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The paleospinothalamic tract has collateral projections to the reticular formation, the tectum, and the PAG. When double-labeling is used to identify collateral projections to the intralaminar nuclei and the PAG, neurons projecting to the intralaminar nuclei and to the PAG were found in layers 1, 5, 7 and 10 of the spinal cord, but predominantly in layer 7 and area 10 [68]. This is further evidence of there being wiring available for the complex processing of affectively-loaded stimuli in spinal cord, brainstem and thalamic structures which have retained the evolutionarily-older pathways.

The self and the interactions of the superior colliculi with the PAG

Panksepp [69, p. 200] “proposed that the foundation for the self is concentrated in centromedial mesencephalic tissues where all basic emotional circuits converge to generate instinctual survival-promoting behaviours and gut-level affective experiences which may constitute the primordial form of consciousness in mind/brain evolution.” This midbrain area contains “a basic neuropsychic homunculus, grounded in action urges, from which a variety of core emotional states of being could emerge.” Self-representation “has to be built upon stable motor coordinates, such as the somatic motor map nestled between the visceral integrations of the PAG ventrally and the somatosensory fields of the SC dorsally”. We consider the basic action urge to be orientation towards or away from a stimulus. An internal sensation would draw our attention towards it in a way which ties in the visual field and the body awareness. The apparatus for this is in the superimposition of the superficial layers of the SC with the intermediate and deep layers. Panksepp, again [69, p. 204–205]: “In the evolution of consciousness, integrated action tendencies, perhaps still reflected in our emotional urges, came before any thought could be generated about how to act.” The PAG and the intermediate and deep layers of the SC project to the intralaminar thalamic nuclei with the paleospinothalamic tract where an early integration of affectively-loaded visceral sensation, orientation to an affective stimulus, and affective response may be channelled into basal ganglia and cortical substrates for complex motor and cognitive programmes.

Autonomic functioning, emotional and physical pain, and the intralaminar nuclei

The parabrachial nuclei participate in autonomic function as they interact with reflex mechanisms based in the medulla and also with higher regulatory centres [70]. With the nucleus of the solitary tract the parabrachial nucleus is positioned for the most basic feelings of pleasure as well as pain [35]. These nuclei receive the sensations from the body which are then given emotional and orienting responses through the PAG and the deep layers of the SC. The parabrachial nucleus in the pons receives inputs from Lamina I of the spinal cord, the source of the lateral spinothalamic tract for viscerosensory information which projects to the ventromedial posterior nucleus of the thalamus [71]. It also conveys information from Lamina I to the amygdala and hypothalamus [72]. Additionally, the PBN has an important pain-awareness or nociceptive transfer of information from the deeper layers of the spinal cord, laminae 5/6, to the intralaminar thalamus. These pain-responsive neurons are found in the paracentral and the parafascicular nuclei [72], have wide receptive fields, and continue to discharge for some time after the removal of the painful stimulus. Their projections to areas of prefrontal cortex involved in the emotional response to pain suggest an involvement in the most unpleasant aspects of nociception which could include the deep painful hurt of emotional distress.

The central lateral nucleus, one of the rostral intralaminar group, receives spinothalamic inputs important for motivational and affective responses to pain [16]. Many of its neurons respond only to the viscera and mediate the attentional, emotional, motor, hormonal, and autonomic consequences of noxious stimuli [73]. Cortical projections from the central lateral nucleus include somatosensory areas. The more discriminated pain sensations travel to somatosensory cortex via the ventral posterior medial and lateral (VPL and VPM) nuclei [73,47] and the posterior part of the ventromedial nucleus (VMpo [43]).

Healing at the midbrain origins of the truncated adaptive orientation

That which cannot be looked at can continue to trouble indirectly through unpleasant sensations, disturbing emotions, and even dispiriting cognitions and self-appraisals. To fully see what is there, to rob it of its power to paralyse gaze before it focuses on that which is intolerable, requires a deep level of attunement between patient and therapist and a liberation of an endogenous healing process. The self is redefined by the altered orientation: what I orient towards or away from is fundamentally changed and with that shift in perspective is the new feeling of who and what I am. The adaptive orientation can occur from the spinal cord to the neocortex and is only complete when all organised layers of the brain, with their templates laid down through the course of evolution, have been harmonised. The memory fragment which provided the access to the stored traumatic material has been integrated into a smoothly functioning system [74]. The self is reorganised from its base in the deep layers of the spinal cord through the brainstem, thalamus, striatum, cingulate cortex and neocortex. Orientation is completed at all levels of the MindBrain and healing that is deep and powerful ensues. Brainspotting provides the setting in which such healing can occur and is therefore an ideal laboratory for neurophenomenological enquiry.

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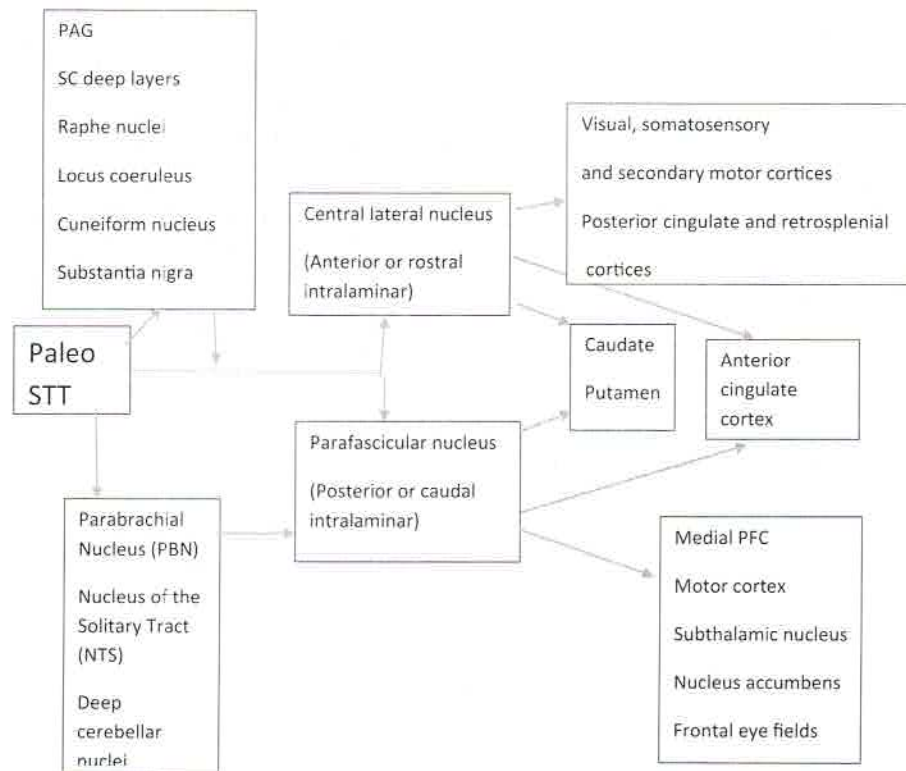


Fig. 1. How affectively loaded information in the paleospinothalamic tract (paleoSTT) can influence orientation, arousal, motor responses, and cognitive awareness and attention through the intralaminar nuclei.

somatosensory cortices and to dorsal and ventral striatal regions. The connections of the caudal intralaminar nuclei confer a role in motor responses to salient stimuli for which cortical processing is potentially too slow. Peritraumatic orienting and defence movements come into this category; and those accompanied by the basic affective responses to trauma engage the caudal intralaminar nuclei in subcortical loops through the basal ganglia as described by Alexander et al. [55]. These same nuclei are also a crucial component of the medial pain system and receive somatosensory information from the intermediate and deep layers of the superior colliculi [63]. Their placement allows them to integrate the cortical and limbic levels above with the brainstem below. They may act in concert with the midline nuclei to raise the level of the entire basal ganglia–thalamocortical system [31]. This is important in terms of the somatic residues of traumatic experience because adversity sufficient to stimulate the noradrenergic, serotonergic and cholinergic systems of the brainstem would increase vigilance, arousal, and the readiness for orienting and defence responses through the midline–intralaminar complex. Sensory information that is more affectively-loaded may be alerting to new and potentially dangerous situations so that the rapid, spontaneous basal ganglia response can occur first and then be rapidly modified by the cortical input. This is dependent on the parafascicular nucleus output to the dorsal striatum.

The parafascicular nucleus has inputs from spinal cord, reticular formation, locus coeruleus, dorsal raphe nuclei, NTS, PBN, substantia nigra pars reticulata (SNpr), zona incerta (ZI), pretectum and striatum. The intermediate and deep layers of the SC project to the parafascicular nucleus from the ventrolateral and lateral columns of the PAG and a lesser input from the dorsolateral and dorsomedial columns. The main output is to the striatum – both dorsal and ventral – and the striatal area served by the parafascicular nucleus receives afferents from prefrontal, entorhinal, perirhinal

and anterior cingulate cortices [64]. There is also a reciprocal connection between the frontal eye fields and the parafascicular nucleus which may be significant for saccadic eye movements [10].

In Brainspotting the inner experience described often includes diffuse peripheral sensations, muscular twitches and motor impulses. These would perhaps fit better with a non-discriminative processing of affective sensory information through the midline–intralaminar thalamic nuclei than the discriminated flow through the dorsomedial and ventromedial nuclei. Vogt and Sikes [65] consider the projections from the parafascicular nucleus in response to a noxious stimulus to induce body orientation through the posterior midcingulate cortex and avoidance behaviour through the anterior midcingulate cortex. There is thus a multi-level motor response that includes, above the brainstem, one from the dorsal striatum and one from the cingulate motor areas. As with orientation the different levels of response available are more likely to result in a failure of integration when levels of affect are very high.

The central lateral nucleus has inputs from the reticular formations, the raphe nuclei, the substantia nigra pars reticulata, the superior colliculi (intermediate and deep layers of the SC [9]), the PAG (all four columns [66]) and the LC. Cortical inputs are from anterior cingulate and retrosplenial cortices but also from some visual, somatosensory, auditory and insular areas. There are outputs to the anterior and posterior cingulate cortices and to the caudate–putamen. The striatum is the main target.

The key intralaminar nuclei are in a position to integrate cortical and brainstem inputs, to have a motor effect through the basal ganglia, and to have a motivational effect through the nucleus accumbens. A functional link between the rostral and caudal ILN is suggested by imaging the impact of deep brain electrical stimulation of the intralaminar nuclei (ILN). Implantation of an electrode into the parafascicular nucleus of the rat leads to increased glucose utilization in the central lateral and paracentral rostral ILN [67] (see Fig. 1).

meditation approach to body sensations is also at the clinical core of Brainspotting. Somatic Experiencing [5] and Sensorimotor Psychotherapy [6] are among the ways in which therapists can be trained in mindful body approaches to the treatment of emotional trauma.

Many of the body sensations associated with trauma are much less discriminated than those carried by the advanced, in evolutionary terms, neospinothalamic tract to the insular and anterior cingulate cortices through the ventromedial posterior thalamus. They are often diffuse, bilateral, and with an emotional or affective quality which differentiates them from the specific, defined sensations associated with non-sensual touch. We consider here that the less discriminative medial spinothalamic tract or paleospinothalamic tract, which carries information about noxious stimuli experienced in the body [59], may be more relevant for psychotherapy. (These neurons do not respond to innocuous stimuli other than non-painful taps – which may be important to practitioners of the Emotional Freedom Technique [60].) The receptive fields for these pathways are large and usually bilateral so we postulate that they are more likely to be involved in the chest-gripping, stomach-churning, throat-tightening experiences encountered with trauma narratives.

The involvement of older and newer spinothalamic tracts in the processing of emotionally and physically painful stimuli

Primary afferent fibres from the viscera and deep tissues terminate in the spinal cord, mainly in layers 1 and 5 [61]. Lamina 1 neurons project not only to the thalamus but also to the parabrachial nucleus, the nucleus of the solitary tract, the nucleus accumbens, the hypothalamus, the ventrolateral medulla and the cuneiform nucleus. Lamina 5 may represent a meeting place of pain information from the skin and muscles and inputs from the viscera. It is organised somatotopically and projects not only to the thalamus but to the cerebellum, the midbrain, and the parabrachial nucleus.

The evolutionarily older spinothalamic tract is derived from layers 1 and 5 and from layers 4, 7, 8 and 10 [61]. Lamina 7 has motor and autonomic functions: inputs from motor cortex, the red nucleus, and the PAG; and outputs to the amygdala and hypothalamus, the cerebellum, the superior colliculus, the parabrachial nucleus and the PAG. Lamina 8 neurons, which are involved in movement coordination, have input from the PAG and also project to the PAG and the cerebellum. Lamina 10, or area 10 [61], is also of interest as a potential mediator of affectively-charged information from the viscera as it is activated by somatic and visceral pain and projects to the lateral parabrachial nucleus, the nucleus of the solitary tract, the amygdala, the PAG, and the hypothalamus.

It is from the deeper levels of the spinal cord that there are projections to the intralaminar and midline thalamic nuclei and "It is hypothesized that **the deep neurons are related to aversive behaviors in response to pain... Spinothalamic tract neurons in laminae 7–10 have large, frequently bilateral receptive fields and respond to deep somatic... and noxious visceral stimulation**" ([16, p. 239], bold added). These tracts to the intralaminar and midline thalamus also send collaterals to the medullary reticular formation, the parabrachial nucleus, the PAG, and the nucleus accumbens.

It can be seen that the midbrain has the circuitry for processing much of the visceral components of the emotions generated in the PAG and it is able to modify autonomic outputs according to feedback from the body. There are body–spinal cord–midbrain loops engaged in emotional activity in response to internal or external stimuli which are relatively remote from cortical control.

A separate spinomesencephalic tract passes from laminae 1, 5, 6, and 10 to the deep and intermediate layers of the superior colliculi, the PAG, the cuneiform nucleus, and a number of nuclei

concerned with eye movements. Part of this tract is the spinotectal tract to the superior colliculi for reflex movement of the eyes. The terminations of the spinomesencephalic tract in the PAG are in the lateral and ventrolateral columns [48] and are somatotopically organised to convey information about superficial, deep, and cutaneous pain. This tract also promotes reflex movement of the head and eyes in response to somatic stimuli. The PAG influences cortical activity via the intralaminar, midline, mediodorsal and reticular nuclei of the thalamus. Most of the thalamic projection arises in the lateral and ventrolateral columns of the PAG which may link to the paleospinothalamic tract, **"the polysynaptic ascending sensory system thought to mediate diffuse pain and its associated emotional overtones"** ([48, p. 384], bold added).

The projections of the paleospinothalamic tract to the midline and intralaminar thalamic nuclei: implications for information processing

Instead of the ventral posterior (VPL and VPM) or ventromedial posterior (VMpo) nuclei employed by the lateral spinothalamic tract the paleospinothalamic tract involves some of the midline and intralaminar thalamic nuclei. The central lateral (rostral intralaminar), paracentral (rostral intralaminar), and parafascicular (caudal intralaminar) were the first to be described as components of the paleospinothalamic tract [59]. The other caudal intralaminar nucleus is the centromedian nucleus which does not itself have spinothalamic inputs but is functionally paired with the parafascicular nucleus [10]. Other thalamic nuclei which may have paleospinothalamic tract inputs are the paraventricular (midline), the parataenia (midline), and the nucleus reuniens (midline). With the possible exception of the parataenia nucleus, all of these nuclei of the paleospinothalamic tract **also have inputs from the superior colliculi and the periaqueductal gray**. Most also have projections from the parabrachial nucleus in the pons and there are noradrenergic, cholinergic, serotonergic and histaminergic inputs from the brainstem. We consider the intralaminar nuclei and those of the medial nuclei with projections from the colliculi and PAG (paraventricular and reuniens) to be those potentially important for the affectively-loaded body feeling encountered in treatment.

The thalamic intralaminar and midline nuclei in which the paleospinothalamic tract is terminating have the connections needed for registering the affectively-loaded body sensations described in psychotherapies like Brainspotting. As well as their spinal inputs they are informed by the PAG and the deep layers of the SC where the emotional foundation of the Brainspot is thought to reside. Their outputs influence wide areas of limbic cortex for emotional experience and processing and they induce drive, motivational and motor responses to the stimuli via the basal ganglia.

The intralaminar nuclei of the thalamus: responding to threat

There are species-specific motor routines which need to be deployed immediately at times of danger to ensure safety. A duck alerted to movement representative of a potential predator will take flight in a different way from a human in a hostile environment who confronts danger. Similarly the fight responses of a dog and a human will differ in terms of muscle groups preferentially engaged and movements enacted. These routines can be practised by the young of the species during play fighting and it is interesting that Panksepp [4] emphasises the parafascicular thalamic nuclei for the generation of rough-and-tumble PLAY. The parafascicular nucleus is in the group of caudal intralaminar nuclei, with the centre median, or centromedian, nucleus, implicated in limbic motor functions [62]. This group has outputs to motor and

in the hinterlands of awareness that accompanies successful processing in psychotherapies such as Brainspotting.

Merker [11] quotes from a 1962 lecture by Denny-Brown in which he wrote: "Consciousness is a term that implies a subjective element which the physiologist tries to avoid. The mesencephalic tectum is, however, essential for the reactions we call general awareness, for which it has an initiative function, just as its ventral component, the mesencephalic reticular substance, is vital to organisation of movement. Further, though there is reason to believe that the reactions concerned are at the primitive instinctual level, our experiments indicate that they are the essential substrate for all the more highly developed behavioural reactions... The pericanalicular grey matter of the midbrain has long been regarded as the essential area for brain function in fishes but its role has been thought to have been transferred to the hemispheres in all higher vertebrates... In the primate nervous system this is still the vital centre of the brain. Its more differentiated peripheral layers, the reticulum and tectum, are more essential than the immediately peri-aqueductal core... this small area deserves consideration as the most vital for unitary functioning of the organism. It is the physiological 'ego'... [52]."

Merker [11] favours the pulvinar as the base for the brain's consciousness space in which feelings and sensations are experienced. This part of higher-order thalamus is connected with both the dorsal and visual cortical visual streams. It is linked with areas integral to memory processing such as the posterior cingulate and parahippocampal cortices. It is linked with frontal and parietal eye fields and with body awareness areas of insular and orbitofrontal cortices. However in the absence of oscillatory binding with the intralaminar nuclei and their projections to cortex the sensory and motor activities of the pulvinar do not impinge on the individual's awareness [53]. The pulvinar requires the intralaminar nuclei for sustained attentional effort which an individual can perceive and respond to.

This means that information processing engaging the pulvinar in any sustained fashion will have a parallel projection through the intralaminar nuclei to the basal ganglia and cortex. Holding an attentional gaze on a spot requires especially the central lateral and parafascicular nuclei of the ILN [54]. We argue that the intense body feelings experienced at the time of traumatic experience engage the intralaminar nuclei more viscerally than the pulvinar. The capacity for subcortical loops through these nuclei to be established by procedural learning was described by Alexander et al. [55] and by McHaffie et al. [12]. Purpura and Schiff [42] propose that the ILN and the pulvinar may act together in certain tasks in which sustained attention in working memory is required. They influence layer V pyramidal cells of the cortex which then have their output back to the SC and the ILN. As processing takes time in psychotherapy sessions it may be that the oscillatory activity in the thalamocortical projections to a wide variety of cortical areas is gradually synchronizing during this time.

In summary: The first-person perspective on the world is largely unconscious – consciousness comes in upstream of the colliculi possibly in the thalamic pulvinar [11] although visual awareness may have its base in the intralaminar nuclei [42]. This places the midbrain and its operations in the psychotherapy unconscious and Brainspotting directly accesses this. However "all the gaze-related areas in cortex and basal ganglia that receive the collicular signal via the extended intralaminar complex and higher-order thalamus are bound to reflect the play of the collicular attention/orienting pointers in their operation." [11].

It is possible that in whatever way the Brainspot is formed by traumatic experience the therapy session frame opens parallel pathways in SC-ILN and SC-pulvinar. If the healing is derived from activity at those levels much of the processing involved feels as if it is just on the edge of awareness – or just outside it. The body feel-

ings pulling in memories involve the SC-mediadorsal nucleus pathway also, again initially outside awareness. The healing proceeds at an unconscious level although the subsequent readout of changed feelings and thoughts is necessarily conscious.

Resonating neurons in the insular cortex during attention to the body feelings

A pyramidal neuron with a soma in cortical layer V has an apical dendrite ascending from the top of the soma and an axon descending from the bottom of it [44]. The axon activates a thalamic neuron and the return of this activation to the originating cortical neuron establishes a thalamocortical circuit or loop. The pyramidal neurons are grouped in minicolumns, structures which have cortical functions through their organisation into columns. The ascending apical dendrites oscillate within a narrow frequency range and generally extend to layer I. Their resonating together at a common frequency in a group of columns can be detected by scalp EEG and the connectivity of two different cortical areas can be achieved through oscillatory activity in the thalamic neurons serving them both. Thus activity in the pulvinar may elicit related activity in separated cortical areas during visual attention, for example in the insula and in the parietal eye fields. In complex mental activities "attention selects a multi-column network whose neural elements are all tuned to a common peak frequency" [44]. Minicolumn resonant amplitudes may be increased by inputs to the thalamus from the superior colliculi when orienting occurs and the required cortical areas, even when some distance apart, are then involved through similar resonant activity in the thalamic neurons common to them. The anterior insula has more and larger layer V pyramids than the posterior insula and this may account for the ability to have a deeper awareness of body feelings with a pronounced emotional component. The sustaining of attention during a psychotherapy session with an intense focus on body feelings would require thalamic activity in areas underlying the anterior insula and the anterior cingulate cortices. In addition to those described by Craig [43] for the neospinothalamic tract are the mediadorsal nucleus and the medial pulvinar. Shibata and Yukie [56] describe projections to anterior cingulate area 24 from midline and intralaminar nuclei; and projections to area 32 from the mediadorsal nucleus, the medial pulvinar and the midline and intralaminar nuclei. Visceral pain of a physical nature is transmitted to the parafascicular nucleus from where the cingulate projections are mainly to area 24 although some are to area 25 [57]. It is then possible that the anterior insula activity is dependent more directly on resonant activity in the medial pulvinar and mediadorsal nucleus; and **indirectly** on the ILN projections via the anterior cingulate cortex and through sustained attention. This polysynaptic pathway may contribute to the difficulty in accessing the body feelings and body sensations arising in response to trauma memory, their persistence in response to triggers, and the difficulty in sustaining attention in the way required for promoting healing.

The body feeling associated with trauma memory activation and the spinothalamic tracts

Trauma therapy emphasises the body feelings and sensations left behind by the adverse experiences which are then brought to awareness by triggers evocative of the original event. The relevance of the triggers – especially with early trauma – is often not recognised in conscious awareness. In 1990 Kurtz [58] described the incorporation of the body into psychotherapy by a number of different approaches and detailed the application of mindfulness. "It is a matter of staying a little longer, gathering more information and allowing things to happen by themselves" [58]. This assisted

evinces the reflexive response based on eye position in an activated client and this is observed by the therapist. For the Inside Window method the client tracking the pointer identifies the eye position at which the activation is maximal by subjectively experiencing the increase in body activation at a specific eye position. The Brainspot can also be identified by the therapist noticing the eye position selected by the patient's gaze when talking about distressing material (Gazespotting): for this the therapist will typically check with the client whether it is indeed a spot associated with activation. For all of these methods the identification of the Brainspot is followed by fixation of the gaze in that position so that processing will follow. The Outside Window method provides the most reflexive and least consciously chosen Brainspot and is therefore the most likely to involve brainstem structures.

The therapeutic frame is structured through attention to the body feelings emerging during recall of the disturbing experiences. The therapist's attuned attention to the client/patient focused on the Brainspot further deepens, it is postulated, the activity in the midline prefrontal and insular cortical areas. The emotional aspects of this involve the projections from the ventromedial prefrontal cortex to the midbrain periaqueductal gray (PAG). The **deep somatic attunement** in the therapeutic interaction is critical to the success of Brainspotting and is considered to be part of the treatment frame established before processing flows.

Multiple levels of orienting response

While the basic orienting response is an oculomotor response to a particular stimulus there are more elaborate responses which recruit the intralaminar nuclei of the thalamus and the basal ganglia and cerebellum. Truncation of orienting is postulated to establish subcortical circuits through the basal ganglia and intralaminar nuclei which become readily-followed pathways. These may be dysfunctional and maladaptive rather than always smoothly helpful responses to stimuli. Visual stimuli activate the superficial layer of the superior colliculi but there is then the capacity for an integration with auditory, tactile, olfactory and visceral sensations in the deeper layers of the superior colliculi. These deeper layers project to the midline and intralaminar and mediodorsal thalamic nuclei.

Attention to the level of activation in the body during the setting of the therapeutic frame involves the interoceptive loops through the anterior insular cortex. Body sensations are transmitted to the cortex via spinothalamic tracts which originate in the spinal cord and in the nucleus of the solitary tract [43]. Somatic pain is communicated through a posterior part of the ventral medial nucleus (VMpo) or through the ventral posterior medial and lateral thalamic nuclei, VPL and VPM [47]. However, there are also massive subthalamic projections from the spinal cord back to the midbrain, especially to the periaqueductal gray (PAG), for transmission of visceral noxious information [48]. This returns information to the superior colliculi so that there is scope for looping through the body and the midbrain – especially where the PAG is generating emotional responses. We consider here the subthalamic and indirect spinothalamic flows of information through other brainstem structures.

It is possible that the body feelings encountered during the therapeutic discussion of the traumatic experience are in "as-if-body-loops" [49]; that they are held in cortical body maps rather than tracing their original pathways from the body to the cortex. If this is the case the substrates for healing in Brainspotting may be in the intraparietal sulcus and its memory connections with the posterior cingulate cortex. However the interaction with gaze direction necessarily involves the midbrain if not structures below it. There are also movement impulses, changes in muscular tension, visceral sensations and associated behaviours, such as retch-

ing or changes in breath patterns, which argue against a purely cortical processing. When the projections from the superior colliculi to the pulvinar have parallel projections from the colliculi to the intralaminar nuclei, Brainspotting allows the appropriate information file to be opened – and to be kept open while processing occurs.

"The unconscious", the subcortical, and the journey of healing

Psychodynamic approaches to the psychotherapy of traumatic experience have focused on the material presented from the "unconscious" and used this in various ways to promote healing. These approaches have been largely displaced by top-down regulatory control techniques such as cognitive restructuring. However as the latter are also not 100% effective in all complex trauma disorders [50] there is still a need for psychotherapies which focus on disturbing clinical features that are not readily down-regulated by force of will or the new perspective provided by a clever rationalisation. This particularly applies to self-defining experiences which occurred at times of brain maturation such as during preverbal infancy.

In psychoanalysis there was initially a focus on abreactive catharsis, "bringing directly into focus the moment at which the symptom was formed, and... persistently endeavouring to reproduce the mental processes involved in that situation, in order to direct their discharge along the path of conscious activity." ([51]; Freud translated by Strachey 1914). Then free association, interpretation, and feedback were used to overcome resistance and to help the patient rediscover "what he failed to remember" [51]. Subsequently interpretations of transference phenomena were still based in the assumption that recognition of a precipitating event was important for clinical recovery. Deterioration during treatment could occur when the "untamed instincts" were released by the emergence of repressed memories without constraint; an early description of affective overwhelm in response to resurfacing of a memory which had precipitated dissociation at the time of the original event.

In Brainspotting the reaction to the spot is made with no conscious or wilful intent, as is best exemplified by the "Outside Window" method in which the reflexive response during the scan of the visual field indicates where processing will best occur.

"The unconscious", the (just) subconscious, and the healing process

According to Merker [11] the first person perspective integral to consciousness has its origin in the need for action control as the sensory experience of the perceived world is a highly transformed cortical construct. The first action tendency, to orient towards or away from the stimulus, occurs in the midbrain. Orientation towards a place of safety while simultaneously orienting covertly to a pursuing threat may be a special case of dual orientation relevant to trauma or the unresolved memory of it. *Every cortical area* has descending projections from layer V pyramidal cells to subcortical targets such as the basal ganglia, the diencephalon, the brainstem and the spinal cord. The midbrain, and specifically the superior colliculus (SC), acts as the hub which funnels the massive information load descending from the cortex into an effector output. This in turn influences cortical function via back projection through the thalamus, for example in the pulvinar, to the cortex. The colliculus which forms the pivot in self-awareness at the centre of an individual's multisensory, phenomenal world is itself outside full consciousness [11]. This would imply that the tectal activity could be at times on the verges of consciousness – just subconscious – and contribute to the feeling of something happening

angry with the bearer of the news or wanting to run from the situation. This dissociation from the truth may be in part neurochemical – the induction of endocannabinoids or endogenous opioids providing analgesia – but its structural roots are in the organisation of the orienting brain. Brainspotting targets the truncation at the neural level at which it has occurred.

Aspects of the orienting response which may be frozen or truncated by neurochemicals mediating stress-induced analgesia and/or peritraumatic dissociation include:

- 1) **Activation/stimulus selection.** The sensitivity of the tectum to specific stimuli may be modified by top-down influences as has been shown for transcranial magnetic stimulation of the frontal eye fields [38].
- 2) The foveating saccade occurs as the **attention shift** becomes overt and a gaze shift is initiated by a pause in inhibitory activity on the substantia nigra pars compacta. There is here the potential for a Brainspot to be established.
- 3) **Muscular adjustments for facilitating orienting** may be frozen and even a microfreeze could establish an affectively-charged Brainspot if there is PAG involvement.
- 4) **Muscular adjustments for orientation and defence.** These are the stuff of sensorimotor psychotherapy and are recognised as potential determinants of the somatic residues of traumatic experience. There is no doubt that a freeze can occur at this stage and clinical experience is of an associated Brainspot. It is postulated that the analgesic and dissociative effects of endogenous opioids and endogenous cannabinoids contribute to the truncation of a motor sequence which is then stored in procedural memory circuits.
- 5) The **facial expression and vocalization** may be triggered by evocation of the original trauma and the associated vocalization may be an important component of processing, for example, “leave me alone”, or simply “no”.
- 6) **Activity arrest.** The PAG is likely to be the key brain structure, as has been shown in animal models of tonic immobility [39], and it possesses both cannabinoids and opioids for stress-induced analgesia.
- 7) **Arousal** generated from the brainstem in noradrenergic, serotonergic and cholinergic centres is conveyed through thalamostriatal and thalamocortical tracts to the upper structures in the brain. This leads to the establishment of emotional memories which may be procedural rather than episodic and may be at the core of what is unprocessed after trauma. The locus coeruleus can be restrained by endogenous cannabinoids which contribute to protection against over-activation [40].
- 8) **Identifying and evaluating.** The amygdala and prefrontal cortex assist in determining the nature of the threat – whether immediate or completed, proximal or distant. It is postulated that an incomplete resolution of this stage of orienting would lead to a state of prolonged hypervigilance. In the rat cannabinoid receptors are present in the amygdala and in the cingulate cortex [41].
- 9) **Alertness (with heightened senses)** may be incompletely resolved and lead to a state of enhanced awareness – a frozen vigilance rather than a narrow attentional field freeze. Of the available routes to cortex from the SC we would favour the ILN and their role in synchronizing eye movement with attentional demands when orienting to a threat may need to be rapid and attention to the environment sustained.
- 10) **Alertness.** This stage can be obstructed in a way which leads to a prolonged attentional field narrowing, possibly a function of the ILN's involvement in visual awareness [42].
- 11) The **body feeling** is activated through different routes but the primary read-out of the body state is in the anterior insular cortex [43]. It is unlikely that any neurochemical truncation occurs in the AIC. A more fundamental consciousness of the body state may be arising from the pulvinar [11], the ILN, or the mediodorsal nucleus [44] and may be subject to peritraumatic disruption at the thalamic level.
- 12) **Evaluation of the stimulus** provided by the trauma memory may be mis-informed and appear present rather than past, for example. In PTSD the functional connectivity of the thalamus with the anterior cingulate cortex (BA32) and ventromedial prefrontal cortex (BA11) is reduced [45]. This component of information processing, when malfunctioning in PTSD, results in continuing physiological activation when the cognitive appraisal is, due to circumstances or internal conflicts, unable to achieve resolution.
- 13) The cingulate motor areas and the visceromotor prefrontal areas and the cortical projections to the PAG act to provide a **unified defence response** with integrated autonomic, behavioural and emotional components. There is here ample scope for dis-aggregation of the elements of the response in the memory of an event.
- 14) A continuing episode of activity will require interaction between cingulate and brainstem areas for **complex behavioural sequences of response** to sudden changes in the environment. Again there is ample scope for dis-aggregation.
- 15) **Reorganisation** of the system to restore the appropriate level of autonomic functioning, arousal and activation. Truncation of the full adaptive orientation sequence leads to energetic, autonomic and sensorimotor residues which present clinically as anxiety, hypervigilance, tension, depression, and a negative valence on the self. The opportunities for truncation in the multi-level complex orienting which engages sensation, defence, attention, arousal, memory, feeling and cognition are many.

Brainspotting as a therapy for experiences which have not been assimilated

Brainspotting (BSP) is a development in psychotherapy which has been originated and described by Grand [1]. It is a novel way to access the brain's intrinsic capacity to heal disturbances of mental and emotional functioning and therefore deserves intense scientific scrutiny. Such investigation will be able to shed light not only on the pathways into healing but illuminate some of the organic aspects of the distress-resolution process itself – perhaps through the kind of neurophenomenological enquiry applied to preictal states in epilepsy [46]. This is of fundamental importance to the essential nature of any effective psychotherapy which aims for healing rather than symptom-reduction.

Distress which swamps the individual's emotion regulation capacities also disrupts the smooth functioning of the brain's information processing streams. While these have evolved to confer on the human brain an astonishing capacity for information analysis and response generation their very complexity can result in different strands remaining separate. This disaggregation sends error messages into consciousness through unwelcome thoughts, images, affects, moods, and body sensations.

Experiences which have not been assimilated are tagged by a body feeling which feels disruptive or distressing. These are accompanied by a Brainspot – a spot in the visual field at which there is resonance with the body activation. For the identification of the Brainspot by the Outside Window method, the client visually tracks the pointer held by the therapist as it is micro-slowly moved across the client's field of vision horizontally at eye level. This

identified with the head still as the SC are engaged but can then be gazed at with the head turned towards it when the cingulate levels are enlisted.)

- 16) **Intentional behaviours** are derived from the rostral cingulate motor area [23]. This stage corresponds with that described by Menon and Uddin [32] in which the anterior cingulate cortex links with midcingulate and other motor areas to facilitate voluntary actions. However at times of danger the efference cascade from which a behavioural response is selected from the mass of information flowing downwards from the cortex is dependent on selection in the SC [11]. There is also recent evidence that the midbrain pedunculopontine tegmental nucleus is involved in learning associations between actions and predicted outcomes [33]. "(B)rainstem systems have a sophisticated capacity to analyse incoming sensory data, understand that input in terms of what is already known and, if appropriate, make an immediate decision to act" [34].
- 17) The brainstem, the cingulate motor areas, the visceromotor prefrontal areas and the cortical projections to the PAG act to provide a **unified defence response** with integrated autonomic, behavioural and emotional components.
- 18) The lateral part of the intermediate grey layer of the superior colliculus is essential for efficient hunting of insects in the rat. Lesions of the lateral SC leave rats unable to quickly orient to prey and their predatory behaviours become clumsy and inefficient [25]. There are projections from this area of SC to the PAG, perhaps contributing an affective quality to the hunt; and to the substantia nigra pars compacta, providing access to the complex motor programmes of the subcortical loops through the basal ganglia. The compacta projection presumably concerns timing signals for salience detection and similar matters related to basal ganglia learning mechanisms. The influence on the SC then ensures an efficient interaction between orienting to the prey, especially if it is moving, and the stereotyped movement sequences. A continuing episode of activity will require interaction between cingulate cortex and brainstem areas, such as the SC and the pedunculopontine tegmental nucleus, for **complex behavioural sequences of response** to sudden changes in the environment.
- 19) **Reorganisation** of the system to restore the appropriate level of autonomic functioning, arousal and activation. It is hypothesized that truncation of the full adaptive orientation sequence leads to energetic, autonomic and sensorimotor residues which present clinically as anxiety, hypervigilance, tension, depression, and a negative valence on the self which may contribute to dysfunctional, relief-seeking behaviours. Whether this is in part because of a lack of harmony among the multiple levels for orientation in the brain remains to be determined.

Truncated adaptive orientation and the residues which drive the clinical sequelae

Modern warfare employs high velocity weapons which can lead to death and injury before a soldier is even aware of the presence of a threat. He may see his colleague collapse with a fatal wound before he has had time to register the presence of a sniper. Similarly in road accidents, especially when the vehicle is hit from behind, there is no time to register what is about to happen. The orientation to threat response is bypassed and the aversive event is concluded. Orientation to the realisation of what has happened may take much longer. Hypervigilance is one consequence of "an amplified, compulsive version of the orienting response" [5, p. 156] that channels some of the posttraumatic arousal energy into

a constant search for threat. Torticollis and persisting neck pain after whiplash injuries may be somatic residues of orienting movements which have failed to complete [21].

In addition to bypassed orienting responses we suggest that trauma can lead to orientation being obstructed or incomplete through other pathways. For example, intrauterine or neonatal trauma can leave an energetic residue which in later life carries a Brainspot, despite there being no external threat to orient towards. Sudden news of the death of a loved one may carry no external point of visual attention, but the interoceptive activation has an associated Brainspot. In these instances the emotional distress has acquired a specific "place" where it can be closely scrutinised – or avoided. The visceral sensations accompanying the autonomic arousal are transmitted to the cortex via the spinothalamic tracts and also passed to the nucleus of the solitary tract (NTS), the parabrachial nucleus, the PAG, and the hypothalamus for modification of autonomic activity through homeostatic circuits in the brainstem. Sensory information from all modalities is integrated in the intermediate and deep layers of the SC and we hypothesize that the Brainspot is acquired at this level, even if it subsequently accessed through the intraparietal sulcus [2]. Of the SC Damasio writes: "There is no other place in the brain where information available from vision, hearing, and multiple aspects of body states is so literally superposed, offering a prospect of efficient integration" [35, p. 84]. Of relevance to Brainspotting he continues: "In all likelihood, the integrated, in-register maps of the superior colliculus generate images as well – nowhere near as rich as those made in the cerebral cortex, but images nonetheless. Some of the beginnings of mind are probably to be found here, and the beginnings of self might be found here too" [35, p. 85].

Unopposed activation of the sympathetic nervous system would lead to death through hypertensive crisis or arrhythmia so the ventral vagal complex must intervene to prevent arousal being fatal. This allows survival in the face of overwhelming activation but the residual autonomic state is unbalanced: the high-revving engine is only just being held by the intense pressure on the brake. This imbalance – as occurs most obviously in states of tonic immobility – is readily triggered in less extreme but nevertheless distressing forms for years or decades afterwards. Endogenous cannabinoids provide a chemical brake on the glutamatergic activation spilling over in excess during the experience of terror [36] and they may contribute to peritraumatic dissociation.

Orientation can be bypassed, incomplete, obstructed or truncated with residual autonomic and energetic burdens which are experienced as clinical symptoms. These all acquire a Brainspot through the body's activation of brainstem structures. The basic affects stimulated by traumatic experience – separation distress (PANIC/Grief), RAGE, FEAR, SEEKING safety – all have both PAG and hypothalamic components [37]. If the emotions are not fully resolved after the trauma has passed their associated energy and autonomic changes are stored in a dysfunctional form. "Not resolved" here means that the emotions are repeatedly stimulated in a way which does not promote reduction in intensity over time. The memory is repeatedly reconsolidated without change in the affective loading of it. "Dysfunctional storage" implies a ready activation of body responses which may not be appropriate to the particular contemporary situation. The trauma memories intrude through body changes in ways which make, for example, easy interaction with others impossible. It may prove to be clinically useful to separate out those truncated responses occurring during orientation to a specific segment of a trauma from those occurring when the defence responses have been initiated. The grief response to the unbearable news of a death, which is just too much to take in, has a mesodiencephalic generation with autonomic and energetic impacts. Defence responses are not immediately required but may be implemented in an effort to reduce the pain – getting

especially to aversive stimuli by reducing the capacity for rewarding feelings and the ability to initiate movement. There are projections to the RMTg from the PAG, the locus coeruleus (LC) and the parabrachial nucleus and from mesencephalic and pontine reticular formations [18]. The RMTg may therefore contribute to the arrest induced by orienting to aversive stimuli both directly in response to information from the SC and indirectly to sudden changes in arousal mediated by other midbrain structures.

- 7) A **drop in heart rate** is stimulated by the reciprocal projection from the superior colliculi to the cuneiform nucleus in the midbrain reticular formation. The bradycardia occurring during orienting in reptiles and mammals is controlled by the dorsal motor nucleus of the vagus [15] but this must occur after the registration of a stimulus as novel by the retinocollicular path. Korte et al. [20] showed that the cuneiform nucleus is instrumental in increasing blood pressure and reducing heart rate during orienting. This is achieved through the projections of the cuneiform nucleus to the parabrachial nucleus and the rostroventrolateral medulla (RVLM), for the pressor response, and to the nucleus of the solitary tract and the dorsal motor nucleus of the vagus for the parasympathetic fall in heart rate. The cuneiform, solitary tract, ambiguus, parabrachial, tegmental nuclei all project to the intralaminar thalamic nuclei, as does the locus coeruleus [10].
- 8) **Arousal** is generated from the brainstem and conveyed to the cortex through ascending tracts to the thalamocortical mantle and from descending pathways to the reticular formation and other brainstem structures. Scaer [21] emphasized the role of the locus coeruleus (LC) in orienting to a threatening stimulus and the pathway from the LC to the amygdala in establishing a memory of the emotionally-charged experience. The LC becomes active <100 ms after stimulus onset. As there are no direct projections from the SC to the LC it is possible that either a defence response, through the PAG, or an increased drive, through dopamine or acetyl choline systems, is needed before arousal occurs. Influences of the SC on the LC are mediated by the PAG and by the pedunculopontine and laterodorsal tegmental nuclei. The locus coeruleus then increases arousal through noradrenergic innervation of the cortex; it inhibits GABAergic sleep-promoting activity and activates cholinergic wakefulness activity in the basal forebrain; it inhibits GABAergic neurons of the ventrolateral preoptic area of the hypothalamus to maintain wakefulness; it has an excitatory effect on the serotonergic dorsal raphe nucleus to promote wakefulness; it activates the amygdala and hippocampus for emotional memory formation and retrieval; it inhibits parasympathetic nuclei and activates sympathetic nuclei; and it projects to some of the sensory and motor nuclei of certain cranial nerves [22]. The LC projects to sensory neurons in the spinal cord, perhaps to inhibit the processing of sensory information if the situation requires that rather than continuing increased openness to potentially salient sensory stimuli. The LC also projects to spinal cord motor neurons for increasing muscle tone and to the sympathetic nuclei for specific organ activation [22]. Both arousal and autonomic nervous system changes are being initiated by LC activation. Brainstem noradrenergic, cholinergic and serotonergic systems all project to the intralaminar thalamic nuclei [10]. Cholinergic mesopontine projections to the anteroventral thalamic nucleus activate cingulate areas [23]. The ascending reticular activating system can be defined as a non-lemniscal projection from the reticular formation of the brainstem and from several brainstem nuclei to the

intralaminar nuclei. The brainstem nuclei contributing to this pathway include the locus coeruleus, the dorsal and median raphe, the pedunculopontine and the parabrachial [24]. Much of this paper is therefore about non-lemniscal activation of thalamocortical projections.

Other pathways for a sudden increase in **arousal** include the projections from the SC through the ventral medial thalamic nucleus to the neocortex; or from the SC to the gigantocellular reticular nucleus [25]. The nucleus gigantocellularis has excitatory responses to all sensory modalities and contributes to motor and emotional reactions through projections to all levels of the spinal cord and midbrain, pons, basal forebrain and medial thalamus. Some of these neurons even bifurcate so that they can influence higher and lower structures together [26].

- 9) **Identifying and evaluating.** The projection from the SC to the pulvinar conveys information to the amygdala which can further activate the LC if the signal matches stored emotional memory of threat. There is also evaluation in prefrontal cortical areas [27]. Both the basolateral and central nuclei of the amygdala project to the PAG for deployment of defence responses and associated autonomic changes when the situation requires them. Halgren [28] differentiated simple orienting from an Orienting Complex which involved the amygdala in a response to stimuli which had cognitive significance. The amygdala response was between 100 and 200 ms and the impact on awareness was probably between 200 and 400 ms. The interaction with the hippocampus provides contextual information very rapidly.
- 10) **Alertness (with heightened senses)** may reflect increased attention [29] or be part of the sensorimotor integration in the intermediate and deep layers of the SC with information being collected from all sensory modalities and their cortical processors. The collicular projection to the parafascicular nucleus increases readiness for orienting or defensive action.
- 11) **Alertness.** Parietal activity can be picked up within 100 ms of an unexpected visual event [29]. Visual streams, for voluntary control of eye movements and for re-orientation to stimuli of emerging salience [30], overlap in the posterior cingulate cortex and in the superior temporal sulcus. Self-relevant visual information is conveyed to the ventral PCC from the parietal, temporal, occipital and orbitofrontal cortices [23]. Groenewegen & Berendse [31] proposed that the midline–intralaminar complex of the thalamus might bring a state of readiness to the entire basal-ganglia–thalamocortical system. This would be especially true for affectively-loaded visceral information in the spinothalamic tracts terminating in the intralaminar nuclei.
- 12) The dorsal visual pathway through the intraparietal sulcus to the anterior insula also communicates a **body feeling**: this happens between 150 and 200 ms after the stimulus [32]. Insular activation in response to ascending spinothalamic inputs during traumatic experience is likely to precede this.
- 13) **Evaluation of the stimulus** occurs through comparison of it with memories stored in the retrosplenial cortex and through valence stored in the subgenual anterior cingulate cortex [23].
- 14) Information in ventral PCC is shared with dorsal PCC and RSC **for multisensory awareness of the head and body positions** in relation to the visual stimulus [23].
- 15) The dorsal PCC drives the caudal cingulate motor area to make **complex head and body movements** through projections to the spinal cord and supplementary motor areas [23]. (This may be why the eye position for the Brainspot is first

differentiates the immediately subconscious, postulated to be mesencephalic; from the unconscious, in which complex information processing occurs without awareness of it. It is proposed that the pulvinar mediates much of the processing while the relevant information file is held open through gaze fixation binding in the intralaminar nuclei. The integrative approach that involves all levels from the spinal cord to the neocortex provides the potential for full resolution and healing with the previously traumatic memories being reconsolidated without associated distress.

Stages of adaptive orientation: Becoming aware of the nature of a threat

"The Orienting Reflex as a complex functional system includes the integrative activities of different brain areas. Its distinguishing characteristic is that it arises in response to novelty..." [3]. Pavlov apparently considered that the Orienting Reflex developed to inquisitiveness in humans, predicting a link between orienting to novelty and activation of the SEEKING system which had not then been defined by Panksepp [4]. The early work on the Orienting Reflex drew attention to the multiple levels in the brain that were engaged by it. When the many levels have to cope with complex information with a high emotional charge we argue that it is possible for there to be a mismatch which blocks the smooth resolution of the orientation to the new information about the environment. Specifically in relation to trauma, Levine [5] described a number of aspects of orienting behaviours which have been staged by Ogden et al. [6]. The stages may occur simultaneously, rather than sequentially, and include: arousal; arrest; alert; muscular change; scanning; locating; identifying; evaluating; taking action; and, finally, reorganisation. Orienting can refer purely to oculomotor behaviour determined at the collicular level; or to head and eye orienting directed from a cortical level; or to direction of attention which may be either based in the midbrain or in the cortex. We seek to clarify by differentiating the stages according to likely neural substrates and argue that orientation of the self towards emotionally-valenced information recruits these orienting, oculomotor, and attentional systems. Furthermore the multiple levels and systems of the brain involved confer the capacity for truncation of a complete response.

Revising the order of the adaptive orientation response on the basis of the anatomical pathways hypothesized to be essential suggests an additional activation before the arrest and arousal stages. The initial responses are mesencephalic, the later responses are cortical. The importance of intermediate response levels in limbic and thalamic structures is less elaborated.

- 1) **Activation/stimulus selection** occurs when the retinocollicular neurons respond to a potentially salient stimulus in the environment which impinges on the retinotopic map in the superficial layer of the superior colliculus. A visual event is selected from the many available as potentially important and the collicular response occurs within a 100 ms. It may be followed by a covert shift of attention based in visuomotor neurons in the intermediate layer of the superior colliculus [7]. The superficial layer of the SC is in close communication with the intermediate and deep collicular layers where visual information is integrated with signals from somatosensory, auditory and olfactory systems.
- 2) The foveating saccade occurs as the **attention shift** becomes overt – even though this may be outside conscious awareness. The initiation of a gaze shift is preceded by a pause in inhibitory activity on the substantia nigra pars compacta within 100 ms of the stimulus presentation [8].

3) **Muscular adjustments for facilitating orienting** are made by the colliculi projecting downwards to the brainstem and spinal cord and to the cerebellum. These can occur without conscious intent or voluntary action to maximise the receptivity of the sense organs to the target object. There are also orienting movements derived from the projections of the superior colliculi to the parafascicular nucleus [9]. Involuntary orienting may be followed by voluntary scanning movements. The cortical coordination of the orienting movements of eyes and head is through the outputs of the posterior cingulate cortex to the cingulate motor area. Another level of control is through the frontal eye fields and premotor cortex which are influenced by the parafascicular nucleus [10]. All levels of activity combine to impose a selection task on the superior colliculi so that the appropriate action is taken [11].

4) **Muscular adjustments for orientation and defence.** Looped circuits linking midbrain areas, including the SC and the PAG, with the basal ganglia were described by McHaffie et al. [12]; these can be active at a subcortical level without cortical direction. The ascending projections from the SC or PAG target parts of the thalamus which project to the basal ganglia. These in turn project back to the SC or PAG for sequences of orienting and defence response movements to occur with a life-saving rapidity in circumstances where cortical evaluation could be too slow. The projections from the SC to the PAG are critical for the rapid deployment of defence responses – active or passive [13] – if the stimulus is instantly perceived to be dangerous. The main thalamic regions involved are the caudal intralaminar nuclei, the centromedian–parafascicular complex, which projects to caudate–putamen, nucleus accumbens, and the substantia nigra pars reticulata. The pathway from the ventrolateral PAG to the cerebellar vermis is activated during freeze responses during both conditioned and unconditioned fear has been recently described [14].

5) The mammalian development of the ventral vagal complex integrates information from cranial nerves to facilitate turning of the head towards a novel stimulus with the appropriate **facial expression and vocalization** [15]. The vagal brake on arousal based in the nucleus ambiguus is immediately removed if active defence is required [15]. Nevertheless the tectospinal adjustment of head and neck position is the primary influence when the stimulus carries a significant and immediate threat. The spinotectal pathway provides the information from the spinal cord which allows regulation of the reflex movements of the head and eyes in response to body stimuli [16].

6) **Activity arrest** may occur if the stimulus represents a potentially life-threatening danger if onward progress is maintained. Voluntary movements are slowed or completely stilled, and this is possibly mediated by tecto-thalamo-subthalamic circuits. The subthalamic nucleus provides a "hold your horses" signal to allow time for selection of the optimal response [17]. Although it is often assumed that activity arrest facilitates increased sensory processing it may be instead to interrupt ongoing behaviour which is dangerous. It is better to stop to evaluate an ophidian shape than to step on a live snake.

The GABAergic tail of the ventral tegmental area receives somatosensory information from the intermediate layers of the SC [18]. This area is also described as the rostromedial tegmental nucleus (RMTg) and has an inhibitory effect on the dopaminergic neurons of the ventral tegmental area and substantia nigra pars compacta [19]. The RMTg responds



Brainspotting: Sustained attention, spinothalamic tracts, thalamocortical processing, and the healing of adaptive orientation truncated by traumatic experience



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ABSTRACT

We set out hypotheses which are based in the technique of Brainspotting (Grand, 2013) [1] but have wider applicability within the range of psychotherapies for post-traumatic and other disorders. We have previously (Corrigan and Grand, 2013) [2] suggested mechanisms by which a Brainspot may be established during traumatic experience and later identified in therapy. Here we seek to formulate mechanisms for the healing processing which occurs during mindful attention to the Brainspot; and we generate hypotheses about what is happening during the time taken for the organic healing process to flow to completion during the therapy session and beyond it.

Full orientation to the aversive memory of a traumatic experience fails to occur when a high level of physiological arousal that is threatening to become overwhelming promotes a neurochemical de-escalation of the activation: there is then no resolution. In Brainspotting, and other trauma psychotherapies, healing can occur when full orientation to the memory is made possible by the superior colliculi-pulvinar, superior colliculi-mediadorsal nucleus, and superior colliculi-intralaminar nuclei pathways being bound together electrophysiologically for coherent thalamocortical processing. The brain's response to the memory is "reset" so that the emotional response experienced in the body, and conveyed through the paleospinothalamic tract to the midbrain and thalamus and on to the basal ganglia and cortex, is no longer disturbing. Completion of the orientation "reset" ensures that the memory is reconsolidated without distress and recollection of the event subsequently is no longer dysphorically activating at a physiological level.

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Introduction

In this paper we argue that a traumatic experience is not fully integrated, and can give rise to clinical features, when some aspect of the experience has not been available for full orientation towards it. Reconnection with the elements hidden from conscious awareness requires a focus on the visceral sensations evoked by fragments of the memory. We suggest that the visceral sensations and the associated feelings evoked when the traumatic experience is brought to mind are conveyed to higher centres by the older, rather than the newer, spinothalamic tracts. The paleospinothalamic tract is extensively interconnected with the brainstem.

Secondly we propose that this implicates the thalamic intralaminar nuclei as important way stations in the healing process: the projections to the striatum being significant in the resolution of motor impulses and in emotional valence. Thirdly we consider the possibility that truncated adaptive orientation blocks information processing and prevents healing from adverse experiences. We define the truncation of adaptive orientation in terms of neurochemical responses to extreme emotional states: the associated memories are susceptible to reconsolidation with no change in their affective loading. Fourthly we consider that the capacity for multi-level processing in the advanced human brain means that orientation can be truncated at different levels. We consider how Brainspotting [1] and other effective trauma psychotherapies may overcome the obstructions and suggest that orientation and its truncation also involve the intralaminar nuclei. The portion of the processing which is accessible to awareness may be relatively small as much of it may occur below the conscious level. This

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Conflict of interest

None declared.

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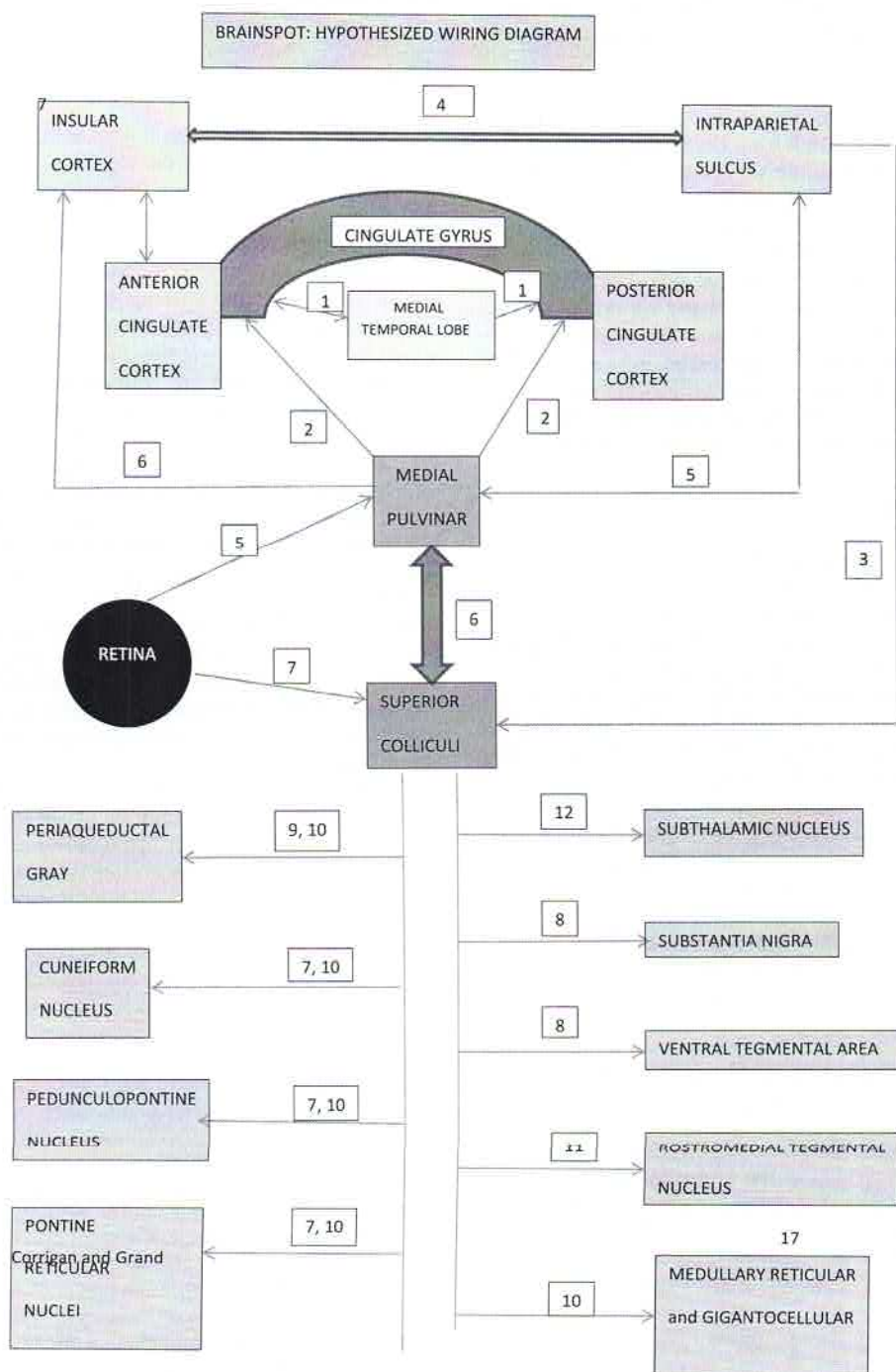
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autoerotic consciousness does not just include a simple awareness of external stimuli but memories of the action impulses, autonomic adaptations and emotional responses to events, then treatment needs to include those areas to be maximally effective. The neural correlates of the self extend from the midbrain through the midline subcortical structures such as the nucleus accumbens, through the medial prefrontal cortices, to the posteromedial cortices.

Therapeutic interventions may be made at any of these levels but lasting and fundamental healing will follow mesencephalic resolution. Brainspotting's strength is its ability to start with events in autoerotic consciousness at the cortical level and integrate with techniques that allow healing to happen from the most basic level of the self at the nidus of the tectal hierarchy, at the fundament of the brain's midline self systems.

Brainspotting: a neurobiological hypothesis



Brainspotting: a neurobiological hypothesis

Brainspotting linking eye position with what is salient in the attentional field requires anterior and posterior subregions of the intraparietal sulcus.

The posterior cingulate gyrus: linking sensation and memory

Posterior cingulate area 23 has reciprocal connections with the retrosplenial cortex for long-term memory and it transfers information about head and eye movements to the caudal cingulate motor area [6]. After a saccade the coding of the position of the eye in the orbit is dependent on posterior parietal inputs to posterior cingulate cortex. The machinery for linking gaze fixation with memory circuits is therefore available in these parieto-cingulate interactions.

Vogt and Laureys [6] propose a six-stage processing model. Stage 1 involves the ventral posterior cingulate cortex (PCC) in extracting self-relevant information from the multisensory inputs, in part through connections with the subgenual anterior cingulate cortex. Stage 2 relates these inputs to memories through the retrosplenial cortex. In stage 3 inputs to dorsal PCC from ventral PCC and parietal cortex provide information about the orientation of the body – and the self – in space. The caudal cingulate motor area is active in stage 4 to orient the head and body via projections to the spinal cord. Stage 5 involves intentional behaviors. Stage 6 turns the information received and processed into appropriate autonomic and behavioral outputs through projections to the midbrain and hypothalamus. These six stages cover many of the features of adaptive orientation which are disrupted by trauma.

Memory-related imagery

Bringing a troubling memory to mind activates autobiographical memory circuits which have been established through the emotional impact of the events. The basolateral amygdala has inputs to many areas significant in recording emotionally-charged life events such as the ventromedial prefrontal cortex, the posterior cingulate cortex, and the hippocampal and parahippocampal areas. It is also reciprocally connected with the insula [22]. In Brainspotting, as in sensorimotor psychotherapy, the processing is done primarily in the body rather than in the thoughts or feelings.

The mind's eye in which traumatic events and losses can be "seen" is dependent on the precuneus, a medial parietal structure, which has inputs from the visual cortex. The precuneus is activated during the visual imagery associated with a memory [45]. In the macaque monkey, the precuneus is connected with other parts of the posteromedial cortex, especially posterior cingulate cortical areas [46]. There are no significant direct projections from the precuneus to the tectum. However the precuneus has connectivity with the angular gyrus and, through that, with the intraparietal sulcus [23].

The precuneus can be divided into three parts: posterior visual, central associative, and anterior sensorimotor regions [47]. The posterior visual part may have a transition zone to the regions involved in memory. Otherwise the precuneus needs to have coactivations created during the set-up of the Brainspot to include the emotional charge. It is possible that the gaze fixation on the Brainspot reduces the precuneus involvement as processing proceeds through interoceptive channels. Visual imagery is not necessarily prominent during resolution of the traumatic event.

Interoception and gaze

The missing step in the argument so far is for establishing neural pathways for connecting the awareness of the body feeling and the spot in the visual field. The awareness of emotions and their

associated body sensations while recounting a traumatic episode is dependent on the anterior insula yet there does not appear to be any significant connection between the insula and the superior colliculi. In contrast the intraparietal sulcus has an anterior region (hIP1) which is functionally connected with the insula [23]. This part of the intraparietal sulcus is closely connected with the angular gyrus which, in turn, is linked with medial prefrontal cortex, hippocampus and parahippocampal gyrus, precuneus, occipital poles, anterior and posterior cingulate cortices. It is clear that these parietal areas have the connectivity necessary to link body sensations, emotional awareness, and autobiographical memory – and gaze direction.

Healing the deep wounds of the midbrain self

Economically-driven symptom-reduction approaches to psychotherapy work with verbal techniques and checklists at a level that has little impact on the core feelings about the self. Although still to be formally evaluated, clinical experience suggests that Brainspotting is effective at a deeper level of the psyche – one that has its neural correlates in the midbrain. Damasio [48] has argued for the primacy of the nucleus of the solitary tract (NTS) and the parabrachial nucleus (PBN) for fundamental feelings of pain and pleasure. These nuclei receive full information about the internal state of the body and are connected with each other and with the PAG. Sensory input is interpreted by the superior colliculi but the body sensations are transmitted via these two nuclei – the NTS and the PBN. The colliculi integrate information in a way which allows effective action through their outputs to brain stem, spinal cord, thalamus and cortex. Damasio [48] proposes that the beginnings of mind and the beginnings of self may be found in the SC.

An alternative view is that the SC is a simple orienting machine that can inform relevant areas of the brain of the occurrence of a biologically significant external event and, with connections to and from the cerebellum, can solve the spatial-to-temporal transformation problem: retinal topography is spatial; control of the metrics of orienting is temporal (Redgrave, May 2012, personal communication).

Panksepp [49] differs in emphasizing the motor coordinates underlying self-representation. He places these in an area between the somatosensory fields of the superior colliculi and the visceral integrating and emotion-generating capacities of the PAG. The urge to act is considered to be more important for the definition of the self than the impact of sensory experience. "*I act and feel therefore I am*" (49, p203). In terms of the SC the basic urge to action would be orientation towards or away from. The self would become defined through orienting responses to sensory stimuli rather than simply through the experience of the sensations. *I orient towards or away from-therefore I feel who and what I am*. Fundamental healing of deep wounds to the self will only occur when the treatment acts at the midbrain level. We have alluded to the possibility that much of the emotional response to an event is generated in the PAG and the feedback about the visceral changes is directly to the PAG from the spinal cord. The PAG and the SC are extensively interconnected making it possible that much of the healing is happening at this level – even although conscious awareness of changes is registering at upper cortical levels.

The self is elaborated through layers of advancing complexity in the subcortical-cortical midline systems [50,51] but the most profound valence will be established at the level of the emotion-generating, autonomic-regulating, orienting midbrain. When consciousness is divided into anoetic, noetic, and autonotic forms [52] it is assumed that in the human it is the autonotic, self-knowing across time, mind which needs to be engaged in therapy. If the

This orienting saccade can be followed by a gaze fixation on the visual axis from the retinal fovea through the optical focal point towards the object being looked at [26]. Fixation neurons in the colliculi become more active when they reach their fixation point [27] and microsaccades prevent loss of vision through habituation [28]. This allows maximal intake of information about the object which may constitute a sudden threat. Both saccadic eye movements and visual fixation are initiated in the superior colliculi (SC) [29]. The SC receive projections directly from the retina and project to brain stem nuclei and to the spine, in direct tectospinal tracts, for initiating movements of the head and the eyes and a shift of gaze. They contribute to three-dimensional orienting movements of the head and eyes [30]. The SC contain a map that is topographically organized according to retinal coordinates and this is aligned during development with a sensory map carrying spatial information and an oculomotor map for accurate location of gaze [31]. The superficial layers of the SC project to deep layers where multimodal sensory integration is translated into motor output [32]. This superficial to deep connectivity is also seen in post-mortem studies of human brain [33]. The SC are responsible for orienting to olfactory stimuli as well as visual, auditory and somatosensory stimuli [34].

In the cortex of the cat, the posterior cingulate gyrus is active during visual stimulation and during saccadic eye movements [35]. In the monkey, the posterior cingulate neurons which are active during gaze fixation may be carrying information about the angle of the eye in the orbit for spatial orientation [36]. The position of the eye in the orbit and in relation to the head in space is being monitored rather than controlled by the posterior cingulate cortex [36]. Cortical areas with both oculomotor activity and direct links to the posterior cingulate cortex include the intraparietal sulcus. A network surrounding the IPS and including the precuneus, posterior cingulate, retrosplenial and parahippocampal cortices [37] mediates control of eye movements in response to salience in the visual field and volition. Gaze fixation therefore activates the intraparietal sulcus and the posterior cingulate cortex.

Subcortical loops through the superior colliculi

Sensory input to the superior colliculi activates, via the thalamus, the striatum which projects back to the SC through the substantia nigra. The substantia nigra pars reticulata maintains an inhibitory control over the superior colliculi. In contrast, cortical areas project directly to the striatum and loop back to cortex via the substantia nigra and the thalamus. It is conceivable that complex events can have many different segregated loops associated with them. Whether they become integrated or remain separate, may dispose to a conflict among cognitive, emotional, and somatic components of a remembered experience. The selection of which loop is disinhibited to allow action is based in the basal ganglia but can be influenced at all the major relay points of the loop by activity within the basolateral amygdala in the case of a triggered fear response.

Cortical projections to the colliculi: corticotectal systems

In the macaque monkey, there are two distinct corticotectal systems [38]. One system is based in the visual information sent from the retina to the superficial layers of the superior colliculi and mainly involves areas of visual cortex. The visuomotor component, in contrast, projects to the deep layers of the superior colliculi from areas of frontal and parietal cortex and mediates gaze fixation, saccades and the coordination of head and eye movements during orienting. In the human, the intraparietal sulcus (IPS), the equivalent of the monkey lateral intraparietal area (LIP), can inhibit the SC

when there is a conflict between the eyes being drawn to a particular stimulus and a need to direct the gaze elsewhere [25]. Voluntary or intentional saccades in humans are heavily dependent on the intraparietal sulcus [39]. A topographical representation of salience within the IPS implicates this parietal area in the response to the direction: "Tell me what point in your visual field matches best with the feeling in your body when your eyes follow the pointer". One of the remarkable findings of Brainspotting is the definite subjective feeling about what location resonates with a particular activation. There is often an objective increase in distress at a particular point.

Thalamic nuclei between the superior colliculi and the cingulate cortex

There are retinal projections directly into nuclei of the thalamus: we focus here on those with greater limbic connectivity. The superior colliculi are connected with the medial pulvinar and with the intralaminar nuclei. The medial pulvinar receives afferents from the deep layers of the superior colliculi and projects to areas of anterior and posterior cingulate cortex. There are also afferents to the intralaminar nuclei from the intermediate and deep layers of the SC, especially from somatosensory neurons [40]. The intralaminar nuclei are involved in orienting and in sensorimotor integration; and their inputs from the brainstem reticular formation and the cholinergic mesopontine tegmentum contribute to activation of the thalamocortical mantle. The intralaminar nuclei connect with all parts of the cingulate cortex whereas the medial pulvinar has specific projections to anterior areas 32 and 25 and posterior cingulate areas 23 (ventral), 29 and 30 [41]. The intralaminar nuclei receive projections from anterior cingulate cortex, area 24, whereas the medial pulvinar receives from posterior cingulate, area 23 [40]. Thus, the medial pulvinar is interconnected with anterior cingulate areas involved in emotion processing and with the posterior cingulate area in which multi-sensory information is coded for self-relevance. The medial pulvinar also influences prefrontal cortex, superior and inferior parietal lobules, insular cortex and parahippocampal gyrus. It has a distinct projection to the IPS.

A nested hierarchy based in the tectum?

The deep layers of the superior colliculi have inputs from other sensory modalities and their cortical representations. Functional MRI studies of crossmodal integration in humans suggest that the superior colliculi constitute the most significant region for this function while the intraparietal sulcus has a weaker integrative capacity [42]. When the connectivity of the superior colliculi in monkeys is studied by microstimulation of the colliculi during functional MRI several areas of visual cortex are activated in addition to the frontal and parietal eye fields. However, there were also changes in the somatosensory cortex, the primary auditory cortex, the primary motor cortex, the anterior cingulate cortex, and the posterior cingulate cortex [43]. The anterior cingulate cortex is part of the interoceptive loop and the posterior cingulate cortex contributes to self-related memories with an emotional component – and both receive projections from the medial pulvinar. Stimulation of the superior colliculi is being followed by activity in areas of the brain involved in autobiographical memory and in focused attention on these.

The anterior part of the intraparietal sulcus is part of a dorsal fronto-parietal network for the assessment of salience [44] and may direct attention even in the absence of eye movements (covert orienting). The posterior part of the intraparietal sulcus may be more involved with eye movements during overt orienting. In

the relational attunement will involve a separate nested hierarchy based in the midbrain periaqueductal gray (PAG) but with an upper level in the ventromedial prefrontal cortex.

Orienting and adaptive orientation

A Brainspot is a stored oculomotor orientation to a traumatic experience which has failed to integrate. When it is accessed in treatment there is potential for greater healing of the emotional residues of the unassimilated event. The concept of orienting – an oculomotor response to a particular stimulus/event in external space – has been expanded in relation to trauma by Levine [11] and Ogden et al. [10]. To avoid confusion with the basic orienting response we will refer to the full sequence described by Ogden et al. [10]: arousal; activity arrest; sensory alertness; muscular adjustments; scanning; locating in space; identifying; evaluating; taking action; and reorganizing – as adaptive orientation. When the full sequence fails to complete at the time of the trauma some components are left unresolved and liable to recur when triggered. There is a truncation of the adaptive orientation which has significant clinical effects. The resulting negatively valenced memory is stored with physiological activation that has not been discharged. Accessing the Brainspot in a careful, mindful, way allows the activation to be processed to completion.

External stimuli are detected in sensory systems and can elicit motor reactions, affective reactions and memories within a millisecond time scale. It may be the first or most intense orienting of the eyes in response to the external stimuli which creates the Brainspot for subsequent elaboration of emotions, thoughts, and behavioral impulses to cluster around. Alternatively there may be no oculomotor link with any event but the gaze associated with the trauma memory has acquired a particular direction through top-down cortical influences. A shock which comes from more cortical processing of incoming information, for example news about a sudden death, carries a signature orientation as the inner eye turns to the meaning of the message.

Orienting to an external threat or traumatic event starts in the superior colliculi (SC) in the midbrain. The SC have direct input from the retina but also from the frontal eye fields (FEF), the supplementary eye fields, and the lateral intraparietal area (LIP) or the intraparietal sulcus (IPS). The superior colliculi detect luminance change in the external world and (with the assistance of the basal ganglia and the cerebellum) direct movements towards or away from the stimulus – depending on physical characteristics and/or associations. The superior colliculi are first responders for orienting but that does not necessarily carry an emotional charge; an affective response is one of the consequences only of particular types of activation of the SC – looming, snake- or spider-like movements (Redgrave, personal communication).

The intraparietal sulcus (IPS) has the connections with the memory areas of the posterior cingulate cortex which lead us to favor the IPS-SC axis for the integrative effect of Brainspotting. Brainspotting combines the activated emotional memory, its impact on the self and the oculomotor orienting which has become associated with that memory.

Interoceptive loops

During the set-up of the frame in Brainspotting, the client is asked to describe the presenting problem and then to notice the level of activation in the body. This is similar to the practice in sensorimotor psychotherapy [10] in which the body's response during the description of the problem becomes the starting point for therapeutic intervention. In both Brainspotting and sensorimotor psychotherapy (SP) there is no need to get all the narrative details, or

to elicit all the associated negative cognitions, if there is sufficient body activation to open the information file which needs to be resolved. In SP the therapist is actively engaged in mirroring movements, making contact statements, and helping the client to find the action which leads to resolution, perhaps through completion of a truncated defence response. In Brainspotting there is no need to explore impulses to action, only to observe them with the associated sensations as the information processing moves to resolution. The development of Brainspotting was influenced by the somatic experiencing work of Peter Levine [11] in which the energetic residues of traumatic experiences are accessed and discharged. All these approaches are based in the clinical observation that there is a natural process which, if liberated, will lead to healing. In Brainspotting the therapist is engaged in mindful, empathic presence while the client's healing process moves towards completion during the period of gaze fixation.

Awareness of the somatic sensations, emotions, and impulses to action accompanying the trauma narrative involves the interoceptive loops through the anterior insular cortex. Body sensations are transmitted to the cortex via spinothalamic tracts which originate in the spinal cord and in the nucleus of the solitary tract [16]. In the thalamus there is a divergence with projections to the anterior cingulate cortex providing a drive, while projections to the insula give rise to the emotional feeling. The feeling becomes more differentiated as the information is passed through the insula from posterior to anterior and then contributes to the core of "the sentient self" [17]. Sensory and visceral information integrated in the sensory network of the orbitomedial prefrontal cortex moves on to the medial or visceromotor network from where there are projections to the emotion-generating areas of the hypothalamus and periaqueductal gray (PAG) [18]. These structures influence the autonomic nervous system nuclei in the brain stem to produce changes in the body which are informed to the cortex through the spinothalamic tracts. This interoceptive loop has the anterior insula as the point of visceral and emotional awareness. The question, "What do you feel in your body when you are telling me about that trauma?" necessarily involves activation of the insula.

The point of interaction of this interoceptive loop with episodic autobiographical memory circuits through hippocampal and posterior cingulate areas is in the ventromedial prefrontal cortex [19]. This visceromotor region [20] is implicated in the clinical action of the alternating bilateral stimulation used in EMDR [21]. The Brainspotting protocol includes auditory alternating bilateral stimulation and an empathic therapist to accentuate the insula-VM-PFC limb of the interoceptive loop which projects to the hypothalamus, midbrain and ventral striatum. There are also projections from the insula to the hippocampus and the temporal pole but interconnectedness with the basolateral amygdala [22] is most likely to be relevant to somatic components of emotional memory. The insula also has connectivity with the intraparietal sulcus [23] providing the circuitry for linking gaze with the body sensations.

There is a large sensory projection to the midbrain PAG [24] which may carry information about the visceral components of emotional reactions to traumatic experiences and the kind of deep pain associated with loss. The PAG is also involved in generating these affective responses [4]. The PAG and the colliculi are extensively interconnected so it is possible that the Brainspot is lining up for treatment the precise feeling registered in the midbrain PAG – even if an attenuated version reaches the insula via the spinothalamic tracts.

Orienting and gaze fixation

Objects which make a sudden appearance attract attention and induce a saccade, a rapid movement of the eyes towards them [25].

intraparietal sulcus is one of the links between the midbrain orienting and the cortical orientation behaviors and it has connections with the insular cortex for linking with body feelings.

"Outside Window" definition of a Brainspot

When a client discusses an area of emotional difficulty in sufficient depth to allow focus on the body feeling associated with it, the therapist asks the client to track a pointer which is slowly moved in a horizontal line in front of the eyes. The therapist can then find the Brainspot by observing a disruption of the client's gaze. As this may be an eyeblink it is useful to look at recent findings on brain activity in relation to spontaneous blinking. Nakano et al. [7] observed that eyeblinks were associated with fMRI deactivations in the frontal eye fields and the superior parietal lobe, components of the dorsal attention network. The brain areas that control shifts of gaze also control shifts of attention: these are the superior colliculi in the midbrain and the frontal eye fields in the cortex [8]. Suppression of activity in the superior colliculi was induced by blinking whereas there were activations in the anterior and posterior cingulate and insular cortices with spontaneous blinking. These brain areas are also important components of the interoceptive response to emotional memories as is described below. It could be argued that the disruption of focused attention during blinking is allowing assimilation of the emotional and somatic experience by facilitating the emotional and memory functions of the cingulate and insular cortices. When blinking is observed in the Outside Window technique it is picking up the momentary heightening of the internal experience that follows the spontaneous tendency to focus the gaze on what is salient.

Non-visual gaze patterns and memory: looking in while looking out

The spontaneous activation of eye movements and gaze fixations during mental activity with no visual component has been extensively studied by Ehrlichman and colleagues [9]. The movement of the eyes during "search" of long-term memory is followed by a gaze fixation when the information is "located". This is seen as analogous to the search for a salient stimulus in the environment and is based in the same brain structures. Saccadic activity and gaze fixation are connected with memory through medial temporal regions and basal ganglia output to the superior colliculus. Focus on a memory sufficient to induce a sustained activation of the medial temporal lobe inhibits the striatum, with which there is a competitive interaction, and releases gaze fixation neurons in the superior colliculus.

Setting the frame

As in Sensorimotor Psychotherapy [10], Somatic Experiencing [11], Lifespan Integration [12] and, it could be argued, EMDR [13] the Brainspotting frame is based in the body feelings evoked by discussion of the traumatic memory. These are accessed through mindful attention to what is happening inside during the recounting to the therapist of the nature of the presenting problem. The activation is studied carefully and working memory involvement with it is enhanced by it being rated on a 0–10 scale.

Focused mindfulness

The client's attention to the internal process recruits medial prefrontal regions for observing emotions, memories, body sensations and cognitions. Sustained observation of the information files which have been opened by the Brainspotting set-up allows

healing change to occur. The Brainspot provides the bookmark or tag on the appropriate information file. The mindful therapist helps to maintain this internal focus by checking on the nature and severity of the activation in the body and allowing it to unfold from within. The presenting complaint is repeatedly referred to until there is no body activation associated with its Brainspot – squeezing the lemon until not a further drop can be extracted. Healing is not imposed by technique but is liberated. When time permits the process is allowed to proceed to completion and the change in state becomes the focus of attention. The resolution of the trauma is accepted with care and patience to give it as much time as possible to rewrite the neural pathways which were previously entrenched in maladaptive and dysfunctional loops.

Dual attunement

Brainspotting's difference from other forms of talking therapy lies in its unique ability to predictably access the brain stem components of the trauma memory during the setting of the frame. Other body-based therapies are effective at a similar level but the ease with which they access the midbrain is dependent on a number of factors not necessarily integral to the treatment modality. The gaze fixation used in Brainspotting (BSP) immediately involves the superior colliculi in the midbrain and this neurobiological aspect of the dual attunement model is specific to BSP. It involves the procedural exploration of the relevant eye positions through Outside Window, Inside Window and Gazespotting. In other words, the BSP therapist is attuning to the client's neurobiology by noticing at which eye positions the client manifests increased, sustained reflexive activity (Outside Window), locating with the client the eye positions where the client "feels it the most" (Inside Window), and noticing the eye positions the client spontaneously identifies by where they gaze when talking about their emotional material (Gazespotting). When one of these three Brainspots is determined, the client is guided to maintain the gaze on the spot or pointer and mindfully observe the internal experience over time (focused mindfulness). The therapist is attuned to the client's neurobiological connectedness with the emotional material accessed through the Brainspot at a primarily brainstem level.

The therapist's gaze has an effect on the client's cortical and sub-cortical structures. The response of the right anterior insula to being gazed at in a non-threatening way [14] may help to maintain the client's focus on the body feelings attached to the Brainspot. Even if the gaze is not strictly mutual – when the therapist is watching the client focus on the Brainspot – the client's awareness of the therapist's gaze should accentuate the insular response to the framing. Also, increased duration of direct gaze stimulates the anterior cingulate and ventromedial prefrontal cortices of the person being looked at [15]. So when the direct gaze of the therapist is maintained on the face of the client who is focused on the Brainspot there is augmentation of the medial prefrontal activation achieved in the client through mindful attention to processing. Being gazed at while fixated visually on the Brainspot is amplifying the circuits framed via the insula and amplifying the medial prefrontal attention on emerging material. This promotes organization and integration through coalescence of hitherto separated information files.

The other aspect of the dual attunement is less specific to Brainspotting. This is the relational attunement of attending to and tracking the client's experience, listening to the verbal and non-verbal communications. The relational attunement includes the somatic and unconscious interactions between the client and therapist. This promotes the focused mindfulness on all the brain systems activated while the sustained gaze holds the brain stem bookmark. All the higher level processes are changed as they are being held under the focused influence of the neural bookmark. We anticipate that



Brainspotting: Recruiting the midbrain for accessing and healing sensorimotor memories of traumatic activation

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ABSTRACT

Brainspotting is a psychotherapy based in the observation that the body activation experienced when describing a traumatic event has a resonating spot in the visual field. Holding the attention on that Brainspot allows processing of the traumatic event to flow until the body activation has cleared. This is facilitated by a therapist focused on the client and monitoring with attunement. We set out testable hypotheses for this clinical innovation in the treatment of the residues of traumatic experiences. The primary hypothesis is that focusing on the Brainspot engages a retinocollicular pathway to the medial pulvinar, the anterior and posterior cingulate cortices, and the intraparietal sulcus, which has connectivity with the insula. While the linkage of memory, emotion, and body sensation may require the parietal and frontal interconnections – and resolution in the prefrontal cortex – we suggest that the capacity for healing of the altered feeling about the self is occurring in the midbrain at the level of the superior colliculi and the periaqueductal gray.

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Introduction: Brainspotting as a therapy for posttraumatic disorders

Brainspotting (BSP) is a development in psychotherapy which was discovered by David Grand [1] in the course of a Natural Flow EMDR session in which slow eye movements are used [2]. When his client's eye movements wobbled and froze David Grand also stopped spontaneously and waited with what happened. The client then processed traumatic material which had not been accessible previously. He followed up this observation in other clients and discovered a similar pattern of processing.

If the traumatic episode being targeted had a prominent visual focus – an attacker's weapon or hate-filled face, for example – it is easy to see how one location in the visual field might become linked with maximum body activation during recall. What is more difficult to explain is the finding that traumatic episodes without a dominant visual feature nevertheless have a location in the visual field, or Brainspot, that is felt to precisely match the somatic disturbance emerging during the retelling of the trauma narrative. It is the activation in the body during remembering and recounting the traumatic event that resonates with the Brainspot. An emotional experience which felt like a kick in the gut or a breaking of

the heart may have no external visual correlate but it still has a Brainspot.

This is an original and important way into the body residues of adverse experiences which allows them to process to a healing resolution. We try to explain why interoceptive distress has a location resonant with it – and towards which the gaze elicits additional activation. The spot can be selected by the client's subjective appraisal (the Inside Window method) or by the observation of turbulence in the flow of the eye movements at a particular point of a slow sweep (the Outside Window method). The Brainspot may also be selected when the client's gaze is settled on a particular point while talking about activating material (Gazespotting) [3].

We hypothesize that the orientation to highly emotional, complex information that does not require eye movements towards a stimulus nevertheless involves the basic orienting response in the midbrain tectum. Just as social pain is based on evolutionary advances in systems required for physical pain [4] orientation to social information is based in brain networks originally employed for responding to visual stimuli. We hypothesize that adaptive orientation to information of a distressing nature involves a nested hierarchy [5] based in the superior colliculi and their subcortical loops through the basal ganglia but involving higher levels in the thalamic pulvinar; the amygdala and hippocampus; the sensory cortices; and the anterior and posterior cingulate cortices. Vogt and Laureys [6] describe six stages for the cortical sequence of orientation, including head and eye movement, through the cingulate cortex. Also involved are the frontal and parietal eye fields in the neocortex. The

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Appendix 3

Tab. 3. – HADS. Univariate two factor analysis of variance (ANOVA) with repeated measures and effect sizes

	Pre		Post		FU		ANOVA			<i>d</i>		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	time <i>F</i> (2, 58) η^2	group <i>F</i> (1, 59) η^2	time*group <i>F</i> (2, 58) η^2	<i>d</i> _{Pre-FU}	<i>d</i> _{Pre-Post}	<i>d</i> _{Post-FU}
(EMDR: n=18, BSP: n=43)												
Anxiety							44.38*** .62	.13 .01	0.89 .02			
EMDR	14.1	4.67	7.1	5.50	6.8	4.93				1.52	1.37	0.06
BSP	12.5	3.55	7.0	4.12	6.8	5.03				1.31	1.43	0.04
Depression							35.83*** .55	.15 .00	1.31 .04			
EMDR	11.1	5.13	5.4	5.68	4.7	5.32				1.22	1.05	0.13
BSP	9.5	4.96	5.3	4.79	4.9	4.80				0.94	0.86	0.08

Note. HADS = Hospital Anxiety and Depression Scale; pre = pretest, post = posttest, FU = follow-up; BSP = Brainspotting; EMDR = Eye Movement Desensitization and Reprocessing. *M*=mean; *SD*=standard deviation. * $p < .05$, ** $p < .01$, *** $p < .001$. Effect sizes: Cohen (1988): $(M_1 - M_2) / SD_{pooled}$

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Note. BSP = Brainspotting; EMDR = Eye Movement Desensitization and Reprocessing. ^aBSP: N=4 missing, EMDR: N=1 missing. * $p < .05$. ** $p < .01$. *** $p < .001$.

Appendix 2

Tab. 2. – PDS. Univariate two factor analysis of variance (ANOVA) with repeated measures and effect sizes

	Pre		Post		FU		ANOVA			<i>d</i>		
(EMDR: n=18, BSP: n=42)	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	time <i>F</i> (2, 59) η^2	group <i>F</i> (1, 60) η^2	time*gro up <i>F</i> (2, 59) η^2	<i>d</i> _{pre-FU}	<i>d</i> _{pre- Post}	<i>d</i> _{Post -FU}
Total score							44.16*** .60	.26 .00	2.03 .07			
EMDR	29.4	12.67	10.4	10.42	8.0	6.52				2.12	1.64	0.28
BSP	25.9	12.36	14.6	10.59	10.9	10.59				1.30	0.98	0.35
Reexperience							44.08*** .60	1.61 .03	1.31 .04			
EMDR	8.8	4.33	2.4	2.77	1.7	1.81				1.11	1.76	0.30
BSP	8.5	4.62	4.3	3.39	3.0	3.35				1.36	1.04	0.39
Avoidance							37.15*** .56	.11 .00	1.64 .05			
EMDR	11.3	5.48	4.6	5.77	2.6	2.83				1.99	1.19	0.44
BSP	9.8	5.69	5.8	5.17	4.0	4.49				1.13	0.74	0.37
Hyperarousal							31.00*** .51	.04 .00	2.72 .08			
EMDR	9.3	4.28	3.3	3.20	3.7	3.12				1.50	1.59	-
BSP	7.6	3.66	4.5	3.03	3.8	3.54				1.06	0.92	0.12 0.21

Note. PDS = Posttraumatic Diagnostic Scale; pre = pretest, post = posttest, FU = follow-up; BSP = Brainspotting; EMDR = Eye Movement Desensitization and Reprocessing. *M*=mean; *SD*=standard deviation. * $p < .05$. ** $p < .01$. *** $p < .001$. Effect sizes: Cohen (1988): ($M_1 - M_2$)/ SD_{pooled}

Appendix 1

Tab. 1. – Comparisons of Demographic information of treatment groups.

	BSP (<i>n</i> = 53)		EMDR (<i>n</i> = 23)		χ^2 or <i>t</i>
	<i>M</i> or <i>n</i>	<i>SD</i> or %	<i>M</i> or <i>n</i>	<i>SD</i> or %	
Gender (female)	41	77.4	19	82.6	.27
Age (years)	43.43 (range: 22-69)	12.30	38.74 (range: 19-58)	12.90	-1.51
Marital status					7.00
Married	19	36.5		26	
Engaged	1	1.9		0	
Cohabiting	12	23.1		13	
Divorced	8	15.4		22	
Single	12	23.1		30	
Other	0	0		9	
Place of residence					13.63**
Germany	33	62.3	14	60.9	
USA	20	37.7	4	17.4	
Austria		0	3	13.0	
Switzerland		0	1	4.3	
Italy		0	1	4.3	
Socioeconomic status					0.63
Low		26		23	
Average		65		62	
High		9		15	
Trauma severity score	4.78 (range: 2-5)	3.72	4.22 (range: 2-5)	0.85	-0.72
PTSD diagnosis by therapist ^a					.04
Simple PTBS	21	42.9	10	45.5	
Complex PTBS	28	57.1	12	54.5	
PTSD diagnosis by PDS (yes)	29	54.7	15	65.2	.725
Additional diagnosis (yes)	23	43.4	8	34.8	.49

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Our study had a longitudinal and quasi-experimental design with two equivalent comparison groups. According to the Maryland Scientific Method Scale (SMS; Sherman et al., 1997), which evaluates the methodological quality of studies, our study is positioned at level 3 on a 5-point scale. The authors indicate that confidence in the results is highest at level 5 and level 3 is required to achieve reasonably accurate results. As differences between groups were analyzed and not statistically significant, threats to internal validity were minimized. For example, regression towards the mean (Stigler, 1997) could be precluded, as there were no group differences for example in the trauma severity score at pretest.

Limitations of the Present Study

Although improvements in symptoms of PTSD have been observed with BSP, we can only state preliminary conclusions on the benefits of this intervention due to the relatively small sample size. Thus, more research with larger samples is needed to replicate our results.

Another limitation of this paper is that we did not use a randomized trial. As randomized controlled trial is often considered the gold standard in evaluating treatment efficacy (Misra, 2012), we also thought about using this design. Due to organizational and ethical issues (Edwards et al., 1998; Sullivan, 2011), we decided that clients should have the possibility to choose whether they are treated with EMDR or BSP.

Both, EMDR and BSP were successful in treating clients with traumatic experiences. Therefore, the common factors in the two treatment approaches and, in general, for all effective trauma therapies should be taken into consideration (Wampold, 2015). Both treatments start with the anamnesis and therapy planning (Schubbe, 2014). In both treatments, the personality and particular attributes of the therapist, the therapeutic relationship, the need of establishing personal safety and stability, and the reprocessing of the traumatic experience could have for example affected treatment outcome. In our study we did not focus on these moderators of treatment outcome. In sum, the development of trauma treatment methods include more and more resource orientation, and BSP follows this overall direction (Schubbe, 2016).

Conclusions and Future Prospects

To conclude, our study supports the use of BSP to treat subjects who show symptoms of PTSD. Thus, BSP seems to be an alternative treatment approach for clients with PTSD. More research is needed to replicate our results and to evaluate effects in different samples, e.g., clients with substance use disorders and comorbid PTSD. Moderator analyses are necessary to further evaluate the contribution of BSP to the treatment of PTSD. Further studies should also analyze the potential usefulness of BSP with other diagnostic measures like the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5, Weathers et al., 2013).

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the effect sizes are also listed. We found a significant time effect in all four scales of the PDS, showing a decrease in the reported symptoms for both treatment

groups. We did not find a significant interaction effect, revealing no significant differences between the groups concerning the decrease of symptoms. Pre-follow-up effect sizes for the measures of PTSD symptoms for both EMDR ($d = 1.11 - 2.12$) and BSP treatment ($d = 1.06 - 1.36$) were high. The same applies to pre-post effect sizes for EMDR ($d = 1.19 - 1.76$) and BSP ($d = 0.74 - 1.04$).

- Table 2 – Appendix 2

HADS. Results for the HADS are presented in table 3. Clients treated with EMDR as well as clients treated with BSP reported a significant decline in symptoms of anxiety and depression. The between groups tests indicate that the variable treatment group is not significant for both scales. Moreover, the interaction of time and group is not significant which means that the groups are not changing in different ways over time.

Pre-follow-up effect sizes for the HADS were high.

- Table 3 – Appendix 3

Discussion

We aimed to investigate a comparison between treatment outcomes in clients treated with EMDR and BSP. The latter is a new psychotherapy approach which theorizes that the field of vision can be used to locate eye positions that correlate with relevance to inner neural and emotional experience (Grand, 2011). With a growing recognition of BSP as an alternative treatment approach for PTSD, this study helps to support the need for the evaluation of treatment efficacy.

We found that clients treated with BSP weren't more impaired than clients treated with EMDR in the variables under consideration. Brainspotting seems to be an effective therapeutic approach for clients who experienced a traumatic event and/or with PTSD. Additionally, BSP seems to be as effective as EMDR in many areas under examination (cardinal symptoms of PTSD, anxiety and depression). In this vein, our study supports the results of Sack et al. (2016) who compared dual attention, eye movements, and exposure only during EMDR in a randomized clinical trial. The use of eye movements as a dual-attention task had no additional treatment effects compared to visual fixation on a nonmoving hand. The pre-post effect sizes for the EMDR treatment group in our study are comparable to other findings (Bradley et al., 2005; Maxfield & Hyer, 2002; van Etten & Taylor, 1998), where effect sizes for pre- versus post-treatment comparisons range between $-.50$ and 2.22 . Even though the pre-post effect sizes for BSP were apparently a bit smaller, there was no significant difference between groups concerning the treatment outcome in either of the scales.

Analyses were conducted using SPSS 23. Independent samples t-tests and χ^2 -analyses were conducted to determine whether there were

statistically significant differences between the means of those treated with BSP and those treated with EMDR on the demographic variables. We used univariate two factor analysis of variance (ANOVA) with repeated measures and χ^2 -tests to assess treatment effects. Effect sizes were calculated according to Cohen's (1988) d statistic. For each scale of the PDS and HADS and for each treatment group the magnitude of change from pre-to posttest, from pre-to follow-up and from posttest to follow-up was defined as $(M1 - M2)/SD_{pooled}$, where $SD_{pooled} = [(SD1^2 + SD2^2)/2]^{1/2}$. Positive effect sizes represent improvements in PTSD and other symptoms (depression, anxiety). Negative effect sizes indicate a worsening of symptoms. The sample sizes for the different items vary slightly due to missing data.

Results

Demographic Data and Traumatic Experiences

Demographic data. Results of χ^2 - and t-test analyses comparing those treated with BSP and those treated with

EMDR indicated no statistically significant differences regarding gender, age, family status and PTBS diagnosis – except place of residence (Table 1).

- Table 1 – Appendix 1

Traumatic experiences. Both groups of clients most frequently listed as the worst traumatic experience an event that is not explicitly mentioned in the PDS (EMDR: 48%, BSP: 37%, examples: working with death bodies, psychological abuse). Accidents were marked by 17% of the clients treated with EMDR and 23% treated with BSP. Sexual assault by someone known was listed by 22% of the EMDR clients and 18% of the BSP clients. The other traumatic events were each marked by less than 10% of the client group. Differences between groups concerning the worst traumatic event were not statistically significant ($\chi^2 [9, N = 75] = 5.11, p = .825$).

Outcome Measures

PDS. Table 2 summarizes the means and standard deviations of the PDS for the pretest, posttest and follow-up for both treatment groups. The results of the univariate two factor analysis of variance (ANOVA) with repeated measures and

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therapist also guides the client to become brain-aware through ongoing opportunities for psycho-education. For a more detailed description of BSP, the reader may consult Grand (2013). The standardized protocol determines the usage of “two eyes” and the “Inside Window”.

First results indicate that Brainspotting could be an effective therapy approach for the treatment of clients having experienced traumatic experiences and clients with generalized anxiety disorder (Anderegg, 2016; Hildebrand, Stemmler, & Grand, 2015; NSHCF, 2016).

Measures

PTSD and symptom severity. To screen the clients for the presence of PTSD and to assess the symptom severity and functioning of the clients the Posttraumatic Diagnostic Scale (PDS; Ehlers, Steil, Winter, & Foa, 1996; Foa, Cashman, Jaycox, & Perry, 1997) was administered. The PDS has 49 items. It includes a 12 item checklist identifying potentially traumatizing events experienced by the respondent. Respondents then indicate which of these events has troubled them most in the last month. To determine whether the DSM-IV stressor criteria are met, the response to this event at the time of its occurrence should be rated. Clients then rate 17 items representing the cardinal symptoms of PTSD experienced in the past 30 days on a four-point scale (0-3). In the last part respondents indicate the level of impairment caused by their symptoms across nine areas of life functioning. By adding up the scores of the corresponding items, the symptom severity for the three subscales re-experiencing (5 items), avoidance/numbing (7 items) and hyperarousal (5 items) is calculated. The total symptom severity score is obtained by adding up the responses of selected items and ranges from 0 to 51 (1-10 = mild, 1-20 = moderate, 21-35 = moderate to severe, > 36 = severe).

Additional mental impairment. Additional mental impairment was investigated through the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). This self-rating scale measures states of depression and anxiety and features seven questions for anxiety (HADS-A) and seven for depression (HADS-D). The respondent rates each item on a four-point scale. The scores for the subscales range from 0 to 21.

Demographic data. Data included sex, date of birth, marital status, place of residence, socioeconomic status (0=low, 1=average, 2=high), traumatic experience (item “How would you describe the client’s trauma?”) with a five point rating scale with the response categories from 1 (minor) to 5 (major) and ICD-10/DSM-IV diagnosis of the client.

Data Analysis

Treatment

The Therapy Approach Eye Movement Desensitization and Reprocessing (EMDR). EMDR was developed by Francine Shapiro (2001). It is a well-established therapy for the treatment of PTSD or other trauma associated diseases. EMDR consists of eight phases, from which phases three to six are original EMDR stages. After establishing a good therapist-client relationship and after the introduction of relaxation techniques or other stabilization techniques, the client is asked to re-experience the traumatic situation while focusing on the therapist's finger tips which are moving on a horizontal axis in front of his or her eyes. In a safe environment and as part of a good therapeutic relationship, the client relives the traumatic situation and reprocesses the feelings, emotions, cognitions and body sensations connected to the trauma (Schubbe, 2006).

The Therapy Approach Brainspotting (BSP). BSP is a psychotherapeutic model discovered in 2003 by David Grand, Ph.D.. Grand has conceptualized BSP as brain-wise and body-aware relational attunement process. In this context he has developed the model of the Dual Attunement Frame. The foundation of this model is the articulation of the attuned, relational presence of the therapist with the client. This relational attunement is seen as being both focused and deepened by the neurological attunement derived from observing and harnessing different aspects of the visual orienting reflexes of the client (Corrigan & Grand, 2013).

By slow eye tracking, either with one eye or with two eyes, locations for BSP are identified. To find these locations, the techniques of either "Inside Window" or "Outside Window" can be used. The "Inside Window" utilizes the client's felt sense, the "Outside Window" helps to locate this location by observation of clients' reflexive response such as blinks, eye twitches or wobbles or quick inhalation, by the therapist.

Once the therapist and client determine together the Brainspot, the client is directed to maintain their fixed visual attention on the position and mindfully observe their internal process. In BSP this is called Focused Mindfulness as the mindfulness that ensues occurs in a state of Focused Activation. The Focused Mindfulness ensues, with the therapist closely and openly following along until the client comes to a state of resolution.

BSP is a focused treatment method that works by identifying, processing and releasing core neurophysiological sources of emotional/body pain, trauma, dissociation and a variety of other challenging symptoms (Grand, 2011). In BSP, the therapist is encouraged to openly follow the client's process with no assumptions. The therapist is guided to trust the innate human neurological capacity for self-regulation given optimal conditions. In this context, the BSP

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Primary aims of the present study were to compare the efficacy of Brainspotting with the established EMDR-therapy and to detect areas of significant change or lack of change (program evaluation). Outcomes assessed were the severity of PTSD symptoms as well as the symptoms of depression and anxiety.

Methods

Design and Sample

The data for this multicenter longitudinal study were collected by independent psychotherapists in Germany, the United States of America, Austria, Switzerland and Italy. The therapists were previously informed about the study by mail or during EMDR and BSP trainings. If the therapists were interested in participating, they were instructed by mail and/or phone and then received a package with all study material. The treatment and data collection was carried out by 27 experienced trauma therapists. There was a pre-determined standard protocol for both EMDR and BSP, which the therapists had to follow during their treatment. Therapists were licensed therapists who were fully educated in EMDR through an accredited training facility and they had at least completed the Phase I training in Brainspotting. Thus, clients were able to choose whether they would be treated with the established therapy approach EMDR or the new therapy approach BSP. In case the client chose BSP and the therapy outcome was not satisfactory, he/she had the right to receive additional EMDR sessions. None of the clients have taken up this offer.

Data was collected before the first therapy session, after one week after the third therapy session and after about half a year ($M=6$ month; range: 2-12 month, with 69% were conducted after 5, 6 or 7 month). The sample is composed of 76 consecutive clients (79% female; mean age 42.0 years) starting their therapy between 2009 and 2015. The inclusion criteria were: a) adult clients aged 18 and over; b) the client have either experienced a traumatic situation and / or suffer from a posttraumatic stress disorder or acute stress disorder; and c) the client gives his written consent to participate in the study. The client was deemed not eligible for the study when the treatment already included more than the preparatory sessions. Between the posttest and the follow-up assessment no treatment of the trauma under focus was applied. Only counseling or supportive sessions were possible and if needed another trauma might be treated. Finally we collected data of 53 clients treated with BSP and 23 clients treated with EMDR. The study was reviewed and approved by an ethics committee of the University of Bielefeld. Informed consent was obtained from all research participants being involved in this research after the study and the procedures were explained.

Keywords: Posttraumatic stress disorder, therapy research, treatment efficacy, Eye Movement Desensitization and Reprocessing, Brainspotting

Introduction

Posttraumatic Stress Disorder (PTSD) is defined as “a delayed or protracted response to a stressful event or situation (of either brief or long duration) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone” (World Health Organization, 1992, p. 147). In general, the range for lifetime PTSD lies between a low of 0.3% in China to 6.1% in New Zealand (Kessler & Üstün, 2008). Current past year PTSD prevalence was estimated at 3.5% (Kessler, Chiu, Demler, Merikangas, & Walters, 2005), with 1.8% among men and 5.2% among women (National Comorbidity Survey, 2005). The prevalence of full or partial PTSD in the primary care medical setting is reported with 12% of the primary care attendees (Stein, McQuaid, Pedrelli, Lenox, & McCahill, 2000). The presence of PTSD is positively correlated with higher levels of health-related problems (Schnurr & Green, 2004) and lower levels of functioning (Thorp & Stein, 2005). Moreover, PTSD is often a persistent and chronic disorder (Perkonig et al., 2005). Thus, effective treatments for PTSD are needed.

There are different treatment approaches to reduce the symptoms of PTSD. Some already existing approaches were specially modified for the treatment of traumatic experiences, e.g., trauma-focused cognitive-behavioral therapy (Benkert, Hautzinger, & Graf-Morgenstern, 2008). Others are developed primarily for the treatment of PTSD, e.g., Eye Movement Desensitization and Reprocessing (EMDR, Shapiro, 2001), Narrative Exposure Therapy (NET, Schauer, Neuner, & Elbert, 2011) or Brainspotting (BSP, Grand, 2013).

In an early meta-analysis by van Etten and Taylor (1998), the most effective drug therapies as well as the best psychological therapies, namely EMDR and behavior therapy, were found equally effective. Later, at least four other meta-analyses confirmed that EMDR is empirically proven to be the best treatment for PTSD in addition to the cognitive-behavioral therapies (Bisson & Andrew, 2007; Bisson, Roberts, Andrew, Cooper, & Lewis, 2013; Bradley, Greene, Russ, Dutra, & Westen, 2005; Maxfield & Hyer, 2002; Seidler & Wagner, 2006).

Brainspotting – the efficacy of a new therapy approach for the treatment of Posttraumatic Stress Disorder in comparison to Eye Movement Desensitization and Reprocessing

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Abstract

Objective: This study aims at determining the efficacy of the new therapy approach Brainspotting (BSP) in comparison to the established Eye Movement Desensitization and Reprocessing (EMDR) approach for the treatment of Posttraumatic Stress Disorder (PTSD). *Method:* The sample consisted of 76 adults seeking professional help after they have been affected by a traumatic event. Clients were either treated with three 60-minute sessions of EMDR (n=23) or BSP (n=53) according to a standard protocol. Primary outcomes assessed were self-reports of the severity of PTSD symptoms. Secondary outcomes included self-reported symptoms of depression and anxiety. Assessments were conducted at pretreatment, posttreatment and 6 month after the treatment. *Results:* Participants in both conditions showed significant reductions in PTSD symptoms. Effect sizes (Cohen's *d*) from baseline to posttreatment concerning PTSD related symptoms were between 1.19 - 1.76 for clients treated with EMDR and 0.74 - 1.04 for clients treated with BSP. *Conclusion:* Our results indicate that Brainspotting seems to be an effective alternative therapeutic approach for clients who experienced a traumatic event and/or with PTSD.

Conclusion & Recommendations

The use of statistical analysis this year underscored the importance of using data to examine community needs and make informed decisions about funding and programming. The Committee was pleased that the assessment validated decisions previously made, such as the importance of supporting a wide range of trauma treatments and recovery services, including those considered by some to be ‘non-traditional’.

The Foundation is currently leading an effort to get systems and organizations within Newtown to develop and implement more effective data monitoring systems. Such systems would allow the Foundation, and others, to have a better understanding of aggregate trends with impacted populations throughout the community and respond accordingly. As recently reported by New York University (NYU) in a study of the community, *“data monitoring systems, particularly if integrated across a network of providers, can create coordinated services, reduce inefficiencies, document progress, and be used for continual learning and quality improvement. The absence of regular data tracking on services delivered and outcomes associated with specific services interferes with quality improvement efforts. The creation of a shared data monitoring system across agencies would strengthen the coordination and cohesiveness of the network. This should also be a tool used by the collaborative oversight coalition to monitor the community’s progress towards shared goals.”* Therefore, the Foundation sees this survey as just scratching the surface on what we can learn about how the community and those impacted by the tragedy are doing and what we can do to best support on-going recovery and community health.

The Distribution Committee will use the information in this survey along with continued research into best practices to make the best decisions possible while always upholding donor intent, the mission of the Foundation, and being compliant with IRS regulations governing non-profit organizations.

To date the Distribution Committee has been focused on using the resources of the Sandy Hook School Support Fund to assist individuals and the community as a whole based on continuous public input and on-going research. That has included the following;

- **Individual Brain Health & Wellness** – providing direct financial support to meet as many individual brain health & wellness needs and requests as possible.
- **Grants Program** – providing grants into the community to build capacity for long term recovery, expand access to alternative trauma treatments, host conferences and workshops to build knowledge and tools for helping, and develop opportunities to build compassionate and caring connections throughout the community.
- **Community Events** – supporting and sponsoring events in the community that provide opportunities to learn, share, and connect with one another.

We appreciate all of those who participated in this important survey and ask that you continue to provide feedback through both formal and informal opportunities so that we can be as responsive as possible to the needs that exist in our community. Committee members, as well as executive director Jennifer Barahona, are available to meet with individuals and small groups on an on-going basis to solicit additional feedback. If interested please contact Ms. Barahona at 203-460-0687 or jbarahona@nshef.org to arrange a time to meet.

Respectfully,

Members of the Sandy Hook School Support Fund Distribution Committee

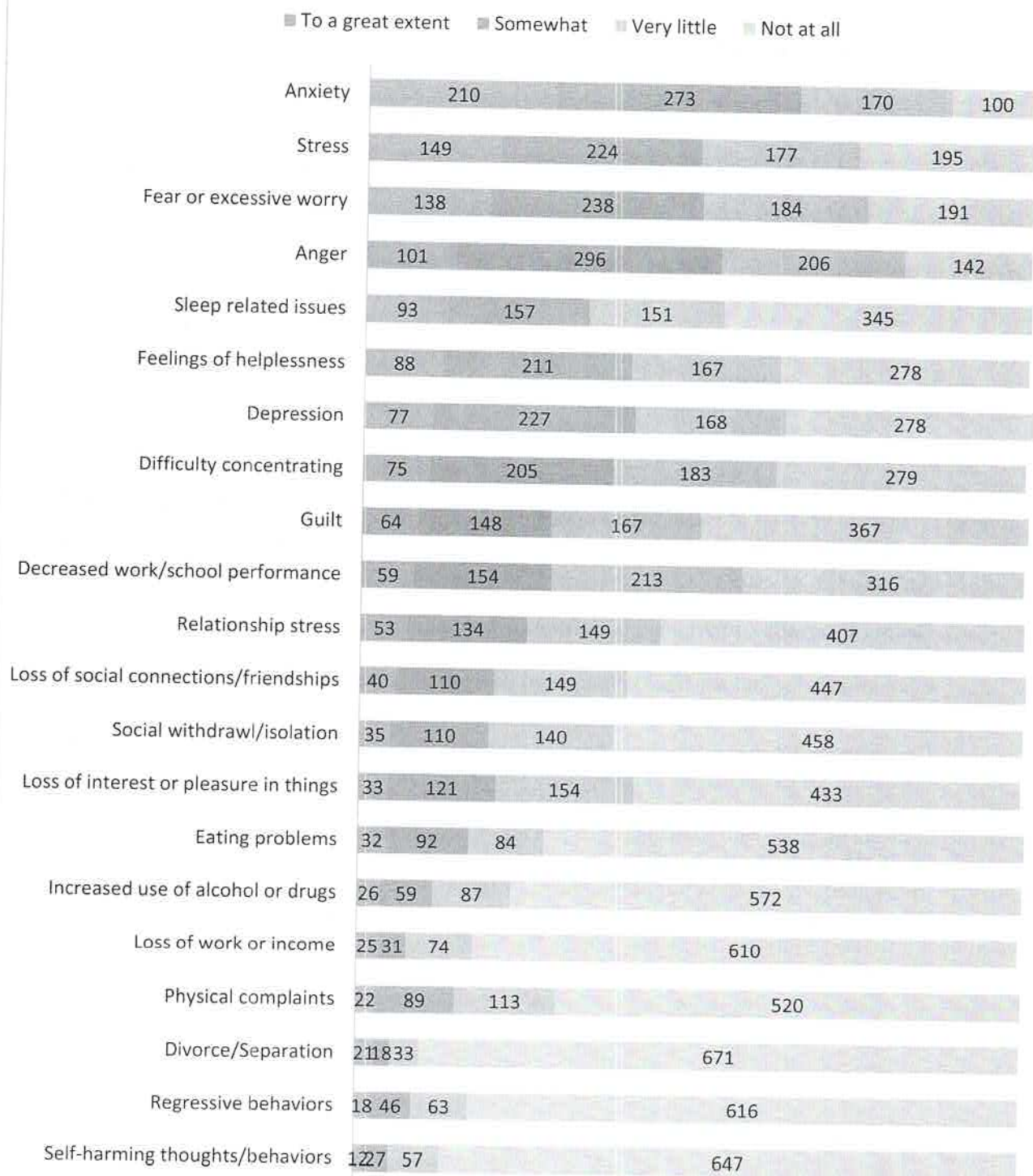
Dr. Robert Bazuro
Jennifer Clark
Kevin Cragin

Cindy Mattioli
Rev. Rob Morris
Anka Roberto

Bob Schmidt (Chair)
James Viadero
Joeline Wruck

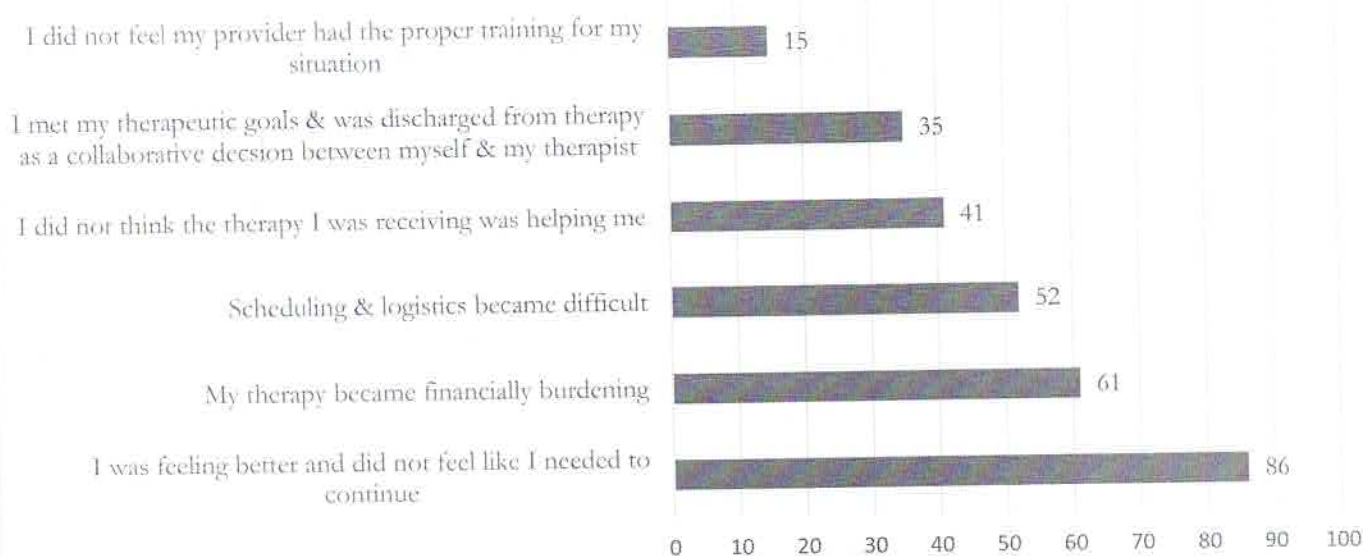
Respondents were asked to rate their symptomatology directly related to 12/14. Anxiety, stress, excessive fear/worry, and anger continue to persist with the most frequency. These symptoms were also reported by clinicians of their clients in a separate survey. There was higher statistical correlation for nearly every category for populations most directly impacted (parents of children enrolled at SHS, SHS staff/teachers, and family members of loved ones killed).

Number of individuals citing the following symptoms



Respondents were asked if they were in any kind of treatment and have stopped, why they stopped.

Number of individuals citing reasons for discontinuing therapy/treatment



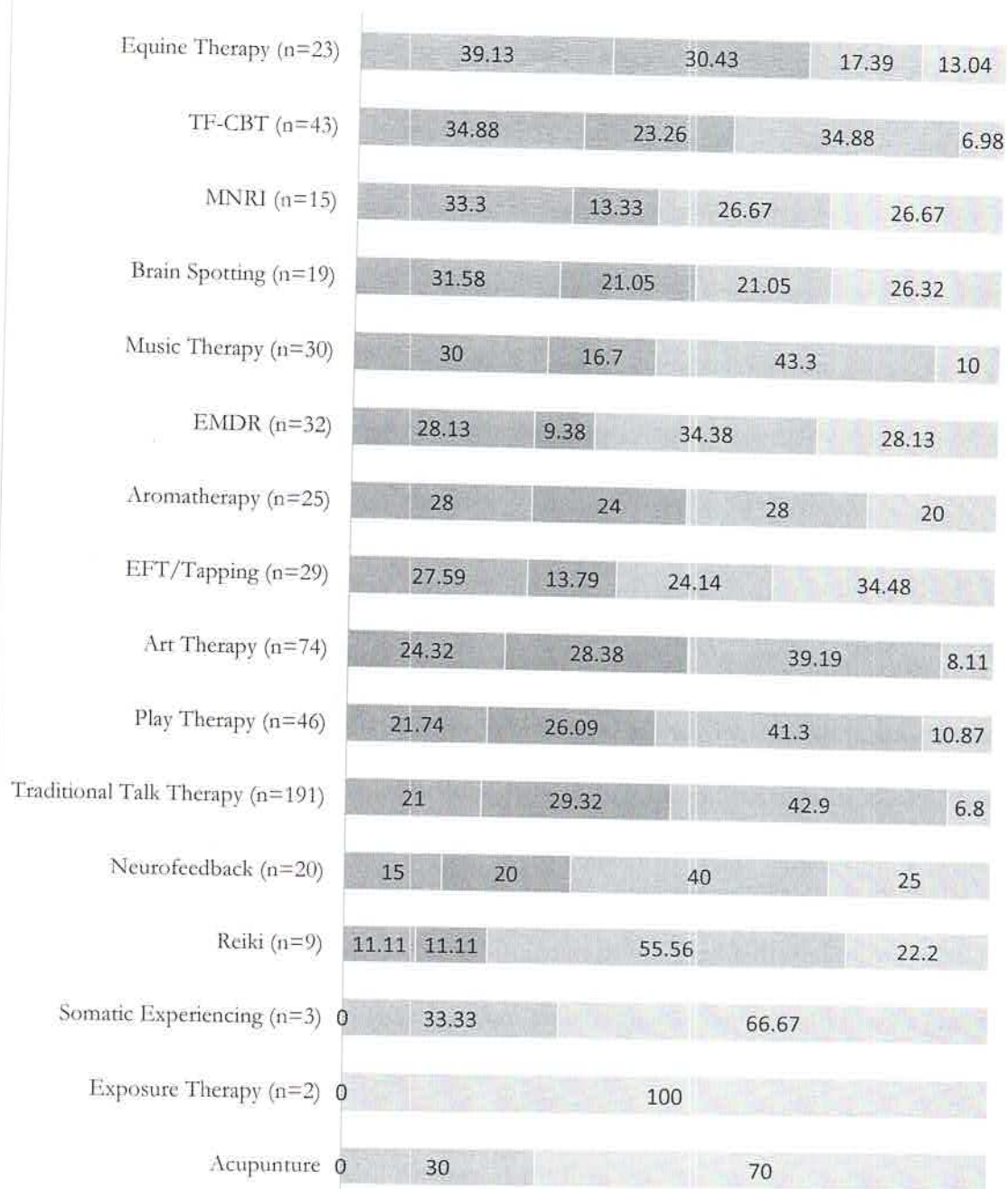
There was statistical significance for Sandy Hook staff/teachers discontinuing services due to scheduling and logistical difficulties', feeling that therapy was not helping, and that the provider did not have proper training for their situation. For parents of children enrolled in Sandy Hook on 12/14 there was statistical significance for discontinuing services in 4 out of the 6 categories listed above (everything except believing that therapy was not helping and that providers were not properly trained). No other groups showed statistically significant correlation.

Qualitative analysis of treatments that have allowed for healing to take place were those that were supportive via group therapy, talk therapy with a judgment free therapeutic relationship, transcendental meditation/yoga, and brain based therapies such as Brainspotting, neurofeedback, and EMDR. Analysis of treatments that have not been helpful were talk therapy where it became a place to 'vent' and not necessarily resolve trauma issues, inconsistent therapy, poor therapeutic alliance, therapist not being a good fit, provider lacking trauma training, lack of experience working with children, a need for group therapy, and not receiving enough feedback from therapists.

It is important to note that while many non-traditional treatments were listed among the most helpful, there is a gap in the number of clinicians who are trained to provide such modalities. It may be prudent to do further investigation into some of the treatments listed and invest in building resource capacity for those that prove efficacious.

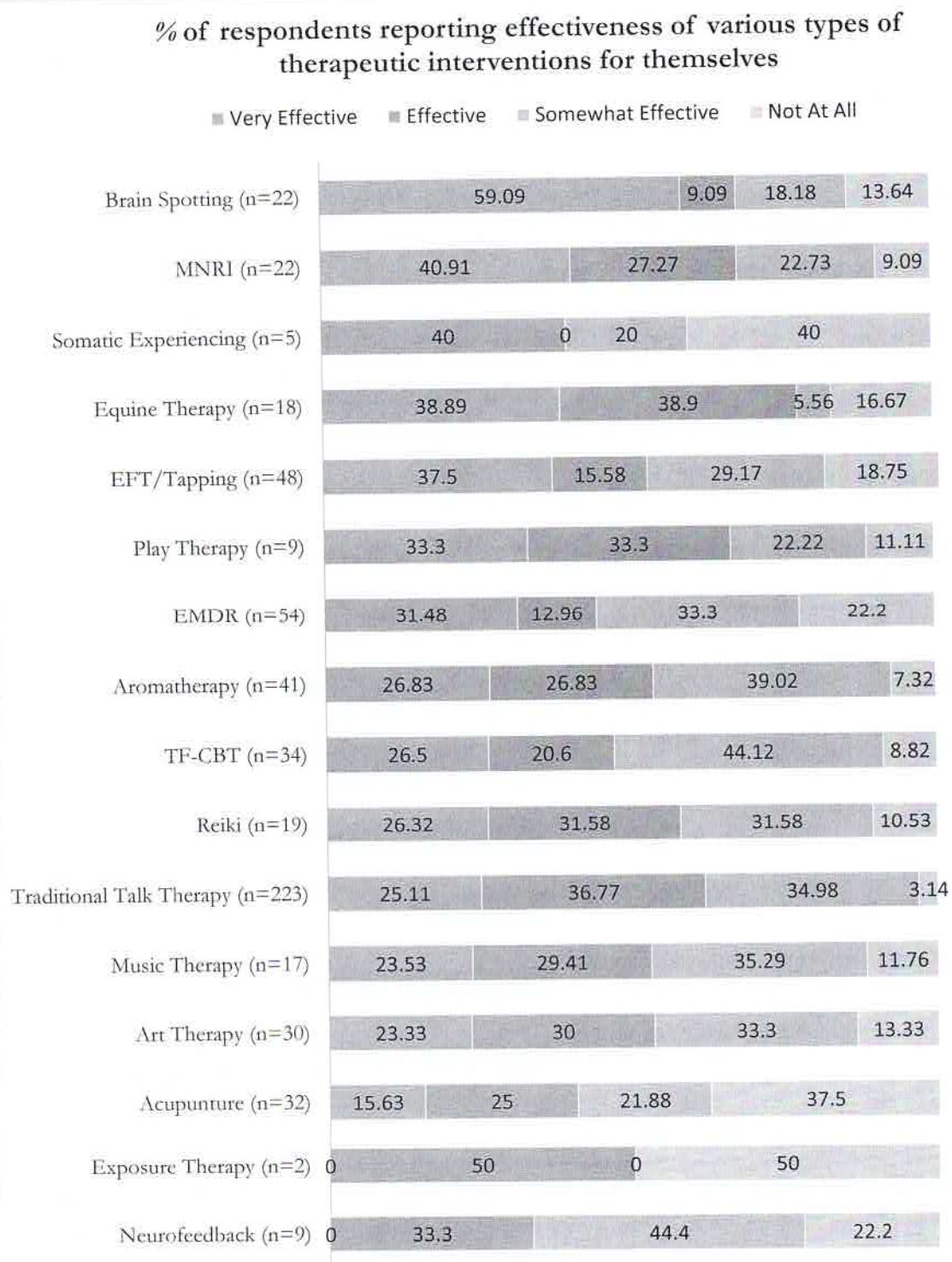
% of respondents reporting effectiveness of various types of therapeutic interventions for their children

■ Very Effective ■ Effective ■ Somewhat Effective ■ Not At All

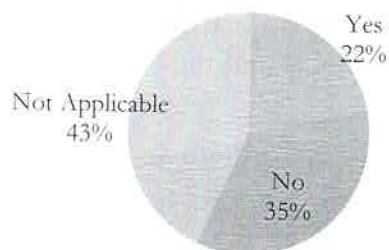


Brain Health & Wellness Services

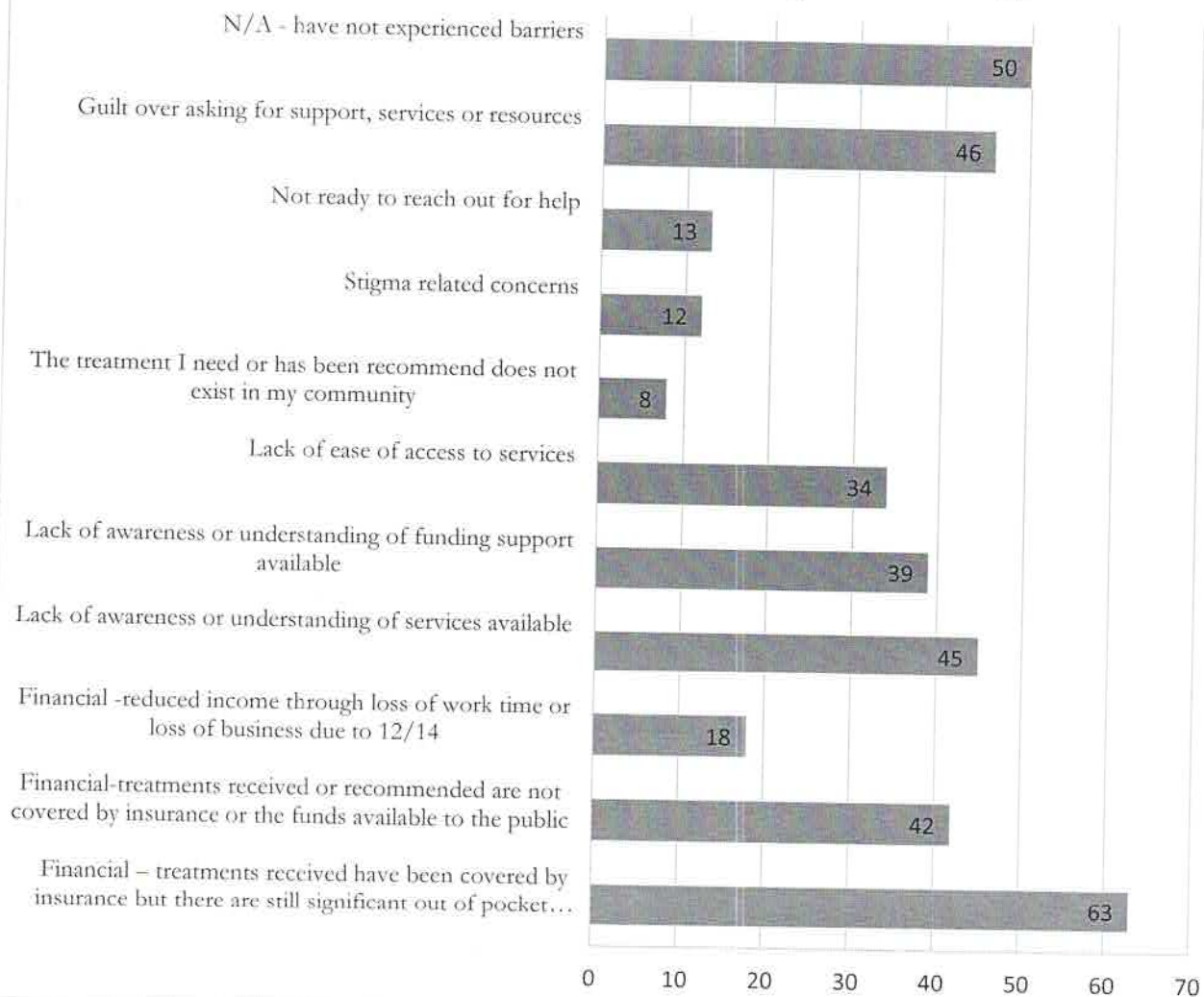
This year we asked a series of questions to get a better understanding of the types of therapeutic interventions used by respondents and the efficacy of the treatment.



% of individuals citing barriers to accessing the help or support they or a family member has needed

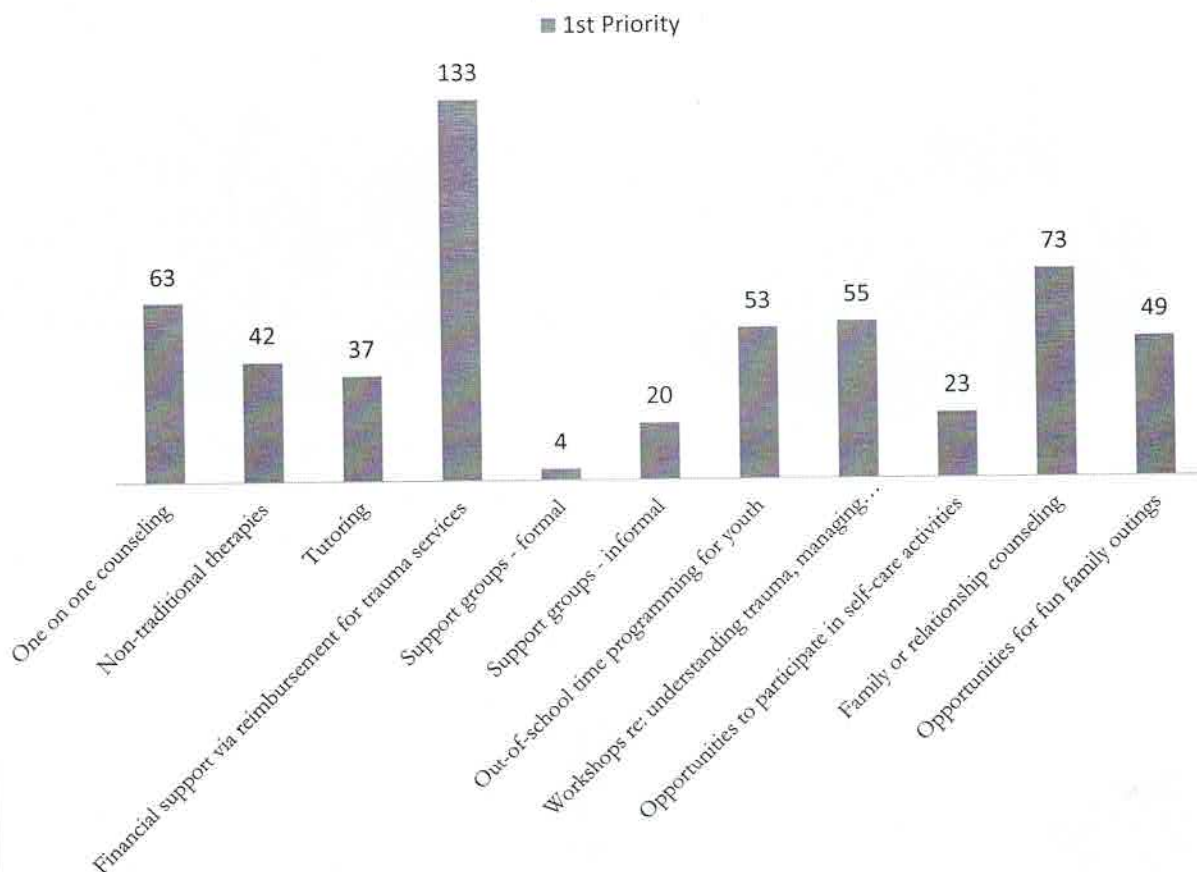


Number reporting barriers to accessing services or support



Barriers experienced to accessing services were noted to be statistically significant for family members of adults/children who were killed and parents of children enrolled at Sandy Hook School.

Number stating which of the services surveyed would they or their family benefit from OR that they believe would be most important to support through designation of funds or community efforts

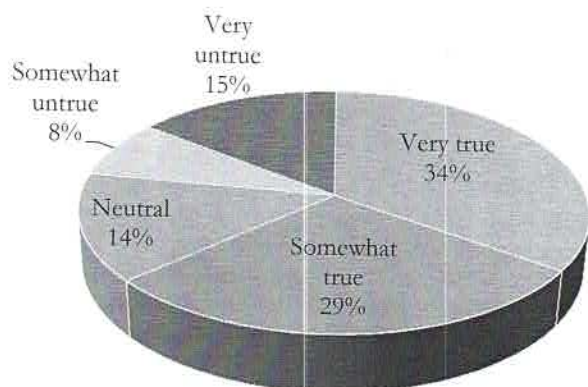


Are there services, programs, or funds (or gaps in those areas) that you would like to see available for a specific purpose that aren't listed in the previous question?

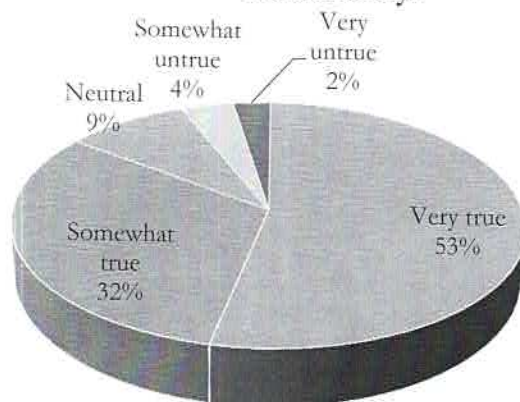
This narrative question generated 109 responses that were very diverse. Despite the variety of comments, there were two themes that emerged.

- One involved parenting and teaching in a post-tragedy community. Respondents felt that parents and teachers needed to be better equipped to address anxiety and behavioral concerns of children/students.
- Another theme that emerged was the idea that the needs of those in the community who were not directly involved or at Sandy Hook on 12/14 have been largely ignored. This is supported by past surveys that have indicated that those who weren't directly impacted feel guilty about their symptomatology. As one respondent wrote, *"Programs for those on the periphery of this tragedy. I believe there is an entire group of silent sufferers. Those that aren't directly impacted by this tragedy but live here and feel the weight of this community's tragedy. We don't feel worthy to speak up because we know there are people suffering far beyond us. We grieve in silence. We push past our anxiety and fears alone. Creating a forum for this sub set of community members would be beneficial. It should be promoted specifically to us to give the 'permission' to attend."*

% who have participated in community events and/or activities related to 12/14 over the past year.

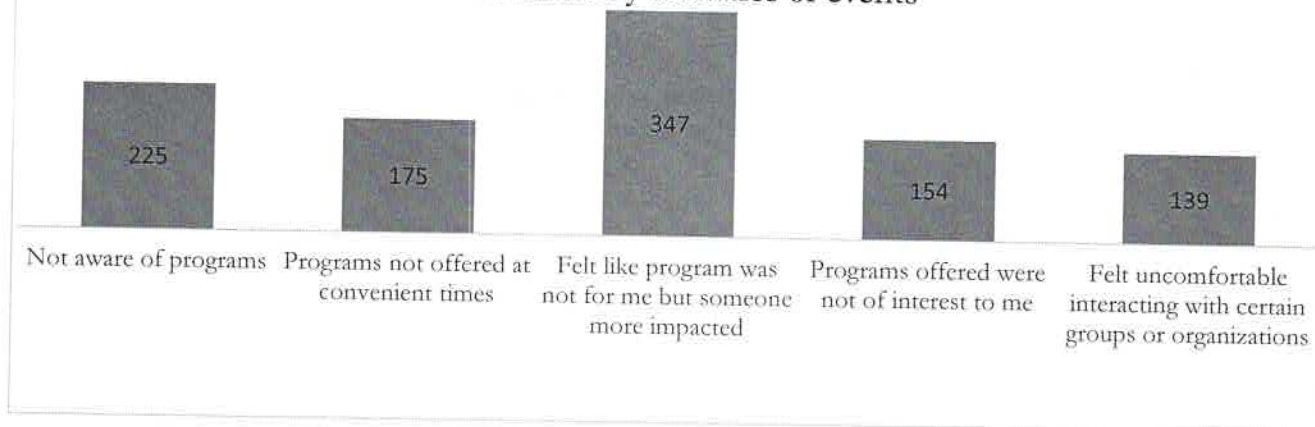


% who report feeling connected to the Newtown/Sandy Hook community.



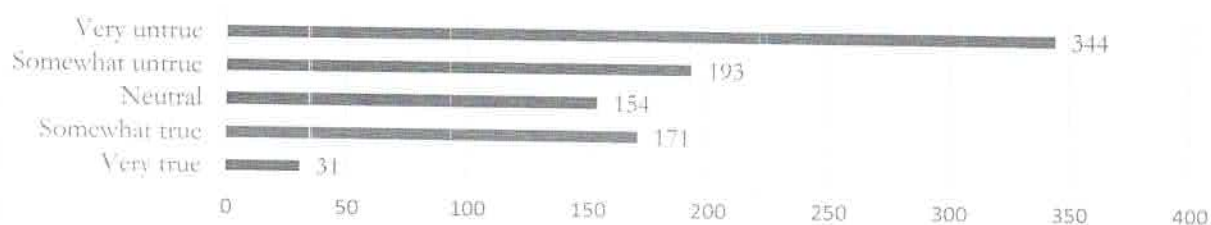
*It is noteworthy that family members of loved ones killed on 12/14 reported not feeling connected to the community. They were the only subgroup that showed this statistical correlation.

Number of individuals indicating why they have not participated in community activities or events



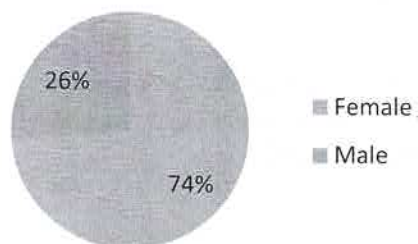
There was statistical significance with the families who had loved ones killed on 12/14/12 feeling uncomfortable with certain groups. This was also true for parents of students enrolled at SHS and teachers & staff from SHS. SHS parents showed statistical significance with feeling the programs were not of interest but did feel, along with SHS staff, that the events were designed for their level of impact.

Number indicating their reluctance to discuss or deal with the 12/14 tragedy

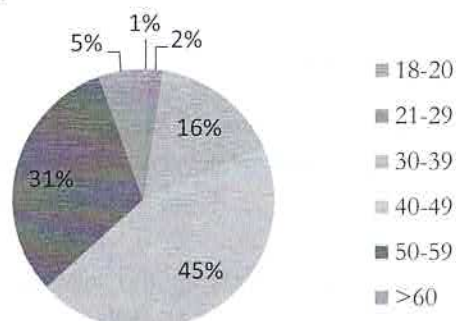


Demographics

Gender



Age



Survey Respondents <i>Note – respondents were able to select up to three categories in which they identified themselves (i.e. parent as well as a teacher or clergy as well as concerned member of the community, etc.).</i>	Response Percent	Response Count
Family member of a child or adult who died on 12/14/12	1.6%	15
Parent of a child enrolled at Sandy Hook School on 12/14/12	15.2%	144
Parent of a child enrolled in another Newtown schools (public or private) on 12/14/12	54.8%	518
Parent who did not have children enrolled in a Newtown school on 12/14/12 (i.e. children too young, already graduated, enrolled in a school out of district/in another community, moved to community since 12/14, etc)	18.0%	170
Teacher or staff member employed at Sandy Hook School on 12/14/12	3.6%	34
Teacher or staff member in another Newtown school (public or private) on 12/14/12	16.2%	153
Police (Newtown PD, State, or other responding community)	1.0%	9
Fire (Newtown or other responding community)	1.2%	11
EMS (Newtown Volunteer Ambulance Corps, Danbury or other responding community)	1.1%	10
Other responding professional on 12/14 (medical, crisis responder)	0.6%	6
Faith Community (clergy)	0.3%	3
Administrator, Public Official, or Town Employee	6.1%	58
Mental Health or other Community Service Provider	2.9%	27
Spouse, parent, or child of an adult witness/survivor (teacher, emergency responder)	2.6%	25
Member of the Business Community (employee/employer Newtown/Sandy Hook)	5.2%	49
Resident of the Newtown/Sandy Hook community that does not fit any of the other criteria (i.e. this is the only applicable answer for this questions)	5.2%	49
Other (please specify)		72
answered question		945
skipped question		0



NEWTOWN-SANDY HOOK COMMUNITY FOUNDATION, INC.

Report of Findings from the Community Survey September 2016

The mission of the Foundation is to devote itself to furthering and supporting operations and activities which address the short-term and long-term unmet needs of individuals and the Newtown community arising from the tragic events at Sandy Hook Elementary School on December 14, 2012.

This report has been prepared and released by the Distribution Committee of the Sandy Hook School Support Fund based on solicitation of public input into the current individual and community needs as it relates to the tragedy on 12/14/12.

The Distribution Committee is comprised of nine Sandy Hook/Newtown residents who represent perspectives from many different impacted groups including victims, surviving children, surviving teachers, emergency responders, Sandy Hook parents, community members, and the faith community. It is the responsibility of the Distribution Committee to solicit public input in order to better understand the needs and gaps that exist in the community as well as the strengths so that they can be built upon for long-term sustainable recovery.

For background on the history and formation of the Newtown-Sandy Hook Community Foundation, Inc. and the Sandy Hook School Support Fund or information about funds spent to date please visit www.nshcf.org.

Methodology

This year the Foundation chose to utilize a statistical methodology in the community assessment to have a better understanding of correlations between groups of individuals and how best to provide services and assistance to those groups. An anonymous on-line survey was released to the public on May 10, 2016 and remained open until June 9, 2016. The survey was disseminated through the Newtown Public Schools (Superintendent's office), the Newtown Bee (May 12th), the Danbury News Times (May 26th), social media, and the internal distribution lists of the Foundation. The survey generated 945 responses compared to 999 in 2015 and 1,633 in 2014. It is understood by the Distribution Committee that this survey represents only a small percentage of the overall community. Input is continuously sought through on-going dialogue with community groups and individuals.

Key Findings

The survey focused on better understanding the strengths of the community, what has been helpful in the 12/14 recovery, what barriers or challenges remain, and what impact the tragedy continues to have on various segments of the community.

Data from the survey is presented in the following pages using charts and visual graphics to depict the results in order to help the reader get an overall sense of the responses. A summary of findings and analysis can be found at the end of the report.

Schmidt, R. et al. Newtown Sandy Hook Community Foundation: Report of Findings from the Community Survey September 2016

Stemmler, M., Grand, D., Hildebrand, A, Brainspotting – the efficacy of a new therapy approach for the treatment of Posttraumatic Stress Disorder in comparison to Eye Movement Desensitization and Reprocessing. Mediterranean Journal of Clinical Psychology. MJCP VOL 5 N.1 (2017).

Scaer, R. (2005) The Trauma Spectrum, Hidden Wounds and Human Resiliency. New York: Norton Books.

Wolfrum, G., et al. Trauma Zeitschrift für Psychotraumatologie und ihre Anwendungen. Issue 3- (2017). Brainspotting. www.asanger.de

problem, yet in actuality the problem is our reactions to these reactions. This phenomenon inhibits our processing through and releasing our reactions, especially on a somatic level. Reacting to our reactions results in stuckness, negative spiraling, misperception – it is unnatural. It is the difference between tracking (following) vs. distracting (and confusing). Processing, which is a focused form of mindfulness, is the experimental exploration by our conscious mind; the destination is always unknown.

We tend to assume that all memories reach consciousness. Most actually do not, evaporating like the meteorites that burn up in the earth's atmosphere before they come close to reaching the surface. Thus our conscious mind holds a miniscule fraction of our awareness.

Physics is seen as underlying physiology and unconsciously affecting all aspects of the human experience and in the Brainspotting process as well. The science of matter and energy and of interactions between the two, grouped in traditional fields such as acoustics, optics, mechanics, thermodynamics, and electromagnetism, as well as in modern extensions including atomic and nuclear physics, cryogenics, solid-state physics, particle physics, and plasma physics. The study of the natural or material world and phenomena has been called natural philosophy. The core of our experience is physiological. This flows into the existential (philosophical) which flows into the psychological (the last stop in the existential flow). Accordingly physics is seen as underpinning the phenomenon of Brainspotting and worthy of attention, exploration and discussion. The rapid change that occurs at times in BSP could be considered as a quantum leap (an abrupt change or step, especially in method, information, or knowledge).

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Patricia FM, Jose FP, de F and Marcelo M. ,Persistent Genital Arousal Disorder as a Dissociative Trauma Related Condition Treated with Brainspotting – A Successful Case Report. *International Journal of School and Cognitive Psychology* (2015) S1:1.

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5. Find highest activation tracking the X axis horizontally at eye level (left/middle/right)
6. Then track the Y axis (above/below eye) to vertically locate the Brainspot.
7. Process on Brainspot until SUDS is 0
8. Squeeze the lemon and process down to a true 0

Basic Resource Brainspotting:

1. Choose cause of activation
2. Focus on the activation
3. Take SUDS – Level of intensity (0 – no intensity, 10 max intensity)
4. Identify location of greatest calm or groundedness in the body (called the “body resource”)
5. Find the location that matches the body resource tracking the X axis horizontally at eye level (left/middle/right)
6. Then track the Y axis (above/below eye) to vertically locate the spot that matches the Body Resource.
7. Process on Brainspot until SUDS is 0
8. Squeeze the lemon and process down to a true 0

Gazespotting

Notice when a client is looking (gazing) unconsciously at a fixed point while talking about relevant, activated material. Point out that the client is gazing at this spot and encourage them to keep looking at it while not speaking (to initiate processing) for 30 seconds to 2 minutes (approximately). This will initiate using this gaze spot for full processing of the issue at hand. Because this is a spontaneous version of BSP, you may not have time to get a SUDS level or body location of activation. The opportunity may arise during the process but do not force it. Processing should be carried through until full resolution of issue at hand (assessed by a squeezed lemon zero SUDS).

Brainspotting is most powerful and effective when enhanced by BioLateral Sound CDs. For highly dissociative and fragile clients, Brainspotting can be initiated without any bilateral intensification, which can be added later as the client is more integrated and flexible. The healing sound directly enters the brain through the auditory nerves while the eardrums are vibrated bilaterally. Used at a low audible level, it serves as background sound which most clients report is calming and grounding (perhaps parasympathetic). The CDs also provide a baseline bilaterality that appears to work synergistically with the focus of the Brainspot. The sound can be used as continual stimulation throughout the session, even during the talking part of the session.

More Reflections on Brainspotting

The brain is a supercomputer with one quadrillion (one million billion) connections, responsible for the ongoing monitoring and adjusting of all our bodily and mental functioning. Accordingly, our conscious awareness of our vast inner space is as limited as when we gaze at a star-filled night sky – and see a scintilla of the vast universe. However, this supercomputer is constantly downloading information to us in the form of body sensations, emotions, insights, thoughts, reflexive actions and reactions. This information is always perfect in content, degree and timing – just what we need at just the right time.

The problem is that when our miniscule conscious mind catches a glimpse of the mental processes of the vast deeper recesses of our unconscious mind, we often feel confused, baffled or threatened. The deepest regions of our unconscious brain/body are devoid of cognition, language and experience. They are knowing, being, reacting, instinctual processes, survival mechanisms, reflexes and body awareness and processes - the place where we live and breathe, literally. When our conscious mind does not understand the communication to it by our deeper brain we feel lost, confused, blocked and threatened. In reality the information is anything but confusing or blocked, except in the misperception our conscious mind. In reality or truth, the answers are actually embedded within the misperceived confusion and blocks.

Additionally, some of this information is uncomfortable or downright painful, which leads us to try to avoid it by denying, ignoring or suppressing it. This undermines our natural moment-to-moment release process and accordingly results in confusion, symptoms and maladaptive behavior. The solution is actually quite simple: “mindfully observe with curiosity, give yourself time and space, and see what happens.” Reacting (downloading information) is our natural way of experiencing, processing and releasing experience. We tend to experience our reactions as the

Reflexive facial expressions are powerful indicators of Brainspots.



In **“Inside Window”** Brainspotting the therapist and client participate together to locate Brainspots through the client’s felt sense of the highest intensity of affect/body distress. Brainspotting can be done with one eye or two. Brainspotting can be directed at distress and Brainspotting can be directed at resources.

Brainspotting processes down to the reflexive core (my term for the deepest parts of the brain/body that hold the substrates of experience). Often when it appears one has reached a zero distress level, a new strata or floor is broken through, probing deeper into the brain. The reflexive core is in the deep, unconscious body brain. It is as out of our awareness as our respiration, circulation and digestion. Brainspotting dismantles the trauma, symptom, somatic distress and beliefs at the core. Brainspotting is a **“body to body”** approach. The distress is activated and located in the body which then leads to the locating of the brainspot based on eye position. Everything is aimed at activating, locating and processing the brainspot.

Simplified Focused Activation:

- *Activation/Focus
- *SUDS Level (10 to 0)
- *Location of Distress in the Body
- *Locate Brainspot
- *Process on Brainspot until 0 SUDs
- *Squeeze the lemon and process until 0

“Squeezing the lemon” is a technique for making sure that all remaining distress is processed out. Often times what appears to be a zero SUDS is revealed to not be when it is challenged. When a client is at a zero SUDS guide them to “go inside and try to push the distress level as high as you can”. In this way the client is internally scanning for anything that still holds a charge. Repeat the process until no distress can be elicited.

Basic Outside Window Brainspotting:

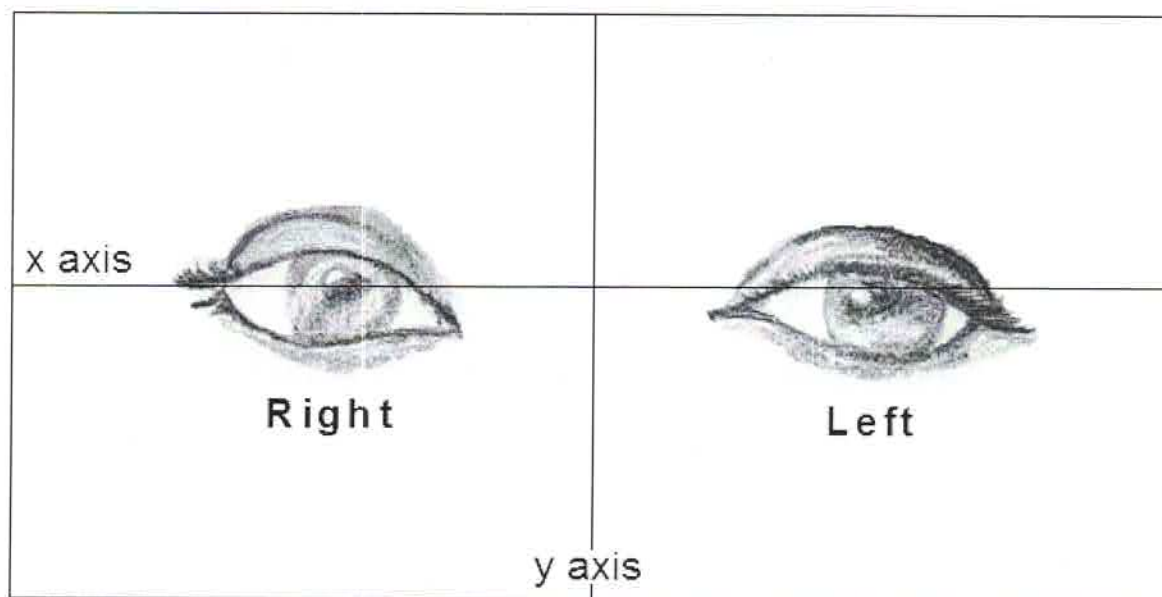
1. Choose cause of activation
2. Focus on the activation
3. Take SUDs – Level of intensity (0 – no intensity, 10 max intensity)
4. Identify location of activation in the body
5. Slow eye tracking to locate brainspot through blinks, twitches and other reflexive responses.
6. Process on Brainspot until SUDS is 0
7. Squeeze the lemon - process down to a true 0

Inside Window Brainspotting:

1. Choose cause of activation
2. Focus on the activation
3. Take SUDs – Level of intensity (0 – no intensity, 10 max intensity)
4. Identify location of activation in the body

I also found that Brainspotting can be done not only with eyes open, "**Shades Up**" or eyes closed, "**Shades Down**." Closing eyes can provide relief for clients who have been staring at a spot for an extended period of time. Also going from eyes open to closed and back to open may provide a change of brain state. Clients have reported a qualitative difference between processing each way and that using both Shades Up and Shades Down is an excellent approach to obtain thorough and comprehensive processing.

In Brainspotting the potential eye locations are divided into four sections, upper and lower, left and right.



When we communicate directions to our clients, **left and right are reversed to avoid confusion**. In "**Outside Window**" Brainspotting the therapist locates Brainspots through observing the client's eyes while tracking micro-slowly, searching for reflexive responses, outside of the client's awareness or conscious participation. There are a multitude of reflexive responses include eye twitches, wobbles, freezes, blinks (hard and double blinks), pupil dilation and constriction, narrowing, facial tics, brow furrowing, sniffs, swallows, yawns, coughs, head nods, hand signals, foot movement and body shifting. **When a Brainspot is stimulated, the deep brain reflexively signals the therapist, out of the awareness of the conscious mind, that an area of significance has been located.**



BSP works with the deep brain and the body through its direct access to the autonomic and limbic systems. **BSP is accordingly a physiological approach with psychological consequences.**

BSP is a Parts Approach - We are biologically made up of parts: molecules, cells, organs, systems and subsystems. These parts are designed to operate both independently and interdependently in harmony and synchrony. Our psychological parts mirror the separate and interactive body segmentation shifting roles, moods, relatedness and introspection. Under sustained duress, especially in our early development, our psychophysiological harmony and synchrony can be disrupted temporarily, sometimes permanently. BSP is a parts approach as a BSP is seen as a part both physiologically and psychologically. **Located by eye position, paired with externally observed and internally experienced reflexive responses, a brainspot is actually a physiological subsystem holding emotional experience in memory form.**

The Brain Scans the Body and Itself – For our survival and stability (homeostasis) the brain is constantly scanning and adjusting every cell, organ and system of the body 24 hours a day. This is possible because of the essentially infinite capacity defined by the one quadrillion connections in the brain. This perpetual scanning mechanism far outstrips the most extensive scans developed to date. It is theorized that BSP taps into and harnesses this brain/body self-scanning to locate, process (adjust) and release focused areas (systems) that are in a maladaptive homeostasis (frozen in primitive survival modes). This may also explain BSP's ability to at times reduce and eliminate body pain and tension associated with psychophysiological conditions.

“The one thing I know is that I know nothing.” Socrates

Phenomenology (observing without theorizing) describes a body of knowledge which relates several empirical observations of phenomena to each other, in a way which is consistent with fundamental theory, but is not directly derived from theory. Another way of describing phenomenology is that it is intermediate between experiment and theory. It is more abstract and includes more logical steps than experiment, but is more directly tied to experiment than theory. The boundaries between theory and phenomenology, and between phenomenology and experiment, are somewhat fuzzy and to some extent depend on the understanding and intuition of the scientist describing these.

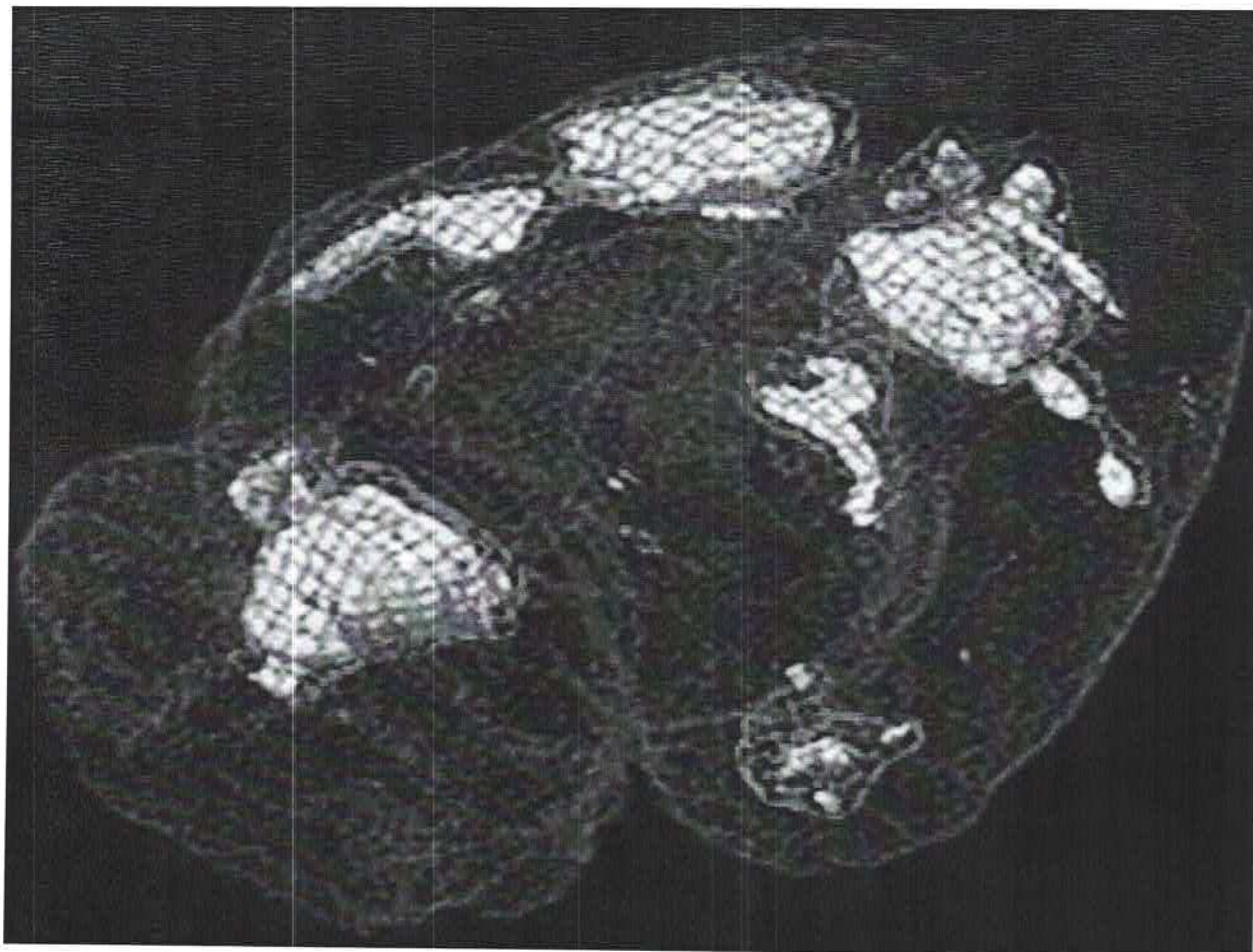
The core of what drives us is the body and the body is natural, instinctive and primitive. Every brain is a genius, containing one quadrillion connections; more than the stars in the Universe. The deep-brain controls all bodily functions and is the seat of instinct, thought and creativity. The brainstem is the true mind/body connection. Everything that travels between body to the brain and back traverses this portal.

Brainspotting allows us to work more phenomenologically as we set a frame for the client both relationally and neurobiologically that allows us to observe and track the client's process without needing to rely on theories or assumptions. We do operate, however, from the assumption that the solution resides inside the client as well as the problem(s) they bring to us.

The Discovery of Brainspotting occurred during a sports performance session with a 16 year old figure skater who could not master the triple loop, although she had mastered the more challenging triple axel. We targeted the moment her jump went awry. Covering her right eye she tracked “as smooth as ice.” Covering her left eye the tracking jumped and then froze at the inside and I instinctively decided to hold her gaze fixed at that point. A torrent of trauma material poured out for what seemed like many minutes. Despite the weekly 90 minute sessions that we had held for over a year, the material about her emotional abandonment by her mother, her parents divorce when she was eight and many injuries on the ice emerged with intense affect. The next day the young skater performed a flawless triple loop in practice for the first time. I discovered that by holding on the spot, we were able to go deeper and deeper into the brain until we reached and dismantled the spot at the reflexive core.

This initial discovery was later defined as “Outside Window” after subsequent observation and exploration revealed that the client's internally experienced felt sense was also a powerful indicator of Brainspots which was designated as “Inside Window”.

A Brainspot is the brain's response to focused activation combined with a designated eye position. A Brainspot is not a single spot in the brain. It is a network of activation in the brain (see scan below) which is reflected in the body with somatic activation.



The focused activation is achieved by three steps. First, the client is guided to "go inside and do whatever is necessary to activate yourself (around the designated issue)." This step is not needed if the client is sufficiently activated. The second step is the application of the SUDS (Subjective Units of Disturbance Scale – Wolpe) from zero (no disturbance) to ten (highest level of disturbance). The third step is guiding the client to locate where they experience the activation in their body.

The corresponding eye position is located through reflexive activity observed externally by the therapist (Outside Window) or felt internally by the client (Inside Window). This locating of eye position process increases the focused activation and determines the Brainspot, which is technically more the activation in the brain than the eye position.

Clinical Brainspotting (BSP) – The BSP approach is designed as a neurobiological tool to support the clinical healing relationship. The clinical work in treatment is not conceptualized as a support to BSP. There is no replacement for the developed ability to engage another suffering human being in a trusting relationship where they feel listened to and understood. We further understand the client in part by combining our understanding own mechanisms and mental processes without imposing it on the client.

BSP gives us a tool, within this clinical relationship, to neurobiologically locate, focus, process and release experiences and symptoms out of reach of the conscious mind and its cognitive and verbal capacities.

date. As this article is being written, a variety of research projects are being conducted, with more to come. These include a research study that cross-compares the efficacy of BSP against other therapeutic methods, an fMRI study and pupillography observational research. Ongoing extensive research is important not only to understand and validate BSP, but in the author's opinion, to further understand the interactive mechanisms of the eye and the brain. In conclusion, the strength of BSP is seen in its Dual Attunement Model, which integrates the relational practice wisdom of the ages with the current and future understanding of the brain and its genius for self-observation and self-healing.

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What is a Brainspot?

speculation that when the closer spot feels less activating to the client and the far spot is more activating; that this may reveal that the client carries significant attachment issues (far feeling more out of reach). The quality, depth and intensity have been observed to be different between close and far and higher and lower levels of activation. BSP trainees are instructed to start the processing at the depth location of lower activation, as the lower levels of activation tend to promote more fluid processing initially.

The choice of z axis BSP, or for that matter any of the six modes of BSP, is determined by the therapist's experimentation and experience will all different modes. It has been repeatedly observed that some clients who responded incrementally to Inside Window BSP experienced a noticeable increase in processing when the z axis was incorporated. In his practice, the author observed some clients, oftentimes those with dissociation, made breakthroughs with z axis that were startling and not attained with any other form of BSP.

Rolling Brainspotting

Rolling BSP is a versatile way of utilizing Outside Window Brainspots. It is performed in a similar manner to how Outside Window Brainspots are initially located and mapped. This constitutes slowly tracking horizontally across the client's visual field, stopping at each location where a reflex expresses itself. In Outside Window, this procedure is used to determine one Brainspot, where the eyes will remain fixated through the entire process, until all activation is discharged. In Rolling BSP, the movement from Brainspot to Brainspot continues for the entire process, until discharge has been accomplished. The amount of time paused on each reflex spot can vary between a few minutes to a momentary pause. It is posited that by using Rolling BSP the flow of movement from Brainspot to Brainspot will be active, integrative and comprehensive. Additionally, some clients appear to respond better to Rolling BSP than other forms of BSP, while others simply prefer it. Although individual application varies from therapist to therapist, and from client to client, the traditional model of Rolling Brainspotting entails initially spending more time on each spot (one to five minutes), followed by gradually decreasing the amount of time on each spot as the process continues.

The theory guiding how long to stay on each spot, is that early in the Rolling BSP, greater depth of processing is the goal, and that as this processing continues, increased movement in the client experience becomes the goal. Rolling BSP can also be used as a way of integratively finishing the more fixed versions of BSP. Using Rolling BSP, after either Outside or Inside Window BSP has attained a zero SUDs for the client, can reveal and process on eye positions that still hold undischarged material. At other times, Rolling BSP can serve as an integration and deepening of a completed process, attained by processing on a fixed Brainspot.

The Future of Brainspotting

In looking ahead, BSP is an open, rapidly evolving model. By the time this article is published, some new applications of BSP may already be in development. The human system is so infinitely vast and complex, that attuning to its expressions, lead to new discoveries and perspectives all the time. As BSP is in its tenth year, it is still in its infancy and is expected to mature and take its place with the many other validated treatment methods. Although most of what has been presented in this article has been discovered or developed by the author, BSP is being increasingly contributed to by many of the 5,000 therapists trained internationally to

Squeezing the Lemon

Another observation made by the author was that a zero SUDs level was not a true zero level of activation. He observed that even after attaining a zero level of activation, clients were usually able to internally increase their level of distress. The author developed a procedure that he called "squeezing the lemon", where the client was guided, after a zero SUDs was attained, to "go inside and do whatever you need to" in order to reactivate the SUDs level. This technique was followed up by continuing processing, on the original Brainspot, back down to zero. This procedure was then repeated until no further activation could be generated. This squeezing the lemon approach revealed that more unprocessed material than was thought remained, despite the attainment of the original zero level activation. This deepening, squeezing the lemon technique, also appeared to reduce the occasions where the effect of the in session progress wore off for the client, days afterwards, leading to the return of their activation.

The author has thus far articulated three ways of locating Brainspots including Outside Window, Inside Window and through One-Eye BSP. The remaining three that will be discussed are Gazespotting, Z axis BSP and Rolling BSP.

Gazespotting

The most natural type of BSP is Gazespotting. This approach makes use of our tendency to gaze at particular points in our visual field when talking and thinking about emotionally loaded issues. When this behavior is observed in clients, they appear to be actually talking to the spot with no awareness of their action. The author, after five years of doing BSP, consciously noticed this phenomenon and wondered what would happen if clients continued to consciously fix their gaze on these spots, while observing their inner processing. The client response that that followed these instructions was observed as naturalistic and unique. Although Gazespotting appeared generally less activating than Inside or Outside Window BSP, it was nonetheless powerful and deep. Gazespotting is the only form of BSP where a client chooses their own spot intuitively and unconsciously. Gazespotting tends to be more gentle and resourced than Outside and Inside Window Brainspotting, with occasional exceptions. Gazespotting is also a good introduction to new BSP clients, as there is no use of the pointer, which can seem odd until the client experiences the powerful effect of processing on a Brainspot.

Z Axis Brainspotting

Z axis BSP brings the third dimension of depth into the locating of eye positions. Inside Window first explored the horizontal or x axis, followed by exploring the vertical or y axis, searching for the highest level of activation or resource. However, the exploration of the differences between close and far, remained to be probed, after the Brainspot has been determined on the x and y axes. The author has observed that most clients will have a higher or lower level of activation looking at the pointer either close or far. Oftentimes, the spot further away on the z axis appears to have a lower activation than a closer spot. Perhaps the perception of an object further away feeling less activating, reflects the hard-wiring in the brain that the further away the potential threat, the safer we are, and the closer the potential danger the more vulnerable we are. It is the author's

Bilateral Sound

Another aspect the author incorporated from Natural Flow into the BSP was the use of bilateral auditory stimulation, delivered by his BioLateral Sound CDs. These CDs were engineered to move healing nature sounds and music, slowly and gently from ear to ear. These CDs, used continuously, had been the primary mode of bilateral stimulation utilized by the author in his Natural Flow EMDR. The author had temporarily discontinued use of the CDs with the advent of BSP, feeling it to be unnecessary due to the power of his new paradigm. However, a number of clients requested to additionally listen to the sound while receiving BSP. To his surprise, the author discovered that with most clients, the CDs enhanced and provided an "auditory resource" that deepened and supported the Brainspotting process. In response, he guided the rest of his clients to listen to the sound during the BSP treatment. The sole exceptions were the easily hyperstimulated clients who found sound to be challenging to their capacity to remain grounded. It should be noted that doing BSP with the CDs is simultaneously accessing and activating the visual and auditory systems of the brain. The observed power of this dual sensory activation and its effect deserve further inquiry and study.

One Eye Brainspotting

As guided and developed by the author, BSP was and still is, an open, integrative, ever-evolving model. One of the first of these integrations was the use of "One Eye" Brainspotting. This borrowed from the work of Fredric Schiffer, who determined that each hemisphere of the brain was like a separate personality (Schiffer, 1999). The access to the two sides of the brain through the visual system is cross-hemispheric. Accordingly he developed goggles that restricted the vision in either eye so that light was only coming in from the extreme left or extreme right activating the opposite hemisphere of the brain. By switching periodically between the two goggles, Schiffer observed an integrative response leading to issue resolution. Prior to BSP, the author had used the Schiffer model with interesting results together with bilateral eye movements and sound. The author hypothesized that doing BSP on the more active eye would further focus the power of his method when needed. But he needed to develop modified goggles, as the Schiffer version covered most of the visual field, making Brainspotting impossible. In contrast, the BSP goggles were designed to obscure 50% of the visual field, either one eye or the other. To determine which eye held the higher level of activation, he asked his clients to alternately cover each eye to assess the SUDs level for the open eye. The eye with the higher level SUDs was called the "activation eye" with the lower SUDs eye called "the resource eye". Once the activation eye was determined, the appropriate goggles were put on with the activation eye exposed. Inside Window BSP was used to find the eye position of greatest activation on the activation eye. The One Eye approach was used when either the client manifested slow processing, or for vague emotional conditions like generalized anxiety disorder or chronic depression, or physical conditions like chronic fatigue syndrome or fibromyalgia. The author originally assumed that when the SUDs level was processed down to a zero, that the process was completed. But he realized he might be missing something and began checking the resource eye after the zero SUDs was attained on the activation eye. He observed that in most cases additional activation was present and that a new Brainspot needed to be determined on this secondary eye. At times the SUDs level flared up on this resource eye to a 7, 8 or 9 and took considerable time to process down to a zero. The One Eye approach is also used by the Resource Model of BSP, when used to locate, and process from, the resource eye first. In recent years, using the One Eye approach for resourcing, because of its high level of efficacy with complex PTSD, has actually supplanted using the One Eye activation model of BSP.

complexity of response to BSP necessitates that a therapist be well versed in a variety of modalities to both understand and respond to the undefined or the unanticipated client reactions. The author has found that trainees of many different clinical backgrounds find a commonality in BSP, reflecting BSP's synthetic nature.

Neurophysiology

The mechanisms that underlie the BSP approach are either yet to be understood or are known in fields outside the purview of the author's knowledge base. It is known that the eye is an extension of the brain. It contains about 125 million light-sensitive nerve cells (photoreceptors) which generate electrical signals that allow the brain to see. There are both conscious and unconscious visual systems and each process along separate pathways in the brain. The unconscious system guides action and the conscious system recognizes objects (Carter, 2009). It is posited that with BSP, "where you look affects how you feel" and that different fixed eye positions correlate somehow to specific neural activity and internal experience. It also appears that by maintaining this eye gaze, while in a state of focused activation around an issue, that the neural activity becomes more focused, thus leading to a more highly economical processing and resolution of the internal neural and felt sense experience. The author believes, as many others do, that we are wired for healing (Badenoch, 2008). He also believes that this is driven by the survival instinct which is at the foundation of all animal and human experience. The author also believes that nothing is held in any part of the human system that does not affect all parts and the entirety of the system, and this explains why BSP has been designed as a brain-body approach. BSP is also relational, understanding that the original attachment to the mother-caretaker is the foundation of the therapeutic relationship, and underlies all psychophysiological development and healing.

The Resource Model of Brainspotting

The "Resource Model" is an essential aspect of BSP. It expands the application of BSP to the most wounded, dissociative clients who tend to be too overwhelmed to utilize the so-called "power therapies". Central to the BSP Resource Model is the "body resource". The use of the body resource in BSP is derived from the author's discussions with Peter Levine, developer of the Somatic Experiencing (SE) model (Levine, 1997). Levine challenged EMDR as too activating, particularly in its focus on body activation. Levine taught the author, as performed in SE trainings, to guide the clients to where they felt calmer and more grounded in their bodies. Levine's "pendulation" model entails spending more time and attention in the body resource ("healing vortex") and much less time on the outer edges of the body activation ("trauma vortex"). In the Natural Flow EMDR approach, the author, after the final step of the EMDR protocol, guided the therapist to shift the client's attention from the body activation to the body resource and then commence processing from there. This appeared to yield less abreactive and more tolerable processing for fragile, highly traumatized, dissociative clients. In BSP, the author observed that the containment of the fixed gaze on the Brainspot, was not always containing enough for these same clients who were so easily overwhelmed. By incorporating this body resource while on a Brainspot, he observed that many clients were able to better tolerate the emotional upheaval and body activation, and accordingly process more effectively. He also realized that Brainspots could be determined, not only by matching them to activation, but located in concert to the body calm or groundedness which he called "Resource Brainspots".

their bodies. Determining a Brainspot is a procedural process; the therapist either observes the client's reflexive response by eye position, or the client reports to the therapist the eye position where the client feels the greatest somatic activation. This procedure can be seen as parallel to a physical examination where the physician determines where their patients feel the most discomfort or pain in their bodies. From this vantage point, the technical aspect of determining a relevant eye position in clients, is an attunement process that is dramatically different from that of the relational attunement process of therapy. BSP, however, in contrast to many other neuro-technical models, is conceptualized and taught from a clinical point of view. The therapy relationship is not intended to serve the BSP, the BSP is intended to serve and support the healing relationship. However, there is no skew toward either the attunement power of the technical, or the relational. The attention is directed to the synthesis of the two together, which is designated as the Dual Attunement Model, the sine qua non of BSP, and hence the source of BSP's observed powerful treatment effect.

The Frame

The Dual Attunement Model of Brainspotting is seen as providing a "frame" for the client's processing (Focused Mindfulness). The brain is seen as mechanism that is driven by its essential survival instinct and its unique capacities for adaptation that can be observed in how humans continually process their internal and external experiences. Trauma is seen, in BSP, as interruptive to these innate human processing capacities, leaving aspects of the traumatic experience unprocessed and not fully completed in the client's nervous system. From a Brainspotting point of view, a client's decision to seek out psychotherapy occurs when the client perceives that their usual capacity "to work out their problems on their own" is compromised. With BSP, the therapist is not seen as possessing the "answers" to the client's "problems". Just as the problems, or unresolved trauma, reside in the human brain, BSP posits that the answers to, and resolution of, the problems reside in the potential of the client's nervous system as well. The trauma is accordingly seen as an attendant neurobiological dissociative barrier, within the client, that blocks the internal brain communication that potentially connects the problem with its ultimate resolution. With BSP, the therapist's relational and neurobiological sustained container of attunement (the Dual Attunement Frame) is seen as supporting the client's brain in enhanced internal communication, resulting in the experience of problem resolution for the client. This BSP model is different from the traditional treatment models that utilize the application of therapeutic interventions, by the technically informed therapist, to support change in the client experientially and behaviorally. The BSP model posits that the vastness and complexity of the brain make it impossible for the therapist to comprehend the unique inner workings, and resultant symptomatology of each client. In contrast, BSP posits that "the right frame" developed and held for the necessary duration with each client will result in "the right resolution" for the client.

Integrative Model

BSP is unique as an articulated treatment approach, in the author's opinion, as it is intentionally designed as an integrative model. Oftentimes clinical-technical approaches are taught discouraging anything less than a fidelity to the model and its protocols. With most other defined approaches, integration is usually tolerated with an, "It's ok if you do it" attitude. With BSP integration is not only "allowed", it is encouraged. This dovetails with how phenomenology is applied to BSP with the recognition that the human system is too vast to be understood from the outside. Accordingly there can be no one model that encompasses the workings of the human system. This in fact explains why so many models of the human mind have arisen and have demonstrated efficacy. Any clinical approach can be used in concert with BSP, or on a Brainspot. In fact, the

author, not only to the left and right of their visual field, but also above and below eye level. This development led the author to first search for client activation along the horizontal, or x axis, followed by exploring up and down the vertical, or y axis, of the client, for the location of the greatest perceived height of activation. This allowed for BSP to move from a one dimensional process to two dimensions in exploring the client's visual field.

Phenomenology

The author, prior to his discovery of Brainspotting, had developed a modified version of EMDR, which he had named "Natural Flow EMDR" (Grand, 2001). He incorporated much of this approach in his further development of BSP. The basic tenets of the Natural Flow approach included the "no assumptions model" or phenomenology ("observe everything, assume nothing"), body resourcing (borrowed from Somatic Experiencing) (Levine, 1997) and slower eye movements and gentler bilateral auditory stimulation (Grand, 2002). All of these methods were relevant to BSP and were as such incorporated in the author's new method. The phenomenological approach came from the author's decades of clinical experience, where he noted how the unexpected always appeared to arise in session with clients. The author combined these unexpected and unpredictable observations with the growing information he studied about the infinite complexity of the human brain, and accordingly how unknowable each client's brain is to the outside observer. This clinical-philosophical approach, entailed tracking, or following the client, uncritically, and without expectation, wherever the client went within their process. By recognizing the necessity of following, and not leading the client, the author also hypothesized that by tracking the client's associative processes, that he was also observing a correlate of their neural activity. The author, accordingly, noted how many subtle assumptions were imbedded in most clinical models, and how these assumptions became a part of the training and belief systems developed by many therapists. In his trainings, the author employed his clinical observations by often challenged therapists presenting analyses of client case scenarios with the question, "how can you know this?"

Dual Attunement Model

BSP is seen as a "Dual Attunement Model" similar to the "Interpersonal Neurobiology Model" (Siegel, 2010). Dual Attunement entails combining the therapist's relational attunement to the client, that is central to the interpersonal model, with neurobiological attunement, derived by the technical locating and harnessing of the client's Brainspots. It should be noted that the author had been a relationally-based clinician for twenty-seven years prior to the point of his discovery of Brainspotting. His original training was in psychoanalysis and psychodynamic psychotherapy, which developed his skills of attuned listening to the multi-leveled communications of his clients. However, the analytic model was too structured for the author and he began to interact in a more open, flexible, accessible manner with his clients. This expanded the reach of his attunement from the observational to the interactive. The attunement skills of a psychotherapist tend to be deepened and widened over years and decades of practice, as therapy can be viewed as both an art and a science. It is accordingly relevant that BSP was discovered and developed by a clinician with over three decades of therapeutic experience. The determination of a Brainspot, as described earlier as a relevant eye position, is very technical from a neurobiological point of view. In essence, there appears to be little that is psychological about determining eye positions that resonate with activation of the client's brain which is felt in

Further Development of Brainspotting

Repeatedly applying this procedure during the following months, the author noticed that by stopping the horizontal eye-tracking at eye level, in front of any reflexive responses by his clients, he elicited a similar deepening and acceleration of their healing processes. These observed reflexes included blinking, quick in-breaths, coughing, hard swallowing, mouth movements, eye widening or narrowing, head tilting and change of facial expression, among other responses. The author found the enhanced treatment effect with his clients both curious and compelling, as it resulted in his already successful treatment outcomes becoming even more powerful and comprehensive. He searched for a name for this process and arrived at "Brainspotting", guided by the recognition that these "spots" in the visual field appeared to access discrete locations and functions within the brain. During the course of the subsequent six months, the author increasingly applied his new technique, amassing anecdotal evidence of its effectiveness with a wide variety of clients carrying different diagnoses, histories and symptoms. It appeared that the containment provided by the fixed eye-gaze, and the possible concomitant focused neurological activation, were accomplishing a uniquely successful approach to emotional healing.

The author recognized the need to have an organized, yet simple, way of accomplishing focused activation, with his clients, in order to initiate the optimal brain arousal needed to accurately locate the relevant eye positions. He accordingly developed a simple "set-up" process to accomplish this step-by-step procedure. The author started by asking the client if they were "activated" around the issue they wanted to address. This activation was assessed by the SUDs (Subjective Units of Disturbance) level discussed earlier in this paper. If the activation was not high enough, the client was guided to, "go inside and do whatever you need to do to push the activation level higher". If it was high enough, the SUDS was simply rated from zero (lowest) to ten (highest). The next step was guide client's to locate their area of somatic activation by observing, "where in your body you feel it the most". After the focused activation was accomplished, the set-up was completed by locating the Brainspot in the client's visual field. Following the set-up process, the client was guided to observe their focused mindfulness process, which ultimately was intended to lead the client to the point of resolution of their issue of activation.

Outside and Inside Window Brainspotting

As his utilization of the Brainspotting process continued over time, the author closely observed and listened to the client's reactions and feedback. A number of his clients, while being observed for their external reflexive responses, provided the author with spontaneous feedback regarding eye positions that resonated with their internal felt sense. These clients guided the author to specific visual positions where they felt their activation the most intensely with comments like, "you just passed it", or, "move the pointer over there". This surprised the author as he had not considered that Brainspots could be located by the client from their inner experience. This, accordingly, gave him two options for locating the relevant eye positions, horizontally at eye level. The author named the original eye location, determined by externally observing reflexes, "Outside Window Brainspots" and he called the locations determined by the client self-observed felt sense intensification, "Inside Window Brainspots". In order to locate these Inside Window Brainspots, the author asked clients whether they felt the most activation looking to their left, center or right of their fields of vision, as they tracked a pointer that he moved to each of these positions. Once the general location was determined, the author found the most precise location of activation perceived by the client. However, some clients kept directing the

Discovery of Brainspotting

Brainspotting was discovered by the author in 2003 while working with a 16 year old ice skater. She had been seen for a year of weekly 90 minute sessions to treat significant performance issues that reflected a dissociative quality. For example, in warm-ups before competition, the skater described either feeling like she had forgotten her program or that she couldn't feel her legs. This resulted in performances far below par and the inability to compete at a national level commensurate with her level of talent. During the year of treatment with the skater, the author used the approach he developed, designated as "The Grand System" (Grand, 2001) which included aspects of EMDR (Eye Movement Desensitization and Reprocessing) (Shapiro, 2001), SE (Somatic Experiencing) (Levine, 1997), micromovements and relational insight-oriented therapy. Some of the factors contributing to the skater's performance problems were a variety of traumas including maternal rejection, parental discord leading to divorce when the client was six, and a protracted history of sports injuries, failures and humiliations. The skater's treatment had for the most part been successful with a few exceptions, which included her inability to complete a triple loop. This required jump is not the most difficult for championship caliber skaters, such as this client, but her inability to perform it rendered completion of successful short and long programs impossible. To attempt to remedy her performance block with the triple loop, the client was guided to imagine doing the jump in slow motion and freezing it at the precise moment she felt and saw herself "going off". She was then guided to follow the author's fingers moving slowly back and forth across her visual field, a variant of EMDR. Within a few passes, just slightly off center, the skater's eyes noticeably wobbled in a sustained microsaccade, followed by locking into a frozen position (Martinez-Conde & Macknik, 2007). Startled by this response, the author reflexively stopped moving his fingers and immediately held them still directly in front of the eye freeze, approximately three feet away from the client's face. During the subsequent ten minutes, a remarkable torrent of trauma processing ensued. A series of new distressing memories emerged and rapidly processed through to resolution. But even more surprising was that a significant number of the skater's "resolved" traumas reopened and processed through to a deeper level. At the end of the ten minutes, the processing slowed and completed, and the skater's eye-lock released. Her ocular manifestations and intense processing was an unusual event indeed, and it was reinforced the next morning when the young skater called the author after practice and reported excitedly that she had repeatedly performed triple loops without a hitch. The skater never manifested her difficulty with the jump again. This dramatic change of behavior caught the attention of the author, and he began to look for similar eye manifestations in other clients, while tracking slowly across their visual fields. When he observed these eye anomalies, he repeated the procedure of holding his finger dead center in front of where the anomaly occurred. He not only noticed an acceleration and deepening of the client's processes, but he was again startled by the client's reports. Comments like, "this is really different", "this feels much deeper", "I can feel it all the way in the back of my head", and "I can really feel it in my body", were offered by a wide spectrum of clients. Of particular note was the feedback from therapist clients, which indicated that they observed a profoundly different experience and outcome from before with this new approach. Additionally, guided by instructions from the author as far as how to perform this new eye-gaze technique, many of these client-therapists tried it out with their own clients and reported back to the author similar experiences of faster and deeper resolutions in session with their clients. Accordingly, in the course of a month's duration, the author, by accumulating his own observations and the feedback from his client-therapists, determined that he had stumbled onto a new method and perhaps a new paradigm.

Brainspotting, a New Eye Position Model for Brain-Based Psychotherapy

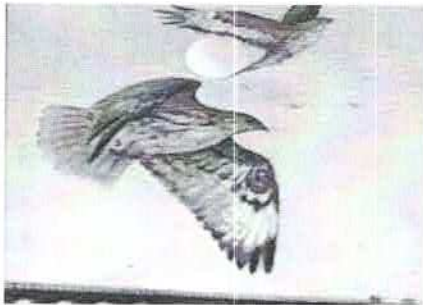
David Grand, Ph.D.

Abstract

Brainspotting (BSP) is a new psychotherapy approach that hypothesizes that the field of vision can be used to locate eye positions that correlate with relevance to inner neural and emotional experience. After these eye positions, or Brainspots, are located, they may by maintaining eye fixation, lead to a healing and resolution of issues that are held deeply in the non-verbal, non-cognitive areas of the neurophysiology. BSP utilizes both focused activation and focused mindfulness as its mechanisms of operation. It aims at a full, comprehensive discharge of activation held in the brain and body. BSP is a model that incorporates systemic activation and resources applied based on both diagnostic and developmental considerations. The BSP model is developed as both relational as well as technical, with philosophical and physiological underpinnings. It is an open, inclusive, yet framed model that invites the therapist to make use of their prior study, experience and practice wisdom.

Background

Brainspotting (BSP) was discovered by David Grand Ph.D., the author of this article, in 2003. This paper will describe the discovery in detail, as well as elaborate the ongoing development of BSP, from a technical, clinical, neurobiological and philosophical point of view (Grand, 2009). BSP is a psychotherapeutic approach that uses the field of vision to locate "relevant eye positions" (or Brainspots) that are postulated to correlate to neurological activation and internal experience. In order to determine these eye positions, the client is guided to be in a state of "focused activation" which is usually in response to psychotrauma or emotional or somatic symptoms. This is assessed the by the SUDs (Subjective Units of Disturbance Scale) level of 0 to 10 (lowest to highest) followed by determining the location of the highest body activation (except when using the Resource Model) (Wolpe, 1969). At present there are six distinct variations of BSP (to be discussed in the body of this paper) for locating the eye positions. Once these Brainspots are determined, the client is guided to uncritically observe their sequential internal process, which includes affect, memory, cognition and especially body sensations. This self-observation is called "focused mindfulness" as it is parallel to meditative practice, and is performed in a state of focused activation. At various junctures, determined by either the client or the therapist, a brief discussion ensues reviewing the ongoing nature of processing. This is followed by the therapist reorienting the client to their body experience as the unguided self-observation resumes, while still gazing at the Brainspot. The process continues until the client arrives at a state of resolution, determined by returning their original issue of activation with no SUDs activation present. This is reinforced by having the client "squeeze the lemon" by attempting to internally reactivate the SUDs level, which is again processed down until it can no longer be reactivated. Based on the diagnosis, complexity of the condition and client capacity for processing, resolution may occur in anywhere from one session to many months or even years of treatment (Grand, 2009).



The Brainspotting DID healing process is one of mutual cooperation and co-creativity

**The most powerful Brainspot
for clients with DID is the
Eye Contact Spot**





**A client in flashback will often
look off in a particular direction**

**Aligning our face where the
client gazes can imprint a
new image into the flashback**



**The most wounded part
(frequently a baby part) is often
trapped in flashback and is not
aware of the therapist's presence**





**The therapist needs to make
contact with the wounded
part and begin a rescue and
healing process**

**A disruptive or aggressive part needs
to be cautiously and respectfully
engaged. In time they can become an
ally in the healing process of all parts.**



Brainspotting is designed to be integrated into the various effective treatments of DID (i.e. IFS, DNMS)





Parts can be engaged one at a time, as well as collectively

In engaging parts one at a time there is the necessity to engage either the most wounded (usually very young) or the most disruptive (aggressive) parts first



Begin to heal severe body distortions



**Begin to heal self-hatred,
self-attack and sense of
utter worthlessness**



**Listen and receive (not challenge
or question) client's meta-
communications, which emanate
from their most wounded parts**

I want to die

I need to die

There is no hope

I can never recover

**Help parts who are stuck in flashback
to begin to escape into the present**



**Gradually teach the
capacity to trust**



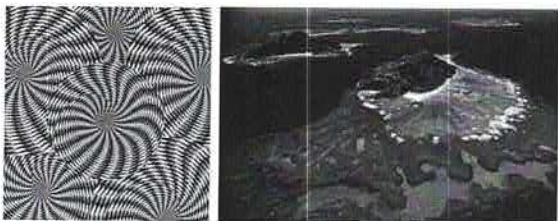
**Intervene to contain tendency
to self-harm and suicidality**



Goals of treatment with Clients with Type A DID



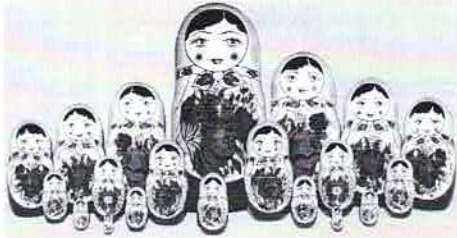
Identify with client their state of 24 hour/day flashback (oftentimes somatic). Then begin to establish with clients islands of non-flashback



Begin to develop capacity for sleep



Extremely Complex PTSD can be divided into DID Type A and DID Type B (Grand, 2014)



DID Type A: severe attachment disruption, sexual abuse, rape, incest, torture and ritual abuse starting by or before age 2

DID Type B: significant attachment disruption, sexual and physical abuse after age 2



Type A Clients with DID:

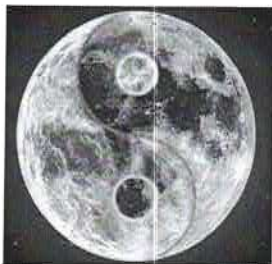
- *In a state of 24 hour/day flashback
- *Little or no capacity for sleep
- *Parts trapped in a flashback state
- *Little or no capacity to trust
- *Tendency to self-harm and suicidality
- *High levels of self-hatred, self-attack and sense of utter worthlessness
- *Often have severe body distortions
- *Frequently speak in meta-communications, often from the most wounded parts



Each client with DID is like a unique Swiss watch. The therapist needs to learn all the component parts and the system's internal consistency (it always makes its own sense)

Key factors in treating clients with DID:

- *Personality of client (those with concurrent personality disorders are harder to treat)
- *Motivation level of client is crucial in regard to engagement and response to treatment



With clients with severe dissociative and attachment disorders the attuned presence of the therapist is the core of the Advanced Resource Model



Demonstration and Practicum of the Resource Model of Brainspotting

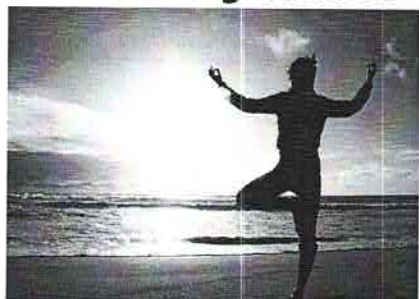
The Brainspotting Resource Model (Inside Window) Set-Up

1. The beginning - choose the issue
2. Check on activation
3. SUDS Level (10 to 0)
4. Location of resource in the body
5. Find resource location tracking horizontally at eye level (X axis)
6. Then track above, at and below eye (Y axis) for the resource location to determine brainspot
7. Focused Mindfulness (Processing)
8. Go back to the beginning to assess change
9. Squeeze the lemon

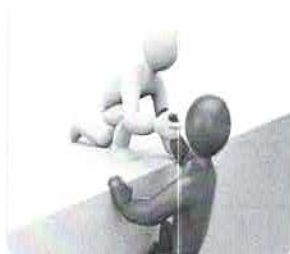


**Extremely Complex PTSD is outside of
the Brainspotting Window of
Tolerance and requires a both
modified and expanded
BSP Resource Model**

A Body Resource is an area of the body that feels calm and grounded



The Body Resource and Resource Spot may be needed for clients with Very Complex PTSD



A Resource Spot is an Inside Window eye position that matches (gains access to) the Body Resource



All animals, including humans, possess remarkable capacities for adaptation and for attaining homeostasis



The Brainspotting Window of Tolerance



**Extremely Complex PTSD
(DID and severe attachment disorders)**

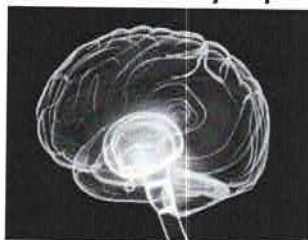
**The foundational model of BSP
is effective for most clients
inside the Brainspotting
Window of Tolerance**

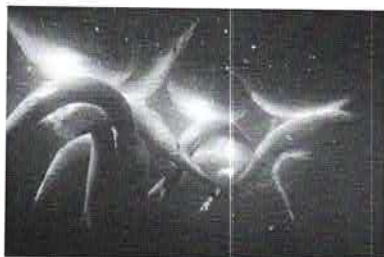


A triggered therapist is also likely to intervene too quickly and too frequently



A Brainspot (activation spot included) is a neurological resource as it provides an attuned, focused, framed accessing anchor to the midbrain (Corrigan and Grand) and is grounded in the body experience





The essential resource is the survival instinct which is deeply subcortical

**Flight – therapist's impulse to create distance from the client:
"get me out of here!"**



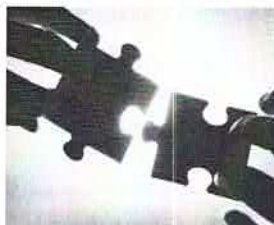
**Freeze – dorsal vagal collapse,
therapist's extreme sense of
somatic helplessness and
inability to think**



**Fight – therapist vulnerability to
struggles with client, especially
with aggressive alters**



The core of the Brainspotting Resource Model is the Dual Attunement Frame comprised of the relational attunement accurately focused and framed by the neurobiological attunement





The attuned, mindful, compassionate (empathic), witnessing presence of the therapist is the foundation of the Brainspotting Resource Model

Limbic countertransference is inevitably induced (flight, freeze, fight) in the therapist by exposure to client's severe abuse material. This activates the therapist's traumas going back to their original preverbal traumas.



Gazespotting

1. Notice when a client is looking (gazing) unconsciously at a fixed point while talking about relevant, activated issue
2. Point out that the client is gazing at this spot and ask for SUDs level and location of body activation
3. Encourage the client to keep looking at Gazespot while not speaking (to initiate processing) for 1 minute
3. Continue client processing on the Gazespot for progressively extended periods of time

This will initiate using this gaze spot for full processing of the issue. Processing should be carried through until full resolution of issue. This is determined by going back to the beginning to assess SUDs level. If activation has reached zero then initiate squeezing of the lemon.

The Brainspotting Resource Model Phase 1 Day 3



Brainspotting is a Resource Model



The Brainspotting Outside Window Set-Up

1. The beginning - choose the issue
2. Check on activation
3. SUDS Level (10 to 0)
4. Location of activation in the body
5. Slow horizontal eye tracking to locate reflex spots observed in the eyes, face and body
6. Focused Mindfulness (Processing)
7. Go back to the beginning to assess change
8. Squeeze the lemon

The Brainspotting Inside Window Set-Up

1. The beginning - choose the issue
2. Check on activation
3. SUDS Level (10 to 0)
4. Location of activation in the body
5. Find highest activation tracking horizontally at eye level (X axis)
6. Then track above, at and below eye (Y axis) for the highest activation to locate brainspot
7. Focused Mindfulness (Processing)
8. Go back to the beginning to assess change
9. Squeeze the lemon

Gazespotting



Fixed gazing while thinking or speaking is natural Brainspotting and can be harnessed

Focused Mindfulness (Processing)



**Observing one's ongoing
internal process while in a state
of focused activation**

Go back to the beginning to assess change

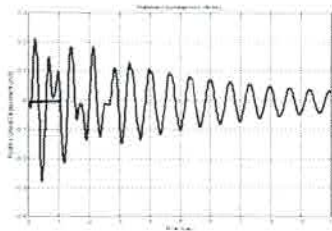


**"Squeezing the lemon" is a technique for
making sure that all remaining remnants of
activation are processed out. When a client
is at a zero SUDS guide them to "go inside
and try to push the activation level as high
as you can"**



**Repeat the process until
no activation can be elicited**

Activation



BSP works with felt sense and activation is used as an open, inclusive term

SUDS Level (10 to 0)

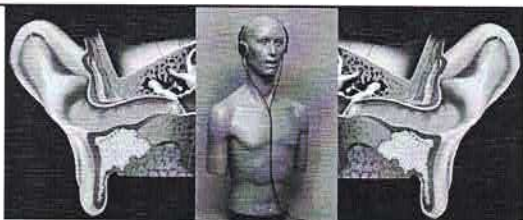
Developed by Joseph Wolpe

Accesses the numerical centers of the brain to assess level of activation

Location of activation in the body

Increases the focus and accesses the simultaneous brain-body communication





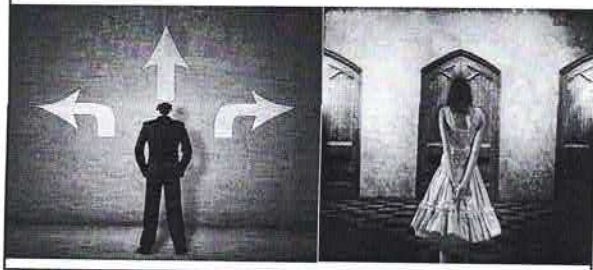
Brainspotting can be enhanced by BioLateral Sound CDs. For highly dissociative clients, Brainspotting can be initiated without any bilateral stimulation, which can be added later as the client becomes more stabilized

The Brainspotting Set-Up

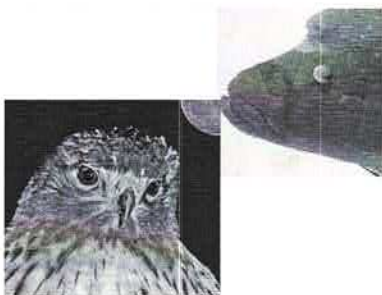
1. The beginning - choose the issue
2. Check on activation
3. SUDS Level (10 to 0)
4. Location of activation in the body
5. Locate eye position of greatest observed or perceived activity – Outside or Inside Window
6. Focused Mindfulness (Processing)
7. Go back to the beginning to assess change
8. Squeeze the lemon



The beginning choosing the issue



**Brainspotting can be done not only
with eyes open or "Shades Up"**



**Or with eyes closed
"Shades Down"**



**Brainspotting appears to process
down to the reflexive core of the
brainstem and the spine**



**Often when it appears one has
reached a zero activation level, a new
strata is broken through, probing
deeper into the subcortical brain**

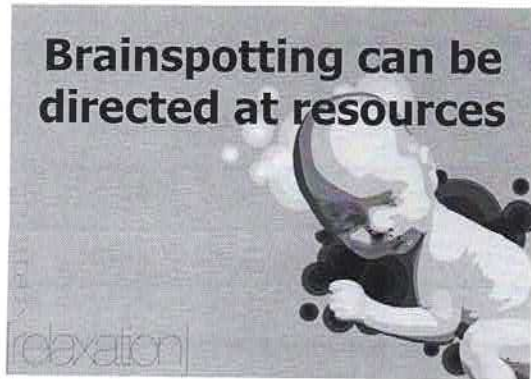
Extremely Complex PTSD is outside of the Brainspotting Window of Tolerance and requires both a modified, expanded, integrative Brainspotting Resource Model



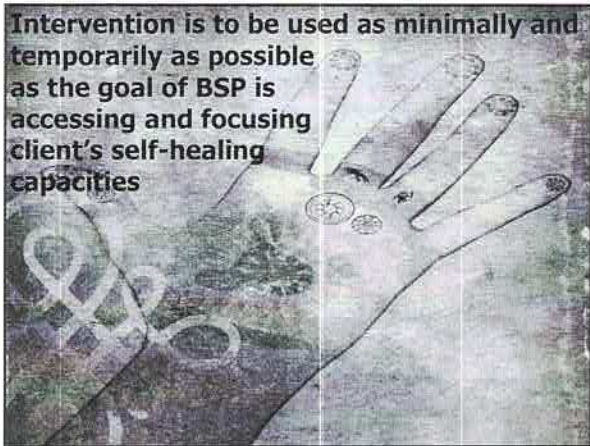
Brainspotting can be directed at activation



Brainspotting can be directed at resources



Intervention is to be used as minimally and temporarily as possible as the goal of BSP is accessing and focusing client's self-healing capacities



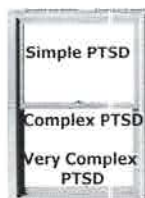
Simple (Type 1) PTSD



Complex (Type 2) PTSD and Dissociative Disorders



The Brainspotting Window of Tolerance

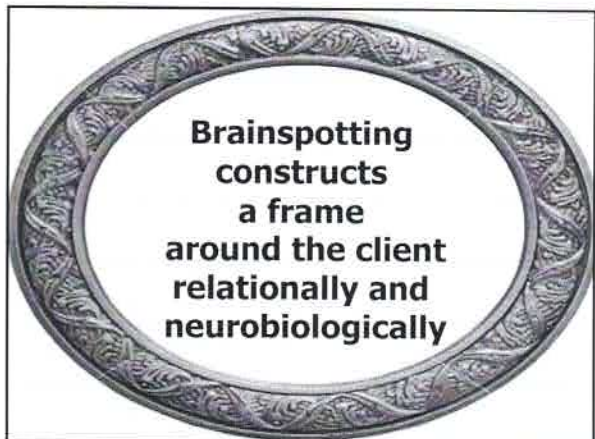


Extremely Complex PTSD
(DID and severe attachment disorders)

All you need to do is observe
with curiosity, give yourself
time and space and see
what happens"



**Brainspotting
constructs
a frame
around the client
relationally and
neurobiologically**



**The Resource Model uses a more
contained frame with greater
containment for clients who become
easily overwhelmed**





Brainspotting makes use of phenomenology:
"Observe everything and assume nothing"

"Ὅτι οἶδα ὅτι οὐδὲν οἶδα"

"I know one thing -
that I know nothing"

Socrates

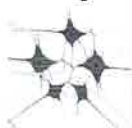


The Uncertainty Principle
(Heisenberg)



"You don't have to know
what it is, to know that it is"

BSP is a Parts Approach - We are biologically made up of parts: molecules, cells, organs, systems and subsystems



These parts are designed to operate both independently and interdependently in harmony and in synchrony



For our survival and stability (homeostasis) the brain constantly scans and adjusts cells, organs and systems of the body 24 hours a day. The immune system is an example of this process

It is theorized that BSP taps into and harnesses this brain/body self-scanning to locate, hold in place, process and release focused areas that are in a maladaptive homeostasis (frozen in primitive survival modes)



Trauma overwhelms the brain's processing leaving pieces of the unprocessed experiences frozen in time and space



Unprocessed traumas are held in capsule form in the brain (Robert Scaer, MD)



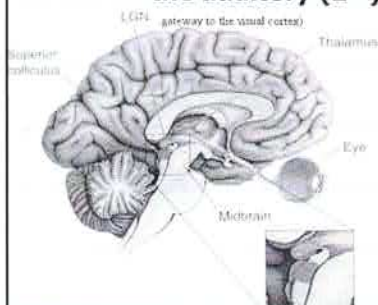
A Brainspot is seen as an eye position that correlates with a physiological capsule that holds traumatic experience in memory form

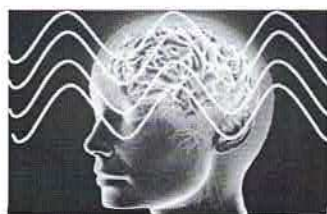




Brainspotting attempts to access the regulating capacities of the agranular isocortex and the allocortex with the dual attunement frame

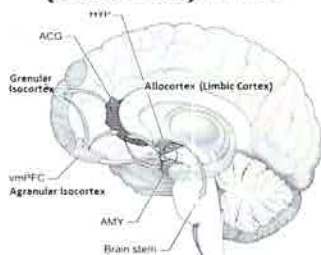
It is theorized the BSP accesses the visual (1st) and tactile (3rd) layers of the Superior Colliculi. The BioLateral Sound may access the auditory (2nd) layer



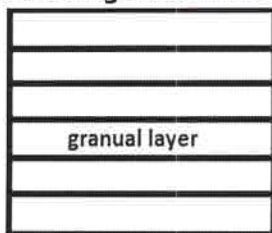


Brainspotting appears to promote coherence between the sympathetic and parasympathetic activation

The agranular isocortex (ventromedial, orbitofrontal and anterior pfc) and the allocortex are involved in ongoing regulation, the granular isocortex (neocortex) is not.

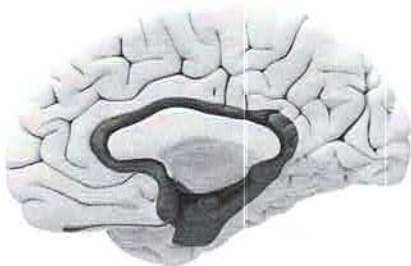


The granular isocortex has 6 layers and the 4th is granular. This contributes to higher order processing but not to regulation

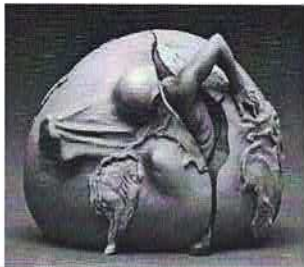


The agranular isocortex has 3 to 5 layers with no granular layer. It accordingly is highly involved in regulation

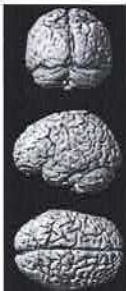
The limbic system has a cortex known as the allocortex (limbic cortex) which is highly involved in regulation



**The brain is capable of
neuroplasticity (Norman Doidge)
and neurogenesis**



**The human brain is an amazing
mechanism that is constantly
processing a remarkable amount
of information**



**The goal of every psychotherapy is to move
clients from dysregulation to regulation.**

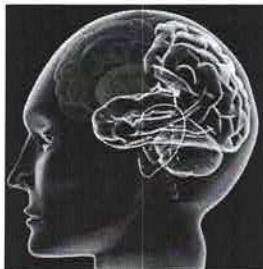


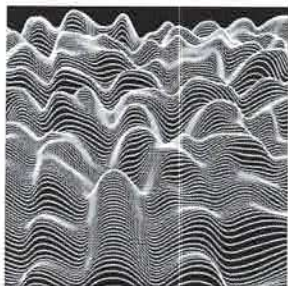
**Brainspotting aims to engage the regions of
the brain that are specifically in
neurobiological regulation and bypass the
regions that are not involved in it.**



**"What's in the brain is in the
body and what's in the body
is in the brain"**

**Every brain is a genius, containing one
quadrillion (1,000,000,000,000,000)
connections (Daniel Amen). The
subcortical brain controls all bodily
functions and is
the seat of instinct,
thought, creativity
and spirituality**



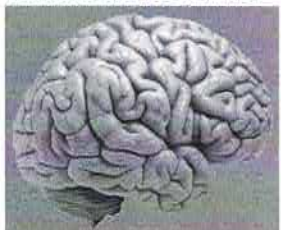


**"Neurons that fire together,
wire together"
(Donald Hebb, 1949)**



Brainspotting is a "brain-body based" relational therapy

BSP therapists think about what's going on in their client's brain all the time



In Brainspotting we often say, "it's all brain stuff"

And educate their clients about how their brain works and where the trauma and symptoms are held in their brain



A large illustration of a chess knight piece, which is shaped like a horse's head and neck. The knight is constructed from several interlocking puzzle pieces. Each piece contains the name of a person associated with the organization. The names visible include: "Clement", "Compton", "Conrad", "Corbett", "Dolan", "Egan", "Fitzgerald", "Gale", "Hart", "Henderson", "Kane", "Lynch", "Mann", "McCarthy", "McDonnell", "McGuire", "Miller", "Moore", "O'Brien", "O'Connor", "Parker", "Rosen", "Sullivan", "Tamm", "Thompson", "Wallerstein", "Weiss", "Wilkins", "Winter", "Zuckerman".

The Activation is paired up with the location of body activation when activating the presenting issue



The Resource is the area of calm or groundedness located in the body while the client is activated around an issue



Brainspots can be matched with either the Body Activation or the Body Resource





**The client is like the head of a comet
and the attuned therapist is like the
tail of the comet that follows the head**

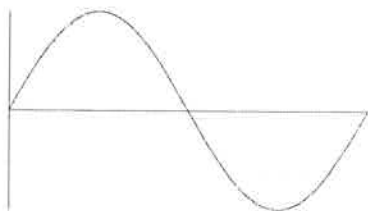
**BSP is an open, creative, integrative model.
It is designed to be adapted into any
clinical approach and therapeutic style**



There is no turf when it comes to healing

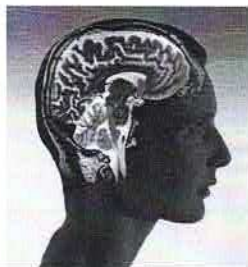
There are two models of Brainspotting

The Activation Model



The Resource Model

Brainspotting makes use of Dual Attunement which is the combined relational and neurobiological attunement simultaneously. This fits the model of Interpersonal Neurobiology (Siegel)



So despite the neurophysiological imperative of Brainspotting, it's still a highly relational process



In fact, the therapist doesn't engage less, he/she engages differently

It is the attuned, mindful, witnessing, compassionate presence of the therapist that enhances the healing



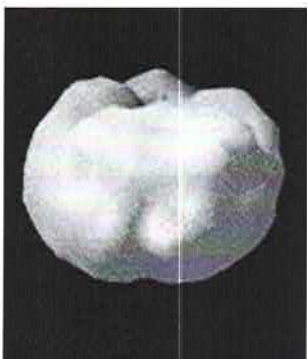
Being mindful of this presence enhances the healing

Gazespotting

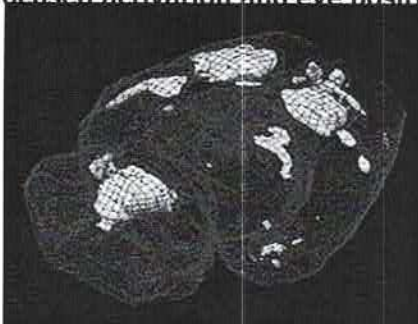


Fixed gazing while thinking or speaking is natural Brainspotting and can be harnessed

What is a Brainspot?



It is hypothesized that a Brainspot is the activity in the subcortical brain in response to focused activation and eye position.



What started as Brainspotting Grand later called Outside Window as he realized Brainspots can be located & processed from the Inside Window of the client's felt sense



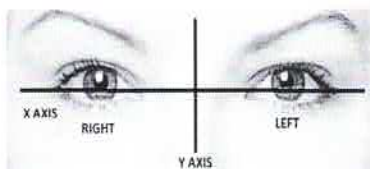
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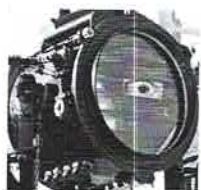


In Inside Window Brainspotting the therapist and client participate together to locate Brainspots through the client's felt sense of the highest intensity of somatic activation





In Inside Window Brainspotting eye positions are divided into two axes, X and Y. First we find the most activated (access) spot horizontally (left, center and right along the X axis) from there we explore vertically (above, at or below eye level on the Y axis)



When a Brainspot is activated, the deep brain appears to reflexively signal the therapist, beyond the awareness of the client's neocortex, that an area of relevance has been located



What does the subcortical brain perceive when we respond to a blink by pausing right at that location?



It appears to feel a sense of connection and attunement the neocortical brain doesn't understand.



Facial expressions are powerful indicators of Brainspots



These include:

**Outside Window
Brainspotting (BSP)**

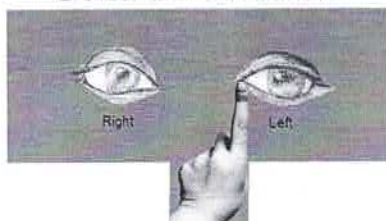
Inside Window BSP

Gazespotting

**In "Outside Window"
Brainspotting the therapist
observes the client's eyes while
tracking micro-slowly,
searching for reflexive
responses, without the
client's awareness or
active participation**

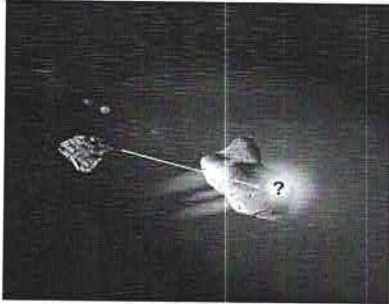


Outside Window



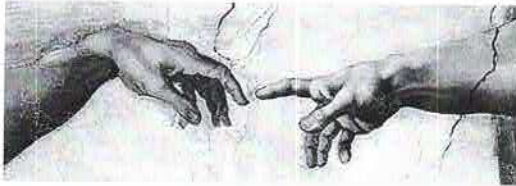
**We can observe a multitude of reflexive
responses including eye wobbles, freezes,
blinks, facial tics, brow furrowing, sniffs,
swallows, head nods & body shifting**

The clients reported that the processing was deeper and more powerful.

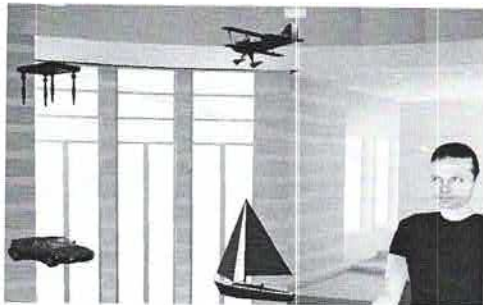


Some felt it all the way in the back of their head

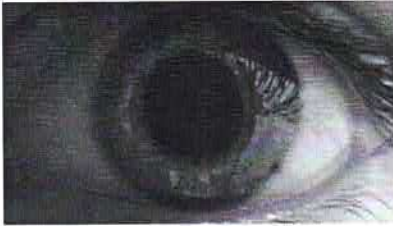
Many of his clients were therapists so they tried it out with their clients and reported similar powerful experiences



During the following years he discovered many ways of locating relevant eye positions in the field of vision



Grand began to look for these eye anomalies with my other clients and held their gaze at the point of the eye freeze or wobbles

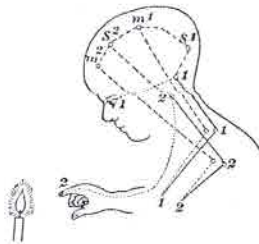


When he saw any eye reflex he held his finger in place directly in front of it so the client could maintain their gaze right at that spot



© Thomas Nelson & Publishing, Inc. 2000

Grand noticed that any reflexive response in the client revealed the presence of a Brainspot



A torrent of trauma material poured out for the next ten minutes.



Despite a year of weekly 90 minute sessions, new memories of maternal abandonment leading to parental divorce as well as countless sports injuries flowed out with intense emotion.

Grand was struck by the fact that new material emerged that had not come out in a year of intensive treatment. But Grand was even more struck that issues that had been "resolved" reemerged and processed through to a deeper level.



The next day the young skater performed a flawless triple loop for the first time.



And she never had the problem again

For information go to:

Brainspotting.com

The Brainspotting Model
Phase 1 Day 1



The discovery of Brainspotting occurred in 2003 with a 16 year old figure skater who couldn't master the triple loop. David Grand targeted the moment her jump went awry.



While she tracked his finger crossing her visual field, her eyes wobbled and froze. He instinctively held her gaze at that point.

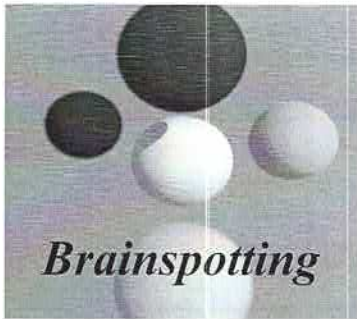
**Brainspotting: Sustained
attention, spinothalamic tracts,
thalamocortical processing, and
the healing of adaptive orientation
truncated by traumatic experience
by Frank Corrigan, David Grand
and Rajiv Raju
Published in journal Medical
Hypotheses
(May 2015)**

**Brainspotting: A
Neurobiological Hypothesis
by Frank Corrigan and David
Grand published in journal
Medical Hypotheses
(May 2013)**

**13,000 Therapists trained in
Brainspotting
55 BSP Trainers Internationally**

Argentina, Australia, Austria, Belgium, Brazil,
Canada, Chile, China, Costa Rica, Ecuador, El
Salvador, France, Latvia, Germany, Greece,
Hungary, Indonesia, Israel, Italy, Japan, Mexico,
The Netherlands, New Zealand, Norway, Panama,
Paraguay, Philipines, Portugal, Romania,
Slovenia, South Africa, Spain, Sweden,
Switzerland, Turkey, U.S., Ukraine, UK

**Journal for Psychotraumatology,
Psychotherapy Science and
Psychological Medicine
(2015)**



Brainspotting

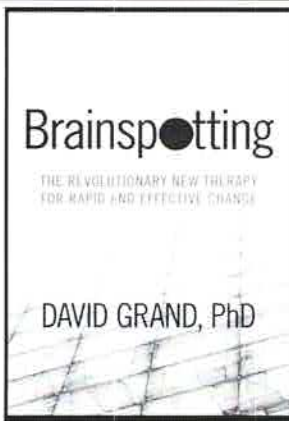
"Where you look affects how you feel"

**Released
by
Sounds
True
2013**

Brainspotting

THE REVOLUTIONARY NEW THERAPY
FOR RAPID AND EFFECTIVE CHANGE

DAVID GRAND, PhD





Sandy Hook Tragedy

NEWTOWN-SANDY HOOK
COMMUNITY FOUNDATION, INC.

Report of Findings from the Community Survey, September 2016

The mission of the Foundation is to devote itself to furthering and supporting operations and activities which address the short-term and long-term unmet needs of individuals and the Newtown community arising from the tragic events at Sandy Hook Elementary School on December 14, 2012.

<http://www.nshcf.org/wp-content/uploads/2016/09/2016-NSHCF-Community-Assessment-Report.pdf>

Brainspotting Training Manual – Phase One

DAY 1

AM

Introduction: “The Story of Brainspotting” (including PowerPoint)

PM

Outside Window

Demo and Practicum

DAY 2

AM

Inside Window

Demo and Practicum

PM

Gazespotting

Demo and Practicum

DAY 3

AM

Resource Model of Brainspotting

Demo and Practicum

PM

Summary and Conclusion of Training

Brainspotting

Brainspotting Trainings Inc.

Phase One

Training Manual

David Grand, Ph.D.
Developer and Trainer

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