences, relived in the absence of autobiographical memories of traumatic events (Freeman & Garety, 2003). The patient did not meet DSM-5 criteria for DID (American Psychiatric Association, 2013). Based on other symptoms of a dissociative disorder and considering the scoring of the DDIS we made a diagnosis of OSDD, which traditionally has been subsumed under the rubric of *complex dissociative disorders* (Loewenstein, 1991).

We did not make a diagnosis of DID because: the patient did not describe voices in his head that spoke with him or with each other; we did not observe the existence of other "persons" who took control of his body; and we didn't find continuous memory lapses. MM does not complain of memory lapses, however despite this he presented with very intense dissociative symptoms, including abrupt changes in emotional state during therapy sessions. The therapist considered these to be based on a discontinuity of the client's sense of self. This change, however, was not accompanied by a loss of awareness of his actions. In accordance with Scharfetter's (2008) continuum of dissociation, we considered MM's identity to be characterized by a loosening of cohesion between his sub-selves (Scharfetter, 2008). We choose this case because of the specific symptoms of hypoarousal and the difficulty for the therapist in using talk therapy because of the hypoarousal. The patient was unable to mentalize because of hypoarousal. Furthermore, after this state of mind MM had amnesia for what the therapist and patient had spoken about before (a switch of Ego States, with amnesia occurring, to our knowledge, only during therapy). The situation indicated a difficulty in mentalizing for the patient. We know that it is not effective simply to ask a patient to focus on his own mental state while he is struggling to maintain stability. Our technique based on MMs's strength is an attempt to achieve a procedural learning within his autonomic nervous system.

Analysis of the DES-T (Waller, Putnam, & Carlson, 1996) revealed a score of 48.8, which placed the patient in the pathological range. His score on the DIS-Q test was elevated above the cut-off for pathological dissociation at 2.98. During our clinical work, the presence of dissociative symptoms and evidence from the patient's history suggested a disorganization of attachment. This was mainly attributable, we thought, to a constant devaluation and disavowal of the patient's emotional state by his parents.

Dysregulation of arousal can cause a dissociation between physiological functions that are normally linked. Several fMRI studies have shown a neurological dysregulation of arousal and a dissociation between states of over-activation (hyperarousal) and states of under-activation (hypoarousal) (Lanius, Hopper, & Menon, 2003). Early in his treatment, the patient experienced drooling while speaking. This tended to increase with symptoms of hypoarousal, which included the slowdown of psychophysiological functions and prolonged asthenia. In the course of working with MM, we observed symptoms of vagal activation associated with periods of psychological hypoarousal and reactivation of traumatic memories. The Dorsal Vagal Complex and The Ventral Vagal Complex are both connected through synapses to the Salivatory Nuclei. Our hypothesis is that, during a strong activation of the

unmyelinated vagus, the removal of the *vagal brake* from the Nucleus Ambiguus, may contribute to increased salivation, while promoting a neural bradycardia.

We assume that the parotid gland, innervated by fibers from the Inferior Salivatory Nucleus (Conti, 2005) is involved in this process. This nucleus, which is connected to the ninth cranial nerve, has strong links to the Dorsal Vagal Complex.

We further assumed that MM's symptoms were facilitated by a gag reflex dysfunction, in which the Nucleus Ambiguus is involved (Restivo, 2007).

Treatment: The initial psychotherapeutic work was focused on building an alliance and on stabilization of symptoms (International Society for the Study of Trauma and Dissociation, 2011; Cloitre et al., 2012). In this phase, which was two years long (81 sessions), during sessions 21 and 22, MM completed a psychometric assessment which included the Dissociative Experiences Scale-II (DES-II; Bernstein & Putnam, 1986) and the Dissociation Questionnaire (DIS-Q; Vanderlinden et al., 1992). During the stabilization phase we worked on increasing mentalization with a focus on triggers (Liotti & Farina, 2011). We built a good therapeutic alliance and MM achieved improved psychophysiological self-regulation.

Once the patient was able to fit easily into his window of tolerance (Siegel, 1999), we developed a list of memories already provided to us by the patient in the first year and a half of therapy, which tended to generate dissociative symptoms (along with the present-day triggers for these memories). The list was composed of episodic memories (related to interpersonal relationships) during which patient experienced symptoms of depersonalization and hypoarousal characterized by difficulty in breathing, prolonged asthenia and drooling.

These memories had been ranked by their degree of unpleasantness as perceived by MM and we assessed HRV after each memory was re-experienced in session. Following this we conducted Self-Mirroring Therapy with MM. We used a modified clinical protocol version of Video-Based Cognitive Therapy (Vinai & Speciale, 2013). The main stages of this therapy were defined as follows:

- rationale stage: the therapist explained to the patient the method used;
- familiarization stage: the patient became familiar with the intervention and the presence of the webcam; video recording had been started a few sessions earlier;
- HRV evaluation stage: we know that one of the major characteristics of clients with complex dissociative disorders is their high capacity for imaginative involvement. During some but not all sessions, the therapist guided the patient in his describing traumatic memories, starting from the least activating and proceeding to those that were more triggering; the therapist used guided imagery to help the patient evoke mental images connected to episodic memory.

  For every episode recalled, associated emotions and cognitions, as well as changes in breath, posture or movement of the body were observed. After further stimulation of each episodic memory (always with the camera on), we measured HRV;
- treatment stage: therapist and patient, seated beside each other, reviewed on the computer the session epochs characterized by dissociative symptoms. Our joint goal with MM was to define together specific dissociative reactions linked to his psychophysiological states, and then to take triggering variables into account, while enabling an improvement in his metacognitive function (Di Maggio & Semerari, 2003).

After two months we conducted a follow-up. Over the course of several interviews, and in the same order as during the

pre-intervention, individual episodic memories were re-activated, and after each of them we measured HRV. We also re-administered the Dissociative Experiences Scale-II (DES-II; Bernstein & Putnam, 1986), and the Dissociation Questionnaire (DIS-Q; Vanderlinden et al., 1992).

4. Data analysis

Although we planned to obtain eight HRV measures per phase, in the first phase (pre-treatment), during the evocation of memories 7 and 8 on his list, MM experienced difficulty in adjustment of his respiratory activity, preventing the measurements from being completed. The measuring device stalled and was not recording HRV. This could have been due to a major difficulty in regulating respiratory activity. Consequently, in our preliminary analysis we discarded the HRV values obtained in the second phase (post-treatment), during the re-enactment of these two memories (numbers 7 and 8 on the list) (Table 1). In a second analysis, we assumed the worst conditions (greatest value) for measure 7 and 8 and used all eight memories (Table 1). The nonparametric test we used for paired samples was the Wilcoxon Signed-Rank Test (Wilcoxon, 1945).

5. Results

As shown in Table 1, all values of the pre-intervention measures were smaller than all values from the post-intervention measures. The Wilcoxon test gave a $p = 0.027$ for first analyses (median and standard deviation in pre-intevention were 72 and 2.5 respectively, and in post-intervention were 79.5 and 1.4). For a second analysis (in which the worst case was assumed for the pre-intervention missed value, median and standard deviation were 73.5 and 6.8 respectively, $p = 0.028$). We used 0.05 as our cut-off for significance.

The evaluation of the dissociative symptoms by the DES and DIS-Q (Table 2) showed a decrease in the scores for dissociative symptoms. Regarding the DES, the score changed from 47.5 (cut-off = 30) in the pre-intervention phase to 26.4 in the post-intervention phase. The score on the DIS-Q test was reduced from 2.98 (cut-off = 2.9) in the pre-intervention phase to 1.83 in the post-intervention phase.

Table 1

Heart rate variability (HRV) measurements at specified time points: before and after self-mirroring therapy for each memory.

Memory	HRV before treatment	HRV after treatment
1	72	79
2	75	80
3	72	78
4	70	79
5	72	80
6	77	82
7	NaN[a]	87
8	NaN[a]	86

[a] In a second analysis NaN values were set to greater than the maximum measured value.

6. Discussion

This study aimed to test the use of Self-Mirroring in the treatment of a dissociative disorder. We measured HRV, an indicator of autonomic nervous system function, while simultaneously measuring dissociative symptoms. The results showed an improved level of HRV after treatment. This could be due to an improvement in the patient's psychophysiological adaptation. The assessment of dissociative symptoms also resulted in a significant difference between the pre- and post-treatment dissociation scores. Dissociative symptoms were lower in the follow-up. In particular, we observed that the DIS-Q subscale 4 score, "absorption", was greatly reduced in the post-intervention. The results of our study could be indicative of a better balance between parasympathetic and sympathetic nervous system (HRV score).

We are aware that the results of the DES and DIS-Q measures do not provide conclusive evidence of a sustained treatment efficacy of Self-Mirroring technique throughout the entire therapy period; different triggers can reactivate dissociative symptoms in certain phases of therapy despite an overall improved functioning in metacognition. This improved meta-cognition allows the patient to be more present during the session despite triggers and some degree of reactivated dissociation.

We hypothesize that the use of self-mirroring can enhance the mentalizing process while reducing dissociative symptoms and thereby reduce the length of the stabilization phase compared to classic treatment.

In mentalization a key role is played by the prefrontal cortex and its orbital and medial areas, which are considered to be "the neural substrate of social life". In the process of self-representation, medial cortical structures (MCS) (Northoff, 2014) play a fundamental role and allow us to assign a meaning to past memories. We hypothesize that, in mentalizing processes, brain structures are involved at two levels: the prefrontal cortex, responsible for the explicit and declarative representations, and mirror neurons that allow recognition of the person's emotional state and which are the basis of empathy (Allen & Fonagy, 2006). Our hypothesis is that Self-Mirroring Therapy can act on both levels, activating a lower response when the patient observes his emotional reaction (mirror neurons) and then a response of the hierarchically superordinate centers performing the meta-cognitive functions (medial and orbital prefrontal cortex). We realize that our discussion of mental and brain processes touches on complex philosophical problems concerning the relationship between mind and brain, but we consider discussion of this relationship to be outside the scope of this paper, so will not consider it further.

Embodied simulation is a mechanism that human beings use to understand their feelings and emotions (Gallese, 2003). In Self-Mirroring Therapy, we think, the reaction to the first trial of the procedure is based directly on the working of mirror neurons, allowing the patient to experience an emotional response similar to that seen in the video. We consider mirror neurons to be providing an advantageous evolutionary adaptation (Rizzolatti et al., 1996). The matching property of mirror neurons promotes action understanding because it puts the observer in the same

Table 2

Dissociation scores pre- and post-test after self-mirroring therapy.

DES pre-test	DES post-test	DIS-Q pre-test	DIS-Q post-test
47.5	26.4	DIS-Q total = 2.98 DIS-Q1 identity confusion = 2.96 DIS-Q2 loss of control = 3.17 DIS-Q3 amnesia = 2.36 DIS-Q4 absorption = 4.00	DIS-Q total = 1.83 DIS-Q1 identity confusion = 1.88 DIS-Q2 loss of control = 2.06 DIS-Q3 amnesia = 1.50 DIS-Q4 absorption = 1.67

causal state as the actor. Observation activates the same motor plan that is producing the actor's behaviour, and, because the observer knows the typical outcome of this motor plan, enables the observer to understand what the actor is doing (Di Pellegrino, Fadiga, Fogassi, Gallese, & Rizzolati, 1992; Rizzolatti & Sinigaglia, 2008).

The observation of oneself in the video might trigger the emergence of dissociated parts of self in an individual with OSDD or DID, for instance a perpetrator introject part that mimics the aggressor might emerge. Such switching should be carefully assessed for and interventions may be required to manage it during sessions. However, in Self-Mirroring Therapy, we set an objective of improving the metacognitive function of differentiation in the patient (Di Maggio & Semerari, 2003), so as to facilitate his or her developing a greater mastery of states of hypo- or hyper-arousal without switching, and without being triggered.

The authors are aware that they have not directly tested or provided evidence for the brain mechanisms involved in Self-Mirroring Therapy. They have included their brain hypotheses to provide theoretical support for the treatment technique, and in order to suggest imaging strategies for future research.

In future research we would like to increase the sample size and evaluate HRV with validated instruments in a clinical population. We would also like to measure the activity of the vagus nerve, by measuring the respiratory Sinus Arrhythmia (RSA) value. In future studies, the post-intervention assessment should include, in addition to indicators of dissociative symptoms, measures of mentalization, such as the Metacognition Rating Scale (Carcione & Semerari, 2006) or Reflective Functioning Scale (Fonagy, Target, Steele, & Steele, 1998). According to Grigsby and Stevens (2000), the most direct way to achieve therapeutic change in psychotherapy is by working with the procedural learning system, rather than with declarative memory. A challenge for the future is for the field of psychotherapy to find new approaches that engage procedural memory, deeper brain functions and bottom-up processing, in addition to declarative memory and conscious cognitive processes. A single case report cannot prove that Self-Mirroring Therapy was responsible for the changes in dissociation and HRV observed in this case, but this did seem to be the case clinically. To demonstrate conclusively that the improvement is due to Self-Mirroring Therapy, randomized, controlled prospective studies will have to be conducted in the future.

Disclosure of interest

The authors declare that they have no competing interest.

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