American Journal of Dance Therapy (2020) 42:296–310
https://doi.org/10.1007/s10465-020-09337-4

Dynamic Equilibrium: Engaging and Supporting Neurophysiological Intelligence Through Dance/Movement Therapy

Kalila B. Homann[1,2]

Accepted: 24 October 2020 / Published online: 13 November 2020

Abstract

In dance/movement therapy, methods are based on the experiential process of embodiment and founded on the understanding that the body deeply informs consciousness. Clinical interventions are effectively and flexibly employed with a wide range of populations across the developmental spectrum. Dance/movement therapy interventions involve shifting attentional states and moving in deeper relationship to self and others; clinical practices include attuned interoceptive sensing, somatic awareness, interactive dance, and authentic movement. This article considers dance/movement therapy approaches in light of affective neurobiology research on vagal and biochemical regulation, interoception, empathy and attunement, memory and affective systems, and brain lateralization. It includes current research, clinical vignettes, and narrative discussion regarding new theoretical insights and treatment applications.

Keywords Dance/movement therapy · Neuroscience · Polyvagal regulation · Interoception · Empathy · Attunement · Brain lateralization

Introduction

Dance/movement therapy lives and breathes in the neurophysiological intersections between mind and body. Methods and approaches are based on the experiential process of embodiment and founded on the understanding that the body deeply informs consciousness. Dance/movement therapy approaches involve shifting attentional states and moving in deeper relationship to self and others; clinical practices include attuned interoceptive sensing, somatic awareness, embodied expression of

✉ Kalila B. Homann
kalila@embodiedneurobiology.com

[1] Embodied Neurobiology Alternate Route Training Program, Austin, USA

[2] 1310 South 1st St., Suite 200, Austin, TX 78704, USA

affect, interactive dance, creative expression, and authentic movement. Unique to dance/movement therapy, specific interventions are co-created in present moment therapeutic collaboration with the participant(s), whose input influences the timing, structure and focus of what occurs in treatment. This relational co-reflection of both therapist and client following an experiential process strengthens both the therapeutic relationship and the effectiveness of treatment. Clinical interventions are effectively and flexibly employed with a wide range of populations across the developmental spectrum (Chaiklin & Wengrower, 2009; Levy, 1995; Payne, 2017).

This article considers dance/movement therapy (DMT) approaches and interventions in light of current neuroscience research on 1. polyvagal and biochemical regulation (Porges, 2011; Carter, 2014); 2. interoception (Craig, 2009; Critchley, Wiens, Rotshtein, Ohman, & Dolan, 2004; Gallese, 2016); 3. empathy and attunement (Decety, 2011; Hart, 2008); 4. memory and affective systems (Ginot, 2015; Siegel, 2012); and 5. brain lateralization (Gotts et al., 2013; McGilchrist, 2009). Case vignettes are introduced to illustrate the neurobiological impact of specific DMT interventions, and a discussion of the neurophysiological processes engaged based follows each example. New insights on current research and possibilities for future inquiry are explored in the conclusion. The intention of this examination is to move toward a more nuanced understanding of the potential of dance/movement therapy to impact implicit processes underlying consciousness.

This may help to explain the potency of dance/movement therapy, which engages neurophysiology at the heart of human vitality, motivation and self-agency.

Body/Mind Origins of Dance/Movement Therapy

Dance/movement therapy's roots include rich fertilization from modern dance, somatic education, and cross-cultural influences from nonwestern societies that inherently presume mind/body cohesion (Cohen, 2018; Dosamantes-Beaudry, 1997; Kawano & Chang, 2019). Eastern cultural practices such as yoga and acupuncture, and community healing from indigenous communities around the globe incorporate integral awareness of mind/body interconnection (Campbell, 2019; Montiero & Wall, 2011) and have inspired and informed DMT approaches. Drawing from these varied sources, the multifaceted foundation of DMT's rich and dimensional approach to embodied therapy emerged.

The field of psychology and the practice of psychotherapy work to develop effective ways to impact the mind's capacity to heal, change, and grow. Current research now suggests that for the mind to transform, the body needs to be included in the process (Fogel, 2009; Levine, 2010). Engaged interactions within a contingent and relational sociocultural context are essential to brain development and form the neurological underpinnings of emotional awareness and the capacity for a subjective sense of self (Damasio, 2010; De Jaegher & Di Paolo, 2007; Decety, 2011). Siegel (2012) illustrates this evolving understanding: "The mind is an embodied and relational process regulating the flow of energy and information" (p. 3).

Since its origin over fifty years ago, dance/movement therapy has been grounded in the understanding that the functioning of mind/body is integrally connected.

"The unique premise of dance/movement therapy is that psychological and somatic constructs are truly identical, that one necessarily implies the other, and that it is merely the perspective or 'point of entry' that differentiates them. …modifying any of these elements, by necessity, leads to changes in the others" (Cohen & Walco, 1999, p. 34).

This foundation places DMT at the forefront of current interest in embodied approaches in psychotherapy. DMT's unique emphasis on experiential engagement of the body has significant therapeutic implications, engaging the mind from the inside out. Movement engages deep systems of biochemical regulation, facilitates arousal and rest, and stimulates the core of self-perception at the neurological intersections of emotional, sensory, and cognitive processes. Five case vignettes are now introduced illustrating specific interventions, with a discussion of the neurophysiological processes that can be engaged through DMT approaches following each example.

DMT Case #1: Polyvagal Regulation through Embodied Interoception

> Rose, a new patient, recently began extreme coughing as she followed her breath with awareness for the first time. It was hard for her to stop, and she voiced her frustration "this happens all the time at work - I hate it - it makes me feel so helpless when I need to engage with customers. I feel trapped."
> As her therapist, I invited Rose "to soften all the muscles and bones that don't need to be working into the support of gravity". She was able to then return to the breathing exploration, following her breath all the way down to rest for a moment in the pause at the bottom of the exhale. When she paid close attention to the sensations and experience inside her body (interoception), Rose discovered she was able to sense exactly where her breath began. Rose could then relax her diaphragm, and stopped her coughing.
> With the embodied experience of impacting something that had previously felt uncontrollable, Rose's mood shifted from frustration to curiosity and interest in her own experience. Before she left the session, Rose decided to try the same process of tuning into her breathing at work between sessions. The next week she reported her discoveries with some excitement "It worked! And nobody can see me doing it - it's like a secret power! Breathing is so different when you bring your mind to noticing what you are doing".

In DMT, moving with awareness and in empathic relationship begins in the first session. For Rose, a perceptual shift began simply by bringing conscious attention to her breathing. The breath is a fundamental embodied resource which can become available through a shift in awareness. Breathing involves taking in nourishment from the environment on the inhale and releasing what is no longer needed by the body with the exhale. As this moment occurred in the session, Rose's emotional shift from frustration to curiosity was significant. Rose impacted something inside her own body that previously felt uncontrollable. This embodied experience provided a metaphor that served as an anchor to the therapeutic process that subsequently unfolded for Rose. Instead of controlling and limiting her experience by

constricting her breathing, she became able to be with her experience and allow herself to sense her own vitality, the flow of life-within her own body. Breathing with conscious awareness, engaged in DMT, is an enlivening and grounding resource that bridges fundamental neurological systems which are engaged from the moment of our birth. Dance/movement therapy (DMT) approaches can evoke physiological and psychological state changes that have a developmental resonance and facilitate deep access to implicit memory and emotion (Bentzen, 2015; Caldwell, 2018; Homann, 2010a, b).

Polyvagal Neurophysiology: Cellular Origins of Body/Mind Relationship

In utero, over just nine months, six trillion cells organize into organs, lungs, brain, heart…orchestrating dynamic cellular relationships that form and reform within us throughout our lives. The developing embryo creates a yolk sac during the first four weeks of gestation. This is gradually absorbed into the core of the embryo and transforms into the organs and the intestines. This primary, *gut* intelligence, the enteric nervous system, forms the capacity to take in nourishment, release what is no longer needed, and generate the energy needed for engaging in life. A second neurological system arises from a parallel but distinct layer of originating cells forming the spine, brain, and skin, creating the ability to sense the environment and organize a response.

The enteric (body) nervous system and the central (brain and spine) and peripheral nervous systems communicate both biochemically and neurologically throughout life (Cohen, 2018). A primary infrastructure of two-way communication connects them through the 10th cranial (vagus) nerve. Information travels from the body to the brain through the predominating afferent fibers, establishing foundation for the brain's perception of the body. The vagus nerve also determines the balance and blood flow between the sympathetic (arousal) and parasympathetic (resting and restoration) branches of the nervous system (Porges, 2011). Flexible and adaptive responsiveness to the environment involves resilient vagal shifts between sympathetic arousal and parasympathetic regulation, between action and rest. DMT can help to build conscious awareness and neurological scaffolding for these implicit regulation processes.

DMT Case #2: Activating Psychobiological Regulation Systems

The following case was shared by a therapist and dance/movement therapy student (whose second language was English), who worked with a young female refugee seeking asylum in Canada after losing a baby due to a forced abortion.

> Our movement work began once she disclosed she was pregnant again, and she was having problems with the new pregnancy emotionally and physically - the new baby was not growing. She initially arrived to the sessions anxious and scared, and we began with breathing. As she became more comfortable, we worked with dance using movement metaphors such as "making her belly bigger and bigger" and "dancing the waters". She danced to music, and especially

> responded to the soft cello sounds of Yo-Yo Ma. After a few weeks, I offered her a piece of baby pink tulle which she danced with as "her baby girl". She rocked it, talked to it, and danced with it.
> After a few months, she was feeling better, and we did movement and dance to support breast feeding (she could not breast feed her first baby). For this, the "seed words" were milk, warm, flooding, river. She imagined "moving the milk" as we danced. When the baby girl was born, she invited me to the hospital to see the baby. It was emotional, and very moving - no one in the room could translate, but we shared gestures, held hands, and she gave me the baby to hold. It was healthy and pretty big! She repeated the gesture of the growing breast, and we both laughed. She was able to breastfeed. (M. Carbonetti, personal communication, August 2014)

This case narrative illustrates how implicit biological processes can be activated and supported through dance/movement therapy. Due to the client's past trauma, her pregnancy activated a deep stress response. Ongoing environmental stress impacts the brain and the body and can negatively impact the immune system, emotional health, and cognitive functioning (Campbell, 2019; El-Sheikh, Erath, & Keller, 2009; Hart, 2008). The therapeutic DMT movement interventions emphasized human interaction and a facilitated a felt sense of connection to the patient's own body in an emotionally safe environment. Attuned, empathetic movement resulted in positive mood changes, stress reduction, and relaxation for the patient. The psychological shift from a focus on past trauma and pain to pleasure in her growing body supported a transition in the patient's initially precarious pregnancy. This re-engaged healthy functioning of psychobiological regulation systems of mind and body (Bentzen, 2015; Koch, Holland, Hengstler, & Van Knippenberg, 2009).

The Psychobiology of Connection

The body's neural, biochemical (hormonal and gastrointestinal), and immune systems create overlapping and interdependent dynamic infrastructures within the body.

> Your brain is extremely well integrated with the rest of your body at a molecular level…Imagine each of these messenger systems possessing a specific tone, humming a signature tune, rising and falling, waxing and waning, binding and unbinding, and if we could hear this body music with our ears, then the sum of these sounds would be the music that we call the emotions. (Pert, 1999, p. 186)

Stress can impact bioregulatory systems, such as vagal regulation, hormonal shifts, and the hypothalamic–pituitary–adrenal (HPA) axis (Decety, 2011; Schore, 2009). In the HPA stress response system, the hypothalamus stimulates the pituitary to activate the adrenals to release cortisol into the bloodstream, supporting the sympathetic nervous system to activate and respond. There is a powerful inverse interaction between the HPA axis, which is activated in stress, and oxytocin, which is stimulated when we experience a feeling of safety and pleasure in connection with others (Carter, 2014). When we reach out to others for safe connection, our stress

levels drop and a sense of well-being is reestablished. The HPA axis recalibrates cortisol levels which drop in response to a biochemical release of oxytocin in the bloodstream (ibid.). Dance/movement therapy can create experiences of embodied connection, impacting these powerful, implicit psychobiological regulation systems.

DMT Case #3: Resourcing Support through Sensory Awareness and Engagement

Pearl began individual adjunctive DMT treatment on the recommendation of her primary therapist, who followed a hunch that Pearl's active interest in dance could become a potential psychological resource for her. Pearl was struggling with a powerful and persistent depression that had resulted in her leaving college and returning home. Pearl managed her shame, disappointment, and anger about her life with complex defensive strategies that included gaming and staying up late. One morning, she arrived looking disengaged and sleepy, and said "I hate Monday mornings".

I inquired, "Can you show me in your body? Can you dance this feeling you have on Monday mornings?" Pearl demonstrated an awkward, seemingly painful (weight on her elbows) transition from the floor to standing. She then spoke with affect and described her experience in more detail, "I feel as if I am trying to move out from under a pile of heavy blankets- it takes too much time and effort to get back (into the world). I have to navigate all the bad thoughts that are waiting for me - it's paralyzing".

I wondered out loud, "Is the floor strong enough to hold you?"

Pearl responded, "I'm scared that my depression is too deep".

I offered "Would you like to try? Give it your full weight, and see whether it is strong enough to support you and any feelings you might be having".

Pearl explored this possibility, and I could see her weight softening into the support of gravity. She rested for a number of movements, breathing fully. When she began to shift her weight, I asked "What would happen if you approach the transition to standing with your experience as a dancer - from a simply physical perspective – is there another way to come to standing?" This time Pearl lay on the floor, stretching her body long, with movement traveling through the core of her body to include her legs, ankles, and feet the rolled to her side tucked her toes under and after a moment on all fours, transferred her weight to her feet, and pushed into the floor, rolling up to standing through her spine, one vertebrae at a time. She looked around the room and said.

"Now I feel more here, and less in my head".

In this example, Pearl engaged her attention and reestablished conscious awareness of her body to support a perceptual shift. This helped her disengage from her powerful shame and anxiety. Throughout the following week, she practiced this way of getting up whenever she could remember to do so, and reported "I tried it when I felt like it was going to be a rough morning, and it helped. It was a relief to have something active I could do when I felt like I was going under." For Pearl, the simple practice of getting up while actively engaging a

conscious awareness of being in her body helped to disrupt the negative cognitive looping and re-engaged a sense of being more in charge of her experience and present in the moment.

Perceptual and Emotional Shifts supported by Sensory Awareness and Engagement

Perceptual shifts, stimulated through cognitive awareness directed to the body, can be a helpful component of treating chronic anxiety and depression through dance/movement therapy (Bentzen, 2015; Caldwell; 2018; Chaiklin & Wengrower, 2009). Throughout life, the brain develops through embodied interactions, and the first cranial nerves to myelinate in early development are those that relate to movement (Cohen, 2018). Infants are born with a capacity to yield and soften into support, and an ability to stiffen muscles in response to the world in discomfort. They can mold into being held or push away, differentiating of their own volition. Their worlds expand through active movement - reaching, touching, and tasting. Curiosity ignites their reflexes and increasingly capable bodies begin to navigate with complex variations on an initial repertoire combining yielding and pushing, reaching and pulling. Engaging force through pushing into the earth creates a foundation for standing on one's own two feet.

Throughout this process, the body is mapped and perceived simultaneously in the brain in many areas, which are in constant reciprocal communication. Each moment, the brain senses the environment through the body and coordinates an embodied response. This requires complex collaboration of over a million neuronal interconnections integrating sensory, emotional, and cognitive processes.

As the mind and the brain develops, sensation underlies perception (Gallese, 2017). Most of the brain's activity is devoted to preconscious integration and smooth coordination of auditory, visual, and kinesthetic information. Multiple specific areas of the brain are specialized for different types of information from/to the body. The thalamus is the relay station of sensory processing, receiving information from the external sensory environment and sending it to the appropriate cortical association cortex - the visual, auditory or somatosensory, which enables conscious perception experience. The thalamus is nestled into the central area of the brain, in close proximity to the hippocampus and the amygdala, facilitating coordination and integration of sensory, emotional, and cognitive processes (Aggleton & Christiansen, 2015; Ammaniti & Gallese, 2014). The nearby insula, the association cortex for interoception, enables the capacity to sense inside the body (gut sensing), which coordinates with exteroceptive sensory data (Craig, 2009; Damasio, 2010). Sensory information is linked to appraisal and motivational systems through the cingulate gyrus and nucleus accumbens (Hart, 2008). In DMT, choices experienced and expressed through intentional movement engage agency and support neurophysiological connections between self-motivation and volitional action.

The integration of cognitive awareness and self- attuned physical (sensory) engagement supports emotional equilibrium.

DMT Case #4: Engaging Attachment through Embodied Attunement

> I met Blanche in a large gym. Her caregiver walked her up from her residential cottage to the gym, the center of much of the activity provided for the residents of the state school for the developmentally delayed. Blanche ignored us as she walked past, halfway on her toes, descending to the floor in a graceful motion about twenty feet away. She lay on her back and began an intricate, repetitive motion with her hands. This movement, itself a dance between her left and right hand, was almost a waltz. It became my bridge to her over the next weeks and months.
>
> I began working with Blanche twice a week. My initial strategy was to enter Blanche's space as unobtrusively as possible, lie down near to her, and begin to build a bridge to her through mirroring her ritualized hand movements. If I got it exactly right, I was sometimes rewarded with a glance, otherwise she simply moved her position to block me out. We repeated this process many times before she acknowledged my existence. One afternoon, as I joined her movement she looked at me directly for a few long seconds. It was her first real recognition of me.

In this DMT example, nonverbal attunement was a core component of the highly physical and embodied process of building a relationship with a patient who had experienced severe early attachment trauma and had cognitive impairment. The dance/movement therapist consciously worked to engage attunement through mirroring, prosody, and synchronicity of movement throughout the sessions. DMT supported a developing perception of safety and trust that was able to sustain and transfer to new relationships (Homann, 2010b).

Attuned Embodied Interaction and the Developing Experience of Self

When we are born, the right hemisphere of the brain is more fully myelinated (myelination is a process which coats neurons in a fatty substance that facilitates efficient flow and conductivity) and is connected directly to sensory input from the body (Damasio, 2010; Schore, 2012). Embodied experiences form our initial sense of self and are emotionally processed and cognitively integrated primarily through the right hemisphere (Decety, 2011; Schore, 2012). Our early attachments with caregivers are highly physical (Hart, 2008; Stern, 1985), and the neurophysiology of the brain's structure during infancy is shaped by emotional and sensory experiences in the context of embodied relationships (Bentzen, 2015; Kiefer & Trumpp, 2012). As we develop, the right side of the brain continues to be deeply connected to the body, and implicitly informs our perception of what is happening in the present (Hart, 2008).

In early development, our minds are neurologically co-created through the valence of interactions with our caregivers. Arousal regulating, limbic and cognitive appraisal systems are formed through a myriad of moments. Daily physical and emotional interactions - the quality of holding, the tenderness of touch, the rhythm of resting and waking form templates of qualitative, implicit knowing about the

world around us and what we can expect when we engage with it. Once established, these patterns of expectation and experiencing the world become deeply rooted, and implicitly reinforced by one's own behavior. As Stern (1985) mentions, "This biologically designed choreography will serve as a prototype for all his later interpersonal exchanges" (p. 16). Attunement to embodied process creates a perceptual shift, a reengagement with a biologically based sense of our existence, a sense of *going on being* which Winnicott (1971) called the "True Self" (p. 141). Gentle connection with another engages the positive, life affirming neurobiology of early attachment, stimulating oxytocin and dopamine (Carter, 2014), and an implicit sense of well-being in the present. Dance/movement therapy can provide foundational experiences which re-choreograph internalized attachment paradigms, opening new relational possibilities (Bentzen, 2015; Caldwell 2018). Over time, self-initiation of relational attachment behaviors can increase as changes in right-brained regulatory systems are internalized and incorporated (Schore, 2012).

DMT Case #5: Stimulating Conscious Access to Implicit Memories

In the DMT training group, participants explored embodied memories of siblings (or a close family member) in an experiential exercise. This began with bringing memories to mind, through engaging the different senses – how did your brother (sister) look, move, smell, and sound? A seven minute authentic movement period allowed time to explore spontaneous movement "within the imagined body" of a brother/sister - how they walked, their typical expressions, and what it might have been like to "be in their skin." After individual time for writing and drawing following the movement, the group came together to speak about their experiences.

Joe spoke about his experience: "It was intense and surprising to me how real this felt in my body. My brother and I have been estranged for almost 20 years and I haven't given him much conscious thought for a long while. The memories are painful - I mostly remember him being cruel." Joe paused for a long moment, took deep breath, and continued, "As we began the experiential, I was terrified. My body was drawn in – I heard and smelled him - and I dropped into it. I imagined myself fully inside my brother's skin as I embodied him coming to the breakfast table…he never spoke in the morning…I felt 'his'tension, anger…and also - fear. Now I understand - from the inside out - that he was scared, too. Joe wept softly as he continued "Being the oldest, he got the worst of it (abuse) from our dad. I feel so sad for us both….as I sat with myself after the movement, I remembered a time he protected me from some kids down the street who were harassing and bullying me. I remembered how proud of him and protected I felt - for that brief moment. Maybe he both loved and hated me. Somehow that makes it easier."

In DMT, implicit memories can become available to consciousness when subtle attention and awareness to the body is engaged through the senses and specifically structured movement exploration. In this example, the experiential process stimulated memories that were not previously consciously accessible to Joe. Joe described

his experience as very real to him, as if it were happening in the present, and he felt his grief deeply as he spoke, indicating strong right hemisphere activation (McGilchrist, 2009; Schore, 2012). DMT approaches can facilitate more fluid access to memories which can then be consciously re-integrated into a deeper and richer narrative of self (Chodorow, 2009; Pallaro, 1999; Stromsted and Seiff, 2015).

Body, Emotion, Memory: Implicit and Explicit Systems

Our minds learn through multiple sensory, emotional and cognitive recording systems processed in interconnected but distinct areas of the brain, which are specialized for different types of information (Avery, Dutt, & Krichmar, 2013, 2014). Sensory experiences orient us in the moment and are filtered through the lens of similar past encounters. The cerebellum records and stores procedural memory - learned movement patterns including walking, driving, and skills such as gymnastics or piano, any movement we *know* by heart. The fusiform gyrus is specialized for facial body recognition, as well as word (form) and color recognition. The amygdala tracks and records emotional relevance, which impacts recall - we tend to remember information that we deem emotionally significant (Hart 2008; Damasio 2010). The rhinal cortex, which functions as a *gateway* to the hippocampus (Fernández & Tendolkar, 2006), is deeply related to the body's sensing of self in space. The hippocampus has discrete regions that process and integrate spatial location, sensory cues and contextual information along with narrative content (Burgess, Maguire, & O'Keefe, 2002; De Jaegher, & Di Paolo, 2007; Fogel, 2009).

What we experience as conscious memory is a layering of neurological recordings that we perceive as a cohesive whole. Each experienced moment is so complex only some of it becomes encoded into conscious memory (Ginot, 2015). When something is familiar, deeply known, it recedes into the realm of implicit awareness and forms the background of our consciousness. This creates a contextual backdrop for what we experience as reality, shaping perception without conscious awareness (Damasio, 2010).

DMT can activate implicit memory systems through conscious embodiment, with powerful impact for individuals who are ready and motivated to work at this deeper level of self-engagement. When the body is engaged, unresolved emotional experiences can be re-membered within a felt experience of being safely connected to others in the present, contributing to psychological healing. DMT offers a range of clinical entry points which are not predetermined, but evolve organically in the process of therapy, leading to in-the-moment surprises and discoveries.

Brain Lateralization: Bridging the Corpus Callosum

Lateralization in the brain develops over time, resulting in simultaneous and distinct ways of perceiving within a single mind (McGilchrist, 2009). The right cerebral hemisphere has close access to body sensing structures; it's attention is spacial, holistic, and integrative. The right brain attends to and remembers nonverbal

communication, stores visual material, creates images and symbols, and regulates intense emotional processes (Damasio, 2010; Decety 2011.) This attentional style is shaped by neurons that have far-reaching interconnections within regions of the brain that link emotional, sensory and cognitive processes. This implicitly helps to shape a sense of context and subjectivity and creates a sense of meaning in experience (McGilchrist, 2009; Schore, 2012).

Language integrates the functioning of both brain hemispheres. In early development, speech originates in embodied experience, as gestures and tones are paired with words to communicate meaning (Johnson, 2007). Language acquisition is inherently relational as we learn to communicate through words to make our experience known to others. Language shifts to primary neurological dominance in the left hemisphere by adulthood (Johnson, 2007; McGilchrist, 2009). Language development accompanies the cognitive ability to perceive that we are independent, individual, and supports explicit consciousness, including our ability to shape and construct our worlds.

Neurons in the left hemisphere are specialized to support specificity, focus, and discrimination, and enable our ability to mentally travel through time, to calculate, and to strategize. When life experiences and social learning discourage empathy and collaboration and emphasize competition and abstraction, the left hemisphere becomes dis-connected from right- brained subjective perception. This can result in separating words and feelings, and psychological struggles between needs for defensive control with a capacity for open and receptive perception of the present moment.

The mind's dynamic complexity is an alchemical balance of structure and flexibility that can devolve into extremes of rigidity or chaos. An illusion of disconnection from the body becomes possible as the left hemisphere matures (Damasio, 2010). This tendency to subjectively dis-connect from the body in times of stress is one of the psyche's protective mechanism for dealing with trauma (Harris, 2009; Levine, 2010). When defensive coping strategies become chronic, they limit access to the experience of one's own vitality, curiosity, and engagement in life, creating psychological vulnerabilities. This can contribute to chronic anxiety and related cognitive distortions (Ginot, 2015), which have become epidemic in modern society. As Todd (1937) explains, "Man alone can be afraid all the time of what has happened, of what is happening, of what may happen. He thus interferes with the wise workings of his body…and prolongs his conflicts even after the danger is past" (p. 274). The implications of this fragility include our capacity to de-humanize and assert power over those perceived as other (De Jaegher & Di Paolo, 2007; Magee, 2019; McGilchrist, 2009).

Psychological healing and well-being involves reestablishing a vital equilibrium within a relationally embodied mind. Schore (2012) clarifies, "Change is not so much about increasing the left (hemisphere's) reasoned control over emotion, as it is the expansion of affect tolerance and regulation of the right- lateralized emotional brain…" (ibid, p. 205). The body is perceived in the mind by each brain hemisphere in different ways, through the right as subjective *I* and the left as objective *it*. Movement and sensory perception is cross-lateral—the right side of the body is perceived and engaged by the left hemisphere and vice versa. Whole body movement crossing

the midline integrates the active functioning of both hemispheres. Dance/movement therapy reengages the right hemisphere, and stimulates bi-hemispheric neurological activation by engaging both full body movement in relational experiential process. McGilchrist speaks to the paradigm shift this invites:

> Empathy and intersubjectivity as the ground of consciousness, the importance of an open, patient attention to the world… the implicit or hidden nature of truth, the emphasis on process rather than stasis, the journey being more important than the arrival, the primacy of perception, the importance of the body in constituting reality. (McGilchrist, 2009, p. 177)

Conclusion

Dance/movement therapy supports neurological integration across multiple channels, and positively impacts perceptual processing at the limbic and cortical levels, as evidenced by increased interaction, eye contact, and positive affect changes in participants (Homann, 2010a; Levy, 1995). Novel, emotionally significant information is neurologically charged, engaging conscious neocortical functioning (Damasio, 2010). It engages the anterior and posterior cingulate gyrus, related to social attachment behavior modulation and play, the orbitofrontal cortex, responsible for monitoring the impact of one's actions on others, and the dorsolateral prefrontal cortex, involved in planning actions. "The greater the interaction between the interlocking systems that guide behaviors, the greater ones instinctive capacity to adapt to changing situations and disconnect from old learning and memory structures" (Ginot, 2015, p 167).

As a therapeutic approach, DMT offers versatile and effective interventions with a wide range of populations across the developmental spectrum. DMT's effectiveness in addressing a range of psychiatric disorders, learning challenges, and somatic difficulties and efficacious treatment with eating disorders, patients with Alzheimers and children and adults with cancer has been well documented (Chaiklin & Wengrower, 2009; Cohen, & Walco, 1999; Levy, 1995). DMT is also impactful in depth psychotherapy and as a training resource for clinicians who are working to engage and develop consciousness through the body (Pallaro, 1999).

Successful and inspiring DMT interventions include implementation with refugees and trauma survivors (Gray, 2008; Campbell 2019), and work with child soldiers and victims of war (Harris, 2009; 2019). The use of DMT to positively impact social systems by engaging embodied empathy and decreasing implicit bias and projective distortion based on fear has shown early success should be further studied (Gordon-Giles & Zidan, 2009). Further research into these applications of DMT is relevant and necessary as the mental health and physical well being of our society is increasingly compromised by reactivity, racism, and bias (Kawano and Chang, 2019; Magee, 2019; Trent, Dooley, & Dougé, 2019).

Dance/movement therapy interventions organically generate neurophysiological state shifts and facilitate psychological change (Caldwell, 2018; Homann, 2010a). Neurophysiological activity beneath the surface of consciousness remains at the

heart of our vitality, our motivation and our capacity for choice (Craig, 2009; Damasio, 2010). Movement and experiential process involves full, embodied participation in the present moment. Dance/movement therapy creates a positive connected social context which can reestablish a more flexible foundation for perceptual processes, rooted in sensory experience. This engages the whole brain, disrupts habitual patterns and cultivates more flexible and aware responses to current circumstances. The ability to impact one's own physiology, emotional resilience, and cognitive functioning through chosen engagement and active awareness has profound implications. Dance/movement therapy supports personal and collective psychobiological health and vitality through embodied, creative engagement in the dynamic equilibrium of life.

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Kalila B. Homann MA, LPC-S, BC-DMT is the founder/program director of Embodied Neurobiology. She teaches and supervises at the graduate and postgraduate level in dance/movement therapy and expressive arts therapy, and maintains a clinical dance/movement therapy practice in Austin, Texas. She has published numerous articles and chapters on the topic of dance/movement therapy and neurobiology, and her courses and workshops are presented nationally and internationally. She received the 2018 Excellence in Education Recognition Award from the American Dance/Movement Therapy Association Board of Directors in recognition of her significant contributions to education in the field of dance/movement therapy. She can be reached at kalila@embodiedneurobiology.com.