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The role of imagery, touch, and interoception in activating cortical and subcortical circuits through somatic movement practices: A science-based appraisal

Chair: Amit Abraham

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Somatic practices facilitate a wide range of cortical and subcortical brain circuits. This symposium brings together experts who will discuss four somatic-related topics—visual imagery, touch, movement, and interoception—while discussing their neuro-cognitive mechanisms and presenting innovative scientific ideas for capturing the multisensory nature of somatic practices.

Somatic, or consciously sensed, movement and cognition are inherently linked. As such, somatic movement is associated with neuroplasticity, including multiple somatosensory mechanisms. In this symposium, four experts within the field of somatic practices will present scientific literature and clinical experience regarding past and current research as well as new research paths. The goal of the discussions will be to elaborate the multidimensional nature and effects of mindful movement on motor and non-motor aspects of human performance.

The field of somatic movement encompasses a range of educational and therapeutic systems and approaches (e.g., the Alexander Technique, the Feldenkrais Method, Body-Mind Centering, the Franklin Method, and Dynamic Embodiment.) Such approaches seek to cultivate conscious awareness in movement in order to improve and maintain human health and well-being. Accordingly, the underpinning mechanisms of somatic approaches include a dependence on numerous neuro-cognitive circuits, many of which are far from being fully understood.

With recent developments in fields such as embodied cognition and affective and relational neuroscience, it has become more possible to get a glimpse into, and even begin to correlate, the ways in which disparate conceptual frameworks of somatic movement systems share a common scientific framework. That said, it seems that although current scientific research conducted within the field of somatics indeed reveals parts of the mystery, significant areas and fields remain unknown. Therefore, fine-tuning research goals and paths and formulating clinical insights into research questions are inquiries that seem to be warranted steps towards pushing the field of somatics (movement) forward.

This symposium's four panelists are expert in specific areas of somatic and movement practices: the Franklin Method, Dynamic Embodiment, BodyMind Centering, and the Feldenkrais Method. These panelists will share

their unique clinical and research expertise in their areas of somatic practices and their thoughts regarding promising research paths. That, in light of current state-of-the-art research findings and practical insights. First, Dr. Amit Abraham will present his research into motor imagery and dynamic neuro-cognitive imagery (DNI; aka "the Franklin Method") in dancers and people with Parkinson's disease, while focusing on visual imagery and associated dilemmas. Next, Dr. Martha Eddy will present a cross-case study of the pioneers of somatic movement and the neural mechanisms involved in interoception inherent to the mindful movement practices these pioneers originated. Next, Elinor Silverstein will discuss how touch and movement may impact parasympathetic nervous system response to stress. Finally, Elisabeth Osgood-Campbell will compare and contrast brain structures and cognitive benefits associated with physical exercise and meditation. From there, Dr. Osgood-Campbell will propose a research project to assess similar and different mechanisms associated with somatic movement practices.

Presenter Information:

Chair: Amit Abraham PhD, Emory University Department of Medicine, Division of General Medicine and Geriatrics; The University of Georgia, College of Education, Department of Kinesiology.

Presenter 1: Amit Abraham PhD, Emory University Department of Medicine, Division of General Medicine and Geriatrics; The University of Georgia, College of Education, Department of Kinesiology.

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Title: Visual Mental Imagery: Beyond What the Eye Can See

Presenter 2: Martha Eddy PhD, St Mary's College, Moraga, California; Montclair State University, Montclair, New Jersey; University of North Carolina – Greensboro. drmarthaeddy@gmail.com

Title: Neural Mechanisms Associated with Interoception and Movement in Somatic Practices: Past and Future Studies

Presenter 3: Elinor Silverstein, Guild Certified Feldenkrais Practitioner®, elinor.silverstein@gmail.com

Title: What Happens in Vagal Doesn't Stay in Vagal: The Feldenkrais Method's® Impact on Parasympathetic Response through Touch and Movement

Presenter 4: Elisabeth Osgood-Campbell, MA, EdM, Harvard Graduate School of Education.

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Title: Somatic Movement, Physical Exercise, and Meditation: Exploring Similar and Distinct Brain Structures and Cognitive Benefits

Presentation 1: Amit Abraham

Visual Mental Imagery: Beyond What the Eye Can See

Mental imagery (MI) is the fundamental human cognitive skill of creating and using mental images and metaphors associated a wide variety of stimuli, such as the smell of a rose, the sound of the ocean, the sight of a sunset, or the sensation of floating in the air. Visual imagery (VI) is the subtype of MI that focuses on a visual aspect of an image, such as when athletes see themselves crossing the finish line first. Used widely with both sport and neurological populations for improving various aspects of performance, VI exhibits multiple similarities to actual visual perception. Specifically, overlapping brain activity between visual perception and VI has been shown to reach up to 90%, in that deficits in the former have been shown to result in corresponding deficits in the latter.

Accumulating scientific evidence points to the beneficial effects of MI on somatic?both motor and non-motor?performance in various populations: from elite dancers to people with Parkinson's disease. However,

further understanding of the complexity and multi-faceted nature of VI could benefit both research and clinical-rehabilitative purposes.

Motor Imagery and Dynamic Neuro-Cognitive Imagery (DNI; aka “The Franklin Method?”) are two somatic MI approaches that rely on VI for enhancing self-awareness, retraining posture, and optimizing medical rehabilitation. In this talk, insights and views on scientific research and practical applications of VI will be presented. Further, recent findings regarding VI from studies conducted by the presenter on motor imagery and DNI in dancers and people with Parkinson's disease will be discussed.

Bio:

Dr. Amit Abraham (B.P.T, MAPty, PhD) is a musculoskeletal physical therapist specializing in dance injuries and rehabilitation and mental imagery. Dr. Abraham is currently a post-doc research fellow at Emory School of Medicine (USA), and his research focuses on the effect of mental imagery training on motor and non-motor aspects of performance in dancers and people with Parkinson's disease and on understanding human-human interactions through touch.

Presentation 2: Martha Eddy

Neural Mechanisms Associated with Interoception and Movement in Somatic Practices: Past and Future Studies

In order to establish a strong context for understanding neuroscience research within the relatively new field of Somatic Movement Education and Therapy, the work of pioneers such as FM Alexander, Gerda Alexander, Irmgard Bartenieff (physiotherapist and movement psychotherapist), Moshe Feldenkrais PhD, Charlotte Selver, Ida Rolf PhD, and Milton Trager MD, is analyzed. This talk seeks to demonstrate the areas of the brain that have been impacted by these leading somatic practices as well as the types of research in somatic studies that are directed toward a deeper scientific understanding of the neural mechanisms of interoception and movement.

After 30 years of case study experience, an additional 5-7 years of systematic cross-case analysis determined the defining features of over 40 somatic movement systems. It was also revealed 1) that research studies use newly emergent methods inclusive of qualitative, quantitative, and mixed methodologies; 2) that reliability and validity measures are variable; and 3) that the quantitative research studies on neural stimulus and response in somatic movement have been primarily focused on cortical stimulation of the visual-kinesthetic or verbal-kinesthetic experience. While the importance of the sub-cortical aspects of neuroplastic changes evident in case studies have been highlighted, there has been a serious limitation in substantiating research. For instance, declarations of socio-emotional change in behavior that are cited to be governed by the limbic system have rarely included neuroscience or neural imaging of limbic activity. Furthermore, the brain structures involved in interoception include other even lower brain structures such as the reticular formation, basal ganglia, thalamus and geniculate bodies, midbrain, cerebellum, and brainstem, as well as the nerves themselves. The predominant thesis is that more research, as well as improved instrumentation and research methodologies, is needed for recognizing the specific roles of deep brain structures in human behavior— inclusive of kinetic, kinematic, and biomechanical relationships.

Bio:

Dr. Martha Eddy is a Registered Somatic Movement Therapist, Teacher of Body-Mind Centering, and Certified Movement Analyst with a doctorate in Movement Science, who has served on the faculty at Empire State Graduate Center, State University of New York, Columbia University, and Princeton University. She is the founder of the non-profit organization Moving for Life as well as the somatic movement therapy training, Dynamic Embodiment. Past president of the International Somatic Movement Education and Therapy Association, she is also the author of *Mindful Movement: The Evolution of Somatic Arts and Conscious Action*.

Presentation 3: Elinor Silverstein

What Happens in Vagal Doesn't Stay in Vagal: The Feldenkrais Method's® Impact on Parasympathetic Response through Touch and Movement

This talk explores the ways in which the somatic movement practices of touch and movement from the Feldenkrais Method® activate neuroplasticity in support of self-regulation, and offers a design study that could assess these processes quantitatively. Practitioners of the Feldenkrais Method® guide clients' movement and self-awareness through touch to change the way the brain perceives itself. Clients also learn movement sequences to activate different neural pathways that calm and settle the nervous system. In the presenter's clinical experience of hands-on contact and Awareness Through Movement® exercises, the vagus, or the 10th cranial nerve, is stimulated and heart rate variability (HRV) increases. Part of the parasympathetic nervous system, HRV, in turn, allows a person to recover from stress activation more efficiently. Additionally, the vagus nerve works in relationship to the amygdala, a center of processing emotional reactivity. In essence, then, the Feldenkrais Method® supports neural and biological mechanisms of resilience.

Feldenkrais practitioners work with people suffering from pain (in the back, knees, neck, and so on), due to misuse or sometimes neurological injuries. Many of these clients have not been helped by conventional medicine, but report improvements in pain levels, range of motion and balance through the Feldenkrais Method®. Qualitative accounts carry limited value in a scientific context, so researching the neural and biological impact of touch and movement in quantitative terms is an important next step in building the research base for this work. A proposal for a research study on the impact of Feldenkrais Method® exercises on heart rate variability will be presented.

Bio:

Elinor Silverstein, an internationally recognized Guild Certified Feldenkrais Practitioner®, holds degrees in both Biology and Zoology. She integrates the sciences of nutrition and inner-biology into her teaching of the Gut-Brain Connection. Elinor has over 35 years of experience using the Feldenkrais Method® to assist adults and children with their healing process as they deal with serious nervous system disorders - both diagnosed and undiagnosed -which are often deeply connected to gut health, and more. She teaches her Gut-Brain program for the general public, as well as for medical professionals and Feldenkrais Practitioners throughout the world, while maintaining a private practice in Orange County, California.

Presentation 4: Elisabeth Osgood-Campbell

Somatic movement, physical exercise, and meditation: Exploring similar and distinct brain structures and cognitive benefits

By teaching mindful awareness of bodily states in motion and at rest, somatic movement practices weave together kinesthetic and mental activities. Substantial evidence indicates that motor and cognitive processes are functionally related and exert bidirectional influence on one another. Along these lines, numerous studies reveal that moderate physical activity and meditation practice correlate with improvements in executive function tasks. For example, both acute treadmill walking and mindfulness practice are associated with increased measures of working memory and attentional control.

Given that somatic movement blends physical activity with mindful awareness, this presentation investigates two possibilities: first, that conscious or somatic movement practices may activate both overlapping and separate brain regions as physical exercise and mindfulness practice, and second, that somatic movement practices may be associated with similar and also unique cognitive improvements. To begin to test these hypotheses, the author presents a tripartite research project: a cross-sectional study to examine how the

thickness of the somatosensory cortex is correlated with the number of years of somatic movement practice (of the Feldenkrais Method or BodyMind Centering, for example), an MRI study to investigate changes in key brain structures associated with cardiovascular exercise and meditation practice (the hippocampus, amygdala, cerebellum and brain stem) after somatic movement activities, and an assessment of attentional control among preadolescent children after a somatic movement practice. Criteria for valid research methodology for such an undertaking (i.e., definition of a standardized dose of somatic movement activity, sample size, randomization, and active control group) will also be discussed.

Bio:

Elisabeth Osgood-Campbell, MA, EdM, is a dancer, educator, and researcher who investigates the impact of movement on cognition across the lifespan. This experiential and academic inquiry conducted in various contexts, including the Harvard Graduate School of Education and Tamalpa Institute, shapes her teaching and performance work. She is a Registered Somatic Movement Educator through the International Somatic Movement Education and Therapy Association (ISMETA) and served on that Board of Directors for nine years. Currently, she acts as the Chair of the Research and Publications Committee for ISMETA and is the author of an academic article on the educational implications of the philosophical concept of embodied cognition.