Mental Dance

Final report 12 July 2022
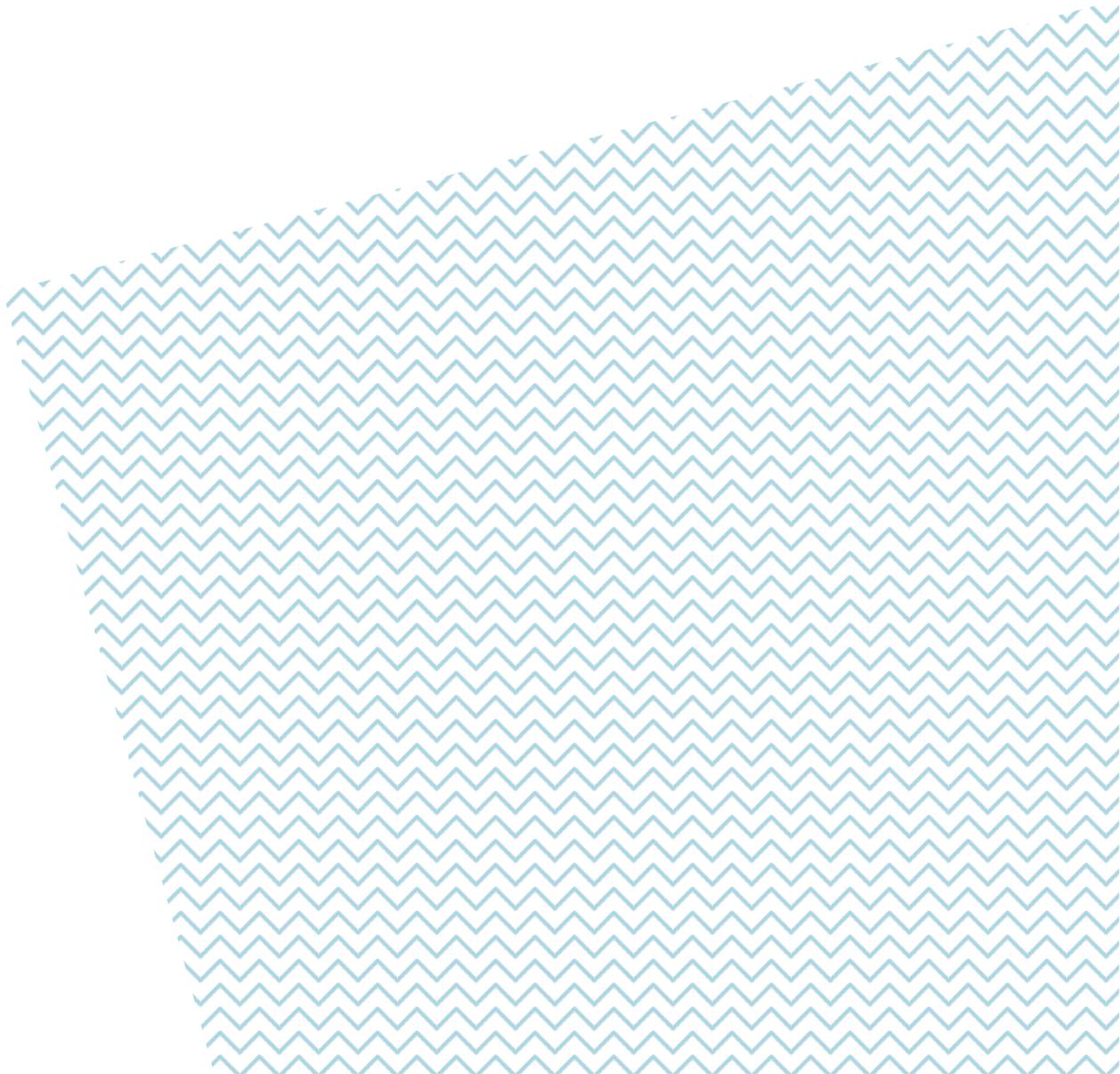
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Project summary

Mental Dance explored the intersection of dance, interactive sound design and psychiatry through the novel concept of an *Empathy Machine*. It brought together artists and researchers from three disciplines: interactive composition, choreography and neuroscience. The project developed a methodology for collaboration that enabled realtime data generated by dancers' movements and vocal improvisations to shape a choreosonic environment for an online audience *Mental Dance*. Elements of this primary research fed into a live performance for the opening of Science Gallery Melbourne, *Mental Spaces*.

At its core *Mental Dance* had a commitment to developing new tools for creative artists and scientists to bring their expertise into dialogue and to learn from each other through mutually reciprocal and respectful processes that bridge disciplinary differences whilst cultivating the wellbeing and mental health benefits of dance-music improvisation. In opening the research to a public audience, online and in situ, the researchers tested the corporeal literacy of audiences and the affective resonances of work shaped by neuroscientific concepts.

This project ran from February 2020 to June 2022. As a result of significant disruptions due to COVID-19 restrictions, the original research plan was reconceived as an online event in collaboration with the Science Gallery with a modified research team due to travel restrictions.

Research team

Carol Brown	Choreographer, VCA Dance, Faculty of Fine Arts and Music
Marta Garrido	Neuroscientist, Faculty of Medicine, Dentistry and Health Sciences
Monica Lim	Interactive Composer, Independent Artist and PhD Student MCM
Jordine Cornish	Dance Research & Performance
Luigi Vescio	Dance Research & Performance
Austin Haynes	Vocalist

Partners

Science Gallery Melbourne

Dance and Interactive Composition, Victorian College of Arts, Faculty of Fine Arts and Music

Acknowledgements

Background

Research context

What does it mean to dance with music, biologically and ontologically? How might we dance to the music of the 'madness' inside us? Dance and music have a deep history of entangled relation in fostering health and wellbeing including through ritual, therapeutic, cultural and experimental performance. But it is not until the development of tools like EEG(electroencephalogram), MRI / fMRI ([functional] magnetic resonance imaging) that neuroscientists have been able to shed light on how the brain responds to musical stimuli and how the mind dances through the firing of neurons in a 'dance of attention' (Manning 2013).

The mental health benefits of the arts are increasingly recognised particularly through the growth of creative arts therapies, however awareness of mental health conditions and the stigma attached to these within society persistently stumble upon cultural, historical and often superstitious beliefs about 'madness' and insanity. Dance and music have a long history of association with 'madness,' from Vaslav Nijinsky (Nijinsky 1999) to Choreomania (Gotman 2018). Contemporary Dance and Music, with its emphasis on letting go of normative constraints on movement, offers the potential to appreciate corporeal and neurological diversity (Manning 2022). Neuroscientific research into dancer's interoceptive accuracy (Christensen 2017) and somatosensory capabilities (Coleman & Turaga 2013; Mendrek 2022) demonstrates that dance has positive benefits for mental health. In this context we asked how might music and dance in relation affect a sense of wellbeing through performance? Little attention has been given to the nature of the interface between dance and music, and the brain-body matrix that is particular to the auditory and kinesthetic senses working together. Interactive mixed reality performances that employ gesture to activate sound and combine human and non-human agency in driving compositional choices – Choreosonics (Wijnans 2010) – offer a new paradigm for experiencing and understanding the synergies between music and dance. *Mental Dance* explored these synergies through the creation of a performance system that brought movement, sound and neuroscientific concepts into dialogue with kinesthetic empathic improvisations performed by two dancers, a vocalist and Creative AI. Lived experience teaches us that body and mind are entwined in a dance of attention that is continually shaping perception and kinesthetic milieu. Through *Mental Dance*, interactive, realtime improvisations tested the capacity for movement to attune to a diversity of feeling-states and affective resonances for an online and live audience. These performance experiments were informed by understandngs of the architecture of the brain and the body-brain nexus.

Project aims

Mental Dance aimed to:

- explore how knowledge about the invisible matter of the brain - the internal matrix of neuronal activity - might inform a creative artistic process

- draw attention to the complexity of music and dance in relation and the cross-modal experience of their synergetic crossings in interactive performance

- foster appreciation of aesthetic and neural diversity through a creative process informed by neuroscientific concepts

- explore new models of performance by exploring the body as interface for sound and music events

Methodology

The Methodology was interdisciplinary and practice-led. It drew upon paradigms of artistic research (Brown 2019) whilst being respectful of current research discoveries in neuroscience and psychiatry (Garrido et al., 2013; Harris et al., 2018). Centered around online weekly workshops during COVID-19 lockdowns, we experimented with the following neuroscientific concepts: Bayesian Brain; Oddball Paradigm; Neural Network; and Spectral Hearing. The workshops were undergirded by our readings of relevant literature (Hagendoorn 2019) and discussions and interviews with Marta Garrido (2021). The workshops led to the making of inter-disciplinary scores for choreosonic performance. The performers (two dancers and a vocalist) responded to tasks and prompts developed by the lead researchers and their movements were mapped in the virtual dimension through an AI Pose Recognition software that could drive the sonic scape and be fed back to audience through online performance using Zoom software.

Through documenting the workshops with digital video and journaling, the choreographic logic unfolded. During this generative and speculative process, selections were made from improvised responses that shaped the kinesthetic and aural milieu of the work and a movement lexicon was discovered. The choreographic and vocal improvisational scores went through a number of iterations across the weekly workshops as we refined and elaborated the nexus of technology and dance-music and developed the core dramaturgical themes. Drawing upon a number of sources including DSM-5 (American Psychiatric Association, 2013), Nijinsky's *Diaries* (1999), James Joyce's *Finnegans Wake* (2000) and the biography of Lucia Joyce (Schloss 2003), chains of spoken words were recorded digitally and provided the basis for mesotics that could be algorithmically and improvisationally played with in performance, in particular by vocalist Austin Haynes. The resulting scores drew on established models for creating random composition through Mesotics and Chance Choreography, building on the rich history of music-dance collaborations such as Merce Cunningham and John Cage (Callahan, 2018).

Whilst we were unable to visit the Computational Psychiatry Lab due to COVID-19, choreographer, Carol Brown and composer, Monica Lim interviewed Marta Garrido and extracts from this interview, as recorded vocals, were included in the sound design. Garrido also observed studio dance workshops, noting the emerging process and providing feedback from her perspective as a neuroscientist.

Through video, audio capture and journaling of the process, the workshops constructed a narrative of progress made and obstacles encountered. University of Melbourne Human Participant Ethics was applied for and accepted for the project which originally included public workshops, surveys and live discussion, however due to COVID-19 this aspect of the research was unable to proceed. Despite the many lockdowns in Melbourne we were determined to present some outcome of the work and managed two public online performances where we shared the work with a global audience.

Key findings

> *Nothing is lost, nothing is created, everything is transformed*.(Antonie Lavoisier 1774)

If in schizophrenia, the brain may be in *a constant state of surprise*, attempting to understand the events that it has itself generated, dance and music improvisations that cultivate tuning into the variability of sensori-motor expression, offer a healthy way to notice and explore novelty, change and transformation through a bodily lens. 'New' knowledge often emerges from a synergistic interaction between different fields, in this context dance, music, Creative AI, wearable sensors and the brain. *Mental Dance* developed a robust methodology for collaboration between neuroscience, dance and sound. The disruption of COVID-19 forced the research team to radically reconfigure the collaboration through online workshops and the incorporation of AI as an artistic partner. The live mapping of sound by dancers working in different spaces created a shared context where a *constant state of surprise* could be held within a creative ecology. As an artistic research enquiry, the project brought public awareness to the neuroscientific debate on the internal matrix of the world and what disrupts

this, whilst exploring interactivity as a concept and tool for fostering human-machine and performer-audience relationships that are ethical, creative, empathetic and vital. This research built upon recent research into neuroscience and creativity including the Trinity Laban and C-DaRe project *In the Dancer's Mind* (2022; see also May 2020), Siobhan Davies Studios and Goldsmith's University's, *Neurolive* (2022) and Wayne McGregor and Wellcome Institute's *Thinking with the Body* (2013). Its significance lies in the capacity of the artist-researchers to develop new vocabularies of collaboration that support a dynamic interplay of ideas, processes and people supporting emotional and physical health and wellbeing. Previous projects on creativity and neurocognition have addressed flexible thinking and creativity, sensorimotor development and impairment and the impact of brain injury and disease. *Mental Spaces* and *Mental Dance* however, were concerned with how the scientific knowledge about brain architecture and function that has been developed at the Cognitive Neuroscience and Computational Psychiatry Laboratory at the Melbourne School of Psychological Sciences, can be applied to dance and music scores to generate innovative art-sci performance. Taking hold of concepts explored in Garrido's lab, in particular predictive coding and the Bayesian Brain, choreographer and composer developed choreomusical scores for performance that blended sound and movement in an integrated and interactive whole.

Project outcomes

Performance:

Brown, C. & Lim, M, *Mental Spaces* (20th November 2021). Opening of the Science Gallery Melbourne (20 minutes). Vimeo https://vimeo.com/665165306

Brown, C., Lim, M., Vescio, L. & Cornish, J. (4th October 2021). *Mental Dance*. Online Performance and Discussion. (50 mins). Vimeo https://vimeo.com/630635399

Written Publications:

Brown, C. (2021) Mental Dance' *NiTRO* 11 June 2021: https://nitro.edu.au/articles/2021/6/11/mental-dance

Brown, C., Lim, M., 'Under the Hood*'.* Co-authored Journal Article in Progress to be submitted to *Body Space Technology* August 2022.

Conferences:

Brown, C. & Lim, M. (9th October 2021). 'Performing Empathy Machines', In *Changing Perspectives on Performance: Interrogating Digital Dimensions and New Modes of Engagement*. International Symposium. Online Performance and Presentation. Angela Ruskin University, UK.

Brown, C. & Lim, M. (14th June 2022) 'Possibilising performance through interactive telematic technology: Mental Dance'. Full Paper Presentation. International Symposium on Electronic Arts ISEA2022 Barcelona, Spain.

Media:

Freelander, Anna (2021) for ABC Arts: 'In the midst of a pandemic-fuelled mental health crisis, Australians are embracing the healing benefits of arts' (includes interview with Carol Brown) https://www.abc.net.au/news/2021-09-15/new-research-supports-arts-for-mental-health/100452968

Other Funding:

Science Gallery Melbourne $20,000 Research Funding for *Mental Spaces* (Opening of Science Gallery performance).

Discussion, implications and future directions

Despite significant disruptions due to COVID-19, *Mental Dance* was adapted from the original research proposal to focus on an interactive dance-sound-tech event and the creation of an *empathy machine* for attuning remote performers and audience to the kinesthetic and aural sense of a fluctuating psycho-somatic presence. Through the project learnings of neuroscientific concepts, we developed a language and lexicon for perceiving attention to the mutable present as always already shaped by perception, prior experience, cognition and corporeal change. Current neuroscientific research emerging from theories of the Bayesian Brain underscored our approach to a digital interface that proposes new relations between audience and performer within the expanded present of the digital. The necessity of this was heightened by the disruptions to our planned research as a result of repeated COVID-19 lockdowns through the duration of this project in Naarm/Melbourne 2020-2021. Shifting to online collaboration we used MediaPipe pose estimation technology to track dancers' movements from webcam feeds (Pose Detection ML Kit online) rather than the intended wearable sensors and head dresses designed by Chrys Zantis. We directed telematic rehearsals and performance of the work on Zoom where dancers in their home environments sculpted and responded to sound scores developed from neuroscientific and psychiatric literature in real-time.

Constraints such as forced isolation, lack of access to technology and space to move, were embraced to create a new type of collaborative performance where the screen became the stage and the interface between movement and sound. This process can be used to enable interactive performance where collaborators are unable to be in the same physical space and have no specialist hardware. The experience of remote collaboration and dancing together from a physical distance had strong wellbeing effects on the participants who reported feeling "attuned", "connected" and "curious" in their mixed reality performance world (dancer feedback to author). Choreographically, relationships to pitch, timbre, voice, text, tempo and tone shaped and structured movement within a dramaturgy that developed across four states or scenes: *Neural Networks*, *Noisy Voices*, *Lucia* and *In My Head*. The dancers, in becoming habituated to each other's movements across rehearsals, developed a synergy which enabled them to shape the choreography from inside the system. This dance of attention suggests that skills in interoceptive and exteroceptive awareness are advantageous to processes that require remote touchless collaboration. We related this kinesthetic intelligence to the theme of neural networks, imagining that the 'brain' of the dance was lived in the sphere of both human and more than human relations. Discussions with Garrido (Interview 2021) highlighted how from a neuroscientitic perspective dancing 'takes place' both inside and outside the brain:

> *"While I think we can 'dance in our head' either through imagery or when we watch someone else dance (mirror neurons), I believe that to really dance one needs the body [and space and music]* (Garrido 2021).

We used the term *empathy machine* to describe the sense of relatedness between inside and outside the brain that the tracking of attention demands from a corporeal and neuro-cognitive perspective. As a metaphorization of this process, the feedback loops and shifting improvised relations between dancers and data generated a constantly evolving expressive terrain that audiences were invited to perceive as part of an expanded neural network. Audience feedback was overall positive, with most people reporting heightened experiences of affective engagement despite the onscreen delivery. The use of domestic spaces received mixed feedback, with some in the audience enjoying the 'intimacy' and 'immediacy' of 'personal 3D spaces', whilst others found the 'home background distracting and diluting the emotional impact'. Many in the audience were intrigued by the technology and its potential for further exploration, both in performance and pedagogy. They were also interested in 'trying to figure out' the mapping where movement by two different dancers in different spaces affected the same sound.

Although our shift to remote collaboration was forced by external circumstances, the exploration of a new mode of working resulted in us viewing the online rehearsals and performances as not just temporary, inferior

replacements for the 'in-real-life' version, but interesting and worthwhile in themselves. The research impacted strongly on the creative team members own sense of wellbeing and mental health. Dancer Luigi Vescio noted how 'knowledge of the three brains and other concepts from neurology, helped me to consider and perhaps have compassion towards the impulses of feelings experienced throughout a dislocated year' (Vescio 2021).

 Having developed this interactive performance system, an *empathy machine* online, we continue to experiment and research with a view to bringing the work to a live audience in future iterations. *Mental Spaces* as an event performed by a chorus of dancers and a dance-vocal interactive duet (Jordine Cornish and Sunny Kim) within the new architecturally designed Science Gallery, expanded the reach of the research and enabled us to explore the idea of neural networks as cognitive spaces on multiple levels and dimensions. Further iterations of the research are being explored currently with the dance-vocal duet, with a particular focus on Creative AI, Dance and Music. Opportunities, such as the Dance Bienniale 2023, will provide us with the possibility to contrast and compare the impact of remote collaboration and in situ collaboration and how this shapes the affective attunement and wellbeing affects of Choreosonic performance for performers and audience alike.

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More information

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