# Shaping Dance Improvisatory Processes Intertwined with Actual and Virtual Bodies: Exploring *Sculptural Qualities* Within Motion Capture Environments

**Lucie Sykes**

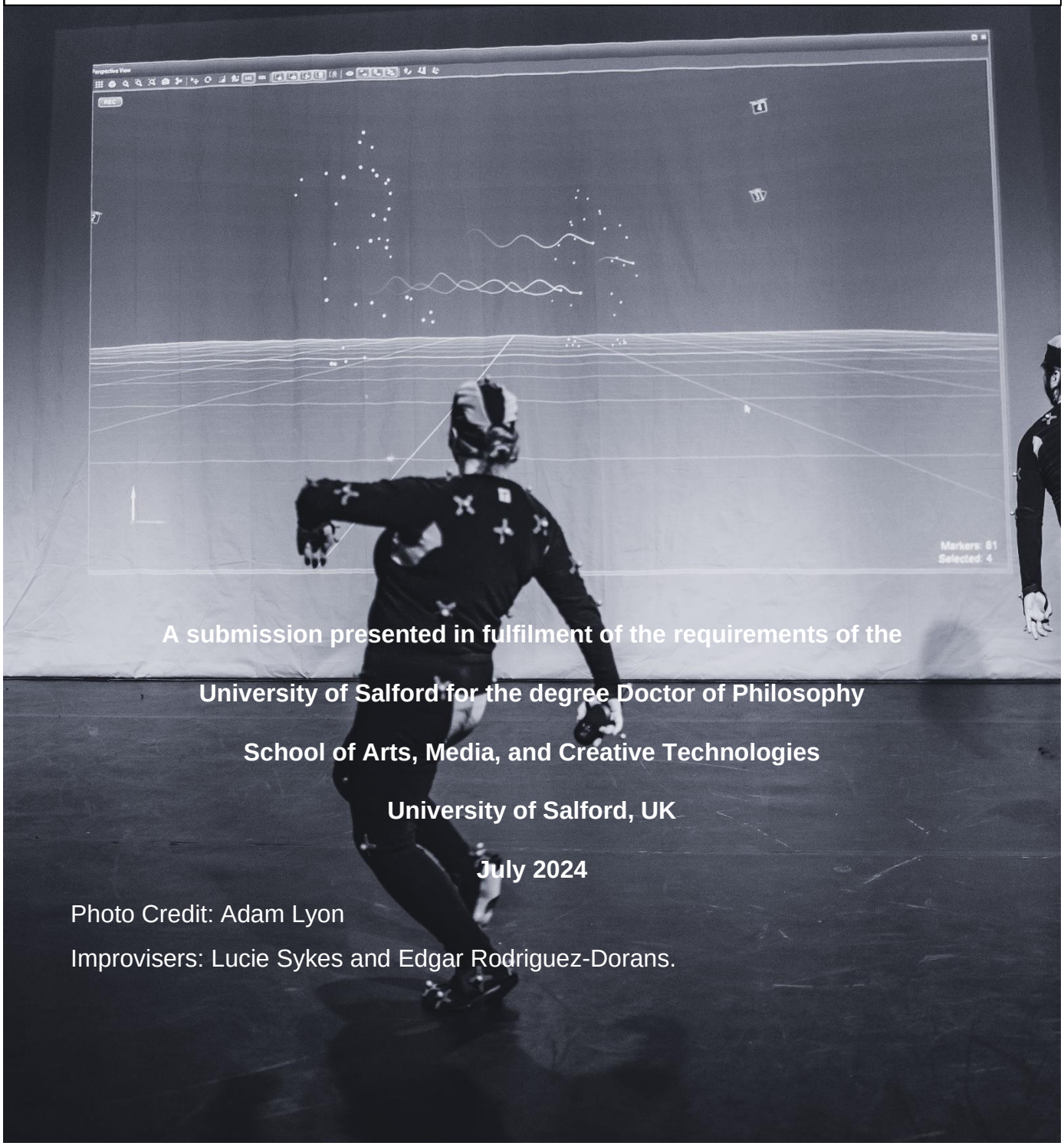


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Photo Credit: Adam Lyon

Improvisers: Lucie Sykes and Edgar Rodriguez-Dorans.

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# Declaration

This thesis is submitted under the University of Salford regulation for the award of Doctor of Philosophy. Unless otherwise stated in the text, I hereby declare that the contents of this thesis are the result of my own work under the supervision of Dr Richard Talbot and Dr Joanne E. Scott. No part of it has been submitted in support of any application for other degree or qualification at this or other institutions of higher learning.

The dancing-writing text on T-pose with Stillness has been published in the Festival of Research event 2021[1] and performed as part of the PaR PhD mini-symposium (2021)[2] organised by the University of Salford. A version of *Range of Coupling* (ROC) has been published as part of the paper contribution to *the Game On*[3] event organised by the University of Salford and delivered as part of the PaR SAMCT mini-symposium (2023)[4]. A version of praxis videos, *Range of Coupling*, T-pose with Stillness and theoretical understanding of *Sculptural Qualities* has been published in the peer-reviewed International Journal of Performance Arts and Digital Media[5].

The main title image of this thesis has been published and displayed on the wall at the Doctoral School, Maxwell Building, University Salford and included in the inaugural research images competition at the annual research conference SPARC 2022[6] at the University of Salford. Some images within this thesis were presented at various conferences and symposiums:

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[1] Sykes, Lucie (2021). Practice as Research: Session 2 - Dance and Motion Capture Technology. University of Salford. Presentation. https://doi.org/10.17866/rd.salford.15043866.v2
Sykes, Lucie (2021). Art as Change Part 1: Interdisciplinary Collaboration Using Dance and Motion Capture Technologies. University of Salford. Presentation. https://doi.org/10.17866/rd.salford.15044142.v2

[2] Sykes, L. (2021).T-Pose with Stillness: A Performative Demonstration. *PaR PhD mini-symposium* (2021), University of Salford. https://hub.salford.ac.uk/amc-practice-as-research/2021/06/04/par-pgr-mini-symposium-2nd-june-2021/

[3] Sykes, L. (2022a). Attending towards to an awareness of your body-mind connection [movement workshop]. In. *The Game On project*: University of Salford.

[4] Sykes, L. (2023). Game changer: body-mind awareness within movement practices Performative movement workshop. *PaR SAMCT mini-symposium* (2023), University of Salford.

[5] Sykes, L. (2024). Shaping movement improviser's experiences: document(ing) embodied and extended sculptural qualities within motion capture environments. *International Journal of Performance Arts and Digital Media*, 1–10. https://doi.org/10.1080/14794713.2024.2324399

[6] Sykes, L. (2022) The Departure and Arrival of Sculptural Qualities shaping improvising bodies within motion capture environments. *Inaugural Research Images competition*. Salford Postgraduate Annual Research Conference, University of Salford

- SPARC – 3TM Thesis Competition 2023[7],
- SPARC – presentation 2022 and 2023[8],
- SPA 10th annual research conference at the University of Malta[9],
- International Symposium 2024 at the Academy of Live Technology[10].

Lucie Sykes

July 2024

[7] Sykes, L. (2023). Embodied Dance Improvisation Approaches: Sculptural Qualities of improvising bodies *within* motion capture environments. *3M Thesis*. Salford Postgraduate Annual Research Conference, University of Salford

[8] Sykes, L. (2023). T-pose with Stillness as Active Listening of Dynamic Rhythms. *Better to Illuminate than Merely to Shine*. Salford Postgraduate Annual Research Conference, University of Salford.

[9] Sykes, L. (2024). Game changer: body-mind awareness within movement practices. *Subject/Object/Practice/Place: Connecting Creatively through the Performing Arts*. 10th Annual Conference of the School of Performing Arts, University of Malta.

[10] Academy of Live Technology. (2024). *International Symposium 2024*. https://www.academyoflivetechnology.co.uk/symposium-2024

# Instructions for accessing Practice as Research Document

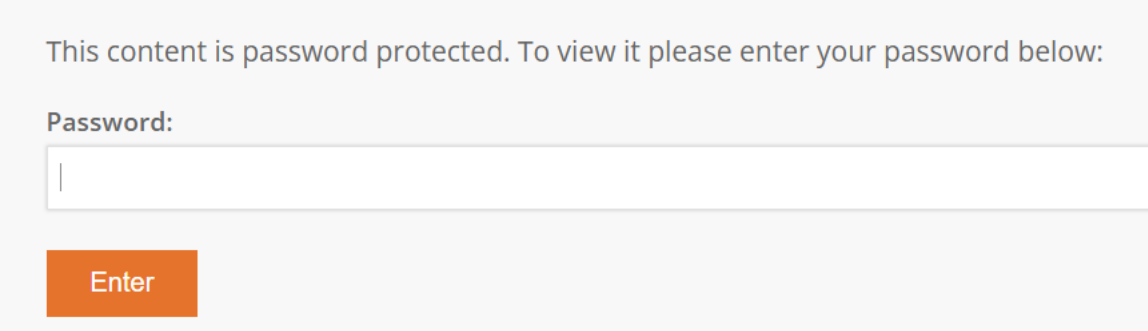
The documentation for this research project is presented as a multimedia web-based document containing videos with annotation, some photos and text corresponding to chapters in this thesis. This document utilises Motion Bank-Mosys integrated application. For a better viewing experience, please view this document on Google Chrome or Microsoft Edge web browser.

There are two ways to access it:

1. If you are reading this thesis digitally, then you can simply click on the following URL link: https://www.lucieleesykes.co.uk/phd-research/

2. If you are reading this thesis printed, please type into your web-browser the link above.

3. Enter password: LLsDC2023!

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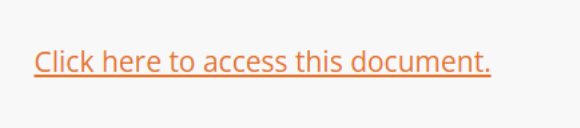

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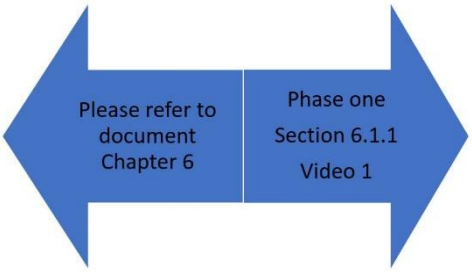



8. Please note that all videos have a sound. Therefore, if you listen through headphones, be mindful of the volume.

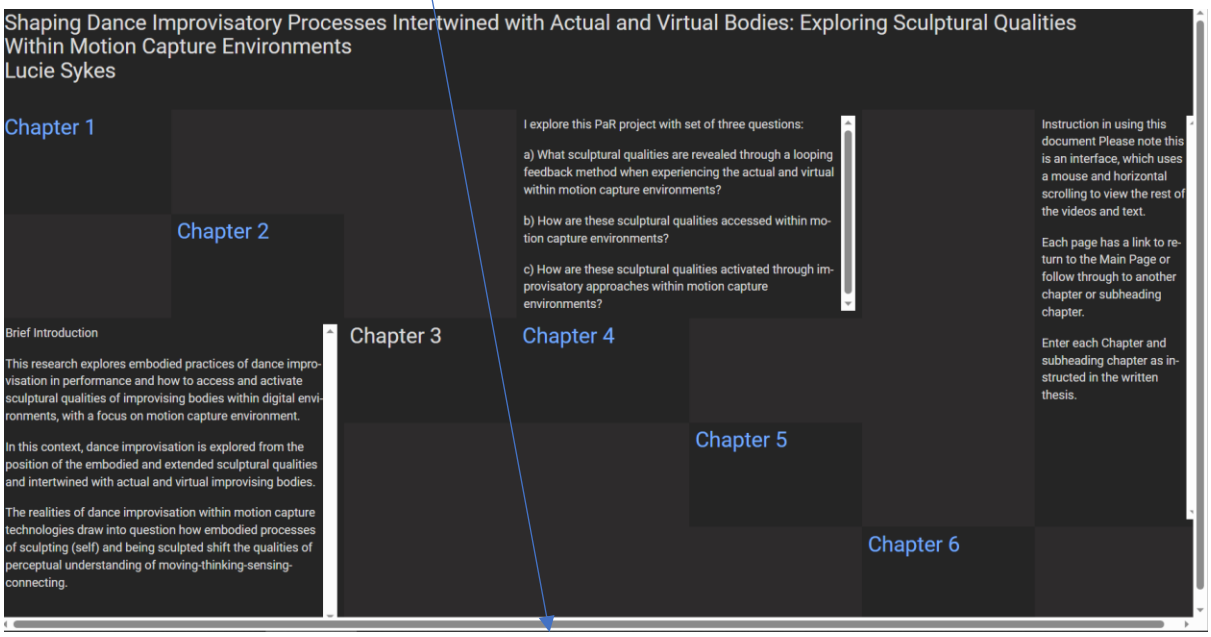
## Document Navigation

The main page will open once you have accessed the document in your Google Chrome or Microsoft Edge web browser.

The document is created using Motion Bank web-based documents. This interface offers a creative engagement of how *Sculptural Qualities* are viewed. I invite the viewer to create their traces as they engage with the document in linear or non-linear ways.

<u>Vertical Scrolling</u>

On each page, you can scroll to the right – vertical scrolling – in the document to view the rest of the page. Some pages have more than one video; therefore, follow the scrolling until the end.




Scroll to the right (and left to return).

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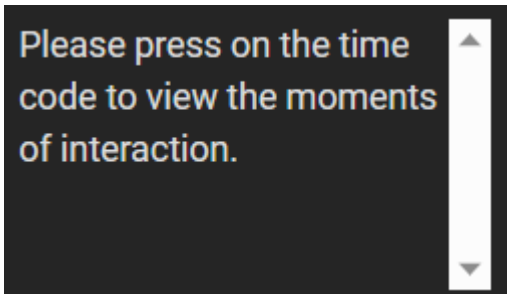
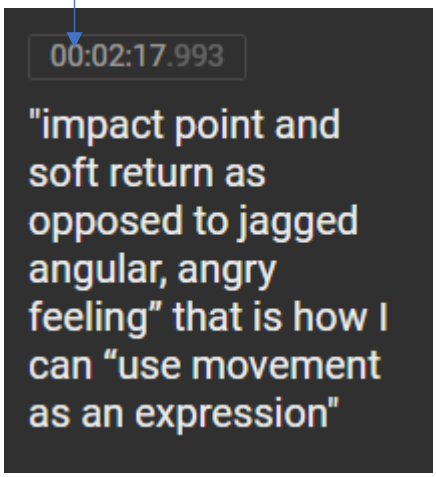
Each annotation will have an instruction at the top with text like this:




Please press onto the time code to view the content in the video to which I am referring in the thesis.

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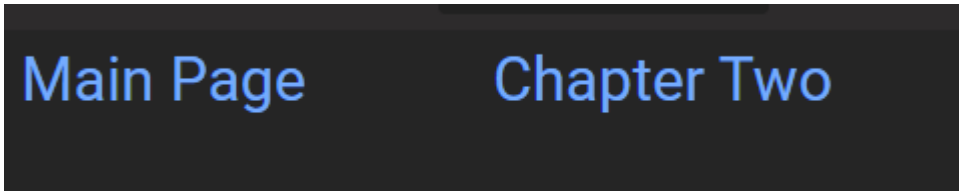


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# Instructions for access videos on YouTube

Studio-practice videos are accessible on YouTube with no annotations. It is an alternative option to view videos without needing the document. Chapters categorize this playlist. Please use Google Chrome or Microsoft Edge web browser for better viewing quality.

## Full list of the video explorations with YouTube links

### Chapter 1

| **1.2** | |
|---|---|
| Moving Memories video | Moving Memories - final video RnD 2017 (youtube.com) |

### Chapter 2

| **2.3.4** | |
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| Shape qualities – sequence of hand seeing and leading. | https://youtu.be/cuGCZ1WbIeA |
| **2.4** | |
| Exploring Chiasmatic relationship in relation to I – body – as – sensory - device | https://youtu.be/CzBKdyzVdmY |

### Chapter 4

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| | |

| | |
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| Researcher – exploring Segment Skeleton digital model | https://youtu.be/yuHabJqi5Gg |
| Researcher – exploring Avatar digital model. | https://youtu.be/J6sszWk0-Yk |
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| **5.5.2** | |
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| Video 2 - movement qualities | https://youtu.be/R-81dCMwmKQ |
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| Video 4 – Mover 1 task 5 | https://youtu.be/-5VdXgnDz20 |

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**Chapter 6**

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| A – head leading *line visuals* | https://youtu.be/516s_Bfw41U |
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| Video 1b | |

| | |
|---|---|
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| Video 1c<br>Mover C – calibration process and responses | https://youtu.be/eArKHDYLCyM |
| Video 2<br>I am demonstrating the T-pose with Stillness part of research festival. | https://youtu.be/jiGS6PfwTzg |
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| Video 2<br>Mover 1 – exploring repetition with variations - task 3 | https://youtu.be/7_dZgjyogOU |
| Video 3<br>Mover 1 – exploring particles - task 4 | https://youtu.be/Xg5jJCiGeWE |
| Video 4<br>Mover 2 – exploring *line visuals* – task 1 | https://youtu.be/fTPDAJYG_3w |
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| **6.5**<br>**Accidental micro-intentions** | |
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| Video 2<br>Mover B – open feedback loop relationship | https://youtu.be/MFYBfrwADgI |
| Video 3<br>Mover 4 – open feedback loop relationship | https://youtu.be/vSMTom1CAx0 |

## Abstract

This practice-as-research investigates embodied dance improvisatory approaches within motion capture environments through a shaping process I call *Sculptural Qualities*. *Sculptural Qualities*, a term developed during this research, are processual and relational. The thesis explores what *Sculptural Qualities* emerge within motion capture environments and how movement practitioners can access and activate these unfolding experiences of being intertwined with body, self, and the world (Merleau-Ponty, 1962).

Within phenomenology and embodiment, access and activation are processes of direct experiential “coupling” (Clark, 2008) of the movement practitioners' bodies, movement impulses and the environment. These coupling processes involve direct and active engagement to enable movement practitioners to "extend" awareness of their sensations, emotions, and bodily experiences of seeing-moving-responding.

As motion capture technologies develop, they enable an innovative way to perceive and interact with movement, allowing real-time tracing of movements and gestures. The real-time engagement introduces a feedback loop and transforms the sculptural motion – the path of the movement visualised in the form of a digital trace (Laban & Ullmann, 2011) as lines, dots, particles and polygons. Through studio-practice experimentation, the movement practitioner's lived experiences and their expressive responses of shaping and reshaping contribute to the sculptural emergence with temporal and dynamic unfolding. I propose that these shaping processes extend the improviser's body-mind into tools, technologies, and the environment (Clark, 2008a, 2008b; Ihde, 2012). This thesis embodies PaR methodology and Nelson’s (2013, 2022) multi-modal knowledge model with qualitative and interpretative phenomenological methods to gather and analyse experiential responses and insights from movement practitioners.

This PaR's contribution is a methodological framework focusing on the holistic experience of sensing and responding as an innovative and dynamic approach to dance improvisation within motion capture environments. I propose new methods for engaging with dance improvisation through in-readiness as an active listening state of experiential couplings between physical and digital. The sculptural intentional improvisations engage feedback loop processes and activate *Sculptural Qualities*

through four core elements: stillness as a dynamic state, states of focused stillness with T-pose, repetition, and accidental micro-intentions.

**Keywords**

Embodied movement, extended experiences, dance improvisation, shaping, feedback loop, sculptural sensibilities, motion capture.

# Chapter One - Introduction

*Dancing is creating a sculpture that is visible only for a moment*

**— Erol Ozan**

## 1.1 Introduction

This research examines a novel approach to embodied dance improvisatory practices within motion capture environments. This study uses a practise-as-research (PaR) methodology (Nelson, 2013) to explore the shaping process of improvising bodies, actual and virtual, to examine how *Sculptural Qualities* emerge. Examining these shaping processes emphasises the importance of qualities as an active state that engages with both the actual and virtual. Therefore, this active engagement with tangible sculptural forms that the improviser can directly interact with involves a heightened awareness of both bodies and spaces and their subtle changes over time. In this research, I characterised these state qualities with opening and rising movement qualities as part of the Effort/Shape movement analyses described by Laban/ Bartenieff.

Further, this research investigates conditions to access and bring to the fore these *Sculptural Qualities* through activation techniques. This PaR inquiry offers an innovative framework for dance improvisation, emphasising the holistic approach through the artistic dimension inherent in improvisational bodies. The *Sculptural Qualities* explorations aim to contribute to the existing embodied practices and literature on dance and technology, mainly motion capture environments.

Underlying this research and informing the embodied enquiry to dance improvisation in these environments are post-phenomenological and extended embodiment theories. Fusing these embodied and extended lenses allows this investigation to explore the relationships between body, movement, and technology. The interaction between the body and technology in real-time enables a feedback loop. In this research, the movement practitioner actively engages with a feedback loop to explore the emergence of *Sculptural Qualities*. These explorations aim to facilitate how these *Sculptural Qualities* can be accessed and activated within motion capture environments. In addition, relevant practices related to embodied approaches in the context of dance improvisation and motion capture are discussed to explore these interactions. This research is notable for examining the feedback loop and how motion capture technologies affect the shaping and reshaping of bodily sculptural expressions and experiences in real-time.

Through my engagement in studio-practice I examine movement explorations with motion data visualisation as digital sculptural trace-forms. These interactions

supported the development of a workshop design, creating an active environment for thirteen participants to interact in and examine the relationship between the body, digital trace-forms, and the environment. These qualitative approaches support gathering feedback in these workshops through observations, semi-structural interviews, and reflections. These methods examine how these shaping processes activate relationships between moving-sensing bodies and the motion capture environments in a lived experience, shaped by the movement practitioner(s) and the researcher in real-time.

Furthermore, as part of the reflexive methods, I have employed the "writing-dancing and dancing-writing" approach to reflection. As seen in Figure 1 below, the writing/dancing enables an "articulation of [the] creative process" and encompasses ways of "engaging with this thing we call choreography", as Midgelow (2013, p.3) states. The articulation of sensemaking[11], "the interplay of action and interpretation" (Weick et al., 2005, p. 409), invites an understanding of the embodied improvising body(ies) experiences of the 'continued flux' of moving-thinking-sensing within digital environments. I include the writing-dancing and dancing-writing text throughout this thesis offering some 'snapshots' into my reflexive understanding of the practice. The writing-dancing text also establishes the dialogue between practice and theory in this research.

[11] I place the text on each line strategically to reflect the dynamical phrasing of my embodied body-mind while improvising in space-time. It is a method, which offers reflective perspective on the interplay between practice and theory and capturing the shaping processes. 'captures' the process and 'extends' the sensemaking of the embodied actions in the form of document(ation), which is further discussed in chapter four.

*Dear Practice,*

*I move to experience,*

*I sense to grow,*

*I write to express.*

*Whilst improvising in the studio and creating embodied extensions of my body-mind,*
*Memories of pathways, which my body-mind took and extended in space-time.*
*The route, which my body-mind attended to whilst in a state of presence.*

*The transforming of pathways into air pathways of*
*lines, sketches, blobs, sparkles, colours, water drops, and….*

*The sculpting motion of dynamic and expressive Self,*
*sculpting the Self into Virtual Self,*
*and experiencing those pathways in-between the physical and virtual.*

*These sensations are creating the need*
*to seek the essence of consciousness to rediscover my actual and virtual presence of Self.*

*Where imagining can become seeing*
and *seeing* becomes *experiencing.*

*Memories where my body-mind as a sensory device created*
*neural pathways while sensing-responding.*
*Memories where my body-mind as a pallet created*
*Colourful expressive pathways and paintings of the sensed-experienced.*

*Thank you for the temporal-unfolding of 'now',*
*for the present moment I dance-write and bow.*

*Dancer*

Figure 1 - Lucie's 'dancing-writing/writing-dancing' reflection on her practice.

## 1.2 Aims and Objectives

The aim of this research is to explore the emergence of *Sculptural Qualities*, which are procedural and relational. The practice of dance improvisation, as an experiential act of dynamic and spontaneous movements, is used in this research as a medium for exploring *the shaping* process of *Sculptural Qualities*. In dance improvisation, dancers can attend to imagery or a phenomenon, emphasising the somatic and phenomenological principles. This connection has the potential to transform dancers' experiences and their movement explanations in response to visual or conceptual stimuli. In this research, the digital sculptural forms and movement are the visual responses for movement practitioners to experiment with while improvising in real-time. Through the practical, phenomenological, and interpretive lens, I attend to dance improvisation as an experiential process to understand how *Sculptural Qualities* emerge within motion capture environments. The experiential endeavour of the movement practitioner's 'living body' interconnects the bodily experiences of shaping the body-mind and extends them in the form of 'living abstractions'[12] of the surroundings. These shaping abstractions are intertwined relationships between the body and the motion capture environments, which I call *experiential coupling*.

The underlying concept of *Sculptural Qualities* in this research explores the interplay between the shaping processes in dance improvisation and the motion capture environment. The shaping process in this research refers to a technique or method of intentionally engaging with the improvising bodies, actual and virtual, and their sculptural expressions. The '*sculptural*' encompasses experimentation of both physical and digital forms and motions. The '*Qualities*' include the aesthetic and tactile characteristics with the overall shape animating Effort-shaping qualities. The *Sculptural Qualities* and their relationships with spatial dynamics, including expansion, direction, and three-dimensional presence, enable the movement practitioner to interact with and respond to in real-time.

Engaging with embodied practices of dance improvisation facilitates the dancer to explore their creative processes of movement creation with

[12] Living abstractions emerged by combining Laban's concept of *living architecture* and how these living structures are explored within motion-capture environments. Utilising mocap technologies and their real-time application, transforming movement pathways into digital trace-forms enables the abstracted visualisations of lines, dots/blobs, spikes, particles, and polygons (see chapter five) to be active-living.

spontaneity (Midgelow, 2019). The movement practitioner makes choices about their movement explorations and expressions while engaging with their underlying artistic creations. In this research, the improviser spontaneously shapes their movement and expressive responses in three-dimensional space in relation to motion capture environments.

Novak (Midgelow, 2019) suggests that the concept of spontaneity is central to understanding improvisation as aesthetic and ideological freedom to artists' expression (Midgelow, 2019). Emphasising liberation of the body leads to natural explorations to *move* in the moment, connecting dancers with their body, mind, emotions, and sensory inputs. These cognitive and mental processes require a heightened awareness and the ability to perceive, shift, and change their movements in relation to the environment. The dancer engages with sensorial feedback and shifts from inactive seeing to active *noticing*. The phenomenon of noticing[13] is considered a fundamental principle for the improvisatory approach for dancers "attending to" something (De Spain 1997, p.131 cited in Midgelow, 2019). In this research, I draw on Merleau-Ponty's concept of *attending-towards* to perceptual engagement with the world and how the act of attending shapes our experiences. *Sculptural Qualities* facilitate attentive observation as the movement practitioner engages in perceptual exploration of their actual and virtual bodies while improvising within the motion capture environments. The improviser actively responds to their sensory feedback, shaping and reshaping their experiences based on real-time feedback. Therefore, this research examines the design processes based on the following three research questions:

a) What *Sculptural Qualities* are revealed through a looping feedback method when experiencing the actual and virtual within motion capture environments?

b) How are these *Sculptural Qualities* accessed within motion capture environments?

[13] Midgelow (2019) suggests finding a common language to communicate the term 'noticing' as each choreographer might refer to it differently. For example, Hay uses 'here and gone' and 'notice and let it go', or Dilley fully understands noticing as mindfulness. She suggests that noticing "encompass all manner of sensory accounts" (p.120), therefore not limited to just a visual perception. Further, she suggests noticing 'how' and 'what' the dancers might attending to while improvising, enabling to explore the improvisation from this phenomenon.

c) How are these *Sculptural Qualities* activated through improvisatory approaches within motion capture environments?

In order to address these research questions, I examine embodied practices in the dialogue between dance and technology. Scholars, choreographers, and artists have extensively explored dance improvisation since the 1960s and 1970s. For example, pioneers such as Steve Paxton, Simone Forti, Trisha Brown, Yvonne Rainer, and Anna Halprin, and scholars and writers Susan Leigh Forster and Vida L. Midgelow are investigating these embodied relationships to push boundaries of dance improvisation approaches to find new ways of moving and expressing. With technological advances, the embodied practices of dance have been explored through technological innovations by many practitioners and choreographers collaborating with digital technologists. These include Merce Cunningham, Bill T. Jones, William Forsythe, Wayne McGregor, and companies such as Troika Ranch, Random Dance Company, Palindrome, and Chunky Move. Their interest in exploring the complexity of dance and technology and their interactions within performances is evident in their choreographic works. Using motion capture technologies in their compositions to capture, analyse and represent or visualise movement data, they aim to generate new vocabularies of movement, explore choreographic possibilities, and create interactive performance systems.

Furthermore, scholars and practitioners working in contemporary dance and performance practices strive to explore and understand the intersection between dance, technology, and culture, including Suzan Kozel, Sita Popat, Sarah Rubidge, Johannes Birringer, Susan Broadhurst, Ruth Gibson, Sarah Whatley, Dan Strutt and Scott deLahunta. They engage in research and artistic practices that explore technological possibilities in dance and performance to create new forms of these practices. For some, these specific research interests involve using motion capture technology, developing interactive performance systems, and exploring embodied cognition and perception in digital performance. Their research and artistic practice inform their contribution to new approaches for choreography, performance, notation, and understanding of interactions between the performers and audiences.

While there are some examples of scholarly literature that discuss dance practices utilising motion capture technologies from a practical perspective (Douse,

2013; Gibson, 2011; WhoLoDance, 2016-2018, Strutt, 2021-23), they do not address dance improvisation from a holistic perspective. Furthermore, there is still need for interdisciplinary approaches to embodiment research with qualitative methodologies to examine these complex relationships. Since dance improvisation is a subjective and individualised form, a qualitative methodology can support a deeper understanding of subjective spontaneous, creative, and exploratory movement. This research aims to embrace these qualitative methods (observations and interviews) in studio practice and to contribute to the theoretical discussions about improvisational approaches in motion capture environments.

Additionally, dance improvisation is a highly embodied experience that involves movement, emotion, and cognition. Understanding these complex expressive processes is an ongoing discussion in dance practice. Therefore, there is a need to establish theoretical frameworks for understanding and analysing dance improvisations within technological environments. This research aims to contribute to these discussions and to provide a creative framework for improvisatory explorations in motion capture environments. By utilising these technologies of whole-body motion capture, this research proposes a framework with a twofold orientation: a) Developing processes and philosophical approaches on how dance improvisation can give rise to *Sculptural Qualities* which are embodied and extended within motion capture environments in real-time (as opposed to post-production of motion capture data into digital avatars), and b) to develop a framework and language to **access** and **activate** the dialog and interplay between improvisational and motion/performance capture practices.

## 1.3 Motivation

Studying how complex cognitive and creative improvisation takes shape in digital environments raises questions about how technology can facilitate these dynamic interactions. This curiosity has led me to investigate the interrelationship between movement and technology. Through the use of real-time motion capture technologies, I am interested in examining the concept of *Sculptural Qualities* as a temporal unfolding, creating kinesthetic and sculptural narratives of forms and their transformations into the digital realm. This exploration highlights the *sculptural*

concept where the movement practitioner's lived experiences shape their improvisational movements into artistic expression.

I was first introduced to motion capture through the 'new media' module in the second year of my undergraduate studies. I explored motion picture methods for filmmaking of stop-motion and how to capture movement with a video camera. The experience led me to take the practice as a research dissertation route, titled *Dance and Technology* (2008). The improvisational explorations challenged the relationship between movement and post-production processes. I experimented by capturing the movement with a video camera and imposing video effects on the filmed movement. For example, in Figure 2, the image in the bottom left-hand corner shows my legs exposed to a wavy movement video effect, morphing the movement. I then returned to my physical body by embodying the wavy morphing movement and acknowledged the shift of felt experience in my body. I repeated the process with other body parts, which introduced the notion of a feedback loop. While the feedback loop in this process was not immediate like established real-time interactions, it offered a layering process of iterative movement explorations. The practice resulted in several performative explorations on video and supporting theories in written dissertations.

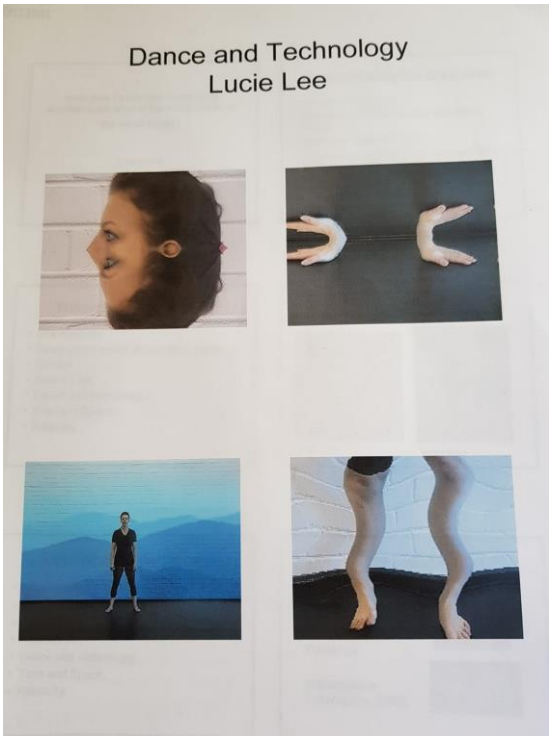



Figure 2 - Lucie's Title page for her BA (Hons) practice as research dissertation.

I continued my interest in motion capture to explore the concept of interactivity and sensory perception with digital technologies in my postgraduate practice-as-research thesis *Sensorial Perception: Empowering Dance Practice Embodiment through Live and Virtual Environments* (Sykes, 2013). I focused on improvisatory practices with the use of Isadora[14] software. Its live capture features allowed me to capture, manipulate, and visualise motion in real-time (Figure 3).

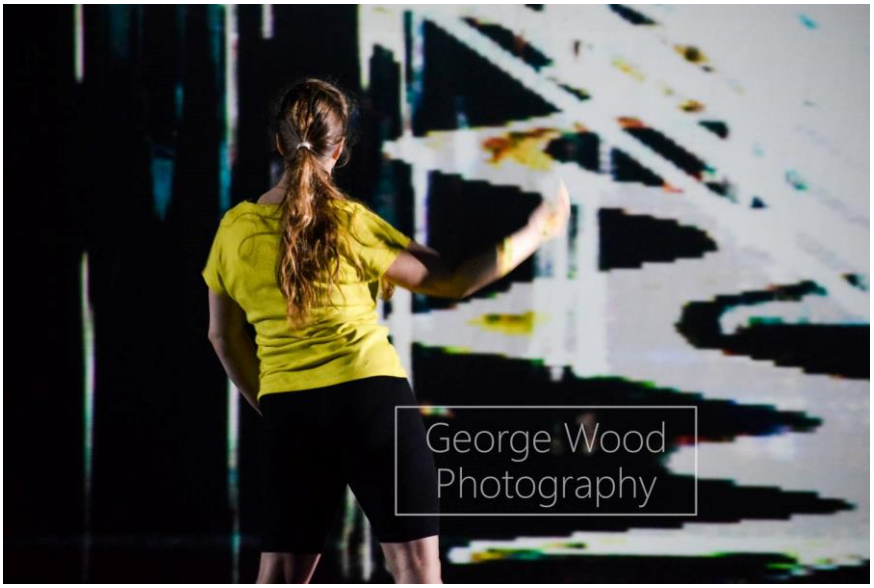



Figure 3 - Lucie is performing score with Isadora software from her MA by Research, credit caption by George Wood Photography.

I continued experimenting with motion capture with Isadora software and the motion tracking sensor Kinect (X-Box 360). Within these explorations I discovered a new interest in 'tracking and capturing motion' with a funded project called *Moving Memories* (2017) (Sykes et al., 2018), which included an interdisciplinary collaborative team of artists. The aim was to track the expressive motion of my hand in a 3D graphical tube image (Figure 4). By using a Kinect sensor and open-source processing application, I captured the motion data into a digital file format (CAD file) ready for 3D-printing into a large three-dimensional sculpture (Figure 5).

[14] Isadora is interactivity note-based programming software build by Mark Coniglio, the co-founder of the Troika Ranch dance company. Isadora is a creative tool for performances and installation artists to creatively combine live and pre-recorded video, lighting and sound to interactively engage with. I utilised the live capture element of this programme and the different visualisation effects to motion capture improvisatory dance in real-time and projected it onto the theatre screen.

Figure 4 - Lucie with a hand-gesture movement being tracked by Kinect and drawing the 3D tube line behind her on the projector – from the work Moving Memories (2017). Credit Caption Brian Slater.

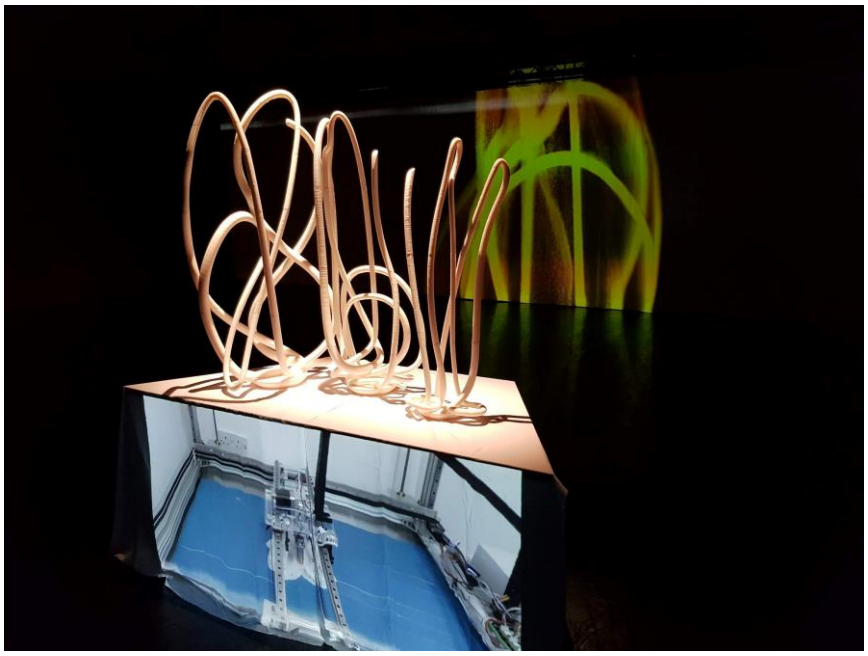
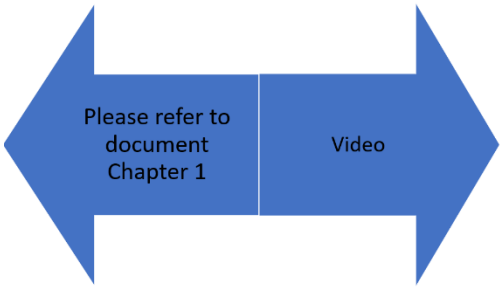


Figure 5 - 3D printed plastic white sculpture placed on the table with a projection of images in a performing space – from Lucie's work Moving Memories (2017)

During this project, I collaborated with sound and a digital artist Michael Dunn and a British sculptor Ian Randall. While working with Kinect sensor Ian suggested observing and analysing the different movement qualities and body-shapes I was creating. He often discussed his approach to making large sculptures and emphasised the relationship between the *body, space* and sense of *shape* as he sculpts. While in the studio, he observed the movement in comparison to the 3D tube visuals creating the sculpture. He suggested that the movement explorations has an "impact point and soft return as opposed to jagged angular, angry feeling" that is how I can "use movement as an expression" and "…[to] intensify the expression" when the movement progresses (Randall cited at Lee, 2017) to create sculpture (see video).




These words always resonated with me. In this research, the 'intensify' movement relates to expanding and evolving the *Sculptural Qualities* with the use of motion capture technologies. It emphasises movement qualities with dynamic and spatial relationships and its temporal unfolding of sculptural impressions.

Working with motion capture technologies, like Kinect sensor and its tracking function, offers an opportunity to explore the shaping process and emphasising the sculptural form and the iterative process, which Ian often referred to. Furthermore, within the *Moving Memories*, Michael Dunn (2017) suggested that

> One of the biggest challenges we faced is translating the ideas in the digital domain within the software in terms of the sculpture and translating these to the physical domain – wherever they can exist and be sturdy enough in a kind of tangible physical formats in the real world (Dunn cited in Lee, 2017).

In this quote, Michael refers to 'the idea' of my movement as a sculptural motion created through improvisational experimentation with my hand and interaction with

the real-time tracking sensor Kinect. The sculptural motion is visualised in the 3D tube line. In this sense, the tracking of the hand motion can be defined as a trace-form, a pathway of movement (Laban & Ullmann, 2011). The challenge lies with the 'translating' sculptural motion into a form that can exist in the tangible form: the physical sculpture (outcome of the tracking motion). The embodied experiences of these sculptural explorations have brought me to the initial idea for this research. However, in this research, the focus is on the holistic experience of the shaping process rather than on the artwork of a sculpture itself. The challenge remains in terms of bridging the gap between the physical and virtual domains while focusing on the holistic approach. It requires the combination of finding effective uses of the technology (its capabilities and limitations) with appreciation of the artistic and expressive creation. Therefore, this practice-as-research examines emergent ***Sculptural Qualities*** when improvising bodies - in their physical and virtual forms - are engaging within optical motion capture environments.

## 1.4 Thesis outline

As a dancer/improviser and scholar, I place embodied experiences of doing-thinking-moving-sensing within interdisciplinary approaches and practice-as-research methodologies. This research draws on various modalities of dance performance capture, kinetic art, and motion capture practices. These fields are typically distinct. However, the combination of these modalities allows this research to develop a comprehensive understanding of the embodied practices of *Sculptural Qualities* in motion-capture environments. The collaborative aspect of each discipline allows me to explore the relationships between body, technology, and the world.

**The second chapter** develops key theories and concepts by examining the terms 'sculptural' and 'qualities' in relation to dance improvisation and draws on sculptural practices of expanding fields concepts by Krauss, Kölmel and Ströbele (2023) and Koed's (2005) sculptural proposition. It explores the sculptural forms and motions of movement practitioner's body-mind extends and is in mutual relationship with motion capture technologies (Merleau-Ponty, 1945, 1962; Ihde, 2002; Clark and Chamber, 2008). Merleau-Ponty explores the perceived body or embodied consciousness as a

lived experience of the body, self, and world in unfolding relationships in which otherness and the world are intertwined with the self. For Ihde (2002) perception of the world is inseparable from our use of technology, and that technology becomes an extension of our bodies and senses. Similarly, in Clark's (2008) EXTENDED theory of mind (capitals in original writing), body-mind is coupled with the environment in a reciprocal feedback loop. For improvisational movement, observation, and its sculptural Effort-Shape qualities analysis, I draw on Rudolf von Laban's concept of *Choreutics* (Laban, Ullman, 1966).

**Chapter three** proposes the original contribution of this research with an additional category to Karreman's (Butterworth & Wildschut, 2017) identified categories on the use of motion capture technologies with embodied practices. Further, this chapter examines relevant motion capture practice by scholars and choreographers, with recent developments in concepts of telepresence theories, augmented theatre, choreographic innovations, and archival-pedagogical research in dance and motion capture technologies.

**Chapter four** describes the methodological underpinning of Practice as Research (PaR) emphasises the role of practice (Nelson, 2013, 2022; Scott, 2016) and artistic experimentation with a theoretical underpinning in discovering knowledge - praxis of know-how, know-that, know-what. This PaR combines praxis with qualitative methods such as observations with semi-structural interviews, reflections (Schön,1983) and interpretive methods (interpretive phenomenology analyses) (Skains, 2018; Sklar, 1991). The approach to document(ing) is also discussed in this chapter.

**Chapter Five** discusses studio-practices involving experimentation between the improvising body and motion capture technology, where the movement practitioner(s) wears a motion capture suit with markers to track their sculptural motion. The raw motion data are then mapped onto a three-dimensional digital model and emanated movement practitioner into the sculptural form of expressive and abstracted dots, lines, particles, floats, spikes and polygons. I also discussed a workshop I designed to respond to these visualisations in real-time.

**Chapter six** includes reflections and analyses on the workshops over three phases to present the findings of the four core elements *of the Sculptural Qualities*. The definition of an open feedback loop is discussed in this chapter.

**The final chapter** will conclude with the present situation of this research and its future developments.

In summary, this chapter has set out the aims and objectives for this practice-as-research inquiry. It discusses the key concepts and theories that underpin this research. I have positioned my previous skills and knowledge within the dance and motion capture practices and how it has led me to the motivation of this research inquiry. This chapter has introduced and identified sculptural motion and *Sculptural Qualities* as expressive and dynamic movement qualities. The following chapter will define the key term of *Sculptural Qualities* in relation to the key embodied and extended theories. I draw on these concepts to identify a framework for dance and motion capture practices on how to access and activate *Sculptural Qualities* in imposing bodies within a motion capture environment.

# Chapter Two – Literature Review

*[E]xpression is the language of the thing itself and springs from its configuration.*

- **Maurice Merleau-Ponty (2002, p. 575)**

## 2.1 Introduction

To contextualise *Sculptural Qualities* in this research, I introduce theories and phenomenological positioning that underpins this research. The first part of this chapter discusses dance improvisation as an ever-evolving process with creativity, spontaneity, and awareness of the human body in motion. Through the existing literature on dance improvisation (Bresnahan, 2015; De Spain, 2000; Heble & Caines, 2015; Ingold, 2011; Ingold & Hallam, 2007; Midgelow, 2019; Ravn, 2020) I focus on the intentional processes of creation of movement in real-time (Carter, 2000). Within these intentional processes, I draw on De Spain's (Albright & Gere, 2003) concept of improvisational awareness to emphasise the active and dynamic relationship between body-mind, movement, and environment. Movement practitioners connect and engage in a profound sensory and responsive form of improvisation by attending to their heightened awareness, allowing them to connect to wholeness. As part of the holistic approach to dance improvisation, I introduce the notion of *in-readiness* as an act of listening in real-time. It allows us to **access** sculptural processes by improvising in the moment, actively engaging in looping responsive activating various states and conditions, which I term *qualities*.

I discuss Albright's (Midgelow, 2019) notion of *produce* to emphasise the interconnecting intentions between the improvisation and sculptural processes. Within these connections, her *What-If* approach and Koed's (2005) proposition on inherent attributes and characteristics that can define sculpture allow me to position the act of improvisation and its sculptural process as expanding and experimental intentions within the expanding fields of sculptural practices in the post-digital age (Kölmel & Ströbele, 2023). I borrow the traditional approach to sculpture - a *process of shaping* - to inform the experiential improvisations in the studio within the motion capture environments. The sculpting-shaping intentions are discussed in relation to artists within the sculptural and kinetical practices to align understanding on how *Sculptural Qualities* may emerge within motion capture environments. For example, Gormley's and Cragg's practises challenge the relationships between the body and the environment. Their methodologies and techniques on shaping materials and use of technologies for their processes can inspire this research in relation to improvising bodies and how they extend and couple within the digital environment. I discuss the sculptural principles of abstraction and extensions of the body into the environments

through works by Loïe Fuller and Oscar Schlemmer, and visual and performative-architectural performance by Brown, De Keersmaeker, and Reeves offers living sculptural and improvisational intentions for *Sculptural Qualities* to emerge.

With the explorations of sculptural abstractions and their forms and shaping transformation into a digital realm, I draw on Rudolf von Laban's movement analysis system. It is a method to describe, observe, and analyse the relationships between movement, space, and time. It involves breaking down movement into components of Body, Effort, Space, and Shape (commonly referenced as BESS). It considers the concepts of Efforts (dynamic and energy shaping movement), Shape and its mode of change (the spatial configuration and form of the body and its parts allowing to re-shape for the creation of visually engaging and expressive compositions), and orientation (vertical, horizontal, sagittal in relation to shape change). These elements are relevant in this research to establish the *Sculptural Qualities* with their form, structure and dynamics while improvising within motion capture environments.

I conclude this chapter by emphasising the relationship between the improviser's body-mind and technology is explored in this research through the lenses of Merleau-Ponty's *The Phenomenology of Perception* (1945), Don Ihde's (2012) post-phenomenology on embodiment and perception theories, and Andy Clark's (2008b) EXTENDED embodiment theory. This concept proposes that the "mind as embodied and environmentally embedded"[15] (p.37). Phenomenology is a philosophical movement that focuses experiential awareness on the first-person point of view (Smith, 2018). The subjective experience relies on the sensory input of the individual and its perception. Using phenomenology as a methodological approach aims to assist this research in communicating my understanding, description, and examination of the relationships between the actual and virtual improvisational bodies in motion capture environments.

[15] This phrase is coined by Haugeland (1998) "Mind, therefore, is not incidentally but *intimately* embodied and *intimately* embedded in its world" (p. 236-237). Thus, the mind of the movement practitioner is embodied and embedded in its world and the world of existence being-toward-the world (see 2.4).

## 2.2 Contextualising *Sculptural Qualities*

### 2.2.1 Holistic Approach to Dance Improvisation

Improvised movement can manifest in many different forms and contexts. Improvisation is embedded and primarily "unscriptable" (Ingold & Hallam, 2007, p. 1) within daily, and sometimes social, activities. The meaning of this improvised movement arises in the moment. As a dance artist, I ground my research and performance work in the practice and principles of improvisation[16]. In this thesis, I primarily focus on "improvisational awareness" proposed by De Spain (Albright & Gere, 2003, p.27) as a way of attending to improvisational experiences in the moment and at any moment. He suggests that "improvisation [is] performed in order to achieve a movement-based somatic state" (Bresnahan, 2014, p. 86) and can be seen as a research tool in movement practices "as an extension of our intentions" (Albright & Gere, 2003, p. 27).

An act of improvisation may lead to translation of the improviser's living experiences into language in real-time. De Spain calls it a *report* in which the "I"-ness and activities performed by the "I" are vocalised of improvisational experience in the moment (De Spain cited in Albright & Gere, 2003, p. 29). Similarly, Albright (cited in Midgelow, 2019) suggests that any vocalisation of the yet *unknown* 'I am engaging in a process' - improvisation - may shift to rather decisive sense of making 'I made a dance' and locates the choreographer "within the map of artistic production" (p.26). Further her proposition is to situate choreography and process within "[an] etymologically related word: *pro*duce . . . pro*duce"* [italicised in its original] to enable 'connectedness'. Thus, the decision-making set into motion by the improviser is 'spontaneous and reflective'. In this sense Albright enables the *what-if* approach to situate the choreographic sensing-thinking with the process of thinking-doing. Within this research, I embody the *what-if* method within the process as follows: *what if* I situate the *sculptural (object/subject)…qualities (states/conditions)* to enable the improvisers' kinetic decision-making. This method allows for exploration and

[16] Carter (2000) proposes that improvisation can be defined in three principal senses as "the embellishments left to the individual artists where a set choreography persists; improvisation as a process of spontaneous free movement to invent original movement intended for use in set choreography; and improvisation for its own sake that is brought to a high level of performance" (p.184).

experimentation, to challenge dancers' assumptions and preconceptions leading to new insights and understandings of being-in-the-world specifically in the context of motion capture environments and this praxis. These improvisational processes are subjected to open form with the emphasis on the process rather than the final product, where the improviser and audience view "one of many possible realisations of the idea" (Carter, 2000, p.181). The process is "the way we work" (Ingold & Hallam, 2007, p.1) and it is in a constant flux of making. Thus, improvisation is "in the process of emerging into the world" (Midgelow, 2019, p.6). Hamilton (1994, cited in Midgelow, 2019, p. 13) suggests that each moment presents itself as a seed for another movement; as a life form, it has a "living structure"
– *processual* improvisation.

Similarly, through this research I examine the process of discoveries in real-time. Drawing on Heble and Caines (2015), I propose that the act of listening within improvisation enables the iterative feedback loops between the inner and outer expressions that enhance problem-solving creative processes in real-time. When improvising in real-time, and in this thesis, I use the term *in-readiness*[17] as a means *to be moved/being mover* rather than preparation, rehearsal, and training. This concept of *in-readiness* offers an act of surprise, and the body-mind has to acclimatise to the change. It emphasises the spontaneous act of improvisation. It encourages the dancer to embrace the state of *unknown*, allowing the authentic and immediate responses to emerge in the present moment. By letting go of pre-planned sequences or choreography, the improviser attends to *in-readiness*, allowing the improvisatory experience to progress into discoveries of *Sculptural Qualities*. The *in-readiness* fosters curiosity, exploration, and experimentation to develop methods of **accessing** *Sculptural Qualities*.

Improvisation is actively present for the improviser and manifests *within* and *through* the somatic state, emphasising the connection between body, mind, and movement - a living body. These connections allow the improviser to connect with their physicality and consciousness, merging into a holistic spontaneous response in the improvised moment. The improviser's body becomes a medium for the kinetic

[17] In the context of human and technology relations – in this case, dance improvisation and motion capture - *in-readiness* emerges when the real-time function of motion capture enables is used, as Heidegger calls "readiness-to-hand" and "handiness" (Svanæs, 2013,p.8:6).

transformation, emphasising the dynamic and fluid exchange of movement and energy. These kinetic transformations arise from the embodied awareness and responsiveness of the living improvising experiences as *in-readiness* states. *In-readiness* encourages the dancer to actively listen and sense their bodies and the bodies of others in the space and the environment. While the improviser actively listens, it enables the improviser to engage fully in the moment. The heightened listening and attending to the present moment allow the body to move and respond spontaneously within the environment. The improviser's openness to explorations leads to various sensations, thoughts, and emotions in their body-mind. The active engagement with felt experiences is present through proprioception, and the sensing-moving of inner impulses connecting with the external cues from the environment is an inherent relationship between improvisers and the world in which they move from and within.

Active attending is a key aspect of somatic practices that use awareness of the body and its sensations to foster mindfulness and improve overall well-being. While active listening enables risk-taking, trust, surprise, and collaboration, dancers' mental processes, bodily expressions, and interactions are highly embodied. The body-mind interaction with their sensations, surroundings, and other bodies presents adaptability to change, which I call shape and reshape, with different expressive behavioural responses, states, or conditions, which I call *qualities*. These attentive *qualities* **activate** the *sculptural* intentions, enabling active listening and the improviser to attune to their intentional processes and foster kinetic transformation. I schematise these transformative intentions with the arrows ⟷ emphasising the mutual relations. For example, when the improviser attentively responds to the environment these intentions ⟷ movement evolve fluidly and organically. *Sculptural Qualities* allow the improviser's body-mind to have heightened awareness to shape and reshape their movement in real-time. The improviser's intentions ⟷ wholeness (body-mind and the environment), allowing for a sense of "need" to move in a "much more fluid feedback loop" (De Spain cited in Albright & Gere, 2003, p.35). The attentive nature emphasises the sense of *noticing* felt experiences from the perspective of the improviser's body-mind, enabling for active engagement with the

environment. The sense of need[18] to interact instigates the “aesthetic choices” (De Spain cited in Albright & Gere, 2003, p.34). By acknowledging these aesthetic choices, the sculptural form emphasises awareness of the shaping and reshaping process. The intended basis for new movement ideas is connected to intentions ⟺ elements of artistic form. While dance improvisation has elements of no predetermined structure, there are some aspects of improvisational ”agenda” (Albright & Gere, 2003, p.35), which De Spain suggests shifts through the conditions and contexts of the intentional relationships between the movement, body and the environment. This shift, known as kinetic transformation or what I term shaping and reshaping, introduces the mutual relationship of *sensing-being* as a holistic approach to improvisation to foster *in-readiness.* Sensing the desire to explore and experiment with these ongoing improvisational intentions involves accessing the feedback loop between the internal shaping and external reshaping responses (to the needs). Being present in the moment, as De Spain calls it the "cutting edge of awareness" (p.37), the improviser’s looping intentions shape and reshape when entering the motion capture space (volume) where *Sculptural Qualities* emerge.

## 2.3 Conceptualising Shaping Processes

### 2.3.1 Defining *Sculptural Qualities*

De Spain’s insights into dance improvisation as a somatic practice, discussed in the previous chapter, provide an expanding lens through which movement can be understood as intrinsically sculptural and transformational. For example, as the improviser is moving and being moved, they explore shape, form, and space, echoing the *sculptural* essence in a dynamic environment. Returning to Albright’s *what-if* approach, I ask myself: *What if* the term ‘sculptural’ is used metaphorically or conceptually and still describes qualities found in the art form you place it in, such as dance improvisation or motion/performance capture where the improviser’s body and the motion capture environment is involved in improvisational sculptural experiences? In this instance, I refer to concepts of *expanding fields* (1979) by Krausse, as it offers a contemporary perspective on sculptural art as a

[18] Laban & Ullmann (2011) describes the need as a desire to be moved and for movement through inner impulses with expressive Effort qualities, which I discuss further in section 2.3.4.

performative form. *What-if* I borrow the *shaping processes* upon which the conventional sculptural art is built upon and place it alongside Krausse's expanding field concepts and Koed's (2005) sculptural proposition, where the central idea that the physical and perceptual properties of materials are used in "...a distinctive way [...] as an artistic medium" (p.150). This multi-layered thinking allows me to align it with post-digital age sculptural concepts towards a new spatial experience in the virtual space (Kölmel & Ströbele, 2023). Therefore, extending Koed's (2005) definition of *sculptural*, I ask again *what-if* I propose that the sculptural element in this research encompasses both actual and virtual bodies and environments. Emphasising the *pro* (in Albright's *pro-duce*) aspect highlights the *pro*active nature of shaping processes and, at the same time, it accentuates the intentional actions taken by the movement practitioner to shape and transform the sculptural into dynamic interactions *with* and *within* the bodies and the environment. Additionally, emphasising the *duce* (in Albright's *pro-duce*) as a means of leading or guiding, it situates the movement practitioner as the performer-designer and directs their intentional movement responses in real-time to create the *Sculptural Qualities* within this research.

Furthermore, I draw on various artists to seek how *Sculptural Qualities* may be configured within motion capture environments. Exploring the elements of working from *within* the body (Gormley) and *from* the body *as* the material (Cragg) can shift the perceptual properties of material into a state of *being* (living experience) and expressed in the sculptural form of abstract shapes (Fuller and Schlemmer), which might suggest metaphorical meanings. When one thinks of *sculptural* in this research, the *body is* a medium (a designer or sculptor) sculpting *with* and *within* the expanding environment, transforming one abstract form into another in real-time. The process of sculpting[19] (or to sculpt) draws attention to the artist's shaping,

[19] In dance fitness, a cardio-based workout promotes burning fat and tones muscles - sculpting a body. Drama uses exercises to develop an actor's improvisatory movement and tableaux technique by working in partners, where one person is the sculptor, and another is the clay – sculpting into what Laban would call a 'body design'. A sculpt(ing) silhouette exercise is part of the Performance Capture (PeCap) technique, which is a technique of using actors who "supply the movement of in-game characters" (Delbridge, 2015, p. 2) for a variety of outputs like video games and films. The silhouette exercises guide the actor to "sculpt" distinct and recognisable poses of their character for animation and view them by the game player seeing the character's silhouette from behind. By shaping their bodies into triangular, irregular angular or mixed curve triangle shapes qualities, the actors develop a sense and understanding of the physical and behavioural archetypes (Dower & Langdale, 2022).

involving active engagement to work *within* and *with* the materials into sculptural experiences. Therefore, I borrow these shaping processes to allow the emergence of *Sculptural Qualities* as processual and relational. Within this research, the shaping processes continually unfold in relation to the body, space, time, and the environment - the physical and the virtual. The improviser actively (intentionally) engages with the body-mind and environment to shape their experiences in real-time, creating three-dimensional expressive movement responses. The qualities in this sense are presented as shaping experiential behaviours, which form the core elements of the *Sculptural Qualities*. The use of 'qualities' as an adjective informs the improviser of a state, condition, or characteristics of the shaping experience. In this research, I refer to Laban/Bartenieff's movement analyses of Effort/Shape, described as opening, rising, closing, sinking, advancing, and retreating. The plural use of qualities developed through research phases one and two, observing that these states or conditions were emerging in multiple forms, informed my decision to change from 'quality' to 'qualities.' The improviser's real-time movement responses shape these *Sculptural Qualities* and, upon receiving feedback from the environment, engage in an iterative process of refining their movement expressions – a dynamic feedback loop. In the next section, I discuss how I arrived at these definitions.

### 2.3.2 Sculptural as an emerging practice

Krauss argued that boundaries of sculpture have developed into the time-based forms of the medium and *expanded* the sculptural context. Therefore, sculptural art offers more than standalone three-dimensional objects, as seen in conventional sculptural art; it expands into practices that engage with space, such as site, architecture, installation, and performance. In this research, the Sculptural Qualities are placed and engaged within a motion capture environmental site that can be viewed as an installation or performative site. Therefore, sculptural practice evokes deeper interaction *with* the environment and the viewer. The improviser interacts with and within the motion capture site (later, I call it volume). An example could be drawn from the spatial expansion introduced by Process Art and Land Art in the 1960s and 1970s (in America and Great Britain), which allowed artists to work *with* materials from *within* the 'land', and as a site, they connected to the Earth, like in this research,

where the improviser connects with the motion capture site (volume). For example, Aycock's environmental sculptures, often built *into* and *on* the land, creating sculptural installations which draw on politics of space (private and interior space) and the body's relationship to the architectural built environment within those landscapes. This research offers the improviser the opportunity to explore sculptural forms and expressions *within* motion capture environments intertwined *with* body-space relationships.

At the beginning of this research, I visited Gormley's[20] exhibition at the Royal Academy of Arts in London in 2019. The works such as *Slabworks Series* (2019, 80 mm weathering steel slab), *Subject* (2018, 10 mm mild steel bar) and *Subject II* (2019, 10 mm square section mild steel bar) (Gormley, 2019) allow me to reflect on the profound connection to the human body and its interaction with the surroundings and how it can connect the viewer to the active relationship with shaping processes. As his works are often site-specific, I felt the explorative endower of the sculptural body and spatial experiences, which kept altering during my visit. The shifting of experiences was felt within my first explorations within a motion capture environment. Thus, my research on *Sculptural Qualities* allows for interactive and active explorations of bodily presence, the awareness of time (temporality) and the dynamic relationship of the sculptural form, which constantly shapes and reshapes.

As I actively interact with the motion capture environment, I recognise that these themes of active interaction with the form and environment can be observed in performance-installation works by Trish Brown, a modern dance pioneer. Brown's work *Stream* (1970), a through-like wooden walkway with placed objects like cooking pans of varied sizes and shapes filled with water, represented the stream of her childhood memories. The audience was asked to engage by walking or running through this stream, avoiding the pans with water, like they would if they were hopping from one stone to another. The improvisational aspect of these interactions introduced spontaneity and movement explorations of moving through, where the

[20] Smithson's work was influential for Gormley's sculptural land art projects, often exploring the relationship between people, places, and time. For example, his work *Land* (Gormley, 2016), where five life-size standing sculptures are installed in specific locations around the United Kingdom, emphasises the ever-fluent connection between body, art, and natural environment. Smithson's works explores the earthy site and introduced the element of scale (volume) into his artworks. For example, his work *Spiral Jetty* (1970) (Rozel Point peninsula on the northeastern shore of Great Salt Lake) used the found soil on the site and over six thousand tons of black basalt rocks to form a coil 1,500 feet (about 457.2 m) long and 15 feet wide that winds counterclockwise off the shore into the water (Rubio, 2012).

audiences become part of the sculptural piece. Therefore, Brown's choreographic vision invited performers and the audience to engage and interact with the sculptural object. By doing so, they became part of the overall sculptural process and shaped their experiences with the artwork (Rosenberg, 2012). Like in Browns' work, where dancers navigate *through* the sculptural pathway, responding to their presence in real-time, in this praxis, movement practitioners direct their movement intentions towards the sculptural environment and transform - shaping - their experiences *through* the bodies *within* the technological and digital environment.

Returning to the pioneers of modern dance, where performative and architectural meet at the intersection of expanding fields, I draw on two innovators, Loïe Fuller and Oscar Schlemmer. Fuller offers visual sculptural motion in her debut performance, *Serpentine Dance* (1891) - skirt dance - emphasising the sculptural elements achieved through her movement and extensions with fabric and the use of lighting shaping abstract forms and imageries (Moore, 2009, p. 15). The textile extends the body by passing its physical bounds (Christian, 2021). As the draperies fold in repetitive and continuous motions, I note that shifting perceptual cues between her body and the material prolong the sensations and emanate into the space around Fuller's body. This prolongment of form and feelings enables the body to extend into space (Andrew, 2020) and expresses the dialectics of the modern experience of dance. The continuous movement manipulated a circle of silk fabric, which Fuller wore from the neck, to enable her arms to rotational movements through the tactility of two bamboo (or aluminium) curved rods attached to the silk and the top of the arm, creating twisting lines of winding fabric (Portanova, 2013). Fuller's interplay between movement, silk, and lighting, which contributes to the overall sculptural motion of abstracted extensions, blurs the lines between human and machine relationships. Her approach to working with body, material and technology inspires me to experiment with this research's physical and virtual elements.

Correspondingly with Fuller's use of material, which influenced her movements, Oscar Schlemmer's *Stäbetanz* (in translation *Stick Dance*, 1928) extends his limbs with wooden sticks, shaping his body into geometrical constellations. As he is dressed in black, the dancer's body blends into the black background of the environment, leaving the visible long white wooden sticks shaping

and extending into the ever-changing environment.[21] Schlemmer's *Stäbetanz* is "a temporal activation of a constructivist sculpture" (Centre National de la danse, 2015) and was seen as an innovation of a choreographic abstraction and follows the laws of the abstract stage, which carries invisible lines of planimetric and stereometric relationships (Ka, 2005, p.7). I often refer to this work during my research phases, as I consider the resemblance of his approach *within* motion capture space (volume) and extend these artistic explorations into the digital age. For example, the Bauhaus School of Design and the GSD in 2019 created movement-based performances exploring Schlemmer's approach to human form and bodily presence with new spatial and bodily interfaces. The *Stick Dance* adaptation called *Hinged* (Harward GSD, 2019, 0.49-2.08) explores the relationship between the mechanical and human body with an additional layer of motion and sound technologies. The soundscape is generated through motion detection and augmented reality (AR) technology to create invisible sound instruments in space. As the performers move with sticks attached to their bodies, hinged in places, and extended into the space, they activate these sounds. Upon observation, these gestural and mechanical movements allow for presence and stillness to develop in response to the space and the other bodies and create sculptural experiences of here and now. Therefore, when thinking of *Sculptural Qualities* in this practice, I experiment with mutual interactions between the human body and technology and how it can shape the perception of the body and space as an artistic medium. While Schlemmer emphasises the spatial relation between man and space (Ka, 2005) and explores the human body as a code, Fuller's utilising the stage lighting effects of her colourful moving veils (Christian, 2021; Portanova, 2013) influences her transformations. These transformations into butterflies, the Spanish dance, the basket, and even allowing her to be at rest (Garelick, 2007) – stillness – evoking abstracted extensions in every expanding field of visual and sculptural performances.

Similarly, the visual and performative-architectural performance is evident in Anne Teresa De Keersmaeker's work *Dancing the Sculptural* (2020), which explores

[21] The visible white line data (the sticks on the limbs) of human motion resemble Marey's chronophotography of *Man Walking* (1884) and *Soldier Walking* (1883); several phases of movement in one photographic surface resulted in technology leading to modern cinema and motion capture technologies (Sobanova, 2016). The noticeable lines connected with dots create a sequence together representing the skeleton structure of the human body in motion, similar to Schlemmer's sticks and their compositions in space. In the context of this research, these dots and lines are evidence in the MoCap software I am using, which has influenced my way of working.

sculptural principles embraced by Constantin Brancusi and her fascination with a form that flies through “embodied abstractions” (Sireekan, 2020, line 21). This durational performance unfolds with different female members of Rosas’s cast. At hourly intervals, they take turns to embody a “choreographic object” (Sireekan, 2020, line 29), resonating shapes one of Brancusi's muses with oval heads and abstracted facial features. The sustained qualities arise from tensions between dynamics and stillness, forcing the audience and performers to observe the dancer's movement to ensure that it is not a sculpture per se. De Keersmaeker's dynamic and durational kinetic performance ends with the last dancer interpreting sculptural imagery of flying birds - defining gravity. She creates a choreographic object which “intervenes into the self-evident notions of both “dance” and “sculpture”” (Sireekan, 2020, lines 134-135). The durational aspects of De Keersmaeker's choreographic object allow me to approach the fullness of the shaping experiences over time within motion capture environments, which means that the bodies, actual and virtual, in motion as living sculptures, are navigating *within* the motion capture space (volume). Each movement and extension, explored by the improvisers, shapes the temporary sculptural form with opening and rising - dynamic and sometimes still - embodying the *Sculptural Qualities* of form under the influence of these temporal tensions. The temporal sculptural unfolding may shape an image or metaphorical meanings as sculptural imagery for the improviser to pursue further. For example, in the *Sculptural Murmurings* (2020-21), the work of sculptor Hazel Reeves was done in collaboration with Rosaria Gracia and Maria del Luz. The performers individually shape their bodies in response to the six different soundscapes they could choose and hear in their wireless headphones with LED lights. The performers also had a choice of responding to others within the space. The 'freezing sculpture' is referred to by Reeves when all participants suddenly find themselves in stillness and shape for a moment, and from there, creating unique bird-like yet human murmurings. The sculptural method she embodies “[i]t's to do how we are shaping the sound in the space when responding to sound” (Reeves, 2020, 0:19-0.27). Within these freezing moments, tableaux evoke a confined sculptural shape. Once again, I ask, w*hat-if* the improvising bodies can draw inspiration from these works in this praxis and transform improvisation into a temporal and dynamic unfolding of the shaping process within motion capture environments? For example, the improvisers can infuse their movements with dynamic qualities in a static medium - freezing fluidity in

time. In this instance, the improvising bodies have the potential to become a living sculptural dialogue with and within the digital environment, tracing the same ephemeral paths that inspired Brown, De Keersmaeker and Reeve's creations. Fuller combinations of stage lighting and colourful displays contributed to the stagecraft innovations.[22] Highlighting that dance is a live medium evolving into a sculptural body of work and sculptural experiences.

Moving into the technologies which support the understanding of the sculptural within these realms and its performative element, I explore the digital age practices. Dobbe & Ströbele (1968) argue that Krausse's discussion on photographic and temporal sculptural is not consistent with her work "sculpture in the expanded field" and they offer a new methodological approach as "expanded field of the sculptural" (cited in Kölmel & Ströbele, 2023, p.11). Burnham's (1968) work on sculptural explores the digital and virtual sculptural phenomena and explores the tech-computer-based sculptural works and the systems aesthetics of several artists. Consequently, Mallary (1968) differentiates between "computer-aided" and "computer-generated" sculptures (Kölmel & Ströbele, 2023, p.12) with the development of his two-computer software TRAN2 and PROSA, enabling the calculation of forms with printing possibilities and generating three-dimensional solid forms like his work QUAD (1969). Similarly, works by Cragg often uses computer software such as 3D modelling[23] software (and others) will assist him with the design and fabrication processes. The 3D modelling software (often Computer-Aided Design CAD) provides immediate feedback on design choices. It allowed him to adjust and refine his mental model. I often observe and admire his works during my

[22] Fuller's motion picture recording of her performance (1985) enabled the development of the relationship between dance and technology - visual effects (Boucher, 2011) followed the development of the motion picture by pioneers Muybridge (1830-1904) and Marey (1830-1904) on understanding motion through photography and contributing to capturing the motion) connecting the Art Nouveau movement of dance and technological innovations in the arts.

[23] The sculptural phenomenon is evident in the digital and virtual realms through sculpting or modelling while creating 3D objects. There are two types of digital sculpting: mesh-based geometry, which is like Blender software, and Voxel-based geometry, which is applicable in Unity game engine and Unreal Engine. For example, with the use of digitised clay, the interaction with the different sculpting options in the Blender software offers possibilities to sculpt clay *as if* the user-sculptor were sculpting with their own hands or using tools to make the objects' surface uneven. Similarly, within the Unity game engine, the sculpting function of an environment enables the user-sculptor to raise and lower the height of the landscape heightmap (Unity Technologies, 2019), shaping it with different selections of brushes. These organic sculpting processes have an artistic expression that is widely used in video games, animation films, and TV in character design and explorations, as well as in environment design, which enhances the object's aesthetic qualities (Community B. O., 2023).

walks on the grounds of Yorkshire Sculpture Park while developing my piece *Moving Memories* (see Chapter 1) and the first phase of this research. I was fascinated learning how his approach to making *with* material, form, and computer programming software allowed him to rethink the fabrication processes of his sculptural works. The 3D modelling software enables the reshaping of the material in a controllable environment, creating feedback-around that shapes the environment, allowing him to create precision and control in his sculptural design. Once the design is created, he can physically move, shift, and change the material during fabrication. His sculptural installations evoke natural forms and shape emotional responses within the environment. Therefore, the processing of the material is not visible on their surface as they are purely pictorial ideas that appear in perfect form *through* computer technology (Kotlomanov, 2016), where the sculptor is the designer. He discusses the process as a painter's palette "…where I can move a material around and find my path through the material" (Wade, 2019, lines 13-14). Thus, when he is reworking familiar objects into new forms, ideas and emotional experiences, his sculptures take unconventional shapes of twisting, rippling, and undulating forms that evoke elements of the natural environment. When he discusses his studio practice, he says he needs "to be there, to see it, to respond to it, to make next decisions…" (Tate, 2018, 2:08 -2.14). Similarly, *Sculptural Qualities* require the improviser to be there to see it and to respond to the ever-changing sculptural forms and environment.

Considering the transformative nature of these shaping processes, which allow for creating and manipulating virtual forms, it can support the development of sculptural concepts within motion capture environments. Therefore, through these digital sculpting-shaping processes within this research, the movement practitioner can shape movement with their whole-body motion. The whole-body becomes a pallet with which the body and mind can actively engage and interact with the environment. Therefore, *Sculptural Qualities* emphasise overall movement and gestures through flowing lines, dynamic poses, and expressive gestures to capture the essence of dance improvisation. By rethinking the sculptural within motion capture environments, I am expanding on the boundaries of conventional sculptural art, where *Sculptural Qualities* include both tangible and virtual dimensions. This approach emphasises the contemporary approach to integrated perspectives of the physical, virtual, and real-time interaction to provide a framework for exploring and experimenting within motion capture environments. To summarise the

term *sculptural,* in the context of this research, it is a shaping process in which the movement practitioner actively engages with and intentionally influences bodies, actual and virtual, which are extended, abstracted, and situated in temporal experiential unfolding in real-time within the motion capture space (volume) and the environment. The improviser and the environment are in the constant mutual iterative shaping processes of influences and adaptations. The improviser's sensing and responding intentions in real-time enable attentive and interactive shaping and reshaping experiences through sculptural sensibilities, which I discuss in the next section.

### 2.3.3 Sculptural sensibilities and Motion capture

In the definition of *sculptural* provided above, the sculptural sensibilities and tactility are inherent within the inter-play between the actual and virtual bodies as an artistic medium. The sculptural sensibilities offer awareness and understanding of the *in-readiness* state where the improviser is attending to these active listening processes. In dance improvisation and somatic practices, sculptural sensibilities inter-play through intentional and spontaneous shaping of the body and mind in relation to space. Movement practitioners rely on their kinaesthetic awareness and physicality to explore shaping processes with dynamic and ephemeral sculptural forms. While they engage with the physicality of their bodies and the environment, they are utilising shapes, lines, and spatial awareness (how movement affects the space). Therefore, the movement practitioner's sensibilities involve a deep appreciation for the form and its spatial relationship between the actual and virtual. Movement practitioners' sensibilities are vital in shaping the bodies, ensuring that the inter-play of their embodied experience offers opportunities from which *Sculptural Qualities* arise.

Sculptural tactility within sculptural art refers to a sense of touch and physical interaction when manipulating the material into a sculptural form. The artist uses their hands as tools to mould, carve, or shape the materials, engaging in the tactile nature of the sculptural processes. In dance improvisation, the dancer experiences tactility through kinaesthetic awareness and physical contact with their own bodies (in this research, the actual and virtual bodies) and the floor or in contact improvisation contact with another dancer in the space. Through tactility, they

explore the sensations of touch, weight, and force (energy), responding and shaping their movements accordingly and adding another level of interaction and engagement in real-time to emphasise the embodied sculptural shaping processes.

The sculptural sensibilities and tactility are offered in the motion capture environment too. Motion capture (hereafter MoCap) enables the sampling and recording of the motion of humans, animals, and inanimate objects as three-dimensional data in virtual space[24] (Kitagawa & Windsor, 2008). In this research, I use the OptiTrack motion capture system with an array of eight cameras placed around the room and Motive software (see 5.2). MoCap technology enables the capturing of movement practitioners' movements and translates them into digital forms (see 5.4, 5.5, and 5.6). The sculptural sensibilities are the intentional and spontaneous shaping of movement data. The movement practitioner's movements become, in a sense raw material, which are sculpted/shaped into virtual form (see 2.4.1). Additionally, the sculptural tactility within motion capture environments is experienced through the feedback and the interaction between the movement practitioner and technology (see 2.4.2). The movement practitioner wears a specialised suit with marker sets for the motion to be recorded.

Thinking of Fuller's engagement with the material of the silk fabric or Schlemmers' approach to shaping the white sticks, *what-if* I could bring these elements into this research, to emphasise the tangible and perceptual qualities of the motion capture suit. Therefore, I draw on the tactility as a type of haptic interface between the dancer's body and the specialised suit with markers (see 5.3.1). These set ups allowing to track the movements of the body, limbs, head, torso, and feet (Figure 6) to transform improviser's movements into abstract digital extensions.

[24] Virtual space is the corresponding term as a "place" within virtual reality "using the information technology and behavioural interfaces to "create the effect of an interactive three-dimensional world in which the objects have a sense of spatial presence" (Bryson, 2013) where the user's respective avatars collaborate in happenings with their actual bodies (Boucher, 2011). I use this term attentively when working with motion capture technology where the three-dimensional data are placed within a virtual space.

Figure 6 - Lucie in the MoCap specialised suit with markers set on the suit.

The motion data is transmediated into a three-dimensional digital model (Figure 7), and the different choices and movement sensibilities offered by these are further discussed in chapter five.

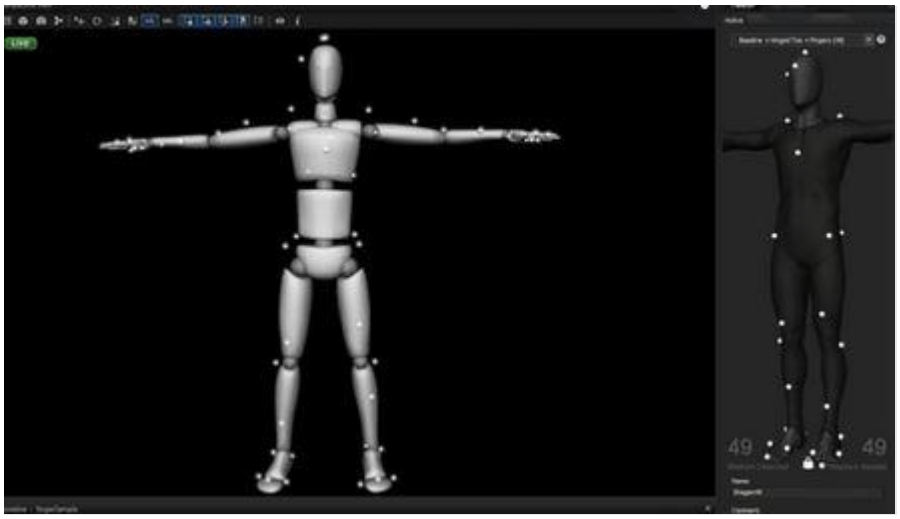


Figure 7- Digital data transmediated into a sculptural three-dimensional digital model in Motive software.

This tactile experience offers an embodied sense of the virtual environment and sculptural form to enhance the feedback loop and expresses interactions in real-time (see 2.4.1). The real-time ability of MoCap to capture and render movements here and now, adds a performative and interactive possibilities to the overall sculptural processes, aligning with Krausse's expanding field concepts. It allows for active and responsive environments to be shaped *with/* to be shaped *through* the improviser's shared physical and virtual interactions. The direct and active engagement with intentional shaping processes connects the bodies and their sculptural form with digital transformation and enables spontaneous movement with sensibilities and tactility. In the next section, I discuss the connection of sculptural forms in relation to Laban/Bartenieff movement qualities and its sculptural consideration to body-space-shape, which intersect within motion capture environments.

### 2.3.4 Sculptural Form and Transformation

Emphasising the shaping process within motion capture environments involves 'tracking' or 'capturing'[25] movement and transforming the motion data into a digital sculptural form. To establish the sculptural form of *Sculptural Qualities*, I draw on Laban's fundamental elements of the body in space, Efforts, Shape, and its shape qualities (effort-shapes analyses further developed by Warren Lamp and Imgrad Bartenieff). These elements support my discussions, observations, and analyses of *Sculptural Qualities* (see chapters five and six).

In the context of the MoCap environment, Laban's concept of the kinesphere--the immediate space around the improviser's body - allows us to consider the spatial configuration to be captured and described. Improvisers and their kinespheric exploration of space and movement create a sculptural form that interacts with and responds to their environment. Understanding an improviser's space is essential to tracing and understanding the lines of movement when "the dancer moves from place to place…" (Laban cited in Moore, 2009, p.109). Therefore, the movement must be observed and described in three-dimensional space. In this case, the improviser's expressions are located around their body as “extensions in space as a fundamental function of matter” (Laban & Ullmann, 2011, p. 18). The living body *extends* and *contracts* through the space, establishing dimensions as they "incline toward space diagonals and diametral directions" (Maletic, 1987). These directions introduce the spheric space known as the Kinesphere “(Greek kinesis - movement, and sphaira - ball, sphere, according to the rotatory nature of the movement of our joints” (Maletic, 1987, p. 59)). Thus, the kinesphere is an immediate space around the body “which can be reached by extending limbs without changing one’s stance” (Preston-Dunlop, 1995, p. 297). In the context of this research, the kinesphere enables me to observe and describe improvisers’ movement within MoCap space--volume (Figure 8).

[25] Woodcock (2016) suggests that capture, hold, and release are three modalities that provide affordances of motion capture and their relationship between the technology and the performer’s movement. The captured motion data “‘holds’ movement in reserve, out of sight so to speak, in inimagable form, but ‘releases’ it in the domain of the digital moving image” (p.22).

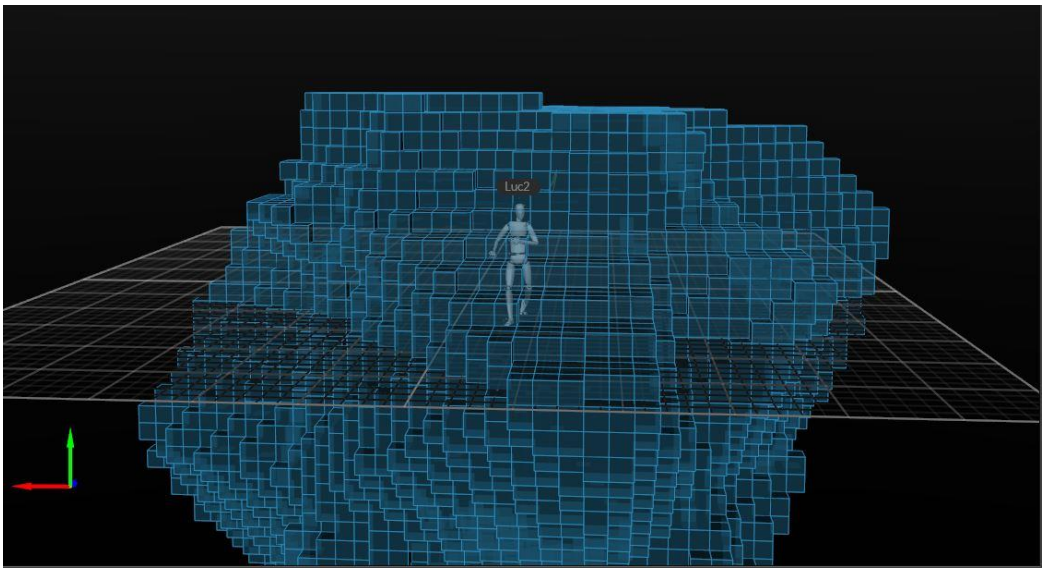



Figure 8 – The volume space representation with the blue squares in Motive software in a motion capture environment.

Furthermore, the directionality of movement is represented from the *cent*re[26] (center USA, centre UK) of the kinesphere and is located "in the body center (sic)" (Laban & Ullman, 1963, p. 93) (Figure 9). Longstaff (2005) highlights that others reaffirm that "Laban placed [the] 'centre' at the body's centre, which is approximately at the navel" – this is known as the centre of gravity[27].

[26] An American spelling of 'center' in its original, and I will transition to the English spelling in my writing and Longstaff quotes.
[27] According to Preston-Dunlop (cited in Moore, 2009, p 136), Laban constructed the rings to oscillate symmetrically around this body center, encouraging a postural performance style rather than gestural.

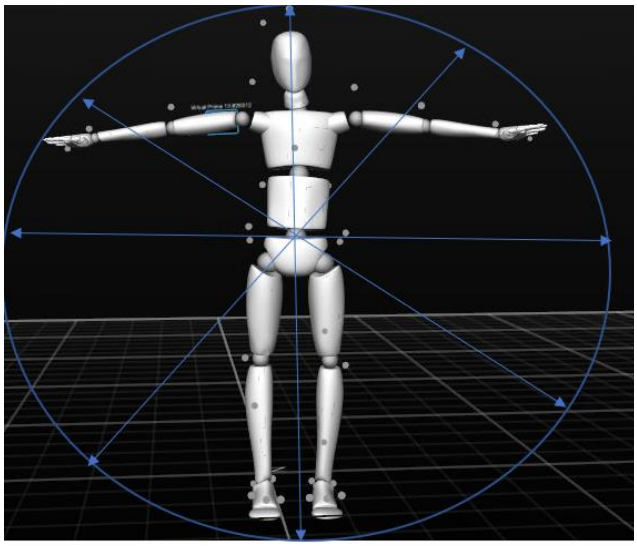


Figure 9 - Centre of the Kinesphere in Choreutics in digital realm adapted from Longstaff, 2005.

Furthermore, the centre can be placed anywhere in the body. Laban (1962) describes how the origin of the directions can be in the torso or anywhere in the body. As a result, smaller localised direction systems are created (Bodmer, 1974, 1983 cited in Longstaff, 2005). These minor localised directions can help examine specific areas of the body parts and their relationships to space and have inspired the movement explorations in the first phase of this research (see 6.4).

I have sensed a central connection between my physical and virtual body and the screen when working within a motion capture environment and projecting the visualisation into the space. Therefore, the space in between the bodies and the screen can be "kinesphere centred" (Longstaff, 2005) or "exocentric reference systems" (Preston-Dunlop, 1978, pp. 70-71), which can be organised around an object or a person as well as between two or more people – creating *shared space* with the centre place in the between. In this research, the shared space formed in-between the physical and the virtual improvising bodies and the physical/virtual spaces, which enabled the kinesphere centredness at the centre in-between the actual and virtual bodies, as shown in Figure 10.

Figure 10 - Lucie and her virtual improviser create a shared kinespheric space with the centre in between them (Sykes, 2020).

Understanding the kinespheric outer space and allowing improvising bodies to experiment with movement will introduce different shapes, forms, and structures and contribute to the emergence of *Sculptural Qualities*. As the improvising bodies shape their sculptural experiences in the space, they create sculptural form and structure. Within the performance capture technique, body shapes are used by animators and actors to signal archetypes - physical and behavioural characteristics of a narrative role (Dower & Langdale, 2022). The shapes hold physical and emotional responses when they are perceived. When the actor responds to a specific shape, this can evoke actions of a fight, a flight, or a freeze response. In performance capture, exercises of working with shapes in a manner of a silhouette (a partner or audience observes the Shape from behind to suggest the view of a player in a game). This silhouette view supports the actors' development of their characters, and the appearance of this animation represents its strength through shapes. For example, triangle shapes may indicate strength, irregular shapes, which are angular, may indication danger, and a mix of curves and triangles may signal a healthy, integrated strength of character (Dower & Langdale, 2022, p.43).

Shapes are found in nature and the patterns of nature are evident in the visualisation of the *Sculptural Qualities*, which I discuss in chapters five and six, where some participants comment that while responding to digital trace-forms of lines and particles visualisation they are metamorphically representing nature. During Laban's fine arts studies, he was encouraged to described natural objects as

images with expressive, linear, plastic, and constructive movements. When Laban applied this approach to dance, he observed the "directional tendencies" in the movement and form of living beings. Therefore, the spatial directions of the movement can be performed in a vertical, horizontal, and diagonal manner in relation to space and can be executed in any combination. These directional movements influence the overall shape and expression, impacting the character's quality and movement (Moore, 2009).

Furthermore, MoCap technology allows the recording of directional movements in relation to the spatial relationships of improvising bodies interpreted in the visualisation in digital form. This process enables shaping the lines and their interpretation and application into the motion capture software Motive. Laban's notion of Shape (capitalisation in the original) combines spatial and bodily factors with expressive values, facilitating improvisers to move holistically. Firstly, Laban refers to the position that the body (a physical mass) takes in a kinespheric "pose" (how the body takes its Shape in space). Often, Preston-Dunlop (1983) refers to it as a “body design” (p.83) or a “limb constellation” (Bartenieff and Lewis, 1980, p. 180). Within *Choreutics*, Laban (1980) discusses four types of "body carriage and its shape" (p.63) in relation to the body's structural and functional factors. These four categories are Pin-like, Wall-like, Ball-like (Figure 11), and Screw-like shapes, representing - sculptural - body attitudes where BESS blends. Longstaff describes these shapes according to Laban’s description as follows:

> 1) “Pin-like” shapes arise from the “spine and its pin-like extension”; 2) “wall-like” shapes arise from a flat surface created by the “right-left symmetry of the body”; 3) “Ball–like” shapes arise from the “curling and circling” of the limbs together with the trunk; 4) “Screw-like” shapes arise from the “shoulder-girdle and the pelvis twisted against one another” (Longstaff, 1996).

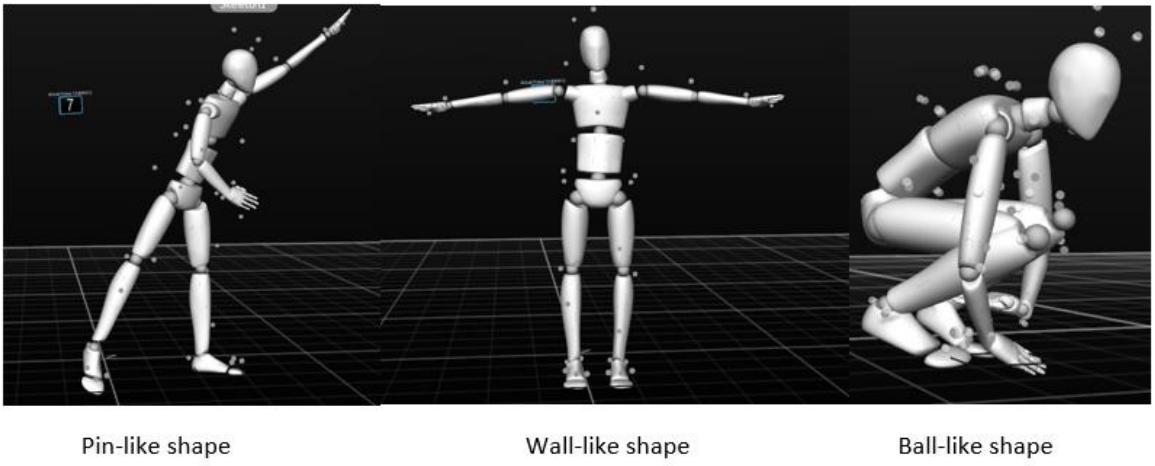



Figure 11 – Laban's shapes represented by the digital segment models in Motive software.

Preston-Dunlop (1983) states that these kinespheric poses have large or small body shapes. For example, the shapes that "elongate" (Pin-like) or "spread out" (Wall-like) represent the longer forms. The smaller shapes are "curling up" (Ball-like). The large and small shapes can be mixed where "the extremities of the body pull against one another . . . in different directions around an axis" so that the different body-parts are "twisting away from one another" (Preston-Dunlop, 1983, cited in Longstaff, 1996). Bartenieff discusses these poses as "Still Forms" (Wiesner, 2018). These still-form poses allow us to describe different kinesthetic abilities of the *Sculptural Qualities* and how the body interacts with the motion capture environment. Bartenieff and Lewis (1980, p. 110) indicate that these poses offer feelings of "body attitudes". The Pin-like shape is "straight and narrow" while penetrating the space. The Wall-like one enables shaping in a "straight and spread[ing]" attitude which suggests the division of space (in relation to the body). The Ball-like one offers a "rounded" attitude and can surround or fill the space. The Screw-like shaping involves twisting and "windings" feelings in the space (Longstaff, 1996). These bodily attitudes, as part of the Laban/Bartenieff movement analyses, can contribute to the observation and interpretation of *Sculptural Qualities* with specific emotional (or psychological) intentions[28] connecting with the kinesthetic empathy of sculptural shaping.

[28] Sutil (2013) suggests that Laban's shadow-forms are identified through action-moods of trace-forms. These actions are expressions of inner drives forming the eight fundamental motion factors in Action Drive.

According to Laban, the gestural movements of improvising bodies and lines have four formal qualities - droit, ouvert, tortilla, and rond. He suggests that these formal characteristics are fundamental elements in all alphabets and acts of writing, drawing and guiding the transformation into movement (analyses). These lines, or trace-forms, are not fixed, like in architecture, sculptural art, and painting. They are sequential, one at a time, appearing and then disappearing - leaving the ephemeral memory of the overall shapes (Moore, 2009). These lines evolve over time and are conceptualised as "modes of shape change" (Hackney, 2003, cited in Moore, 2009). For Bartenieff, these modes of shape changes represent the shape flow as "self-to-self" and the directional shaping as "self-to-other" through an arc and spoke-like movement. Within the motion capture context, the shape flow involves the relationship between a moving body and its parts - self to self (see 5.4.1). The shaping of different body parts interacts and influences each other and contributes to the layering of sculptural form with growing or shrinking qualities. Furthermore, the directional shaping - self to other - can represent the sculptural interplay between multiple bodies, creating trace-form quality such as spoke-like, straight/droit, or arc-like within a motion capture environment (see chapter six).

Laban further suggests that all these lines (tortilla can be angular shaped as the letter Z) are closely related to forms of bodily movement. For example, Figure 12 shows the movement visualisation of *line visuals* (see 5.4.1) from the praxis first phase explorations. These *line visuals* demonstrate the shaping of bodily movements and the shaping of the lines. It can be observed along the droit line, which has directional spoke-like movement when reading from left to right. The third to the left, the ouvert is slightly curved with arc-like directional movement. Most *line visuals* on the right resemble the inverted letter S, a tortilla line with arc-like directional movement. What is missing in this example is the rond line, which resembles Arabic cipher 3 (in its original American spelling).

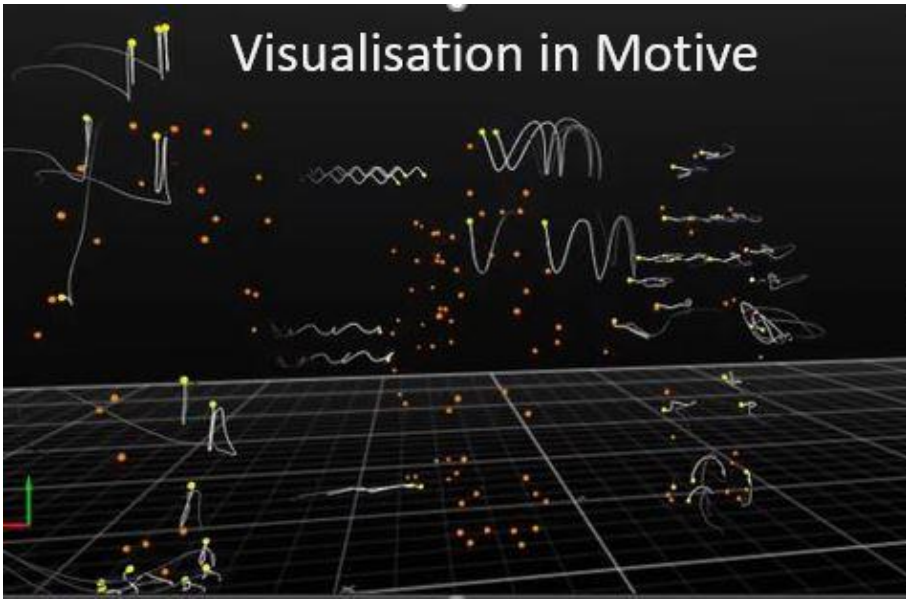



Figure 12 – Data motion represented in *line visuals* in Motive, created by improvisers moving through different movement qualities and gestures.

Furthermore, as these lines are observed in moving and dancing bodies, they create a spatial path that connects with two, three or more directions (Maletic, 1987). As a result, new variations of shapes can be observed, as in Figure 13, showing the digital model of varied shapes. In the context of this research, the new variations of shapes can form core elements of *Sculptural Qualities*, and I used these within the analyses in chapters five and six.

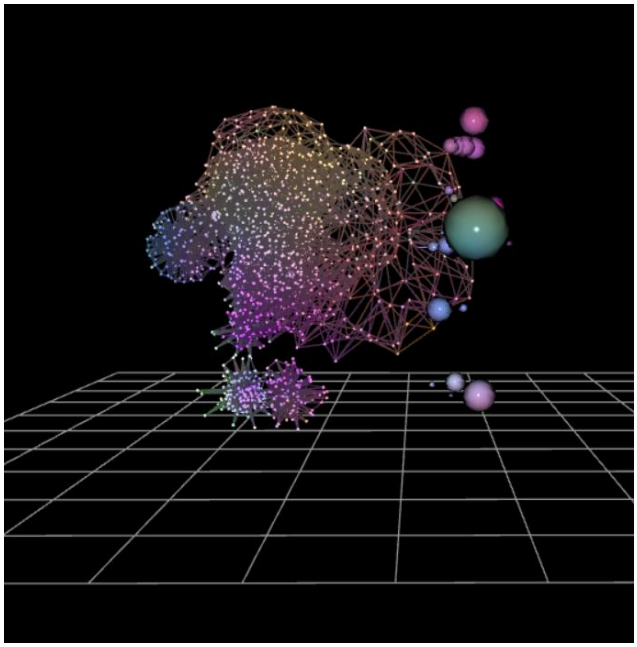


Figure 13 – Lucie's digital models have two different shaping variations: spherical, collaborative, and connected with lines and dots.

All lines have a shape and create a holistic approach to spatial and bodily experiences with dynamic qualities. Laban (1986) suggests that:

> *Movement is, so to speak, living architecture – living in the sense of changing emplacements as well as changing cohesion. The architecture is created by human movements and is made up of pathways tracing shapes in space [which] we may call 'trace- forms'* (p.10).

Laban refers to all lines and pathways as trace-forms and suggests that knowing what we might form, say, a triangle - or knowing that the familiar outline of the trace shape resembles a cave or a worm - allows us to remember the trace shapes and to understand the perspective of the dancer's movement (Moore, 2009; Moore, 2014).

The concept of pathways as trace-forms is based on how geometric and mathematical principles are realised in Platonic solids[29]. Therefore, as the body moves within its kinesphere, the trace-forms are created as an outer form of the kinesphere. It is visualised in three-dimensional space through “points linked up into a line or pathway” (Sutil, 2013, p. 8) of the moving body in kinespheric space[30].

The transformation of the physical to digital realm involves the multidimensional exploration of movement through Efforts, Shape, and shaping qualities to establish these sculptural expressions within motion capture environments. Laban’s dynamic qualities of kinespheric scaffolding introduces the ‘dynamosphere’ in *Choreutics* (Laban & Ullmann, 2011). The dynamosphere connects the outer movement and inner attitude, and the dancer can execute the movement with greater or lesser intensity. The inner domain of human movement is where "[the] dancer moves from mood to mood" (Laban cited in Moore 2009). The idea of the kinesphere introduces the 'personal' and 'shared' space in space harmony; the harmony of movement is explored through the "relationship of the dynamics of bodily actions and their spatial patterns" (Maletic, 1987, p.77). Thus, the dynamosphere introduces Effort (initially defined by Laban as *Eukinetic – Greek words* – “eu” meaning beautiful or harmonious and “kinetikos” meaning movement (Moore, 2014)) and as a spatial pull, creating a specific movement quality in relation to the three different planes discussed above. Effort qualities deal with *how* the body is moving-creating meaningful responses to inner impulses or external stimuli. Laban’s Effort motion factors[31]. They are arranged into four components and eight polarities. The polarities are pairs of opposite movements with contrasting expressive attitudes: Space is direct-indirect, Time is sudden-sustained, Weight is strong-light, and Flow is bound-free (Laban & Ullmann, 1960) (Figure 14).

[29] Platonic solids are configured as a regular convex polyhedron. The five three-dimensional geometrical solids are tetrahedron, cube, octahedron, icosahedron, and dodecahedron. Within the context of Platonic solids, each pathway introduces a different shaping process and leads to the development of scales. However, within the scope of this research, I utilise trace-forms to influence movement creation and variation. These explanations support the development of *Sculptural Qualities* within this research.

[30] Laban developed these into rhythmical circles to capture the progressive stages of movement. With sequential circuits, for example, the three-ring (is triangular) and a five-ring (is pentagonal), creating taxonomies of prototypic movement (Moore, 2009).

[31] Furthermore, the Effort drives are introduced through the dynamic qualities and qualities traits are experienced in the dynamosphere and create eight fundamental directions in space: Floating, Dabbing, Wringing, Thrusting, Pressing, Flicking, Slashing, and Gliding (Laban & Ullmann, 2011), which is part of the Action drive.

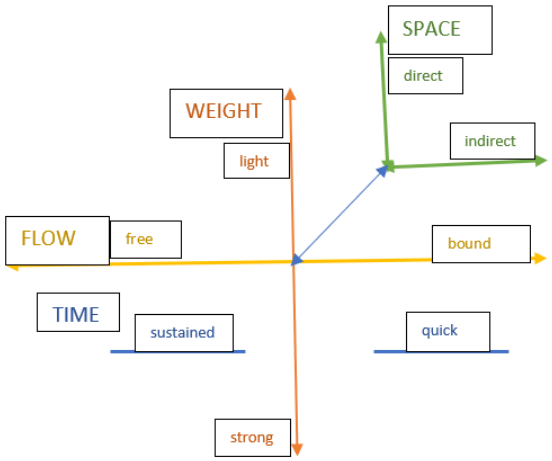



Figure 14 – Lucie's drawing of the Laban Effort graph (with dimensional axis) with four factors and eight polarities based on Burton et al. (2016).

The Effort qualities introduce a way of accessing and activating *Sculptural Qualities* in the improvising bodies. For example, the Effort of weight may create a sense of gravity and grounding in movement and contribute to the stability or solidity of *Sculptural Qualities*. Depending on the intensity of the energy deployed, it can be either strong or light. The time Effort introduces a sense of rhythm or pace in movement and creates dynamic tension or energy of *Sculptural Qualities*. Laban points out that the movement is quick/slow compared to its surroundings. The Effort of flow creates a sense of continuity and connections in movement, thus introducing fluidity and continuity to the shaping processes in this research. Space Efforts have a sense of specific shapes and spatial relationships in movement, thus informing the form and structure of *Sculptural Qualities*.

The pairing of two Effort qualities offers interesting dynamic dialogues. For example, a combination of strong and direct Efforts can give a fighting attitude and a forceful and assertive movement quality. On the contrary, light, and indirect Efforts can lead to fluid, delicate and exploratory movement qualities. The movement and its inner impulses supports emergence of embodied intensions (Block & Kissell, 2001). These elements support analyses in chapters five and six on how these Efforts are displayed within a motion capture environment.

The Flow Effort (spaceless) informing the continuity quality of movement. Therefore, the inner attitude of the improviser is towards “ongoingness” (Wahl, 2018). It can be free, enabling the expansiveness of movement, or bound, such as contained, withheld, or controlled. Within MoCap environments, it enables the improvisers to be receptive and open to the environment. The physical intention of opening and freeing the Flow as a state of mind, Wahl (2018) suggests, connects to the sensing breath and its deepening functionalities. In Laban/Barteineff, the breath keeps the movement alive and facilitates the shape change (Moore, 2014). The intention of Flow in the torso encourages easing and opening the ribcage as slowly widening/rising, and when breathing out, narrowing/sinking (see 5.3.1). As Wahl (2018) suggests, "observing and engaging from a place of free Flow opens channels for empathy…" (p.95). For performance capture, breath is essential to ensure the actor's performance is readable with tension, breath and micro gestures represented in the 3D cloud of the motion data (Dower & Langdale, 2022, p. 19). As the body is mediated through MoCap, breath in PeCap gives a lifelike dimension to the animation (captured motion) and enables awareness of how the body communicates these sensibilities. It involves the immediate presence of the ‘live’ actor/dancer involving the sensing of immediate co-present of the “[e]ffort, breath, weight and so on…” (Whatley cited in Reynolds & Reason, 2012, p.266). Within this research, Flow connects to breath and its tangibility[32] towards the improvising bodies (actual and virtual), which resonates with the temporal unfolding of shaping *Sculptural Qualities*.

As noted at the beginning of this section, shapes[33] are a hybrid of the space and body category and relate to emotion, breath, and trace-forms. In Laban/Bartenieff, the Shape is combination of related Laban’s fundamental elements Body, Effort, and Space - shaping the internal and external environments (Wiesner, 2018). Therefore, in this research, the improviser’s body progresses *through* the volume and shapes it in new variations. Experiencing the journey *through* space, the dancer introduces shape qualities - six essential characteristics shown in Figure 15, which only arise when Effort/Space (*Eukinetics/Choreutics*) are in a relationship.

[32] Chambers-Coe (2023) explores the Flow as a sense of touch through the notion of vibration of the body.
[33] Originally, form (shapes) for Laban was a gestalt concept, a combination of the lines drawn by the body in space and the dynamic qualities observable in these three-dimensional sequences (Moore, 2021).

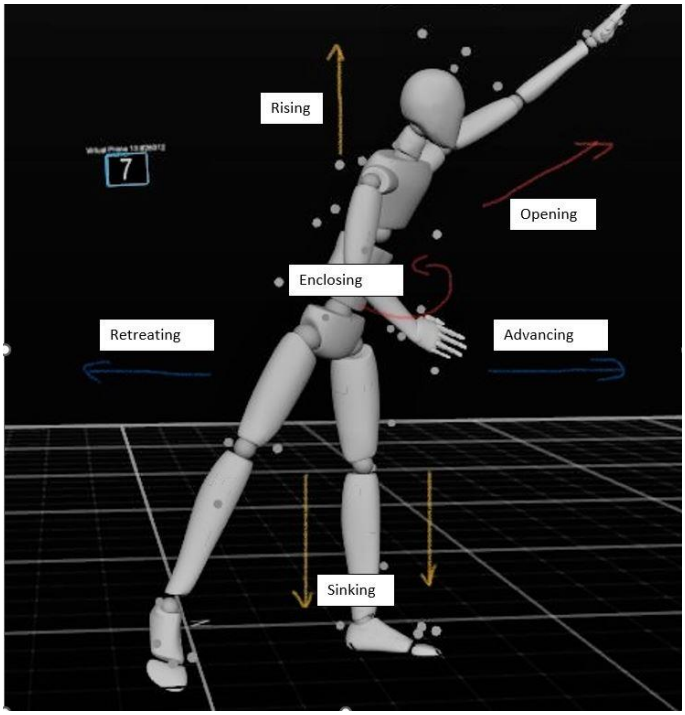
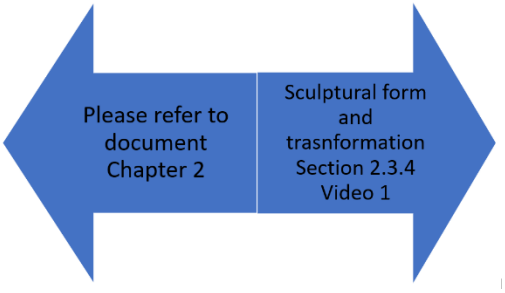



Figure 15 – Lucie's model of shape qualities with six essential qualities.

These six shape qualities are established through movement progression[34] in space. Within this research, the shape expressions allow the dancer's kinaesthetic awareness to shape and re-shape bodies to suggest variety, complexity, and dynamic movements. The movement practitioner can emphasise either the destination or motion depending on the sensing responses in the moment when improvising and responding to visualisations and the environment (see chapters five and six).

[34] For example, when the dancer aims to move from one corner of the stage to the other side of the stage and ends up on a marked cross on the floor, the specific destination is in the dancer's mind. The dancer focuses on the marked cross where the last movement needs to finish rather than how the dancer moves across the stage. The interest in how the dancer moves across, Laban describes it as a movement away from a starting point in a direction relative to that point. Therefore, this creates motion, focusing on the dancer.




For example, in video 1 the warm-up sequence, the improviser reach towards the motion capture cameras in space, and their limbs extend[35] towards to each point in the space with a destination in mind using spoke-like directional movements suggesting shape qualities combination[36] of motion as follows:

rising, opening, and advancing (towards the camera 1)

sinking, enclosing, and retreating (towards the body)

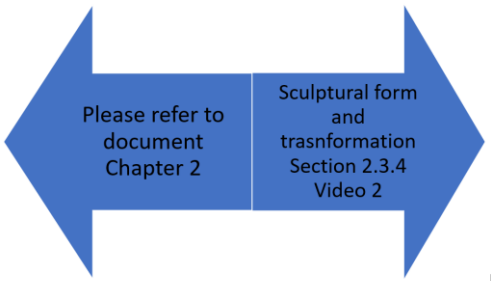
rising, enclosing, and advancing (towards the camera 2)

sinking, opening, and retreating (towards the camera 3 behind them)

rising, enclosing, and retreating (towards the body)

and so on.

When shape qualities are transformed and expended upon the motion capture environment, it introduces the re-shaping of these into hybrid forms.




Video 2 demonstrates phase one movement explorations, where I move only with one hand and shape an arc-like motion. The combinations of ouvert, toritlle, and droit

[35] Pakes (2006) suggests that phenomenal experience of raising hand, the dancer senses and feels the air surrounding the hand and offers a resistance to the motion, and the feeling of muscles tensions in shoulders.
[36] I adopted the combination within the motion capture environment-based on Moore, 2014, p. 122.

informs the shaping qualities of my movement exploration. Both examples enable sculptural motion in a variety of qualities and shaping patterns[37].

In summary, within the motion capture environment, these sculptural forms transform through Efforts (*Eukinetics*) and Shape qualities, Laban's concepts of *Choreutics* forming movement analyses framework. Integrating these movement expressions in the digital realm offers a hybrid sculptural form and establishes the foundation for observing and analysing *Sculptural Qualities* within this research. By exploring the sculptural traits of body-shape in space and time, the sculpting of virtual trace-forms improvisers can embody Laban's movement principles. Through the interaction of these sculptural forms, improvisers can create aesthetically attractive trace-forms in the moment and develop them into complex and intricate forms. Therefore, *Sculptural Qualities* expand on Laban's movement principles using technology, which can influence the improviser's creative process. The relationship between the body, technology and environment is continued through sculptural art in the next section.

## 2.4 Sculptural living body

In this section, I discuss the actual and virtual bodies viewing them from the proposition of 'living' bodies as sculptural living bodies[38] . These bodies are not merely passive, but they are appreciated for their dynamic physicality and perceptual sensibilities, including shape and movement, and their interactions within motion capture environments. I draw on Merleau-Ponty's view that the body *is* a **living body** (*corps vivant)*[39] and is experienced in a non-objective environment. The body is not just a physical object, or a biological organism observed and analysed from a scientific stance, but the *body is* constantly engaged in a dynamic relationship with the environment.  I explore these continual dynamic interplays within the *Sculptural*

[37] Moore (2014) suggests that integrating the shaping process enables changes in shaping patterns "concavity and convexity" (p.122). For example, the inward curve creates a sense of closure, the feeling of gathering energy towards the core, evoking a sense of containment and introspection in movement. The outward curve has a sense of expanding or extending, contributing to the dynamic and expressiveness of movement and considering how the movement path leaves a visible or imaginative trace in space.

[38] Whatley (Reynolds & Reason, 2012) discusses the 'living dancing body' as immediate and co-present.

[39] Merleau-Ponty discusses the "living body" (English translation from the French term *corps vivant)* and "lived body" *corps vécu (Leib-German)*. He also calls it "the phenomenal body" (English translation from the French term *corps phénoménal*) in a chapter titled "Vital structures" (Merleau-Ponty 1942, p. 169/156) (Heinämaa cited in Wehrle, 2019).

*Qualities*, which introduces notions of seeing and moving, in dance practices. Weschler (Broadhurst & Machon, 2006) suggests that "[t]he human body in motion draws its expressive power in no small measure from the special sensitivity of the human eye to particular qualities of movement" (p.63). By understanding of the improvisers living bodies' expressive movement, as empathised by Weschler, I see it as a vital part for developing and appreciating *Sculptural Qualities*. The intricate relationship between movement and its perceptual sensibilities of the human eye is felt by the movement practitioner in this praxis, enabling them to gain insights into how their movement is perceived/being perceived. I reflect on the experience by 'writing-dancing/dancing-writing' (Figure 16).

Eyes meander, the head, torso, and feet follow,

Body flows, vision traces to extend,

Motion shifts, sights adopt.

Figure 16 - Lucie's 'writing-dancing/dancing-writing' text on seeing-moving.

In the reflection above, I explore the improviser's act of seeing as an embodied experience of attending (noticing) and responding, allowing the eyes to trace the body's air pathways visualised as digital trace-forms. Through their sensing and moving experiences, improviser's movement qualities are expanding and contracting from their navel centre away from the torso and coming back, expanding outwards into the volume (space) with a sense of openness and extension (see 2.3.3). The weight shifts from one leg to another, and the improviser notices how the body follows[40]. In this example, the improviser's *body is* - as perceiver - situated in a MoCap environment and has awareness of the virtual bodies - perceived as an abstractions and digital trace-forms (see 5.4, 5.5 and 5.6). In this example, I form the conceptualisation of sculptural as both - actual and virtual - and the perceiver and

[40] The act of seeing-noticing embraces dancers' intentions and perspectives to move to travel with different Efforts-Shape in a sustained or quick and opening or rising manner.

the perceived are connected to the environment *within*. Therefore, in this research, the improviser's living body is situated in an embodied environment that involves both actual and virtual being in unfolding sensory exchanges between the internal and external. According to Merleau-Ponty, this dynamic relationship of sensory inputs is intertwined between the self, others, and the world. The improviser's sensory awareness and their movement responses are in mutual "chiasm" (*le chiasme*) (Merleau-Ponty, 1969b) relationship to inform and shape the improviser's experiences within the environment. Chiasm suggests that bodily movements are deeply intertwined with the perception of the world. For example, in this research, the improviser creates movement responses to the specific environment characteristics they attend to (notice or witness), like the digital trace-forms of their visualised movement. The shape of the environment influences the improviser's way of experiencing these actual and virtual forms and creates complimentary arching and curving movements or angular movements to contrast. Therefore, the improviser's body *is* in active negotiation with the motion capture environment, which informs the shaping of their bodies and digital trace-forms. At the same time, the improviser (as a receiver) shapes their situatedness within the volume (space). In the example above, this means that the movement choices the dancer made are not simply a personal preference of the style. Their movement choices are influenced (affected) by the environment (cameras, suit, markers, digital trace-forms and the world) and their sensory inputs (see 2.2.1) in which the body *is* seeing-sensing-noticing-responding. In the context of *Sculptural Qualities*, seeing emphasises the holistic understanding of movement and space also involving the visual perception. Sensing encompasses the sculptural tactility (see 2.2.1) and can include the improviser 's proprioception experienced by the improviser. Noticing - as a way of attending to - the awareness of subtle nuances of the improviser's shaping experiences and movement expressions. These shaping processes enable the dynamic interaction between the improviser's intentions and environments – as responding actions. I reflect on this in the context of dancing-writing/writing-dancing as follows (Figure 17).

to act,
to move,
to explore,
to sense,
to feel,
to meet,
with the world through our movements.

Figure 17 - Lucie's reflection writing-dancing on embodied capacity.

Therefore, my dancing-writing reflection suggests the multifaceted nature of the improviser's movement. These moving/moved actions encompass a deep reflective movement practice, as I wrote these after my improvisation within the volume space. It captures the array of embodied experiences and is intertwined with the intentional engagement of the body, mind, the environment and the world. This "basic intentionality, and consciousness is not in the first instance an "I think that" but an "I can" (Merleau-Ponty, 1969a, p. 137). In other words, while I was improvising within a motion capture environment, it was not solely the *produce* (returning to Albrights') of abstract thought (I think). However, consciousness and intentions arrived through my embodied dimensions to perceive (see-seeing) and respond (move-moving) within the digital surroundings - I can[41]. Therefore, "I can" move-explore-sense-feel-meet encompasses a heightened awareness of bodily sensations, movements, and positions - kinesthetic awareness. I describe this intentionality with the notion of kinesthetic awareness through dancing/writing reflections as follows in Figure 18:

[41] For Merleau-Ponty, the term "I can" allow understanding of our bodies and is based on relations and uses the concept of "lived" and "own" body, which is *of* lived space and introduces the habitual body and the way how the body shapes our experiences (Gallagher & Zahavi, 2008). Therefore, the habitual body as a *lived body* relates to *the lived* space in which the body *is* embedded *within* (hence the title of this thesis) and emphasises a first-person experience of the world as temporal (Toadvine, 2023).

*I can -*

*move into rhythmical expressive phrasing of sculptural qualities*

*sense my gravity, momentum, and speed*

*feel the attention-tension in my muscles*

*meet*

*on the "threshold" where I am shifting my weight/force through the physical and virtual space.*

Figure 18 - Lucie's writing-dancing reflection with I can.

All these elements guide how my body-mind responds when engaging with MoCap, its visualisation, and the environment. As the improviser moves and interacts within the mocap environment, the intentions, sensations, and feedback created by their movement responses shape these kinesthetic experiences and extend their bodies of noticing-attending sculptural motions. Therefore, as Blom & Chaplin (1988, p.4) suggests, kinetic-kinesthetic experiences are "...sensed, experienced and perceived physically," allowing the improviser to have felt experiences tangibly. Connecting these felt experiences within this research allows the embodied engagement with the world, which shapes my perception into sculptural space, form, and movement. By connecting these felt and sculptural experiences, I gain a holistic understanding of the embodied interactions and begin to unfold the emergence of *Sculptural Qualities* within the physical and digital realms, discussed in the next section.

### 2.4.1 Technology and Perception

The interplay between seeing-sensing-noticing-responding is deeply intertwined with Sculptural Qualities, as discussed above, and can be viewed through a technological perception. In this research, I draw on Don Ihde's (2002) framework of the phenomenological and utopian bodies. As the improviser's living bodies interact within motion capture environments, it could be perceived through these bodies. The phenomenological one is based on Merleau-Ponty idea about the body, which I have discussed in the above section, and Ihde (2002) calls this body one as the existential body of living (p.69), and the utopian body is discussed as the body two as a "culturally constructed body" (p.17) in relation to Foucauldian framework[42]. In the context of motion capture environments, the improviser's living body - body one - has the immediate experience of the world; Ihde refers to it as here-body. The here-body is experienced directly through the senses and the internal organs – micro-sensory body – it is the body that we see, feel, and move with (Mendieta, 2003).

*Body two* Ihde (2002) refers to "the culturally or socially constructed body" (p.70) and could be of any embodied form as it is a *cultural perspective* markable body "as experienced body" (p.17). Mendieta (2003) suggests that this utopian body of techno-fantasies seeks to merge with *body one.* However, *body two* has its idealisation of the body or futuristic body that is projected through technological progress and enhancement. For example, improvisers' expressivity is amplified through the digital trace-forms within motion capture environments. Therefore, this technological transformation of improvisers' gestural and expressive movements could enhance the emergence of *Sculptural Qualities*' visual impact with dynamic and visually chiasmatic experiences.

I explore the chiasmatic experiences of these two bodies, which can be situated within mocap environments as a *composed body.* The composed body is

[42] I propose that sculptural practices embody Ihde's concept of body *two* and Foucault's "technologies of the Self". The sculptural practices can be social constructs that shape *the body* and transform the self to create sculptural forms that reflect and shape identity, social norms and cultural values. The improviser's interaction with MoCap technologies and the environment influences their bodily experiences and shifts their self-knowledge. This process requires a deep engagement with *the body*, which permits individuals to be affected by "their own means or with the help of others a certain number of operations on their own bodies and souls, thoughts, conduct, and way of being" (1988, lines 36-42) and transform themselves through these sculptural interactions. I further argue that dance improvisation within MoCap environments transforms the "docile bodies" (Green, 2002-2003; Foucalt, 1975) into attentive and responsive to creative impulses and may have to oscillate between discipline and spontaneity.

the transformation of the phenomenological one in the digital environment. For example, within the T-pose and calibration processes, the improviser attending to the here-body and the experienced body (see 5.3.1 and 6.3) creates the *composed body*. I propose that as the improvisers experience *the composed body* through these two processes, the mocap becomes *a gateway* (see 5.3.1) through which they interact with *bodies one* and *two*. This *composed body* (*body two)* heightened the possibilities and expanded the visual perception of new embodied sculptural forms. Mendieta (2003) argues that this “phantasmagorical body that re-inscribes, expands, and transforms in accordance with fantasies, projects, and technologies that are ideologically logical” (p.96) enables Ihde to make a distinction between the two bodies. Although the two bodies give the impression that they are separate, they are very much intertwined as Ihde (2002) suggests “...that for there to be .... body two, there must be a body one...” (p.70). I reflect in writing as follows (Figure 19).

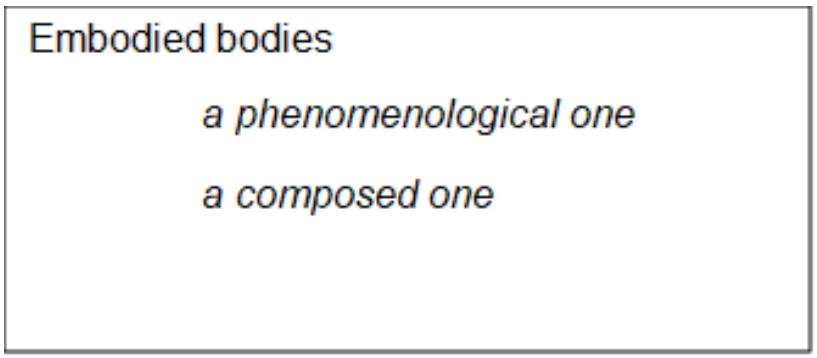



Figure 19 – Lucie’s writing reflections on embodied bodies.

Therefore, the composed body would not have been experienced without the improviser’s whole sensory body. The chiasmatic experiences of both bodies are evident in the MoCap environments, as the improviser’s body and tactility of the MoCap technologies enable the composed body to be seen, sensed, noticed and responded upon. The sensibilities of the phenomenological body continue to reshape the composed body as it is kinaesthetically experienced. I reflect on the experience by 'writing-dancing/dancing-writing' (Figure 20) below.

*I can-I am*

*Embodied bodies*

*a phenomenological one*

*a composed one*

*shaping its out-line and in-line and trace-forms living and inhabiting*

*the three-dimensional space,*

*extending beyond the 'threshold' of physical and virtual.*

Figure 20 - Lucie's 'writing-dancing/dancing-writing' text on "I am my body"

Furthermore, in this research, I explore the concept of embodied bodies: firstly, the proposition of the I-body, which is the phenomenological body, and secondly, the intriguing transformation of the I-body into a sculpting virtual improviser through the composed body. I develop these ideas through Ihde's (1974, 1990) embodiment relation framework, which suggests that the multiplicity of human-machine relations offers numerous propositions on how body-technology integration is becoming a part of our daily lives. These embodiment relations form the interwoven connections between a human being and technology, directing our attention to the world. Ihde (1974) schematise these understandings as follows:

(human – technology) —> world.

In Ihde's framework, the human component refers to the individuals – bodies, minds, and consciousness. It encompasses the physical form, cognitive abilities and emotional states. It could be said that this is the body one - the phenomenological one (actual) - and it refers to the improviser's lived and embodied experiences, including their physical presence and sensibilities in the world. The technology component refers to tools, devices, and systems that extend human actions through these instruments. For example, Ihde (2002) refers to a phone as the technology we

use to connect with the other person. This technological mediation extends the caller's body one and enables interaction with body two. Similarly, in this research, the improvisers extend their body-mind through the motion capture suit, markers, cameras, and software and connect the phenomenological one with the composed one.

Lastly, the world component symbolises the dynamic relationship between the two schematic elements (human-technology). Therefore, the actions of improvising bodies, which are facilitated by motion capture technologies, impact the world in which the improviser is situated. The embodiment relation shapes the improviser's understanding of these intertwined relationships between their bodies, actual and virtual, the motion capture environments, and their interactions with the world.

Considering the above discussion on embodiment relations in this research, I developed a proposition for *the I-body,* which is Ihde's phenomenological *body one*. For Merleau-Ponty suggests that “I” perceive through the relevant organs (Reynolds, 2004, p. 5) as a vital and performative human act of perception. Therefore “I” is not an isolated thinking body; instead, it represents the lived body (*corps vecu*) that perceives *through* relevant organs. These specific senses (vision, touch, hearing, taste, and smell) and their bodily functions contribute to the experiences of the world. Merleau-Ponty introduces the concept 'of 'corporeal intentionality' to describe the intentional nature of our bodily movements and their role in shaping our experiences of the world. Therefore, improvisers' bodily movements are not merely mechanical but intentional expressions shaped by the lived body experiences and the environment.

The technology mediates these intentional expressions within the motion capture environments through the interactions with the system. The notion of the I-body is intertwined with the relevant organs, brain and central nervous system, and the environment guiding the improviser's gestures and expressions. The technological interfaces of MoCap serve as mediators of the embodied experiences of I-body, influencing how the improviser is perceived/and is perceived and actively engaging within digital environments. I further propose that the living I-body is a sensory device emphasising its dynamic and active role as an instrument of perception and interaction with the world, and I schematised the embodiment relation as follows:

*I-body-as-sensory-Device*
within motion capture environments.

The *I-body-as-sensory-device* helps the understanding of *Sculptural Qualities* and how the body mediates improvisers' experiences and responses in the context of embodied approaches to dance improvisation within motion capture environments. Moreover, I reflect through my 'writing-dancing/dancing-writing' text (Figure 21).

*As my body 'thinking-moving' through the space, I am aware of number things - my presence, connection, sensation of pull and tension; my actions and the choices 'know-what' to interact with a digital interface of my 'mind' to activate and access sculptural quality of my improvising body. This body appears as a sculpting virtual dancer on the TV screen, on a projector screen, on a laptop screen. I sense an attention-tension, represented in line and curve, between myself and the sculpting virtual dancer in this environment.*

*I am = I can*

*moving, move - into rhythmical expressive phrasing of sculptural quality*

*seeing, sense - my gravity, momentum, and speed*

*feeling, feel - the attention-tension in my muscles*

*meeting, meet*

*on the "threshold" where I am shifting my weight/force through the space;*

*pull and tension*

*creating an invisible line or curve of presence and connections,*

*creating a visible line or curve of sculptural quality and rhythmical scores.*

*I am I-body-as-sensory-Device.*

Figure 21 – Lucie's 'writing-dancing/dancing-writing' text on *I-body*-as-sensory-device.

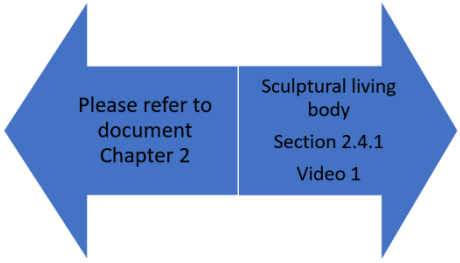
Lastly, I would like to develop the proposition of the *composed body* (Ihde's body two), drawing on Ihde's notion of "reflexive transformation," as he states:

> I take the technologies into my experiencing in a particular way by way of perceiving through such technologies and through the reflexive transformation of my perceptual and body sense (Ihde, 1990, p. 72).

In order words, when perceiving through technologies like mocap, the *I-body* undergoes a reflexive transformation of its perceptual and sensory experiences. It could be said that as the improviser's *I-body* is actively interacting with the motion capture system and within the volume (the intentional space), they adapt - and later, I use Clark's (2008) notion of extending - to the technological interface in which they are situated and embedded within the world. I acknowledge that they are relevant ideologies what happens “when the body [one] is 'transformed'... into digital environments” as Dixon suggests that “it is not an actual transformation of the body, but of the pixilated (sic spelling is usually pixelated) composition of its recorded or computer-generated image” (Dixon cited in Cisneros et al., 2019, p. 14). Dixon’s understanding of the transformation challenges these notions. It prompts anyone who works within digital environments to reevaluate perception and interactions with physical and digital self – through the notion of digital double. What is interesting is that one of four notions of digital double Dixon (2007) proposes as a “spiritual emanation” the notion of ghosts, celestial bodies, and soul projection, which disrupts his suggestion that the physical self is not fundamentality altered but instead represented in a new digital form[43]. Returning to the Merleau-Ponty idea of the phenomenological body, he suggests that “the perceiving mind is an incarnated mind” (Marleau-Ponty, 1964, pp.3-4), allowing the “concept of body” to think and perceive (Reynolds, 2020, lines 202-204). Thus, the incarnation presents an interesting discourse on how technology facilitates the hybridisation of embodied experience. For Ihde (2002), the hybridity of bodies can be understood as morphing and polymorphism processes, which the body “transmute” (p.12) or expands through technological mediation, and in this research, the composed body shapes (morphs) as *sculpting virtual improviser* - a composed manifestation of the motion data – shaping and reshaping their identities in the process.

[43] Some theories on performance see the performer as a communicator or conduit to higher spiritual forces. Cunningham (Dixon, 2007) suggests that dance is a "spiritual activity in physical form", and Sontag "enacts both being completely in the body and transcending the body" (p.254). The transformative nature of the body is represented as an avatar, a term coined by Garriott (1985) for the computer game Ultima IV: Quest of the Avatar. If we apply Ihde (1974) concept of embodied relations, the avatar becomes the perceivable relation between the improviser's physical body and computer-generated representation. Others suggest that “an *avatar* defined as an incarnation of the human form in an artificial or virtual image, hence the self-attribution of the avatar or part of it, would most likely be a more direct proxy of its realism” (D'Alonzo, Mioli, Formica, Vollero, & Di Pino, 2019). In this research I try to avoid use the term Avatar and replace it with the sculpting virtual improviser to emphasise the shaping processes.

Consequently, the embodied shaping within technological environments, mocap is a most effective tool for digitising human motions to generate visualisation of those forms (morphs) through computer graphics. The visualisations can differ in manifestations, such as *avatars or virtual dancers* (Boucher, 2011)*, visualisations* and *sonification,* which afford new perceptions, relations, and experiences of movement (Bleeker, 2017). Similarly, Whatley et al (2015) suggest that mocap is a tool which offers "bridging self and other, and between the visual and the kinaesthetic" (pp.196-197). In this example, the *extending across* involves two processes: by connecting temporally the "live dance(ing)" and the capture projected in the volume in real-time or by utilising visualisation techniques to make visible the motion data generated by the imagery (Whatley et al, 2015, p.197). Similarly, chapter five discusses the visualisation techniques explored in this research, where the composed body shapes and reshapes through the *sculpting virtual improviser.*




For example, in video 1, Mover's (M3) *I-body directly responds* to the sculpting virtual improviser in the form of traces, and the immediate interaction shapes the dynamic and interactive relationships between physical actions and the digital world. Utilising Merleau-Ponty philosophy, which emphasises the shaper experiences, the improviser's experiences of these immediate interactions are navigated through the reflexive transcending I-bodies into sculpting virtual improviser. Thus, M3 embodies the idea that the 'living body' is the shaper and shaped by its surroundings. These shaping processes emphasise the active, embedded, and expanding improvisatory experiences through the ongoing feedback loops in real-time within motion capture environments, which is discussed in the next section.

### 2.4.2 Feedback loop

When considering space as a technological environment, this research examines motion capture environments and the chiasmatic relationship between technology and the experience of movement practitioners. To understand this relationship, I refer to Ihde (1990) concept of *embodied-technics*. It emphasises that technology is not just an external object or tool. Instead, it is deeply connected to our bodily experiences and perceptions. He argues that these relations that interconnect material technologies into bodily and sensory experiences shape our perceptions and movements.

Similarly, this chiasmatic relationship between perception and technology can be observed through the post-phenomenological lens of Ihde's concept *of technological mediation* – discussed in the section above. The concept refers to how our experiences are mediated through technology. It shapes the perception and brings attention to what is usually invisible. Technological mediation has four dimensions, and within this research, I focus on *sensory-extension-reduction* (1979) – the experiential sense of the world. On the one hand, technology is expanding our sensory capabilities, allowing us to perceive and interact with all aspects of the world that would otherwise be beyond our reach.

On the other hand, technology introduces a reduction in sensory experiences by filtering and limiting our perception of the world. For example, when the improvising body is within a MoCap environment, the motion data are visualised and projected into the space. The technology extends the improvisers' (perceiver) sensory experiences and allows them to be perceived (see) and analyse aspects of their improvisational movement. The visualised motion data transforms the invisible element of movement pathways into a visible medium, allowing the improviser to respond (moving) and analyse the movement patterns in a new way. Therefore, based on the Ihde's notion of *technological meditation* (Nørskov, 2015) of being-in-the-world, MoCap technology transforms and co-shapes the intentional experience. In this research the characteristics of motion capture with interactive visualisation software Motive and Touch Designer (see chapter five) shapes improviser's experiences and relations as follows

Embodiment relations: (Improviser-motion capture technologies) ⟶ world

However, simultaneously, the dancer's sensory experiences are limited and filtered by their perception of their movement. The improviser can become overly focused on the visual feedback provided by the technology. Furthermore, while it might be helpful, it can lead to improvisers' *reduction* of embodied experiences of their movement and focusing only on certain aspects of their movements while ignoring others. It can create a “cognitive overload” (Rosenberger, 2013 cited in Aagaard, 2015). This potential cognitive overload in this research can be overcome by allowing the improviser to reflect and critically analyse the experience. I embrace this type of reduction to explore its potential (see 4.4) by incorporating a somatic approach utilising Laban Movement Analysis and Schön’s (1991) two-dimensional process: reflection-*in*-action (1983) and reflection-*on*-action (see 4.4.2). These reflective and analytic methods move towards the improviser’s kinaesthetic awareness (see 2.2.1) to ensure that the improviser’s perception of their movement is grounded in their embodied experiences.

This type of technological mediation introduces a form of feedback loop in which the technology *extends* the body’s experiences, and *through* the felt experience of the technology (Ihde, 1974), the improviser can shape perceptions and actions in response to feedback received from the system. This type of feedback loop can be understood through the lens of Clark's (2008) EXTENDED mind concept. Clark proposes that cognitive processes and mental states are not contained within the skull. Instead, these processes are extended beyond the skull to include the tools, technologies, and artefacts we use daily[44]. Similarly, Merleau-Ponty (1964) proposes that when a painter leads his body to the world in this manner the artist transforms the world. The artist's body and mind are intimately involved in painting (moving and interacting) and active and bodily engagement with the world enables the artist to create something new. The paintbrush, paint, and canvas are not simply tools but active partners in creation. Consequently, according to Clark's EXTENDED model

[44] For Merleau-Ponty, the mind, the symbolic level of form that identifies with the human, is not organised around vital ends but around the characteristic structures of the human world: tools, language, and culture. These are not encountered initially as things or ideas, but as meaningful "intentions" embodied in the world (Todwine, 2019).

> The actual local operations that realise certain forms of human cognising include inextricable tangles of feedback, feed-forward, and feed-around loops: loops promiscuously crisscrossing the brain, body, and world boundaries. If this is correct, the local mechanisms of mind are not all in the head. Cognition leaks out into the body and world (Clark, 2008a, p. viii).

In other words, the cognitive process is that mental states are tangled/knotty or, in Merleau-Ponty's notion of chiasm of flesh - intertwined - in a continuous feedback loop. On the one hand, the feedback-forward suggests that the body-mind interaction with the environment and tools provides feedback that helps us to improve our cognitive processes. For example, a sculptor carving a stone receives feedback in the form of sensory information. The stone reveals different textures and patterns for the sculptor to think about how to carve the stone. This feedback enables the sculptor to adjust and refine their cognitive thinking. On the other hand, the feedback-around suggests that the sculptors' interactions with the environment and the tool used to carve the stone and shape the environment for future use. For instance, if the sculptor encounters resistance while smoothing one of the areas of a stone, they may adjust their grip and posture, which will affect how they approach the next step of the carving process. This reshaping of body-mind and the environment is intertwined with continuous exchanges of feedback loops and influences the cognitive processes and mental states.

Clark (2008) suggests that the feedback loop between the brain, bodies, and environment have outward loop - continuous reciprocal causative recursions - “as a functional part of an extended cognitive machine” (p.322). Therefore, influenced by each other, the brain and body and their relations to the environment creates a dynamic and continuous flux. For example, the brain influences the body, which then affects the environment, and the relationship between each element is constantly evolving and interconnecting. In the context of this research, the movement practitioner begins by moving from a T-post position to see what has changed in the environment. As the body moves, their motion data is visualised in front of them on a large screen for them to see and respond (see 5.2). The environment influences the movement practitioner's body-mind to activate the shaping process. While responding to that feedback, their movements reshape and respond to the environment in new and creative ways. As the mover continues to explore movement possibilities and receive feedback from the visualisations, the loop of causation

between the body, brain, and the environment increases in complexity and dynamic – which I call *loopiness*. This *loopiness* leads the dancer to surprising discoveries and allows the dancer to create a novel way of moving-sensing-responding.

In addition, engaging in the reciprocal understanding of this relationship introduces the dialogical feedback loop embodied within the studio-practice with MoCap. The evaluative element of a cause-effect loop in dance improvisation is the relationship between the dancer's (perceiver actions and choices and the resulting movement responses (perceived). This cause-effect feedback loop introduces the relational 'feedback' (Ashby, 1956). It is feedback between a body's action, which changes the environment/world, and in turn, the environment 'influences' the future actions of the body (Dawson, 2013). The higher the degrees of feedback occurring when the body is immersed, the higher the level of response that is expressed. These loops are part of improvisers' cognitive processing, which they are aware of while improvising. The improviser perceives the representation of sculptural motion in digital visualisation. The experience of the perceived representation shifts the improviser's perception and response, creating 'new insights' to generate movements, which feed back into the digital environment (Figure 22).

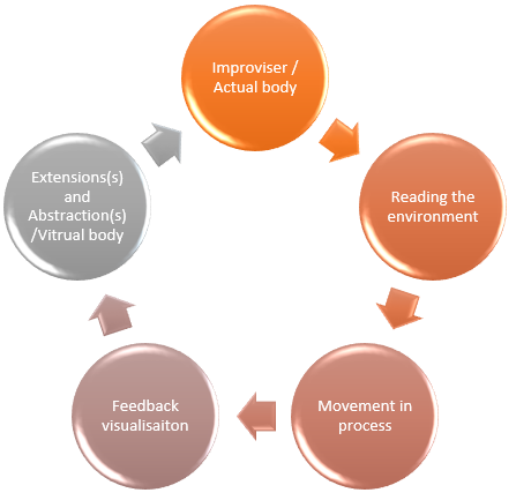



Figure 22 - Lucie's embodied feedback loop method within this PaR.

These relational feedback processes highlight the importance of their *loopiness*[45] and what Clark (2008) points out that the such loops - cycles - "*supersize* (italics in its original) the mind" (p.319). Moreover, there is an ongoing interaction between the dancer's body-mind (perceiver) and the motion data visualisation (perceived) (as shown in the above figure 22). What is interesting is that Cragg emphasises the role of the feedback loop as follows:

> If you make something with your hands, every change in line, volume, surface, and silhouette gives you a different thought or emotion. After several moves, you are in unknown territory. Although I change the material with my hands, the material itself changes my mind. It is a dialogue in which the material always has the last word (Kellaway, 2017, lines 48-53).

Therefore, Cragg suggests that the process is dynamic and reciprocal, with continuous interaction between the artist's body, mind, and material. Similarly, in this research, improvisers' bodies are shaped and reshaped *through* interaction *with* the motion capture technology, enabling the continuous feedback loop between their bodies-minds and the motion capture environment, leading to the emergence of *Sculptural Qualities*. Cragg's approach to reshaping materials through a feedback loop and the dancer's improvisatory methods through a feedback loop highlight the ever-evolving dynamic reshaping with the reciprocal nature of artistic creativity.

It could be argued that this feedback loop is evident in the work *Dôkk* (2017) created by Fuse company (a collaborative team of digital and design/performance artists), which uses MoCap Perceptual Neuron in real-time within their performance. This type of MoCap system is a full-body wireless solution that features finger tracking, and it has up to 18 sensors available. During the live performance, the performer wears the internal sensors on their body and moves 'through the air' (using aerial highness and choreography) and on stage. *Dôkk* integrates the various additional real-time analyses with the live performance. For example, the real-time heartbeat data of the dancer is analysed and fed back to the visual-auditory software

[45] The cyclical processes, which have a chiasmatic relationship, provide interplay between the known (considering improviser's improvisatory knowledge) and the unknown (responding in the moment) through a repeating cycle of intentions and actions. This foster looping feedback of dance knowledge, leading to a more profound understanding of the improviser's bodies and sculptural movement potential.

to shift and reshape the visualisations and sound in real-time. The forward feedback is also evident in how sentiment analysis of contents shared on the social network Twitter is fed back into the visualisation and sound, creating real-time digital landscapes with 3D objects on the stage at that performance and manipulating the audio in real-time. It could be argued that the reciprocal feedback is present as the interactive environment creates a loop of mutual causations between the dancer's body-mind, the motion sensors, Twitter feeds and the environment. It may also influence the subsequent movements and gestures of the dancer on stage and contribute to shaping that experience. Since *Dǒkk* is an immersive installation and performance that uses motion capture technologies, it has some overlaps with my research. For example, both works create interactive and evolving environments. While both works explore experiential and sensory aspects of art, my research focuses mainly on the tactile-visual senses, whereas *Dǒkk* focuses on the visual-auditory sensory experience.

Moreover, this research focuses on how *Sculptural Qualities* can be accessed and activated by the dancer's full-body motion, not the Twitter sentiment analyses or the dancer's heartbeat. Therefore, *Sculptural Qualities* are experiential and sensory experiences initiated by the improviser's living body, shaped, reshaped and abstracted inertially by the improviser's real-time interaction through the feedback loop. It focuses on understanding the experiential *being-in-the-world*. Both works envision exploring the blurred boundaries between the physical and virtual. However, the explorations of *Sculptural Qualities* and how they engage with the improviser's senses and perceptions evoke kinaesthetic and empathic responses, in this research.

Similarly, *Dǒkk* seeks to understand how the dancer interacts with and responds to visuals and spatial stimuli. It could be argued that these responses are (partly) pre-planned in the live performance (due to its intricacy), and improvisations are embodied during studio experimentation to find those responses for the live composition. Nevertheless, due to the complexity of the technical integration, the improvisatory element is less spontaneous. In contrast, my work thrives on the freedom of some simplicity of the technical set-up, where the improviser actively engages in improvising moments of sensing-moving-responding to shape and reshape in a continuous feedback loop.

In summary, this chapter has set out to contextualise and conceptualise the *Sculptural Qualities* in improvisation within motion capture environments and emerges as a shaping process that combines several interconnected elements. *Sculptural Qualities* extend beyond the conventional static sculptural forms and include the physical and virtual elements with multifaced performative interactions as temporal and dynamic happenings. Central to shaping processes is the improviser's active, intentional, and mutual relationship with their bodies, actual and virtual, and the environment. A post-phenomenological understanding of bodies offers new perspectives on embodied and extended improvisational practices. Actual body I termed the *I-body* as the phenomenological experienced body, and the virtual body is composed body as *sculpting virtual improviser*. As the improvisers actively engage with their bodies, the shaping and reshaping in real-time is part of ongoing looping feedback interactions. Using motion capture systems allows for real-time experimentation and explorations where improvisers' bodies are extended in an active and temporal relationship with the volume, creating sculptural abstractions visualised as digital trace-forms. These sculptural abstractions have a sense of opening and expanding experience that is constantly in flux, leading the improviser to moments of surprise and novel discoveries. Through the sculptural sensibilities and tactility inherent within these shaping processes, improvisers actively engage in touch and physical whole-body interactions with the motion capture suit, floor, volume, and other bodies in space while shaping and reshaping their sculptural abstractions.

*Sculptural Qualities* as shaping processes have a transformative impact on the embodied and extended experiential and temporal unfoldings fostering a holistic interwoven relationship of body-mind, environment, and the world, enriching improvisational approaches within motion capture environments, and discussed in the next chapter.

# Chapter Three – Practice Review

*Developments in tracing, capturing, archiving, and sharing motion at the turn of the recent century suggest that tiny, motion captured gestures might be another way of writing the minute, the instantaneous, and the discontinuous.*

- ***Susan Kozel (2020)***

## 3.1 Introduction

Moving into current practices, in this chapter, I examine the embodied relationships between the body, movement, and technology (Bleeker, 2017; Kozel, 2008; Popat & Preece, 2012). The interplay between dance and technology has renewed interest in exploring embodied actions in dance practices because of the technological developments of new technologies such as “motion tracking, artificial intelligence, 3D modelling and animation, robotics, digital paint, interactive sound technology, and biotechnology” (Broadhurst, 2006, p. 137) including nanotechnology. The interest in utilising these cutting-edge technologies requires a shift in physical and philosophical thinking-doing in choreographic practices. Thus, embodiment in the context of Human-Computer Interaction (HCI) has become vital to dance and choreographic processes. According to Whatley and Sabiescu (2016),

> Artists, including choreographers, have used digital technologies as choreographic tools, shared working spaces, and experimental playgrounds or have embraced computing languages more broadly to approach their art-making, envisaging their artistic work in computational and algorithmic terms (2016, p.18).

Therefore, the choreographers' interplay between movement and computer information processing capabilities is becoming vital to their choreographic-creative processes. These new practices created a range of approaches to dance knowledge. Rubidge (2002) argues that digital technologies such as digital animation and the motion capture system generate data to contribute to or supplement the content of choreographic works. Popat (2005) examines how internet and communication technologies enable new opportunities for traditional theatre spaces and 'remote' interaction in performances. Kozel (2008) suggests that as “computers become closer to our bodies”, it raises questions about the domains of ethics, corporeality, and ontology within motion capture environments. Thus, the ontological corporeal question of where “body ends and synthetic digital” starts when exploring the body-self and the digital-other “that is an extension of the self but also profoundly different" (p.214) in these environments. Rosenberg and Popat (2016) discuss “mixed reality and the phenomenon that has become known as “ubiquitous computing”, in recognition of how digital technologies are becoming increasingly embedded in our social and cultural experience” (p.1). Popat et al. (2017) raise a

critical question of how bodily extensions and body-technology “adjust, change or augment" in physical and virtual spaces and provocatively suggest that "the centrality of a body to be extended” (p.101). Bleeker (2017) and deLahunta suggest that the *transmission in motion* enables a different type of knowledge that is "mediated, stimulated, or redirected" (p.3). These transmissions in different projects define categories for knowledge embedded in the movement archived, choreographically explored with technological progression, and blurring the boundaries of live and virtual reality.

Furthermore, Bleeker (2017) advocates a rethinking of meaning and knowledge in *technologising* dance by shifting attention “towards dance as partner in dialogue…from the perspective of permanent transfer rather than storage” (p.xx). She draws on Ernst (2013), who observes "that the traditional separation between transmission media and storage media becomes obsolete" (p.98) and focuses on the permanent transfer in the near future. For example, transmission media such as television or radio were the primary interface in delivering content to the audiences in real-time, and storage media such as books or recordings of interviews preserve the content for later access. Ernst's assertion implies that with technological advancements, these lines are blurred where digital platforms enable real-time transmission and long-term storage. The content is accessible at any time, sharable and preserved in various ways simultaneously. Therefore, when considering dance and technology, what both Bleeker and Ernst suggest is shifting the relationship between dance and technology and evaluating how dance is perceived in these environments. The "choreographic communication" becomes dynamic, where technology becomes a dialogical partner in the creative process and artistic creations. This new paradigm shifts traditional transmission from one-way to multi-directional, which I explore through Ihde’s lens on multidimensionality (De Preester, 2010) (see 2.4.1). Bleeker and Ernst suggest that digital technologies, in this case, MoCap technologies, allow the perpetual transfer of dance content to challenge traditional notions of impermanence in live performance. Therefore, the boundaries between transmission and storage are shifting, as Ernst suggests.

For example, closely examining “motion” and “capture”[46] becomes a medium with technological possibilities of capturing, storing, processing, and transmitting motion. Thus, the mediated and fluid movement becomes a vital part for understanding of dance knowledge and its transmission processes (Sutil, 2012, p. 147) (Bleeker, 2017, p. 3). The *Sculptural Qualities* research is positioned in these discussions, where new dimensions of movement possibilities can be formed. The movement practitioner engages with their transformed digital models and trace-forms innovatively, offering a feedback loop between the improvising bodies. It involves dynamic and ever-evolving movement qualities and expanding *Sculptural Qualities* that can emerge in these environments.

I investigate the concept of digitalising dance used by scholars such as Bleeker (2017) and deLahunta and their discussion of knowledge-making embedded in the movement, archived, choreographically explored with technological progression, and blurring the boundaries of live and virtual reality. I explore Karreman (Butterworth & Wildschut, 2017) overlapping categories on how knowledge production is developed by utilising motion capture technology. The overlapping categories explore how knowledge production is developed using motion capture technology. I propose that this research on *Sculptural Qualities* offers a new category of *holistic, embodied and extended artistic dimension*.

Furthermore, I discuss current research and choreographic works such as *Dancing in Metaverse - Mocap technology in telematic and virtual dance performance – Research* (2020-2023*)* by Goldsmiths University and its partners; Alexander Whitley works (2021-23); Tobias Gremmler and Giles Jobin (2021-2023) works on augmented theatre and dance practices; *WhoLoDance (*2016-2019*),* Dr Ruth Gibson’s work on *Capturing Stillness: Visualisation of Dance Through Motion Capture (*2010-2013), Dr Louise Douse (2013) and her doctoral research on *Moving experience: an investigation of embodied knowledge and technology for reading flow in improvisation.*

[46] Returning to Woodcock (2016) and her tri-fold conception of capture, hold, release, she points out relations to Being (Heideggerian) where movement is vital component in ontology of being. In this sense movement/motion of motion capture “the temporality and the crucial role of inimagable motion data” (p.23) enables the relationship between captured movement and its formulation in the moving image – animation.

## 3.2 Proposition of new category

Exploring Karreman's (2017) framework on how dance knowledge is understood through motion capture technologies could provide a basis for this research on *Sculptural Qualities*. Karreman (Butterworth & Wildschut, 2017) addresses the "multiple meaning-making agents" and how MoCap is embodied in dance research and practice. Her framework can provide a starting point with a focus on the technological aspect of the mocap through four categories: a) for the use of artistic and creative aims, b) as part of dance notation applications, c) to support motion-based recognition of dance qualities and d) for archival and pedagogical purposes. Despite these categories seeming separate from the survey conducted in her doctoral thesis, she suggests that these four aims "overlap" (p.105). These overlapping intersections are the potential basis for my research. I have chosen to present it through the visual circular graph with a sense of interconnectedness, as shown in Figure 23.

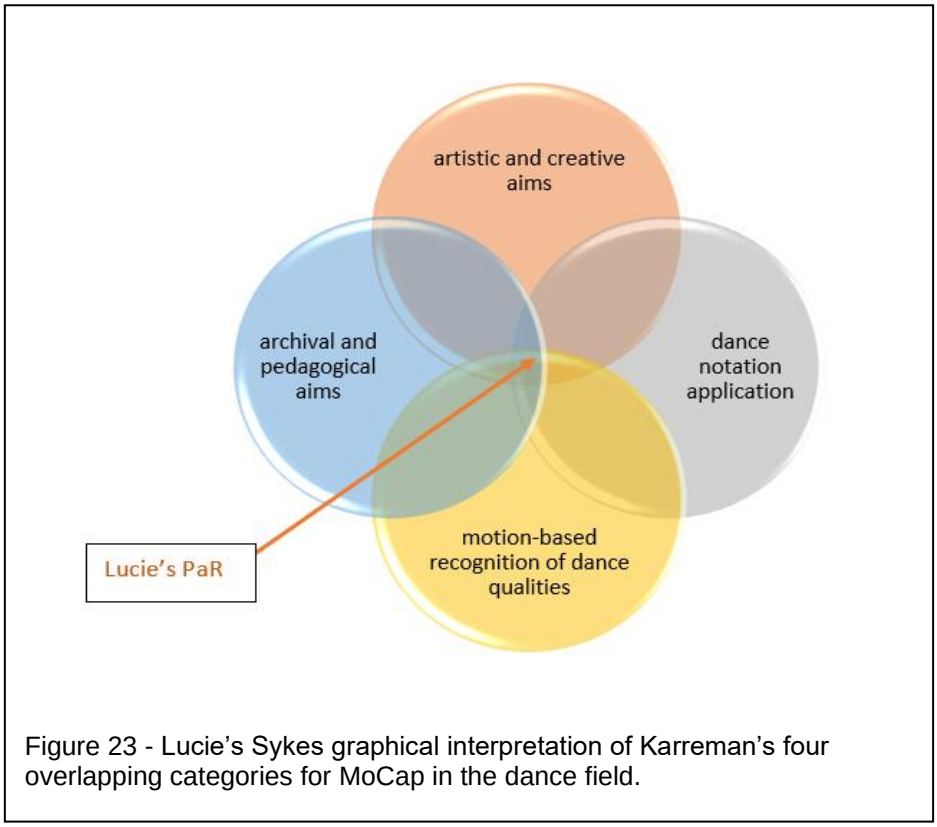



Figure 23 - Lucie's Sykes graphical interpretation of Karreman's four overlapping categories for MoCap in the dance field.

The overlapping connections between each category can be evidenced in some of the choreographic and scholarly works I explore in this chapter. For example, artistic and creative aims often intersect with pedagogical aims[47]. Such as the new *Otmo* (formally known as *Dance Digital Studio)* (2024) launched by Alexander Whitley dance company, creating a space where movement potential is realised through the interaction with digital avatars and choreographic inputs where students can enhance their artistic creations. Whitley's work often explores the relationship between embodied knowledge and motion-responsive technology to foster creative choreographic opportunities. A similar exploration that directs innovative choreographic techniques to inform dance education is the work *Becoming* (2000) part of the *Thinking with the Body - The Choreographic Language Agent* (CLA) choreographic tool by Wayne McGregor in collaboration with OpenEndedGroup and Nick Rothwell. This live and artificial intelligent installation adapts the abstract body through lines, and when it arrives at the rehearsal room where dancers can interact in real-time, it evokes moments of learning and discovery associated with dance pedagogy. The dancers embody these artificial shapes; in return, these shapes would redefine concepts of *becoming* with "algorithmic thinking" (Drew, 2016, line 29).

Another example of overlapping relationships in Karreman's (2017) dance notation and archival categories is the innovative notation technique with the development of *Motion Bank* (2011) as a web-based platform. *Motion Bank* is a tool for choreographers to notate and archive their in-depth thinking processes through interactive visual notations such as text, videos, and photographs in one place. For example, Deborah Hay's work *Using the Sky* (2013) and solo *No Time to Fly* (2010) offer a choreographic "online score" (Jennett & Weber cited in Motion Bank, 2012) as a documentation of Hey's thinking processes. Additionally, it documents the production sessions through analytic extraction of the dancer's motion data and motion pathways of each performer to visualise through computer vision and 3D graphic animation tools. This digital adaptation suggests the co-relationships of

[47] I must acknowledge these pioneers who explore the movement with technology and have not only choreographic outcomes but also pedagogical such *LifeForms* (1989) and *BIPED* (1999) by Merce Cunningham, *Improvisation Technologies* (1994 &1999) and *Synchronous Objects* (2009) by William Forsythe*, Material for Spine* (2008) by Steve Paxton*, Choreographic Outcomes (2005)* and *Vocalise (2008)* by Jacqueline Smith-Autard as part of Bedford Interactive Production.

space and precise geometry. Here, the pathways were visualised for each dancer through graphic lines offering a notational line of the body in relation to time in space for each dancer (provided in PDF format within the online score) (Motion Bank, 2012).

Furthermore, Karreman's (2017) overlapping categories have a communal thread of embodiment, creativity and innovation, interdisciplinary collaboration, data interpretation, and motion documentation. I will discuss these weaving elements throughout the analyses of these four categories.

Within the first category, *artistic and creative aims*, the mocap is a tool to explore the interaction between digital technologies and performers. Karreman suggests that this explorative approach allows for exciting works to emerge from companies like Palindrome (2016), Troika Ranch (2016) and Cunningham's collaborative works with OpenEndedGroup (2016). While these pioneering artists provide the foundation for interactive explorations by viewing technology to enrich artistic and choreographic vision, they emphasise the embodied approach to movement. Similarly, *the Sculptural Qualities* framework offers intersubjective experiences to develop an understanding of their movement aesthetic in sculptural form within mocap environments. However, it encourages a holistic approach to understanding the improviser's body and mind connections as it engages with space, time, energy, shape and the environment (see 2.3.4). Concerning improvisational awareness (see 2.2.1), the environmental affordances of the motion capture system and techniques allow for sculptural creative impulses to emerge through the practice. Furthermore, by integrating the real-time function of the motion tracking system, like in Troika Ranch 16 [R]evolutions (2006) work utilising Isadora software (TroikaTronix) and interactive manipulation of the visuals through the dancer's vocal expressions, the improvisers are extending their embodied experiences of movement, creating an active environment for artistic explorations.

Additionally, Karreman (2017) suggests that her approach to her thesis study is through the dramaturgical dimension (p.14), which I would call the dramaturg-researcher, and its responsibilities, which manifest through seven steps as follows: "positioning, interpretation, mediation, translation, support, ambassadorship and research" (Karreman, 2017, p.15). In comparison, my role within this research is through practitioner-researcher principles of practice as research methodologies (PaR) (discussed in the next chapter), which also emphasises the practice as the

centre of its inquiry. Within this (dual) role, the researcher part also became necessary when operating the motion capture system and building the visualisation of the sculptural motion in Touch Designer (after receiving training from digital artists – see acknowledgement). As Karreman (2017) suggests, cross-disciplinary curiosity and expertise may play a crucial role in developing artistic research to integrate motion capture technology, and it quite rightly became part of my process. The (dual) role allowed me to articulate both disciplines' concepts and vocabularies, fostering the development of the theoretical framework and embodying dance knowledge as an improviser in the studio practice. Bridging the holistic approach in this study, for example, I discuss the importance of sculptural sensibilities - touch - in chapter five. The improvisers are asked to place their motion capture suit in a shape on the floor, and later, they apply markers in direct interaction with their suits. This embodied tactility allows them to become improvisers-technicians fostering the symbiotic relationship between body-mind and the digital environment to develop sensing-noticing-responding (see 2.4.1) insights to support their artistic and creative aims and emergent *Sculptural Qualities*.

Moving into the second category of using mocap data for *dance notation,* it introduces two types of notations: symbolic dance notation and what Karreman (2017, p.182) calls the *kinesthetic rendering as digital traces* of the motion data. The symbolic notations are already established systems like Labanotation, Benesh notation, and Eshkol-Wachman Movement Notation (Laumond and Abe in Calvert, 2016). The symbolic signs of these notation styles can be interpreted and understood by anyone who studies them. However, considering that the kinesthetic rendering “may convey important clues about specific choreographic concepts or movement qualities by appealing to the kinesthetic imagination of the dancer" (author, year, p.182) and therefore cannot be studied with the same approach as the symbolic notation. As the dancer's body becomes the kinetic energy in motion, the *kinesthetic rendering* becomes vital for understanding these embodied experiences. My research focuses on the holistic approach to provide a richer understanding through a framework of *Sculptural Qualities*.

Thinking about the notation of dance and how movement can create visual traces in the space could be considered through drawing like the pen traces-draws movement on the paper in a pattern to create scores or drawing choreography. Whilst Karreman introduces the *dancing-drawing* body as it “leaves traces and marks

the space” (p.185) to conceptualise body metaphor influenced by Lakoff and Johnson (1980), I am introducing the *sculpting virtual improviser* discussed in the previous chapter (see 2.4.2). Karreman argues that the *dancing-drawing* body structures the motion-capture-based imagery "into [a] specific type of visual imagery" (p.181) and can be applied to other computer graphic visualisation tools. These visual imageries are characterised through graphic lines, traces, or abstracted two or three-dimensional shapes or objects as they animated movement data. For instance, the works by Vincs et al. (2020) explore the spatial and temporal mode of movement pathways through motion trail visualisation as data points with linear trails. These trails are drawn by the dancer's movements in real-time into "shapes of colorful traces" and offer learning opportunities. At the same time, it develops their proprioceptive understanding of moving in this type of environment (Karreman, 2017, p.113). It aligns with my research using OptiTrack Motive’s (2.1version) visualisation of the marker's history through white lines (Figure 24). For example, improviser D3 (in phase two) suggests that the visual imagery and the behaviour of the traces make the connection to the natural movement of fireflies. In this moment, the improviser D3 creates a sensory connection to enrich and understand their experiences in the moment – which is part of the embodied metaphors. These metaphors arise from cognitive theories that aid in understanding abstract concepts through the body's sensorimotor experience.

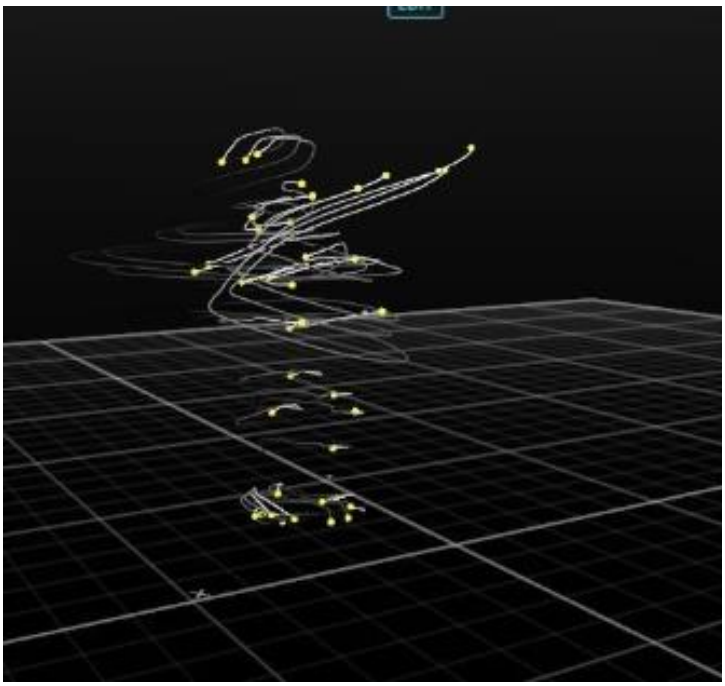


Figure 24 - Improviser in Motive with history lines.

The role of MoCap technology is primarily utilised in biomechanics and sports to provide quantitative data on gait movement. It can also be used with third-party software like MATLAB®, which may not necessarily allow recognition of the expressive movement qualities. When *extracting dance qualities,* Karreman's third category, a multi-modal approach, is required to understand the relationship between quantitative and qualitative data of embodied experiences. For example, a Fdili Alaoui et al. (2017) study explored how seeing and sensing experiences allow them to read movement qualities utilising Laban Movement Analyses focusing on SPACE and Efforts through the evaluation of three types of data: positional data in volume through 3D Vicon MoCap system, dynamic data obtained with inertial sensors and physiological data recorded with electromyography (2 EMGs and one accelerometer for data acquisition). Similarly, the study by Hussain et al. (2019) explored the different movement qualities when a dancer was given different kinesthetic rendering through the Unity system representing the texture of metal and particles. They used the Rokoko Smart Suit Studio with MoCap Toolbox in MATLAB® concerning the hip's joint movement pathways (due to the inaccuracies with arm and leg lengths) as the correlation of Laban's center of gravity. However, the explorations still relied on the participants communicating the different movement qualities through LMA Efforts

cards they saw in their motion data's visual feedback. Another example, Douse (2013) utilises mocap, EVerT visualisation software, videos of the improviser, improvisers questionnaire, and her journal entries to compare all the multi-modal data to read the flow in dance improvisation, and I discuss Douse's research in more detail in this chapter. The work by Gibson (2011) in *Falling Upwards* (2013) is part of a more significant project *Capturing Stillness* (2011), within the Skinner Release technique (SRT), where the project aimed to rethink the transmission of the SRT qualities of “weightlessness, floating, suspension and flow” through utilising mocap, CAVE technology and visualisation of “two, vertically aligned, rippling planes floating above the ground” (Karreman, 2017, p.208). Similarly, Gibson and Roche’s piece in *Expanding Fields* (2022) captures traces, and their kinesthetic renderings are visualised through 3D tube imageries that travel through virtual space. Therefore, moving beyond the numerical or quantitative data, my research employs multi-modal analyses such as kinetic renderings, Laban/Bartenieff’s Efforts-Shape, videos of participants in Motion Bank documents and the participant's lived experience of these rich embodied responses, as the *Sculptural Qualities* emerged in the moment.

Moving into archival and pedagogical research – Karreman’s fourth category – the challenge is how dance can endure beyond its performance. The conventional way of preserving dance movement can be applied through Labanotation or video capture of the choreographic processes like Siobhan Davies's project *RePlay* (2009-2021), which allows digital access to her past works, as Whatley (Coventry University Research, 2014, 0:41-0.46) said, Davies has been the pioneer of the contemporary dance when it began. However, how can we preserve the embodied experience of the dancer? Here, MoCap technologies allow the preservation of motion data to be accessed as it would happen at that moment. For example, the work *Loops* (2001-2011) by Cunningham and OpenEndedGroup could be part of this category. Through the mocap, Cunningham's improvisatory hand movements performed, its loops were captured and preserved and continue to “live on”. The mocap data of the loops are digitally accessible as open source and often interpreted in a different mode of the medium by OpenEndedGroup in a project to address the cultural memory of movement and choreographic works. Because of the mocap digital data preservation, dancers can study and discover their movement alphabet and improvisation techniques.

However, dance - movement - is not merely a technical endeavour as it is deeply rooted in embodied practices encompassing a wide range of intentions, sensory responses, and aesthetic experiences, as I discussed in chapter two regarding De Spain's improvisational awareness. While Karreman's framework offers a foundation for dance knowledge with these four categories, my research explores dance knowledge from a new perspective. It emphasises the understanding of the *wholeness* of the sculptural experience by inhabiting the mutual relationships between the bodies and spaces, the physical and virtual, enabling the temporal unfolding of improvisatory experiences in the moment. The *in-readiness* as an active listening state enables improvisers to shape and reshape their movement intentions and responses through mutual feedback loops. Therefore, I propose that the concept of *Sculptural Qualities* and its framework further develops an additional fifth category – holistic and embodied extended artistic dimension (Figure 25).

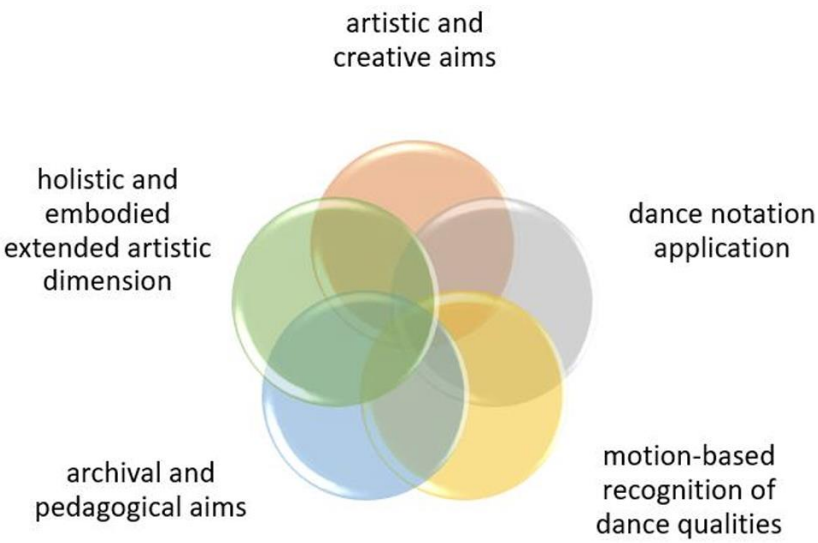



Figure 25 - Lucie's proposition of a new category integrated into Karreman's established overlapping categories.

Within this new fifth category, the MoCap is a vital part of the wholeness experience and, through real-time interactions and sculptural sensibilities, improvisatory intentions with attentiveness. These feedback loops (see 2.4.2) interconnect improvisers with their sensory experiences, tactility, and nourishing coupling

experiences in the present moment. The present moment offers sculptural forms and motions with abstract and artistic dimensions. The kinetic feedback loop fosters a holistic approach within motion capture environments between the body and mind. In essence, the concept of *Sculptural Qualities* invites the improviser to experiment beyond the mere surface of movement data in physical and virtual environments and consider these mutual embodiment relations (see 2.4.1) actively engaged – extending their I-bodies *within* the environment. Movement transcends experiential awareness and its multifaceted kinetical and sensory experience, which evokes the shaping process of sculptural dynamic forms, allowing for a new relationship between the body, Self, and the environment. Therefore, I propose that the *Sculptural Qualities* framework introduces a holistic focus on dance improvisation as an embodied and extended artistic dimension *within* motion capture environments.

## 3.3 Practices with the use of motion capture technologies

### 3.2.1 Dancing in the Metaverse

*Dancing in the Metaverse* (2021-2023) is a current AHRC research funded project by Goldsmiths, University of London and its partners Akram Khan Company, Alexander Whitley Dance Company, Midheaven Network, and Gowanus Loft. It explores “the application of motion-capture technology in telematics and virtual dance performance through a framework for long-distance remote communication” (Exeter University, 2022). This work utilises Inertial Measurement Units (IMU) systems, such as Perception Neuron and the Posenet, to enable experimental exploration of the affordances of new marker-less MoCap systems such as remote creation, rehearsal, teaching, and performance of dance work. This work deals with the telematic element of dance and choreography, where both dancers wear MoCap IMU’s suits in two different physical locations. They focus on global locations, such as a dancer in London is ‘dancing’ with a dancer from New York in real-time in the virtual space--the Metaverse. It is possible through their innovative *Mocap streamer* platform that enables the real-time streaming of motion capture data online. Similarly, to *MotionRiver: the Universal Mocap Streamer developed by Gibson and relevant partners* utilising the OptiTrack system rather than IMU’s (Gibson & Martelli, 2020).

In this sense, Strutt (2022) suggests that their research “explores the embodied co-presence within virtual spaces …[and]…the potential for remote dance creation” (p.1). The immersive showcase of this research is shared through an online platform in the form of a "digital-dance installation that sees three dancers move together in real-time through remote connection” (Goldsmiths, 2021, lines 1-2). It presented intimate interactions between dancers in different locations through computer-generated virtual landscapes, interacting with their avatars “spinning out shapes, light, and particles that weave and intertwine to give a feeling of virtual touch and embodied connection” (Goldsmiths, 2021, lines 4-5).

While they are utilising visualisation software in Unity, my research explores the use of Motive and Touch Designer to represent the motion imagery with dots and points. They are also delving into the emotional commitment of the dancer in the creation (Strutt et al., 2021), which has similarities with my participants. My participants expressed that the imagery sometimes triggers memories and perhaps a sense of empathy for these aesthetic experiences. Therefore, my research focuses on creating a holistic space and environment where movement practitioners actively interact with visualisations as digital trace-forms. There are some distinctions, such as their belief that the physical body controls the virtual body as a puppeteer, which contrasts with my research. My work focuses on chiasmatic relationships between the actual and virtual bodies. As discussed in chapter two (see 2.4) I explore these relationships through embodiment relation of the *I-body-as-sensory-Device* as the phenomenological body) and the *sculpting virtual improviser* as a composed body.

In summary, Dancing Metaverse and their Mocap Streamer involve virtual dance studios where dancers from various locations collaborate, dance, and perform. It suggests innovative explorations of presenting dance performances to an audience through virtual reality (VR) or in the physical space with other immersive technologies - my research focuses on the aesthetic aspects of motion data and its shaping transformation into sculptural form. My research focuses on the qualitative, subjective experience of the mover at that moment and finding a framework for understanding the complexity of embodied movement within the realm of motion capture environments. Furthermore, my research proposes application to various creative domains, such as visual arts, animation, gaming, and interactive installations.

### 3.2.2 Alexander Whitley

Alexander Whitley is a British choreographer who explores the relationship between body and technology. His works involve motion capture technology systems, interactive projections, virtual reality, and other digital tools that enhance his choreographic intentions. His work *Digital Body* (2021) project was born from the COVID-19 pandemic response to provide creative exploration and output for others to engage with. The project explores how motion capture and 3D animation technology can represent human movement in different environments. This work uses the Inertial Measurement Unit's (IMU's) technology Perception Neuron, like *Dancing in Metaverse*. Digital Body aimed to engage audiences while staying home and enhance creativity during these difficult times. Therefore, he provided the motion data and artists could use those data within their practice and create different versions of the 'digital body'. This project inspired him to develop further works such as the *Chaotic Body* (2022) – which then became an application for iOS and for others to access on their smart mobile phones and interact with avatars moving in viewers' environments (on the street, on the table, in the garden) – and *Overlow* (2022).

His current work, The *Anti-Body* (2023), "explores the drive to transcend the material constraints of the human body" (Whitley, 2023) through an illusory visual world of abstract code. The three performers embody the tensions between the embodied and disembodied form, which are becoming even closer to reality in this current technological climate. Whitley's recent developments explore choreographic compositions in the digital world with *Digital Dance Studio* (DDS) (2022-current) for educational purposes. Only a few months ago, Whitley developed DDS into an interactive workshop using still IMUs with OptiTrack and a large projector screen to project the virtual environment, where dancers can interact and engage in real-time. This recent development of his DDS has similarities to my research, as I am exploring the development of a holistic environment with three projection screens where the movement practitioner is placed within these surroundings in real-time (see 5.2).

In summary, Whitley's digital dance and performance work focuses on the 'digital body'. His choreographic explorations offer exciting discussions on how technology enhances the body's possibilities within dance performance. However, my research focuses predominantly on the lived experience and its authentic expression of the movement practitioner. The intersection of motion capture technologies within embodied practices can be used to augment or present spontaneous improvising, resulting in a unique sculptural experience within this research.

### 3.2.3 Tobias Gremmler and Giles Jobin

*Augmented Theatre* (2022-23) is a research project exploring augmentation of the physical stage into the virtual space and is investigated by Tobias Gremmler (Zurich University of the Arts 2020). This research is in conjunction with the practice-based exploration of Spatial Augmented Reality at the Immersive Arts Space. The current technologies enabling the optimisation of latency and the development of high-precision projection mapping on fast-moving objects and human movement have gained interest and investment within this institution. Augmented, in this sense, means incorporating augmented reality (AR) or interactive digital elements into traditional theatrical performances. Gremmler uses the OptiTrack motion capture system, where digital motion and avatars are projected onto a panel screen. However, these screen panels can move around the room and be placed in different positions. What is more interesting is that the screen panels have flexible openings; therefore, when a performer's physical body decides to go through the screen, it is transmediated into the virtual digital avatar, and the physical body disappears behind the screen panel. This screen panel has a portal function where the physical meets the virtual in real time. Sometimes, the performer's body is half physical and half virtual, which questions the relationship between the theatre's physical and virtual boundaries (Zurich University of the Arts, 2020).

Similarly, Gilles Jobin's work is known for its experimental nature, continuously innovating in contemporary theatre, dance, and technology. One of his notable works, *Cosmogony* (2021-23), explores themes of the universe's origin and human existence. His choreographic intention explores the fundamental questions of life, the cosmos, and the interconnectedness of all living beings. Jobin suggests that “[c]horeography is a language that fits new technologies very well, because it is

concrete and abstract, it is not narrative but it carries meaning" (Pietrobon, 2022, lines 68-70). He further discusses that technologies have a range of possibilities with the use of choreography (and, of course, limitations, which theatre itself has, too). Therefore, *Cosmogony* is what he calls "live animation" (Pietrobon, 2022, line 135), utilises motion capture technology in real-time (OptiTrack), where performers interact in the physical space (the volume) and translate into the virtual world. They can interact and manipulate virtual elements in real-time designed explicitly as a virtual reality (VR) experience for the audiences, enhancing the theatrical experience with innovative storytelling with characters exploring the proximity between them and the audiences, 360 degree immersion and sensory enrichment (spatial audio and visual elements) (Pietrobon, 2022).

In summary, Gremmler's work imagines theatre as a digital art with interactive design, physical set pieces, and motion graphics to create immersive and augmented experiences with visually compelling theatrical experiences. His explorations of digital elements in space and interplay with light and shadow create dynamic artworks. Similarly, my work adopts the theatrical setting with projection screens, light, and abstracted visualisations to shape movement practitioners' *experiential couplings*.

Consequently, Jobin's work often pushes the boundaries of traditional theatre and the relationship between dance and technology. By incorporating VR into his work, the elements of merging both physical and virtual space to create new and transformative performance experiences. While Jobin's work focuses on specific themes and concepts exploring philosophical and existential questions, as seen in *Cosmogony*, my research explores the philosophical question on being-in-the-world, and it is not theme-driven. My work focuses on the immediate *experiential couplings* of spontaneous improvisatory movement, emphasising the experimentations and the intertwined relationship between movement and technology as a whole system. These relationships can be seen to some degree in Gremmler's and Jobin's work as a starting point for their choreographic explorations, and it may differ in their context and artistic intention to this work. Thus, *Sculptural Qualities* can potentially transfer into performance settings.

### 3.2.4 WhoLoDance

Another example, which uses motion capture technology (OptiTrack), is a research project*, The Whole-Body Interaction Learning for Dance Education* (*WhoLoDance,* 2016-2019), conducted by a consortium of organisations and European universities, including Coventry University (C-DaRE). WhoLoDance experimented with the use of Artificial Intelligence (AI) technology to teach a computer to recognise and interpret the bodily movements of a dancer. WhoLoDance explores the relationship between body-technology through the concept of “body datafication”[48] As a process where the body becomes data “as embodied form of knowledge” (C-DaRE, 2021). Burkhardt et al. (2022) suggest that the rendering of activities into machine-readable formats is not simply a representational shadow or “data double” (Ruckenstein, 2014 cited in Burkhardt et al., 2022); instead, the activities are re-formed/reshaped by the datafication process. By "becoming datafied versions of their former selves, these activities transform” (pp. 9-10).

Furthermore, WhoLoDance work captures the non-verbal expressive movements of dance styles such as Greek, Flamenco and contemporary dance. These stylised compositions become part of a web-based system called *Choreomorphy.* In this system, the dancer selects pre-set movements of Greek, Flamenco, ballet, or contemporary dance style allocated in the movement library (WML). Within the first stage, the dancer can view and annotate them. In my research, the dancers are working with movements that their bodies create. The real-time movement creation is introduced during the visualisation stage, which visualises the dancer's body through various digital avatars and dancer movements in trials. The *Choreomorphy* visualisation offers movement visualisation, highlighting different aspects of movement and triggering different qualities and patterns of movement.

In contrast to their avatars, my research focuses on the abstract representation of the improviser's body (see 5.4). In chapter five, I discuss moving

[48] Datafication is a contemporary phenomenon, a term first coined by Mayer-Schönberger and Cukier (2013) “datafication” to signal a general “transformation in how society processes information” (p.29), which refers to the quantification of human life through digital information, very often for economic value. Data are “material produced by abstracting the world into categories, measures and other representational forms [...] that constitute the building blocks from which information and knowledge are created” (Kitchin, 2014 cited in Mejias & Couldry, 2019, pp.1-2).

away from avatars and focusing instead on abstraction and trace-forms. These two elements are significant to explore in relation to the emergence of *Sculptural Qualities*. Through the direct interaction with the improviser's motion, the notion of *in-readiness* as a moment of spontaneity is established (see 2.2.1) for the improviser to respond with different qualities and moving patterns. The visualisation in both projects offers self-reflection and experimentation. By enabling the experimentation in *Choreomorphy* through the blending engine stage, it enables the dancer to blend "movements consecutively in time to form a longer, seamless sequence, or in parallel, i.e., superposing parts of movements to form new movements, e.g., with the leg movement of one sequence and the upper body part of another" (WhoLoDancE, 2018; WhoLoDancE, 2016, lines 38-41). This application offers an exciting exploration of choreographic compositions blending two or three cultural dance styles and recreating them in new forms.

Furthermore, the documentation of this project suggests the sonification stage by exploring audible intentions to represent the movement's qualities. Furthermore, *Choreomorphy* offers real-time movement exploration with different types of avatar through the IMU's system (also usable with the Microsoft Kinect motion sensor). The dancer can initialise “visual parameters including avatar textures, particle systems, motion trails and motion traces, and even the virtual environment itself” (Raheb et al., 2018, p. 3). The system can switch between several viewpoints of the avatar, including a first-person perspective. Therefore, the system requires inputs from the motion data of the moving dancer and their selection controls.

In contrast, within my research, the notion of a feedback loop is introduced to facilitate the self-reflection and experimentation stages. Furthermore, I introduce the reflection methods through Schon’s *reflection-in-action* and *reflection-on-action* (see 4.4.2). Therefore, the reflection methods, in conjunction with the real-time shaping and reshaping of movements, contribute to the developments in understanding bodily knowledge. Another stage of *Choreomorphy* uses the OptiTrack system with other technological tools like Virtual Reality (VR) headsets and Augmented Reality (AR) - HoloLens (v1). While the dancer views and embodies the chosen segmentation using a Virtual Reality (VR) headset, the audience (and possibly the dancer) wears the HoloLens, which enables them to generate an augmented avatar that simulates the dancers' movements. The audience wearing the HoloLens observed the dancers' avatars and their movements mapped onto the physical body

and space. Through the gaming joystick, audiences select the dancer's avatar and a choice of where to position it in the physical space. It also enabled the visualisation of the dancers' paths and directions of movement traced in three-dimensional space.

In contrast to WhoLoDance, this research creates an active environment enabling augmentation through the use of three projections placed within the space to create a triangulation immersive experience for the dancer, which is in the middle of that space, providing a holistic approach to dance improvisation in these often-complex digital environments (see 5.2). In both projects, the exploration of bodily knowledge (attending to sensory information, perception, affects, and feelings occurring during the experiential event) is explored through layering processes. In WhoLoDance, the dancer's body becomes the data, which is then used for various processes of analyses for movement patterns, providing feedback to dancers to respond to, and enhancing dance education. In contrast, this research focuses on exploring and understanding *Sculptural Qualities* that emerge from the movements of improvising bodies. Similarly to WhoLoDance, it involves exploring bodily knowledge to engage with the creative and interpretive aspects of the movement. Therefore, it suggests the layering of the improviser's body oscillating between being-becoming as a dynamic interplay between the actual body and its potential for transformation into virtual. This layering shaping process of *Sculptural Qualities* implies a constant flux and reshaping during the embodied improvisatory experiences. The WhoLoDance three-year research project aimed to prototype new technologies to support the learning and teaching of dance (Raheb et al., 2020). Likewise, *Sculptural Qualities* can enhance movement practitioners' embodied experience and understanding of movement with its dynamic artistic dimension in dance and performance capture pedagogy.

### 3.2.5 Capturing and Reading Stillness

Ruth Gibson's work *Capturing Stillness* (2011) uses motion capture technology in combination with the computer engine Unity to create transformative experiences of the Skinner Release Technique (hereafter SRT) and its poetics (Gibson & Martelli, 2015). Gibson's previous work[49], enable her to reflect on the practice and the notion

[49] *SwanQuake:House* (2007/2008) - an installation by Gibson/Martelli, aka igloo – exploring the oscillation between the physical and the virtual.

of disorientation, chaos, and vertigo and confronting these elements when working in virtual worlds and recognises the similarities of “the risk taking she experiences in her SRT practice” (Whatley cited in Reynolds & Reason, 2012, p. 272). The SRT explores the somatic body in relation to the environment, the natural and the 'real' experience and the dancer's awareness to senses "with [the] alignment of the whole self" (Skinner Releasing Institute, 2009), including stillness, minimal movement, and partner work through contact (touch). The dancer explores the 'image actions' through metaphoric propositions such as the swing motion of the arms or body transforming into a pendulum, and with each swing of the pendulum becomes a sensory experience of weight. These metaphoric explorations stimulate imagination and kinaesthetic experiences “…situated in that precise moment in time” (Emslie, 2009,p. 173 cited in Whatley et al., 2015).

Whatley (Reynolds & Reason, 2012) suggests that exploring SRT in virtual environments might present differences in the creative process of moving because "technology intervenes in myriad ways” (p.274). It highlights the extensive and sometimes complex way technology influences our daily lives in a broader context, as it has diverse uses. When considering motion capture technology in dance practices, it can offer a variety of approaches to explore movement, as discussed in relation to Karreman’s categories. MoCap in both projects (Gibson's and mine) mediates the creative processes of STR and dance improvisation techniques. It allows for precise tracking of dancers' movements and is used as a basis for further movement explorations and visualisation. In this research, mocap mediates and shapes how movement is generated and experienced within dance improvisation. As the primacy of dance improvisation is the body, like in SRT, it creates embodied movements and experiences that shift between the physical and virtual bodies within the mocap environment. The exemplified shift, which I term *experiential coupling,* changes in movement quality, stillness, energy level or the overall felt sense effecting the kinaesthetic awareness and somatic experience of improvisation (and SRT) - interconnecting to shaping processes with the body, technology, and the world.

In contrast, Gibson calls the experiential relationship *kinosphir* to facilitate the awareness of the Self and connect with the environment. SRT “goes beyond tissues and accesses the subconscious to explore” (Gibson, 2011, p. 210) concepts of “‘nothingness’, ‘emptiness’, ‘sensory imaginings’, ‘reacting in the moment’ and

‘constant becoming’” (Whatley cited in Reynolds & Reason, 2012, p. 273). Furthermore, the imagery and these concepts guide the spontaneous movement into explorations of more “technical principles such as multi-directional alignment, suppleness, suspension, economy and autonomy” (Whatley cited in Reynolds & Reason, 2012, p. 273). It encourages a fluid and open approach to movement explorations. Similarly, dance improvisation embraces the notion of fluidity and openness to encourage dancers’ presence in the moment of improvisatory intuitive responses to imagery and internal impulses as external stimuli (Midgelow, 2019). As improvisation fosters explorations where movements arise from spontaneity, the experiential coupling enables the sense of letting go, like in SRT, where movement continually evolves and responds to the ever-changing relationships between the Self, body, and the environment. I offer *Sculptural Qualities* as a framework for exploring dance improvisation within motion capture environments, whereas Gibson offers an approach to capturing stillness in an immersive environment. It is important to note that *experiential coupling*, or *kinosphir*, is a subjective experience, which contributes to developing an understanding of the physical, cognitive, and energetic aspects of a dancer's embodiment in the (mocap) environment.

Furthermore, Gibson focused on the poetic metaphoric imagery cited in Skinner’s notes on the technique and explores “how the stilling, breathing, image-based motion of SRT can produce animations and visualisations that speak of the individual dancer …” (Whatley et al., 2015, p. 197). Gibson acknowledges that stillness is observable in the character’s breathing and is aware of the motion capture limitations for stillness where “perhaps some minute shifts of weight or motion that takes place beneath the layers of the skin towards the inner” (Whatley et al., 2015, p. 197) can be ovoid. As stillness and gestural movements are transmediated into visualised abstract forms with fabric-like image texture in Gibson's work, similarly, the movement practitioners' movement is visualised within this research. However, these sculptural forms are represented as lines, dots/blobs, floats, spikes and polygons, and particles, which influence the movement creation (see 5.4, 5.5, and 5.6). I explore these visualisations as imagery facilitating the emergence of *Sculptural Qualities*. Whatley (Reynolds & Reason, 2012) suggests that Gibson’s visualisation of the body is highly novel, allowing for “…new ‘coupling’ of human movement and digital technology” (Solano, 2006 cited in Birringer, 2007, p. 44). However, Whatley emphases that Gibson is aware of potential technological

constrain of motion capture systems, as a controlling technology, the visualisation, and transformation of the still movement into the virtual environments. Despite these challenges, Gibson's project on *capturing and reading stillness* demonstrates "the potential of motion capture to reflect on SRT as pedagogy, and as a source for technical and compositional practice" (Whatley cited in Reynolds & Reason, 2012, p 275). Whatley concludes that a digital dancing body within an immersive environment "provide[s] [a] new and transformative viewing experience" (p.276). It offers a sensorial experience between the viewer and the digital dancing body. Through the engagement with these sensations, the viewer is confronted with the intense kinaesthetic experience, making it feel like an embodied experience. Gibson's project on visualising Skinner's imagery for virtual environments engages with the critical engagement with the practice in the hope of enhancing the understanding of it within these environments. Her project enabled other SRT practitioners to explore if the 'raw material' of the SRT technique and its visualisation within the created environment affect kinaesthetic empathy.

Equally, *Sculptural Qualities* ask improvisers to engage with their intentional shaping processes, like SRT, to connect with their sensibilities and explore the tactility in a mocap environment. It focuses on the improviser's creative decisions with a holistic and immediate relationship with the mocap environment – as a whole system. In contrast, Gibson's' research investigates how moments of stillness can be 'captured and read' through motion capture and Unity. The artistic choices of transmitting stillness and other SRT elements through mocap technologies offers new understanding of these movement qualities. Both works utilise visualisation for interpretation analysis and artistic exploration within this research and explore embodiment, with my research contributing to the discussion on the extended and embodiment relations (see 2.4.1).

### 3.2.6 Capturing and Reading Flow

Similarly to Gibson's interest in reading stillness, Douse (2013) focuses on reading the Flow while improvising in her practice-as-research doctoral thesis. She draws on Mihalyi Csikszentmihalyi' concept of Flow and Laban/Lamb's understanding of shape flow movement. Douse (2013) examines and explores through a post-phenomenological framework on embodiment to understand Flow and to expand on

the current definitions utilising transdisciplinary methodology between dance and technology.

Douse (2013) argues that visualisation is a form of evidence of the body and is presentational. In the hope of reading the Flow, she draws on Ihde's hermeneutic technics - the interpretive relationship between humans and technology - to understand and define her choice for visualisation analyses of improvising bodies. In the hermeneutic relationship[50], "the technology functions as an immediate referent to something beyond itself" (Introna, 2005, cited in Douse, 2013, p.157). Similarly, in this research, Ihde's (1974, 2002) work, in conjunction with Clark's (2008) theories of embodiment and extended embodiment, are employed to support an understanding of *Sculptural Qualities*. The shaping processes are coupled with the improviser's body-mind and the mocap environment (see 2.4).

Furthermore, she draws on the movement analyses of Rudolf von Laban and shape analyses (*Choreutics*) further developed by Warren Lamb for visualisations of pathways and proposes a framework for reading flow through "adding a trajectory of past movement to each data point" (Douse, 2013, p.167).

For visualisation analyses and to identify the moments of Flow and those non-flow, Douse (2013) utilises the Motion Analysis EVaRT visualisations to determine both visualisation analyses: the markers in motion and the visualisation graphs accompanying the software. Within EVaRT, the graphs with x, y and z axes offer positioning of the markers (in space), velocity and acceleration. However, this meant that Douse had to reduce the number of marker data points on the body to fourteen, supported by the concept of point-light animation (Johansson, 1937) and the notion of identity (Press, 2011), which suggests less perceptual information has a more significant impact on the belief (on human motion). This point-light concept was established by Johansson (1973) as a display technique where

[50] Ihde (1974) suggests that through phenomenological hermeneutic approach offers a model in perspective of *what* is observed, and it must be *relative* to the situation or proposition the observer is situated in. Therefore, Ihde argues that this model needs to be examined in the realm of *relations* between humans and technology. These relations are divided into three relations as follows: non-neutral, the magnification-reduction structure, and the amplification-reduction.

> light emitting or reflective dots are attached to the joints of the body in a darkened room so that (Douse, 2013, p.118) a very good recording of the motion tracks of the different joints [is given] without revealing any traces of the background or the body contours (Johansson, 1973, p. 202).

Today's motion capture technologies have developed rapidly since 2013, and the recording and capturing of motion have significantly improved with sophisticated software, like Motive in this research, enabling realistic motion data evoking a compelling impression of human actions and gestures. The velocity and acceleration[51] of human movement can be visualised alongside the trajectories of movement pathways. Douse draws on the pragmatic approaches to visualisation for 'easy read accesses of motion data, utilising a colour scale to represent velocity such as

> [y]ellow, for example, could represent high-velocity movements, moving through red to blue for low-velocity movements. Velocity would be seen in the colour of the trajectory, and acceleration would be noted in the speed of the colour change from blue to yellow as well as the increasing length of trajectory (Douse, 2013, p.169).

The EVaRT Motion Analysis software included marker points and trajectory lines of both past and future motion. Therefore, some limitations were presented while visualising the trajectories, as it did not allow for 'viewing' only past movements nor changing the colours. Therefore, the researcher provided additional graphs "visualising various aspects of the data, for example, the velocity, acceleration and position of the markers, and the distance between two markers...is presented as one single line" (Douse, 2013, p.182 and p.192). The analyses were to identify moments of Flow and non-flow, comparing with the graphs available, and observational analyses of the dancer's movement video recording, where the researcher viewed the video and motion data recordings after two months of the initial recordings. Utilising methods of reflexive embodied empathy observation and dancer's reflective discussion based on Schön (1983), Douse (2013) was able to identify the time frame of the movements in the Flow of the dancer and compare them against the time frame in the EVaRT graphs. She suggests that these comparisons mostly aligned and were able to identify the moments of continuity of the movement and posture-

[51] Weight can only be easily defined with the usual motion capture system if working with the sports plate for sports analysis purposes. As Douse (2013) and similarly, my research is utilising the typical motion capture full-body motion system; this plate is unavailable for both studies.

gesture merged movement – Flow – within the motion data and adds to her analyses:

> It was, for example, possible to see in the emotional qualities of the visualisation of the sequential movement of the markers in which there was "action involving continuous adjustment of every part of the body" (Lamb, 2012 cited in Douse, 2013, p.197).

The Flow was readable in dancer 1 in the spinning motion with "movement advance through the body to the ends of the limbs, "where a postural movement supports and is consistent with a gestural movement" (Douse, 2013, p.197), and with the dancer 2 the gestural movements "solely involved the arms, but at others, these movements were integrated into the whole body, where "a gesture merges into a movement of the body as a whole" (Lamb, 2012, cited in Douse, 2013, p.197).

There are methodological similarities between Douse (2013) and this research, where both utilise OptiTrack MoCap systems and explore dance improvisation from two different points. This research focuses on revealing (reading) insights into artistic expressions and shaping processes that contribute to the creation of *Sculptural Qualities*, whereas Douse (2013) focuses on reading Flow in dance improvisation. The analytical approach in both studies utilises reflexive methods of semi-structural interviews and reflexive accounts of the researchers. Additionally, interpretation phenomenology analyses are applied in this research (see 4.4). Both studies emphasise the role of embodiment, and in this research, the focus is on the extended embodiment of artistic concepts and aesthetics, which impacts the creation of *Sculptural Qualities*. The techno-mediated environment influences how improvisers embody and transform their creative intentions into digital sculptural forms. The broader implication of this research can contribute to both artists and the technological realm. The insights of emergent *Sculptural Qualities* can influence the field of dance practice, performance capture, and other disciplines such as art.

In summary, this chapter opened with discussions on current practices exploring body, movement, and technology in the context of embodied approaches. In response to Karreman's and Bleeker's suggested categories of dance knowledge

utilising motion capture technologies, I proposed that *Sculptural Qualities* offer a new category titled holistic and embodied extended artistic dimension. Therefore, *Sculptural Qualities* contribute to the existing literature and practice on embodied practices within motion capture environments. I explored choreographic and scholarly works that contribute to understanding how dancer's (choreographers') lived experiences unfold movement and choreographic exploration in the context of dance and mocap technology. Correspondingly to *Sculptural Qualities*, these practices challenge the dialogue between the body and the technology, navigating and negotiating the dancer's embodied experiences within these environments. In contrast, *Sculptural Qualities* emphasise the shaping process through feedback loops as experimenting with multi-layered processes as a whole system. In the next chapter, I introduce practice as a research methodology.

# Chapter Four – A Processual understanding of *Sculptural Qualities* – key methodologies and methods

*[P]erformative research represents a move which holds that practice is the principal research activity – rather than **only** the practice of performance – and sees the material outcomes of practice as all-important representations of research findings in their own right.*

- **Brad Haseman (2006, p. 7)**

## 4.1 Introduction

This chapter focuses on methodologies of Practice-as-Research (and hereafter PaR) to support explorations and methods of **accessing** and **activating** *Sculptural Qualities* within motion capture environments. The notion of *in-readiness* (see 2.2.1) enables the access of *Sculptural Qualities* as a means of methods and techniques applied in studio-practice. It provides the foundation for activating processes through dynamic qualities offered by the seeing-responding improvisers lived experiences within the MoCap environment. Drawing on the theoretical and practice discussion in chapters two and three, I examine PaR in relation to Nelson's *Knowledge model* called the *Multi-mode epistemological model for PaR* (Nelson, 2013) and an updated version *of the Onto-epistemological model for Practice Research* (Nelson, 2022). The multi-mode model enables this praxis to understand the sense-making processes of 'being-doing-knowing' with studio-practices. As practice is central to this research, I adopt Nelson's (2022) term *praxis* - imbricating theory within practice (p.20). His PaR approaches to praxis are interviewed with qualitative approaches such as observations and semi-structured interviews of the movement practitioners. These are discussed in relation to Schön's (1983,1991) two approaches: reflection-*in*-action and reflection-*on*-action. I introduce methods for interpreting these in/on action reflections employing the interpretative phenomenological analyses (IPA). The process of document(ing) the improvisers' and researchers' lived experiences is discussed in relation to capturing these trace-memories in the form of an 'active document' utilising a web-based software called Motion Bank.

## 4.2. Methodology

At the centre of this research is a methodological framework, Practice-as-Research (PaR), to respond to the research inquiries and questions. Nelson (2013) states that PaR "involves a research project in which practice is a key method of inquiry, and where …a practice…is submitted as substantial evidence of a research inquiry" (pp.8-9). In this research, the embodied practice of the improvisatory approach is at the heart of the enquiry as a movement practice method. Barrett and Bold (2019) provide examples of praxis exploring the relationship of dance and improvisation with other art disciplines by postgraduate students on Master of Philosophy and Doctor of Philosophy degrees and Barrett suggest that:

> practice as research not only produces knowledge that may be applied in multiple contexts but also has the capacity to promote a more profound understanding of how knowledge is revealed, acquired and expressed (Barrett & Bolt, 2019, p. xi).

In other words, practice as research methodologies produce knowledge and foster a deeper understanding of how that knowledge emerges from praxis. Barrett and Bold (2019) suggest that PaR focuses on the process rather than the product of enquiry. Similarly, this research is not about making a performance 'product' but exploring improvisatory shaping processes and how they give rise to sculptural movement qualities within motion capture spaces.

A recent example of dance practices focusing on processes is a campaign #*DanceResearchMatters* (2021-2022) led by the Centre for Dance Research at Coventry University (C-DaRE) and the Arts and Humanities Research Council (AHRC), which brought together dance researchers from the UK to examine the relationship between dance and knowledge. Whatley (2021) suggests that "dance research has made a significant contribution to the knowledge base of the nation and countless new initiatives have had a positive impact on the cultural life of us all" (p.1) and "dance has informed the digital humanities and benefited from new technologies that have transformed ways of experiencing, recording and sharing dance" (p.1). In further support of dance practice as research, Burrows highlights embracing "the plurality of diverse practices – including embodied forms of research practice" (Stamp & Artpradid, 2021, p. 3). Further, Ellis calls for a consideration of

> the way in which practice-research might reach beyond its own boundaries – to dialogue with other areas and extend practice beyond its own margins". For example, we could ask, "how might these hard to grasp methods move the extraordinarily large mass of the academy?" as the potential to make a beneficial impact (Stamp & Artpradid, 2021, p. 2).

Adewole discusses the importance of lived experience to practice (as) research and "how that diversifies epistemologies, emphasising that much invisible work goes with bringing lived experience into academic work" (Stamp & Artpradid, 2021, p. 3).

Similarly, my PaR examines what knowledge emerges through the living (lived) experiences of movement practitioners and myself as practitioner-researcher. These lived experiences are explored through a real-time feedback loop approach that expands, shapes, and reshapes improvisers' experiences within motion capture environments (see chapter two). In addition, integrating technology and experiential explorations within PaR research methodologies provides new perspectives on existing knowledge of dance practices and motion/performance capture practices.

Another example of research project utilising the PaR is The Artistic Doctorates in Europe (ADiE) (2014-2017). ADiE aims to "create a step change to the inquiry within research-level degrees in Dance and Performance" (ADiE, 2017). For example, Krische questions the artistic doctorate in dance through a manifesto called *Rach Does Dancing - A solo performative lecture disguised as a dance performance*. She aims to demonstrate (or not) that the artistic doctorate "can be a vehicle to support a universal equality between words and movement – equalising the value of movement for the word inclined and words for the movement inclined", and she adds "incontrovertible proof that dancing is an intellectual (joyful, spectacular and accessible) articulation of knowledge, both explicit and tacit, in and of itself – Yeah!" (Laitinen et al., 2019).

Both ADiE and Dance Research Matters (C-DaRE) methods emphasise embodied improvisation as a vital component and tool to gain new insights into dance practices. On the one hand, ADiE highlights the relationship between the artist and the audience, encouraging them to reflect, document and analyse the creative process. On the other hand, Dance Research Matters (C-DaRE) focuses on the importance of sharing these embodied practices and creative processes of the relationship between the body and technology. Both methods are relevant to the *Sculptural Qualities* in this praxis, with the use of motion capture technologies allowing artists to transform movement knowledge and develop a new sense of 'doing-thinking'. The transmission process offers new opportunities for creative expression, documentation, and analyses. By engaging improvising bodies with new technologies in an exploratory manner, this research offers new insights into creative processes and develops innovative approaches to dance improvisation practices.

### 4.2.1 Approaches to Knowing

To unpick ways of 'knowing' within the praxis as an embodied and kinaesthetic experience of sculptural sensibilities, this research is adopting the *Onto-epistemological model for Practice Research* (Nelson, 2022) (Figure 26).

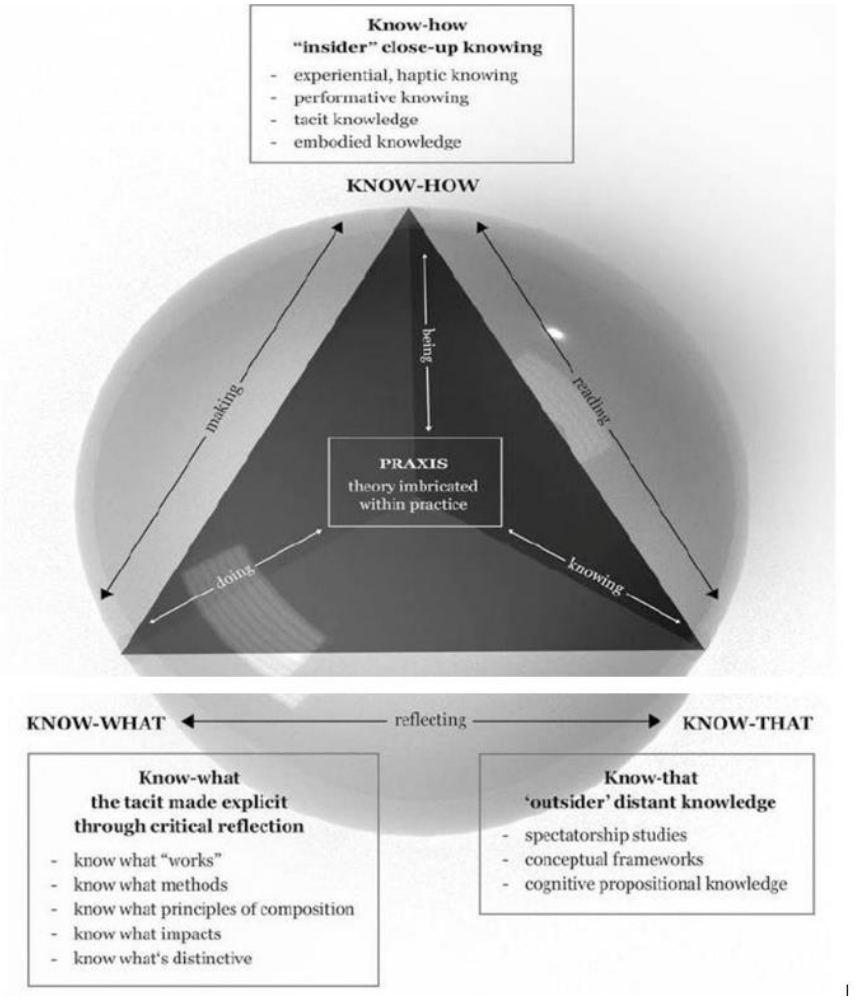



Figure 26 – Onto-epistemological model for Practice Research (Graphics Leyao Xia) (Nelson, 2020, p.47.)

This multi-mode model seeks to draw on relationships between practice and theory. Nelson's model is dynamic and explores triangulated processes through intra-relations between modes of knowing *'how-insider, that-outsider, and what-tacit-to-explicit'* with three factors: practitioner-researcher knowledge, conceptual framework, and critical-artistic reflection. As a practitioner-researcher with movement improvisatory experiences and the use of digital technologies I bring this '*know-how'* to the research. This prior knowledge moves into the 'know-that', enabling practical

explorations with OptiTrack motion capture technologies to be informed by theoretical frameworks. These two *intra-related* processes are coupled with critical reflection utilising qualitative approaches of interpretive phenomenology from researcher-participator-practitioner roles to understand and access the '*know-what'.* Engaging with Nelson's PaR multi-modal approach and qualitative approaches of interpretive phenomenology enable this research to embody and acknowledge diverse perspectives. These perspectives recognise and incorporate the multi-dimensional epistemological knowing of sensory, somatic, experiential, and theoretical modes. In this chapter, I unpack these two relations through modes of critical reflection and critical analyses (see 4.4), and document(ing) approach (see 4.5) in this chapter.

I combine Nelson's PaR multi-mode model with a qualitative approach: face-to-face semi-structured interviews (utilising Schön's reflection in/on action discussed below) and the textual presentation of data derived from these face-to-face encounters (transcripts, writing reflections, and drawing reflections), and observations (participant and non-participant). This interwoven relationship offers a holistic understanding of *Sculptural Qualities* and the exploration of subjective experiences. The qualitative research enables a process of exploring and interpreting subjective experience. Combined with Nelson's model, it encompasses a diverse understanding of modes of knowledge and focuses on the experiential exploration of *Sculptural Qualities*. It allows this research to examine the complex interplay of body-mind and motion-capture technology from multiple perspectives. As the practitioner-researcher I am actively engaging with the theoretical frameworks on extended embodiment and concepts related to dance, motion/performance, and sculptural practices. At the same time, I explore and experiment with the practical aspect of using motion capture technologies in dance improvisation. Crabtree and Miller (2012) suggest that this involves the researcher who is "personally engaged in an interpretive focus on a natural, often human, field of activity, to generate holistic and realistic descriptions and explanations" (p.5). In other words, in this praxis the researcher actively interpreting and understanding the field of study and the emergence of *Sculptural Qualities* in the context of the embodied practices of dance improvisation. Through methodological underpinning, the research methods are planned and conducted for this praxis to generate comprehensive descriptions and interpretations of the phenomena of *Sculptural Qualities*.

This praxis requires a multi-faceted approach to conduct the research, as discussed in the above sentence. It involves the researcher undertaking multiple roles within the research to ensure a comprehensive and meaningful study. Similarly, to Nelson's model, the researcher is also a practitioner and forms the relation of practitioner-researcher within 'know-how'. I activate this role through the 'insider' knowledge of dance improvisatory practices. The movement-improvised approaches are embodied in all three phases of this praxis (see 2.2.1 and 4.4) as 'doing-thinking'. For example, Scott (2016) embodies the PaR process of doing-thinking in her doctoral thesis *Intermedial Praxis and Practice As Research: 'Doing-Thinking' in Practice,* in which she positions improvisatory practices in live intermedial work in relation to *comprovisation* (Cooke cited in Scott, 2016) and "the simultaneous conception and performance of a work" (Smith and Dean 1997, p. 3) to identify herself as the "performer-activator" within the notion of "intermedial improvisation" (Scott, 2016, p.x). Scott (2016) suggests that the performer-activator "represents a site of fluidity, uncertainty, and productive instability," and the "interactions with technical mediums" (p.58) enable the dual role to be activated. In the context of this research, the movement practitioners who are participants in phase two and three of this research embody the role of a performer-creator, who activates and interacts with the medium of motion capture technology while improvising.

Improvisation is a technique that offers freshness, a sense of freedom and "...thrill that comes from *not knowing* what it will be in the next moment or the next time. That dare is its lure" (Buckwalter, 2010, p.3). As the practitioner-researcher, I explore the new possibilities of dance improvisation's 'unknown' elements within motion capture environments. The outsider of 'know-that' is activated in the role of *participant-observer* to facilitate the different set of tasks within the workshops in all phases - with me as auto-ethnographer and with other participants, which introduces the ethnographic approach to this praxis. When I am 'being' in the role of participant-observer, I am actively moving with Self (phase one) and the other improvisers (phases two and three). I am - *being* - in the space during the workshop with Self and others, such as warm-up sequences. I am the participant-observer and performer-creator. This dual role happened mainly in phase three as I became Mover D and Mover H (see 4.3.1). I place myself in these multifaceted roles as a practitioner-researcher, participant-observer, and performer-creator within embodied

practices to generate holistic descriptions and interpretive explanations of the phenomena under the study (Figure 27).

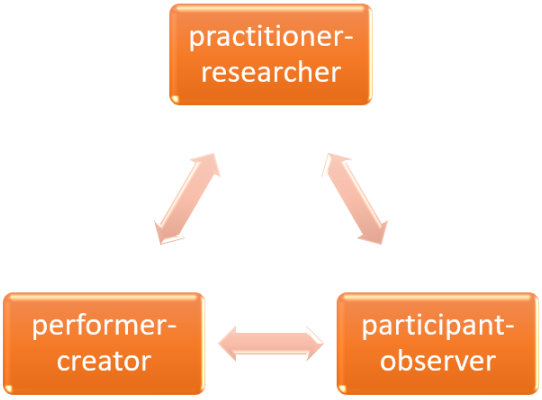



Figure 27 – Lucie's multi-faceted roles in this praxis.

These roles are intertwined within the praxis as a continuous unfolding experience of fluidity, dynamics, and emerging *Sculptural Qualities* "as a way of finding something" (Buckwalter, 2010, p. 3). Throughout the different elements, the intra-relationships[52] of each role - mutually entangled (Nelson, 2022, p.4) - while I actively engage with each phase of this praxis. In the next section, I discuss the three phases of praxis in working with movement and motion capture technologies.

## 4.3 The Praxis Process

This section briefly introduces the developmental stages and the methods associated with the praxis to address the research questions. Embodying the application of a Multi-mode PaR methodology, this praxis is carried out in the studio with OptiTrack motion capture technology (see 5.2) and other relevant software such as Motive and Touch Designer. The praxis evolved through three phases discussed below.

[52] Nelson (2022, p.45) points out that through his critical reflections, the "intra"-relationship has mutual dynamism. I propose that the intra-relationship can be closely examined through Merleau-Ponty chiasmatic relationships, which are mutually entangled.

Phase one was an exploratory phase to create an active environment that stimulates sensory and cognitive experiences and responses. From the *know-that* position, the first hands-on explorations consisted of learning (with some technical support) the operation and workflow of the motion capture OptiTrack technology. The main structure involving the volume set-up (called 'wanding') (Appendix 1) and the calibration process of the actual body into the virtual digital model (utilising T-pose) focused on understanding how the technical workflow allows me to engage with the technology as a practitioner-researcher and performer-creator. I explored the different options for displaying a digital model, which enabled me to identify a skeleton marker as a working digital model for further explorations (see 5.4). Understanding how to operate Motive software and the software capabilities led me to explore the visualisation element of my movement (see 5.4.2). During studio practice, I engaged in several exploratory improvisational tasks, exploring the elements of feedback loop, intentionality, felt presences and the affordance of the environment offers the individual to access and activate the sculptural quality (see 5.4 and 6.1.1).

Phase two was a development phase building on the foundation explored in phase one. I began by reviewing the reflections for the first phase, which allowed me to create an action plan for studio practice and explore other relevant theories (see chapter two). Due to the ongoing COVID-19 restrictions, the first part of the second phase was conducted as a researcher and performer-creator in the studio practice with the motion capture set-up. I began exploring additional visualisations of the trace-forms using Touch Designer software (see 5.5 and 5.6). With these visualisations, I began the development of the workshop design with improvisational tasks to respond to five different visualisations of trace-forms and digital bodies. I explored the semi-structured self-reflection questions using Schon's reflection in/on the action, video journal, and drawing reflections (see 4.4.2). After calibration, I began designing warm-up exercises (see 5.3.1) and a participant recruitment process. I started to develop my understanding of how to use the Motion Bank web platform to create a document of the history of *Sculptural Qualities* and how it influences the different phases of the research process. In the second part of the second phase, I conducted several workshops with individual participants (see 6.1.2).

Phase three consisted of four phases: a) redesigning the studio space b) designing a workshop for two participants at the same time in the same space, c) developing the visualisations of virtual bodies and trace-forms with Touch Designer software, and d) developing the document and visual data with 360 video cameras. In the first part of phase three, I set out to test the technical set-up in the studio theatre space instead of the studio-screen space. The studio theatre space is a larger black box-style space with lighting control. The aim was to test three larger projectors and projection screens to enhance participants' visual experiences. I could light up the participants by utilising a studio theatre with a lighting rig (this was not available in the first studio space). In the second part of phase three, I explored the notion of *comprovisation* and how two people can be calibrated within the same space. This exploration supported my confidence in my technical skills using Motive software and allowed me to redesign the workshop for two participants. I further developed the warm-up structure and creative tasks, and explored how the reflective methods could be implemented by two participants simultaneously. The workshop redesign focused on developing the virtual bodies and trace-forms using Touch Designer. The additional training by a digital artist 2 on using Touch Designer enabled me to develop three different trace-forms and virtual bodies, and I started to develop a sense of structure for the creative tasks within the workshop. In the second part of phase three, I started recruiting participants; some participants were from phase two, and some were new. The recruitment process is discussed in the next section.

### 4.3.1 Sample group

This praxis approach encompasses qualitative sampling methods and interpretive strategies to explore how lived experiences of *Sculptural Qualities* emerge through holistic and embodied improvisatory experiences within motion capture technologies. In all three phases, the recruitment of participants focused on movement practitioners with movement improvisation and dance technique experiences. Those who understood Laban's fundamentals, choreography, screen acting, and performance were contacted via email, utilising a recruitment poster and participant information sheet. The recruitment email was sent to third-year undergraduate and postgraduate students and professionals with academic teaching experience. The

participants have shared improvisatory experiences but differ in their characteristics, and their individual experiences allow them to articulate and reflect on the given experiences within the framework of my designed 3-hour workshop. Participants were from a wide range of dancers, performers, and teachers (current or future) with backgrounds in the dance and performance industry. The total number of participants who attended the phase two and three workshops were eight women and two men at different stages of their professional dance and acting careers. This research adopts the interpretative phenomenological analyses (IPA) and benefits from "….a concentrated focus group of a small number of cases" (Smith et al., 2009, p. 51). The smaller focused group provides "sufficient cases for the development of meaningful points of similarity and differences between participants" (p.51). In this research, the sample focus group consists of four participants in phase two and eight participants in phase three from which I represent the improviser R, MH, and MD (Table 1). Within this thesis, I present the movement practitioner's reflections on their lived experiences within appendices; transcripts files with each participant have code as follows in Table 1.

Table 1 - Lucie's sample data coded within the thesis.

| | **Phase One** | **Phase Two** | **Phase Three** |
|---|---|---|---|
| 1 | Researcher - R | Mover 1 – M1 | Mover A - MA |
| 2 | | Mover 2 – M2 | Mover B - MB |
| 3 | | Mover 3 – M3 | Mover C - MC |
| 4 | | Mover 4 – M4 | Mover D - MD |
| 5 | | | Mover E - ME |
| 6 | | | Mover F - MF |
| 7 | | | Mover G - MG |
| 8 | | | Mover H - MH |

Furthermore, this research has been conducted according to the ethical frameworks set out and approved by the University of Salford. It includes gaining informed consent for participation and data collection, data management and repository management, and risk assessment to conduct the workshops under the health and

safety university's guidelines. In the next section, I discuss the modes of critical reflection in this praxis.

## 4.4 Modes of Critical Reflection and Analyses

Like the very central core of an orange, which guides this research through the PaR processes of 'being-doing-thinking', this PaR process consists of "peeling back of layers of understanding" (Cooper & White, 2012, p. 5) to access and activate the core of *Sculptural Qualities*. I use the metaphor of 'peeling back of layers' of an orange as a gradual and iterative process engaging with each phase of this praxis brings the researcher closer to uncovering new insights about the shaping process in relation to dance improvisation and motion capture environment. Each layer of the three phases allows for critical reflection to respond to each research question. For example, the outer layers the zest (flavedo) and white pith (albedo) represents the surface knowledge of *know-how* of the initial stages of the praxis process and utilises the practitioner-research role as the insider and outsider utilising qualitative approach. I peel the notion of (embodied) Self in the act of writing and processing through the dancing-writing/writing-dancing (Midgelow, 2013) approach as a reflexive in a dialogue between the 'dancer and the practice'. The dancer asks a question, and the practice responds to it. In its response, the practice suggests a thought/question and presents that to the dancer, and, in return, the dancer responds to it (Figure 28).

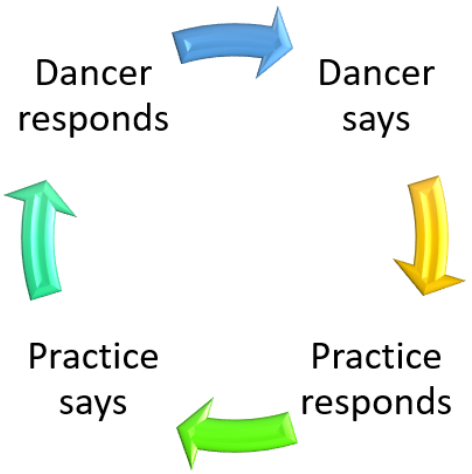



Figure 28 - Lucie's dancing/writing-writing/dancing reflective feedback loop.

The dancing-writing/writing-dancing texts present a layering of reflections and feedback loops in this thesis. Like the circular shape of the orange, with no starting or end point – forming a loop. It symbolises the feedback loop as an active experience of participation and interaction when peeling (and eating). Within the reflective practice of dancing-writing/writing-dancing the knowledge meets with experiences of knowing (Midgelow & George-Graves, 2021) and is closely related to embodied processes where the dancer's understanding is rooted in bodily engagement with the subject (like the central core of the orange). In this thesis, it is not only written expression - text - (phase one) but also drawing reflection (phases two and three) of the practitioner-researcher as a non-verbal reflection. For example, in phases two and three, I had very little limited time to reflect in writing form and began to express my experiences of meeting with the practice in a drawing (Figure 29).


Figure 29 - Lucie's drawing-writing reflections on the praxis.

Ihde (Ihde, 1990; Ihde, 2009) emphasises that different senses mediate embodied experiences, which can enrich the creative process. These writings and drawings expressed the embodied explorations of dance improvisation in motion capture environments, enabling the documenting process and articulation of new insights into each layer in the praxis.

After peeling these two outer layers, it reveals the different and individual segments of walls, juices vesicles, and seeds. Separating each segment represents an embodied ethnographic approach to the reflective process representing the intermedial knowledge of know-that. Similarly, through the cyclical nature of dancing/writing-writing/dancing reflections and its implications for a practice involving layering and returning to my understanding as the practitioner-researcher, refining the praxis process and revealing the nuanced understanding of *Sculptural Qualities*. By utilising Schön's reflection methods in the first phase of the praxis, I employed reflection-*in*-action (1991) while improvising accompanied by prompts (Appendix 2) to respond to visualisations and technical workflow. The sweet (or sour) and juicy segments offer sensorial and felt experiences - symbolising valuable insights into the shaping process and its understanding of the improviser's lived experiences and how it accesses and activates *Sculptural Qualities* (know-what). As *Sculptural Qualities* are sensorial lived experiences within this praxis, I utilised the reflection-*on*-action (1983) method, firstly straight after the live experience in a video diary recording and

after observing the video recordings of the lived experience. These reflection methods helped me to understand these sculptural *experiential unfoldings* in studio environments.

Thus, I included these methods for the workshop, which helped me to design the different layers of interaction and reflections participants had to respond to. Thus, the 'being-doing-thinking' about *Sculptural Qualities* of the embodied improvisatory processes, which occur in the studio phase one, impacted phase two and phase three of the workshop design. The workshop included observations of the participants responding to the visualisations, reflections (writing and drawing) and short semi-structured interviews on the experiential event.

### 4.4.1 Inside and outside modes of reflexivity

Throughout the three stages of this research, I embodied the practitioner-researcher role as an active engagement with the praxis through the iteration of the layering processes, such as peeling the first zest orange layer. Merleau-Ponty suggests that the embodied and situated understanding of the subject is through bodily engagement with it (Toadvine, 2019). I embody the “insider” (Butz, 2012; Nelson, 2022) firsthand experiences of the practitioner-research role to foster a rich dialogue between the living experiences and immediate responses within motion capture environments. The insider experiences enable the dialogue between my experiences and embodied theories to acknowledge any preconceptions I may have through reflexivity. Goldspink and Engward (2019) suggests that “[r]eflexivity, as a concept, aids this dual perspective of being both inside and outside the research by informing self-awareness and analysis with the inclusion of the “other” (p.291). In relation to Nelson's multi-mode model and the intra-relationships between the insider–outsider roles, attending to the reflexive process is vital in facilitating a balanced consideration of both. The insider knowledge enriches the understanding of the emergence of *Sculptural Qualities*, and the outsider role allows me to adopt other perspectives and their experiences as part of the whole process. Therefore, reflexivity within this research allows me to emphasise responsiveness, critical reflection of my experiences and movement practitioners' perspectives in forming holistic approach to new knowledge.

Furthermore, reflexivity encourages the kinaesthetic awareness of sensing and experiencing movement from within (internally) and awareness of the overall visual form (externally) of sensing and knowing. I draw on Laban's *Choreutics* and its three modes of multilateral description of movement to explore insider-outsider awareness. Laban (1996) suggests these three modes as follows:

1. That of a mentality plugged into the intangible world of emotions and ideas.
2. That of the objective observer from outside.
3. That of the person enjoying movement as a bodily experience and observing and explaining it from this angle (Laban, 1966, p.7).

These three aspects of movement can be observed as a whole or unit of movement (BESS) and space. In this research, these three attitudes allow me to observe, describe, and analyse the improvisers and my experiences of *Sculptural Qualities*. The first refers, for example, to the inner observer who deals intensively with a movement on an emotional and intellectual level. This observer is focused on the expressive qualities of movement and the artistic concepts that emerge from these bodily acts. In this research, I embody this internal observer role through insider knowledge (*know-how*) to understand movement qualities by delving into deeper layers of movement analysis.

The second refers to the external observer, maintaining some level of detachment to remain at an analytical distance from the insider level of observing movement. Nelson (2013) suggests a level of detachment as an outsider (*know-that*), which is in an intra-relationship with the insider mode of knowing (*know-how/know-that*), observing and analysing the mechanics of movement, its spatial patterns, timings, dynamics, and forms. In this research, I adopt this outsider observation to analyse the participant's videos and the in-depth interviews through interpretative phenomenological analyses (IPA) discussed in the next section.

The third refers to the embodied observer, who engages with the movement as a visceral and sensory experience. This type of observer immerses themselves in the bodily sensations and kinaesthetic awareness that arise from their moving-sensing experiences. It involves attending to sensorial feedback and kinesthetic experiences of moving-sensing and the challenges of these felt experiences while moving. I mainly engage in this embodied observation within phase one and during

phase three, when I had to become one of the performer-creators during workshops (*know-what*). While the first example of observation focuses on the emotional and philosophical aspect of movement, the third observation is concerned with physical sensations and its feedback in motion (i.e. reflection-*in*-action). These different roles in observation allow me, as the practitioner-researcher, to access various dimensions of dance practice.

I reflect on the 'insider' knowing through the reflective approach of the dancing-writing/writing-dance method to understand these immediate feelings and responses to the environment. Midgelow (Midgelow & George-Graves, 2021) draws on Les Todres' idea "that embodying is where being and knowing meet" (Todres, 2007:20 cited in Midgelow & George-Graves, 2021, p.110) and suggests that the "meeting of knowing and being [I] am interested in the body-mind at work - knowledge in the making" (p.110). The intra-relationship between *knowing-being* in body-mind connections refers to the cognitive understanding (*knowing*) and the embodied experiences (*being*) (Nelson, 2022, p.47). It involves the practitioner-researcher exploring the shaping process in relation to movement and the 'felt' sensations that the movement evokes. Through the dancing-writing/writing-dancing methods, I established the dialogue between the 'dancer and the practice' (see 3.4 above). These writings are located within this thesis throughout different chapters, layering the different understandings of each phase. For example, in chapter one in 'Dear Practice' (Figure 1), I write a personal 'hello' to the practice and highlight the elements of exploration and thoughts leading me to discussions in chapter two, the ways of seeing-moving (Figure 17). The understanding of the felt body that 'I am' one body – the phenomenological one and the composed one - is highlighted in Figure 20. Having these sensations, I arrive at 'I can', emphasising the embodied knowledge in writings of 'I can, I am' responding to the felt sensations manifesting through kinesthetic awareness of shaping processes within motion capture environments.

Moreover, in phase one, these writings enabled me to refine my prompts for reflections-*in/on*-action (see 4.4.2), which I embodied as a way of writing-dancing, but instead writing – speaking and drawing. The speaking and drawing reflections are included in the transcripts of phase one. For example, after improvisational task one, I reflected in free-writing reflection (Figure 30) and drawing reflection (Figure 31).

Rising/ sinking/ open/ close

Researcher wrote (free writing for 2min): I felt that there were more visuals happening, when I was moving larger movements. It was visually interesting to use moments of stillness to see the lines visuals coming back to me (to the marker point). The rising and sinking became more interesting visually when I started to use my hands. The open and closed lines - the journey large movements into the small closed once.

Figure 30 – Lucie's free writing reflection-on-action after task 1 phase one


Figure 31 - Lucie Sykes reflective drawing for task 1, phase one.

These reflections were annotated and are part document(ation) (see 4.5), where visuals, drawings, text and moving images are interwoven reflections-*in/on*-action. Through this iterative reflective process, writing-annotating-drawing allows this praxis to articulate and refine lived experiences and perceptions of *Sculptural Qualities*. These reflections aligning with Schön's (1983, 1991) reflection methods in practice 'during' and 'after' the movement experience, discussed in the next section.

### 4.4.2 Schön's reflection *in* action and *on* action

Practice as Research actively promotes reflective practice where reflection-*in*-action is the core of the praxis (Schön cited in Nelson, 2022, p. 43) and is embodied within dance practices too. As discussed in the above section, the insider-outsider roles of the practitioner-research allows me to discover the experiential shaping processes, layer by layer. I adopt Schön (1992) two-dimensional process reflection-*in*-action (1983) reflection-*on*-action (Schön, 1996), where reflection-*in*-action allows for internal reflection in-the-moment, and reflection-*on*-action externalised either verbally or in writing. I used these two modes of reflection in phase one. Because of its reflective richness, I have included this method in the workshop design for movement practitioners to reflect on their experiences of *Sculptural Qualities* in phases two and three. The movement practitioners reflected on their roles as performers-creators, *in-practice,* and *on-practice* during improvisatory workshops.

When using reflection-*in*-action, I developed a set of prompts to enable the felt experiences to be verbally expressed. For example:

R: *What are you attending to right now?*

This prompt question (Appendix 2) enables the participant to shift their awareness from the purely instinctive mode of improvisation to a conscious and reflective state of improvisation. The performer-creator focuses on their ongoing process of self-monitoring and self-regulation. Schon (1983) suggests that by embodying reflection-*in*-action, "the problem is continuously framed and reframed and as solutions to complex or ambiguous problems are systematically sought" (p.5), and therefore "continual interpretation, investigation and reflective conversation with oneself" (Sellars, 2013, p. 5). Thus, these prompts *in* improvisation offer shifting attention and perspectives, heighten awareness of the improviser's movement choices, and frame their current experience within a reflective context. The descriptions of these embodied experiences enable the expression of what is experienced and how it is experienced. Thus, reflection-*in*-practice enables the movement practitioner and researcher to articulate how *sculptural shaping* occurs in the moment. That moment of verbalisation of those actions prompts the movement practitioner to surface

awareness of sculptural processes to identify their core elements (see chapters five and six).

Additionally, Schön's reflection-*on*-action consciously captures one's actions and reasoning to bring new thinking to the forefront. This reflection is in writing as a reflective practitioner process (Bolton, 1999). These reflections "provide a central place to gather insights from reflections on unfolding actions" (Schön 1996; Forbes 2014, p. 275). Bolton (1999) suggests that the written form is usually through "…logs (journals or diaries) and critical incidents (critical event analysis)" (p.206). However, this research takes the form of a video diary interview and written reflections between the movement participant and the researcher. I utilise prompts (Appendix 3) for the reflection-*on*-action interview. For example,

R: *When responding - Did you attend to*

- *your body's natural impulses or*
- *the other body in space or*
- *the visualisation (colour shape change in dynamic) or*
- *the environment.*

With this prompt it provides some guidance on the areas which I want the improviser to focus on, and allowing for flexible responses from them where they revisit their embodied experiences and facilitates deeper movement analysis. Reviewing these multiple instances of moving-sensing with a motion capture environment can identify patterns and variations of *Sculptural Qualities*. It enables the researcher to examine recurring elements contributing to the specific *Sculptural Qualities*.

Furthermore, the reflective practice of thinking through gesture, bodily action and performance enriches the understanding of embodied expressions. In dance practice, thinking through gestures, physical expressions, and performance thinking can also be explored through thinking-drawing. Incorporating thinking-in-drawing as a means of reflection can offer a new dimension of thinking beyond the traditional forms. Flavel and Luzar (2019) suggest that "drawing emphasises processes, movements, or active ways through which art is created, in an embodied way" (p.3). I draw on Laban's approach to drawing movement-trace forms in space on paper (see chapter two) and ask participants to reflect-on-action as a medium for after-thoughts. The drawing reflections are enacted straight after the movement improvisation with two open-ended prompt questions (Appendix 4). The open-ended prompts

encourage the participants to explore their thoughts and experiences without limitations, and the *drawing* reflections are part of the visual multimodal data collected in the workshops.

These processes of reflection in-practice and on-practice enable the interpretive modes of critical analysis to enhance the understanding of *Sculptural Qualities* within motion capture environments, as discussed in the next section.

### 4.4.3. Modes of Critical Analysis

As discussed at the beginning of this chapter, dance and improvisation as a kinaesthetic experience enables a deeper understanding of movement with praxis at its core. The experiential data (questionnaires, interviews, and reflections) and the practice (the types of movement that emerge from different prompts and visualisations) collected reflect both the movement practitioner's and researcher's lived experiences. These concepts form the dance knowledge to critically analyse and identify the core elements of the *Sculptural Qualities* that arise from these shaping processes.

Since the focus is on the lived experiences of the performer and creator and the researcher's understanding of the shaping process, I employ the interpretative phenomenological analysis (IPA). As *Sculptural Qualities* are rooted in the embodied act of improvising, it involves subjective experiences of the movement practitioner (phase two and three) and me as practitioner-researcher in phase one of this research. Interpretative language explores the “person’s relatedness to, or involvement in” (Smith et al., 2009, p. 40) shaping process of *Sculptural Qualities*, aiding, understanding of these subjective physical sensations, emotions, and artistic intentions. The interpretation focuses on the ‘circularity’ of understanding how *Sculptural Qualities* emerge, access, and activate within the motion capture environment. The participants’ verbal reflections utilise Schon’s reflection-*in/on*-action methods (see 3.4.2) to provide accounts of improvisers’ lived experiences to analyse. Therefore, the transcripts can be analysed in combination with the movement analyses to bridge the gap between participants’ subjective experiences and the visual data of their movement. I draw on the methodological frameworks of interpretative phenomenological analysis (hereafter IPA) to examine the transcripts (Appendix 5). IPA is a qualitative approach developed within the domain of psychology for investigating personal lived experiences (Smith, 1996). The focus is

on in-depth exploration of personal experiences and understanding the individual's perception of their experiences (Smith & Osborn, 2008). The analyses take an idiographic approach where each transcript analysis is individually examined through IPA in four stages before moving on to the fifth and sixed stage to establish themes (Appendix 6).

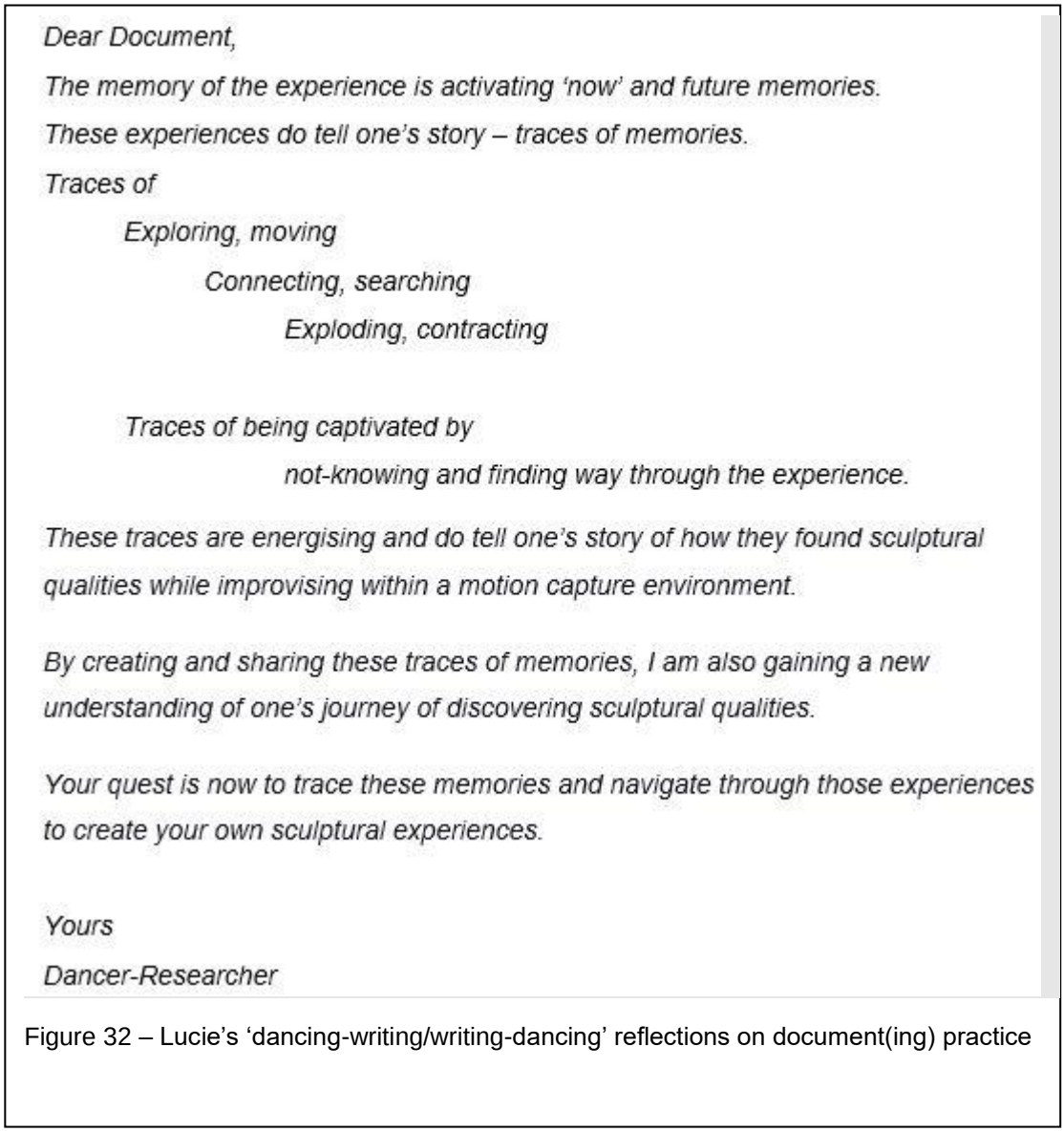
Firstly, the phase one analysis of my lived experiences as the researcher and participant was considered through the reflexive approach. Through these analyses, I started to formulate the arrived concepts. These concepts established initial core elements of *Sculptural Qualities* (see chapters five and six) and continued to the following stages in phases two and three. Within phases two and three, these concepts continued to develop by further conceptualising each of them and cross-examining with similar concepts of each participant. Within phase three, the researcher refines concepts and renames some concepts while cross-examining them with phase one and two analyses (stage six in IPA – identifying recurring themes/concepts).

As the researcher I have examined the video recordings and interviews for significant themes and threads that align with the research inquiry. The visual documentation offers a tangible link between the improviser's words and actions. Thus, it enriches the researcher's interpretation, adding a layer of detail to the discussions. The comprehensive insights arrive from these integrations of both analytical approaches to offer a holistic understanding of the emergence of *Sculptural Qualities* and how they can be accessed and activated. The next session discusses the document approach of the practice, and how it is applied within this research.

## 4.5 Document(ing) traces of memories approach

**The document is accessible at URL link** (see further instructions p.12)

https://www.lucieleesykes.co.uk/phd-research/



*Dear Document,*

*The memory of the experience is activating 'now' and future memories.*

*These experiences do tell one's story – traces of memories.*

*Traces of*

*Exploring, moving*

*Connecting, searching*

*Exploding, contracting*

*Traces of being captivated by*

*not-knowing and finding way through the experience.*

*These traces are energising and do tell one's story of how they found sculptural qualities while improvising within a motion capture environment.*

*By creating and sharing these traces of memories, I am also gaining a new understanding of one's journey of discovering sculptural qualities.*

*Your quest is now to trace these memories and navigate through those experiences to create your own sculptural experiences.*

*Yours*

*Dancer-Researcher*

Figure 32 – Lucie's 'dancing-writing/writing-dancing' reflections on document(ing) practice

In this research, the methodological approach to document(ing)[53] the creative process is not only to capture lived experiences to articulate this investigation. It reveals how *Sculptural Qualities* emerged in this praxis (Figure 32). Movement, for Laban, is an "uninterrupted flux" (Moore, 2014, p.23). It is a process of change in

[53] The use of 'document(ing) and 'document(ation)' in this written format is based on Sant (2017) the relationships between two processes "[t]he "documents (in the sense of documentary residue) and documentation (the process of turning a collection into an archive that provides long-term access to documents) in relation to practice of documenting performance" (pp.1-2).

relation to the location of parts of the body. Describing this constant flux emphasises bodily actions' dynamic and ephemeral nature (stepping, running, twisting, gesturing). Movement is intentional from within, directed towards tangible or intangible aims or objects. Therefore, observing this psychophysical phenomenon of inner impulses to move manifests in outwardly visible bodily expressions (Moore, 2014). Sutil (2012) suggests that "[an] analytical eye encourages us to think of movement and rationalise it as a series of immobile divisions" (p.147). Laban (1966) refers to these split components as "snapshots" and suggests that "we consider our snapshots separately only for the sake of analysing the characteristics of the whole flux" (Moore, 2009, p. 4). He suggests that analyses of movement units (BESS see 2.3.4) require attention to the materiality of graphic inscription utilising various graphic methods and media. In this research, the medium of recording, capturing, and analysing movement is motion capture technology and Motion Bank Mosys facilities to create a "snapshot" of the continued flux. It becomes what Sutil (2012) calls "identifiable as a fixed object of analysis, as well as an object for documentation and reconstruction" (p.147) and "relies on a certain materiality of graphic inscription, as well as specific techniques and technologies for mediated visualisation (p.148). In this practice, motion data is captured through two mediums: the motion capture system Motive, the digital trace-forms using Touch Designer and filmed using a professional video camera (Panasonic 180). These are then edited through editing software (iMovie or Video Editor) to create graphic representations[54] of the lived experiences and sculptural forms of movement and digital trace-forms. This praxis utilises only the visual recording from the filmed camera, the screen recording of the digital trace-forms in Touch Designer and the digital models within Motive, and images that are static representations in the form of screenshots of the movement explorations. This type of visual documentation ensures that intricate details of improvisatory movement are noticed. It offers multi-perspective analyses of capturing the three-dimensional movement and its interaction with the surroundings. The screen recordings of digital trace-forms allow us to focus the analyses on the shaping processes between the *I-body*, the virtual sculpting improviser, and the environment.

[54] For this research analyses, the raw motion data in Motive are not relevant for *Sculptural Qualities* analyses as it would require other software such as MATLAB or EvART (see 3.2.6).

The motion capture camera's ability to record and freeze motion/movement allows the temporal unfolding of lived experiences to be revealed through visual means “beyond the scope of the human eye” (Reynolds & Reason, 2012, p. 239). Through the recording, freezing, reflecting, and moving-embodying cycle, I developed this holistic document(ing) to offer insights into my research process. To help capture, preserve, and trace back the temporal nature of movement I utilise different movement-based visualisations such as video recording, photography, movement practitioners’ reflections (transcripts and drawings), mine (from phases one and two), and dancing-writing/writing-dancing notes to record my own experiences. Further, I have utilised the web-based application Motion Bank. The creators, Florian Jennett and Scott de Lahunta focused on digital documentation and made this tool available to support venues and artists in these challenging times of Covid-19 and post-Covid-19. For me and this research, Motion Bank offers an approach for presenting dance materials and creative processes in a way that influences new and creative uses of web-based documents. This interface offers a creative engagement of how *Sculptural Qualities* are viewed, hoping that the viewer can create their traces as they engage with the document. This engagement is explored using two built-in applications for documenting, annotating, and transmitting dance: Piecemaker and MoSys. I utilise the Piecemaker tool to annotate analyses of the video movement diaries from the studio practices. These annotated analyses are linked to the MoSys tool through title headings to create traces of the *Sculptural Qualities* and its processes with ‘dancing-writing’ text, drawing reflections-on-actions, and still images capturing the visualisation of improvising motion (Figure 33).

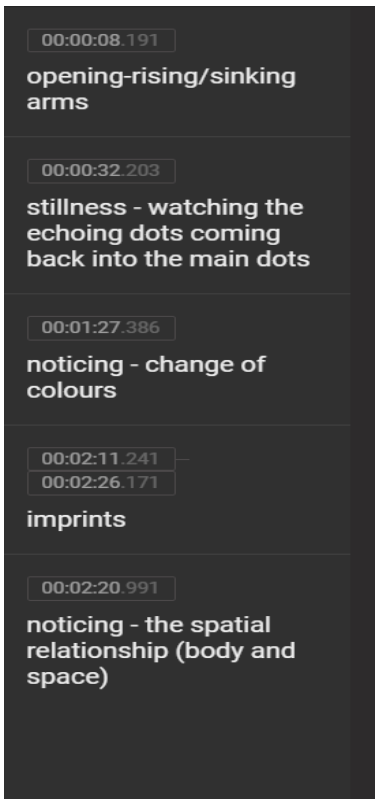



Figure 33 - Annotation within the Motion Bank Document.

These multimodal images as subjective "data" are living documents that are witnessed to moving memories of *Sculptural Qualities*. The document structure has the Main Page (Figure 34) with subpages corresponding to this paper's chapters.

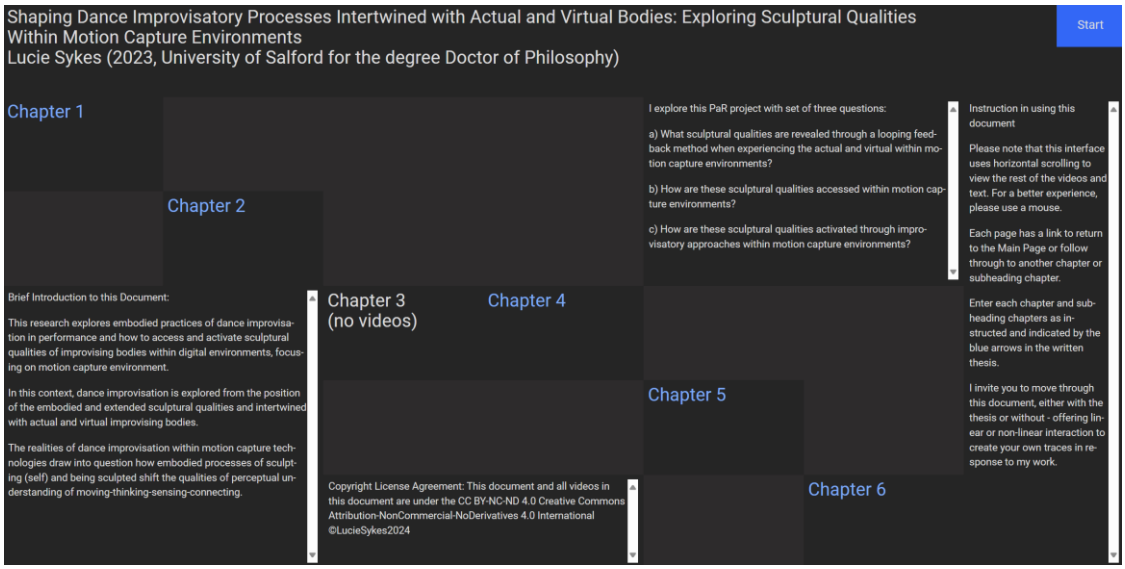
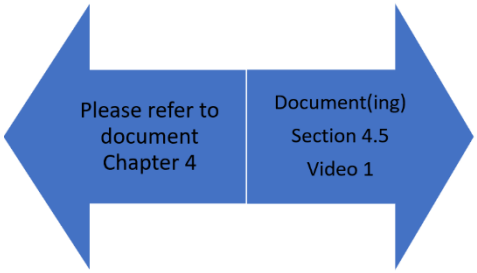



Figure 34 - Lucie's Ph.D. MoSys Main page with chapters to access the different parts of the research process.

This document - traces of memories - is an active element of creating dance knowledge within the ongoing creative process of exploring *Sculptural Qualities* of improvising bodies within a motion-capture environment. By combining the annotation with the video documentation, the viewer can experience the movement in real-time and its relevance and significance to this inquiry. In this submission, I am using the inter-section of reflective practice and multimodal data of text, imagery, and links to the 'straight recording of studio practices and explorations' accompanying this paper. Nelson (2013) suggests that a document "is the archive, along with various representations of performance contained within the archive, which give performance form and meaning and that speak about performance" (p. 44). Archiving is a means of "construction of narratives and images about the past, the process of constructing memories becomes meaningful in the present, and thus it plays with the temporal logic of events," as Salazar suggests within performance art and their memories (Sant, 2017, p. 19). In this praxis, traces of the studio-practice videos utilising the Motion Bank to archive and review for analyses of these explorations are signposted to the document link and each section throughout the paper. The use of post-production editing, in this case, iMovie software, allows the 'mirror' positioning and interplay between the video recording of the 'dancer's movement/action' and the imagery created in Motive – see video 1.




This method enhances communication and creates a visual coherence of the dancer's bodily movement and trace-forms. However, this editing was applied in phases one and two. In phase three, the recording of the space demonstrates the visualisation within the space from the graphic recordings of the video camera. The blue arrows indicate that the reader should view the video documentation in the Motion Bank document (a link to the document is provided at the beginning of this chapter and in the forefront communications of this paper, pages 12-15).

In summary, this chapter has set out the methodological approach to Practice-as-research using Nelson's *Multi-mode epistemological model for PaR.* The model reflects my embodied knowledge of the participant-researcher with the understanding of the *Sculptural Qualities* (know-how) to inform the studio-practice with critical reflections gained through theoretical contextualisation. Improvisation as a movement method is observed, analysed, and described using Laban Movement Analyses (LMA), which focus on Effort-Shape qualities to identify emerging *Sculptural Qualities and where MoCap* is a tool for real-time movement interaction (*know-that*). Through critical analyses of reflective and interpretive iterative processes, the dance knowledge transforms and mutual entanglement between *know-that* and know-what to know-how in identifying *sculptural qualities* within this praxis. The chapter addresses the ethnographical approach to studio-practice and critical reflection with awareness in creating an 'active' document(ation) to engage with the practice, theory, and knowledge development utilising a web-based application, Motion Bank. These methods are embodied within studio practices to inform the reflections and analyses, which are set out in the next chapter.

# Chapter Five: Accessing *Sculptural Qualities*

*Let's begin with traces. Traces of the past. Traces of a dance. Traces of light … and colour and fabric. Traces of a body, animating all these sources of movement. Traces of a life spent spinning across nations, across centuries, across identities. How do we trace the past? Recon figure what is lost? Are traces always even visible?*

- **Anna Cooper Albright (2010)**

## 5.1 Introduction

This chapter focuses on developing an approach to accessing *Sculptural Qualities* within a motion capture environment. Accessing is a means of setting conditions employed within studio-practice to enable improvisers to connect with the improvisers' body-mind and the MoCap environment. It is associated with in-readiness (see 2.2.1), emphasising *moving* towards the *experiential coupling*. *Sculptural Qualities* are the intentional shaping process of creating a three-dimensional sculptural form with expressive qualities in relation to the motion capture environment. These qualities are shaped by the improviser's body-mind connections and their decision-making when responding to their visualisations and representations within motion capture environments. In this research, sculptural refers to intentional shaping and engagement with tangible and expressive qualities of the actual and virtual bodies. The improviser actively experiments and explores the temporal relationship between bodies and the environment, where sensing and expressive responses are in an ongoing feedback loop. Within the motion capture environments, these shaping processes are active in real-time. Through improvisers' full-body interactions in real-time, their sculptural abstractions and digital trace-forms continuously shape and reshape the space and their experiences. *Sculptural Qualities* allow improviser to extend their embodied experiences and harness their creative and expressive potential for new sculptural discoveries, utilising the intertwined relations between the virtual and physical. Through the practical applications of PaR methodologies, I discuss the development of an active environment (the motion capture technology set-up with projector screens), warm-up exercises (floor work, exploring space, and partner work), and the use of improvisational tasks to foster an essential connection between the body-mind and the motion capture environment. This connection serves as a conduit to access *Sculptural Qualities* and extend them beyond the physical body. Drawing on artists' visual vocabulary (see 2.3.2 and 2.3.4), I create digital models and digital trace-forms, with Motive and Touch Design software, that embody the essence of sculptural shaping, *re*shaping, and offer explorative and playful interactions for improvisers to engage with. The visualisations of digital sculptural forms enable the interaction and responses of participants and the researcher. These practical set-ups

and exercises enable access to spontaneity and activate awareness within motion capture environments.

## 5.2 Studio-practice environment

*Sculptural Qualities* are intertwined between improvising bodies and environments. In this praxis, I have established an innovative environment that draws inspiration from the concept of living architecture proposed by Laban. This environment establishes the framework for *Sculptural Qualities* to emerge through bridging the physical space as an architectural space (the volume image in chapter two evokes an architectural aesthetic of the captured space) and the movement of sculptural forms with expressive qualities. I approach this design by utilising Laban's notion of shared kinesphere (between the improviser's body and the virtual model/trace-forms see chapter two) and kinespheric zones allocated to the physical space instead of the body. Through this process, I am defining distinct spatial areas of interaction, exploration, and movement within the volume of the motion capture environment. Firstly, I would like to discuss the volume space (sometimes called volume stage) (Delbridge, 2015), which is a physical space defined by the motion capture cameras placed in an array around the space. Delbridge (2015) suggests that the analyses of space and the devising space facilitated by the motion capture camera arrays are influenced by Schlemmer's interrogation of the Laws of Cubical Space (1924). His two works, *Man and Art Figure*, from *The Theater of the Bauhaus* (Gropius and Wensinger eds.1961), enabled him to understand the "dialogic between the soft lines of the organic human body is set against the hard lines of measurable cubic space" (p.47). He imagined a "mathematics of dance" (Centre National de la danse, 2015) as the scaffolding of organic human movement within the cubical space, offering the body's transformation, emphasising the mathematical properties of the volume. Therefore, the frame provides a method for "identifying both the volume with focused MoCap system and the camera array that tracks markers in the environment" (p.47) and its potential for movement (Figure 35).

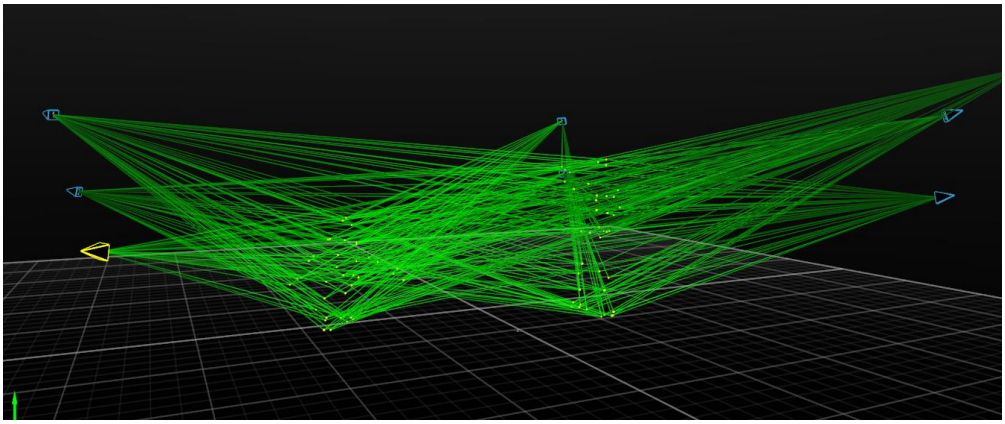


Figure 35 – The camera array tracking the set of markers in the environment, creating volume in Motive.

This volume space is a 3-dimensional area and can be further defined with a grid pattern with 1-metre squares on the floor (Dower & Langdale, 2022, p. 12) (Figure 36).

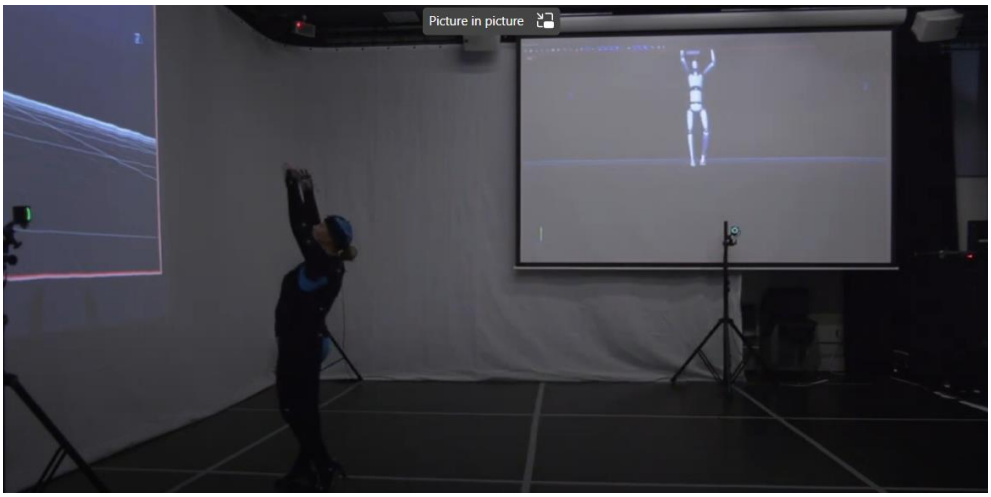



Figure 36 – Volume space with the floor grid of 1-metre square in the Lucie's PaR.

The grid pattern is transformed similarly into Motive's virtual (digital) space (and other motion capture software like Axis and Rokoko) with grids, as seen in Figure 36. Wideström (2019) identifies the interaction space within the co-existing realities of physical and virtual spaces (Figure 37). He suggests that in a phenomenological sense, these spaces simultaneously create unifying space without any hierarchy

levels. As previously discussed in chapter two (2.3.4), I refer to this interaction space, which has a shared kinesphere, creating a centre of this shared kinesphere within the interaction space.

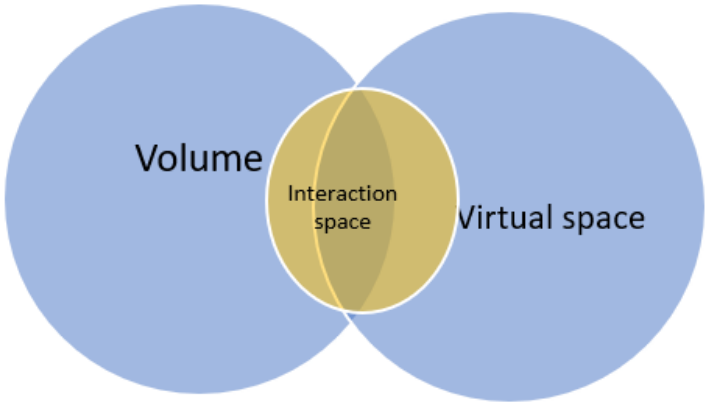



Figure 37 – Forming interaction space between the Volume and Virtual Space based on the Interaction space (Widestrom, 2019).

These kinespheric zones are placed within, outside, and on the edge of the volume stage, defining three regions: space outside the sphere, space within the sphere, space on the sphere (on the threshold), as seen in Figure 38.

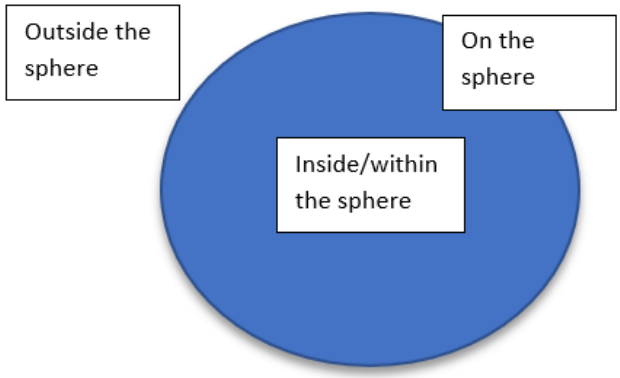



Figure 38 - The space as a means of kinesphere with four spaces.

First, the space outside the volume, extending beyond the immediate tracking and recording parameters of the cameras, represents the outermost limit of the movement potential in the volume. This element is not used by performance capture because it cannot record the actor's movement for animation. During studio-practice I stepped out of the volume and saw the digital model still echoing on the projector screen. I felt that this experience was unexplored in traditional motion/performance capture and, therefore, saw an opportunity to experiment with the participants in the workshop, which led me to the "step out" task (see 5.3.2) in the last phase.

The second zone is the space within the volume where movement occurs within the immediate physical reach of the improviser in relation to the virtual. It is a space where the improviser expands movements by maintaining a connection to the virtual and the overall experience. It contributes to the emergence of *Sculptural Qualities* because the motion data is being tracked. Thus, visualisations are immediate to the movement responses of the improviser.

The third zone, the space on the sphere (on the threshold), is a transitional space between the physical and the virtual. It is in-between the step-out experience and the immediate experience of shaping processes. The improvisers can playfully challenge these boundaries and negotiate these two realisations (see 5.5). It explores the spatial relationship between the physical and the virtual and transforms the actual into the virtual (bodies and trace forms) with *Sculptural Qualities*.

Embracing these three spaces within motion capture environments heightens expressivity, spatial relationship and sculptural forms and motions, allowing for a more profound embodiment of *Sculptural Qualities* in this study (see 5.2). Below, I discuss the spatial design of the interactive space and how it has developed over the two phases to inform the holistic kinetic-spheric (sculptural/architectural) space in phase three.

### 5.2.1 Phase One and Two

For phase one, the technical workflow of the motion capture system was set-up with eight camera arrays around the space, with four cameras on the top bars in the ceiling and four cameras around the space on the tripods at eye level (Figure 39).

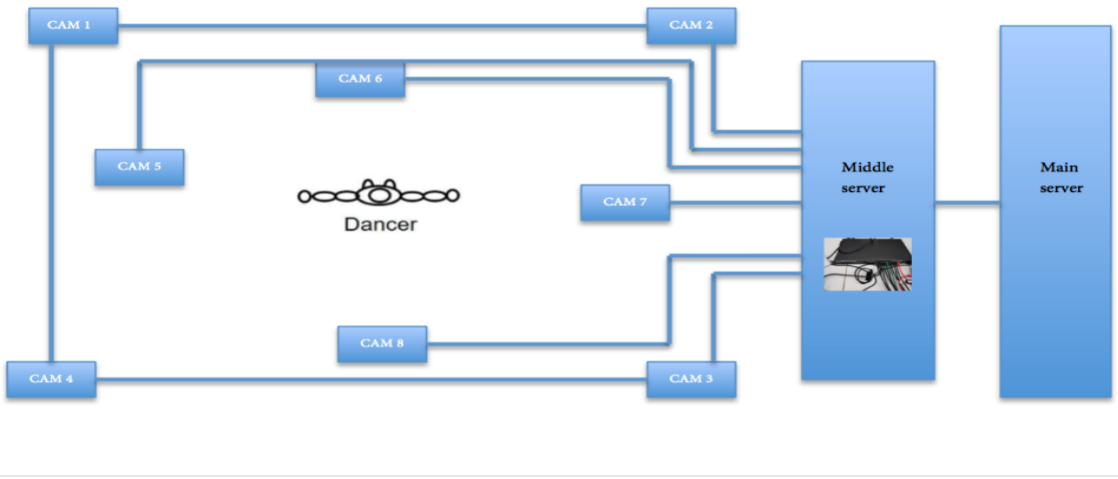



Figure 39 - The Motion Capture workflow - set up in the space with eight active cameras, a laptop and a primary server. Dancer in the middle of the space.

I and the participants wore the specialised MoCap suit using 41 marker sets (Figure 6 - see 2.3.1 and Appendix 1). I positioned myself in the middle of the capture volume, viewing the visualisations on the television screen in front of me. I began to explore movements with visualisation. My focus was directed towards the television screen, which reduced my body movements and limited head movements within the three-dimensional space. Therefore, for the second workshop of phase one, I increased the viewing experience of virtual space with two additional data projector screens (Figure 40) projected onto the two walls.

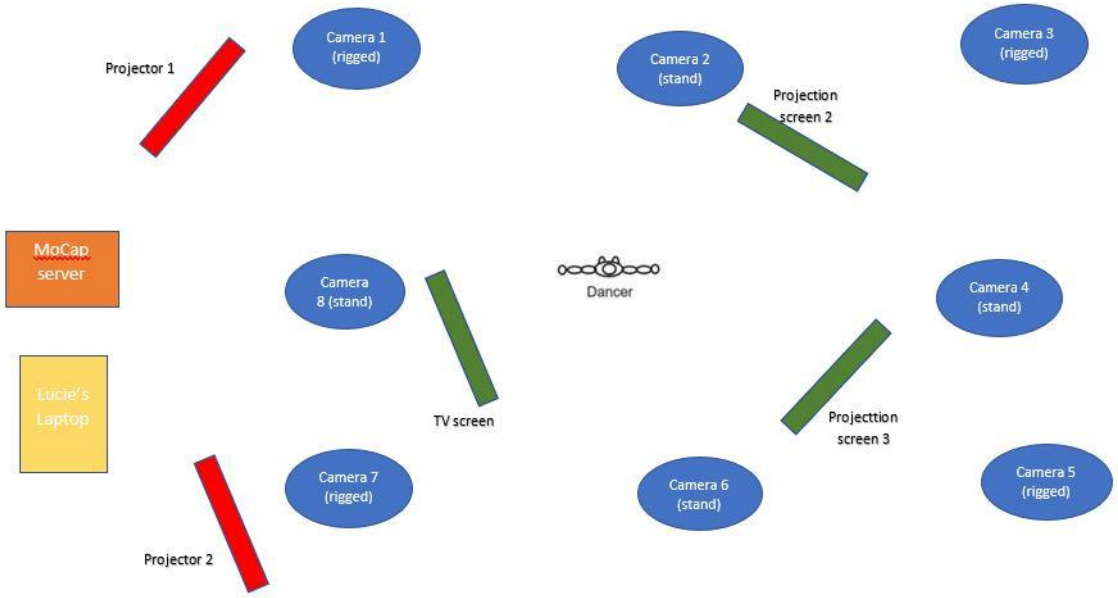



Figure 40 - Visual feedback of the action with three additional screens– TV screen and two projector screens.

The two data projectors were positioned to project onto a white curtain in two different directions, and the television screen created a triangular position to perceive my actual and virtual body. Gibson suggests that her dancers' motion data were captured outside of the usual volume space, enabling the authenticity "within the framework of perfect 3D geometry the presence of the figure dancing is a trace of the real, the human" (igloo, cited in Jefferies et al., 2009, p. 45). Similarly, viewing the sculptural motion on three different screens enabled the possibilities of authentic movement and responses. The dancer perceives their actual and virtual bodies simultaneously on three screens, offering more comprehensive witnessing and sensing experiences. It enhances the shaping processes and the dancer's ability to recognise and understand the nuances of their movement responses. Sculpturally, the 360-degree witnessing of my embodied experiences freed my movement and appreciation of the shaping of my sculptural motion from different angles (like viewing a sculpture from multiple perspectives). This perceived experience impacts

the increasing complexity of the *Sculptural Qualities* and travelling through space utilising the dynamosphere (see 2.3.4). Thus, the same set-up was implemented with participants in the phase two workshops. During the phase two collection data, it became evident that having three screens to see the motion data being visualised enabled the dancer/mover to have freedom of which way the gaze would be facing. This freedom enabled the mover to place active attention towards the screens as M1 comments reflection-in-motion:

Q: *Is your attention placed in the space as well?*

Mover 1: *Yes. Probably to the screens rather than to the cameras*

However, some commented that the TV screen has much better viewing quality because the used projectors had less (lumen) brightness. In the next section, I discuss exploring a studio-theatre space within the university to maximise projected images' brightness.

### 5.2.2 Phase Three

The studio-theatre became available, and I had two trial tester sessions, where I explored with the theatre technician team the layout, projectors, different screens, and the use of theatre lighting (Figure 41).

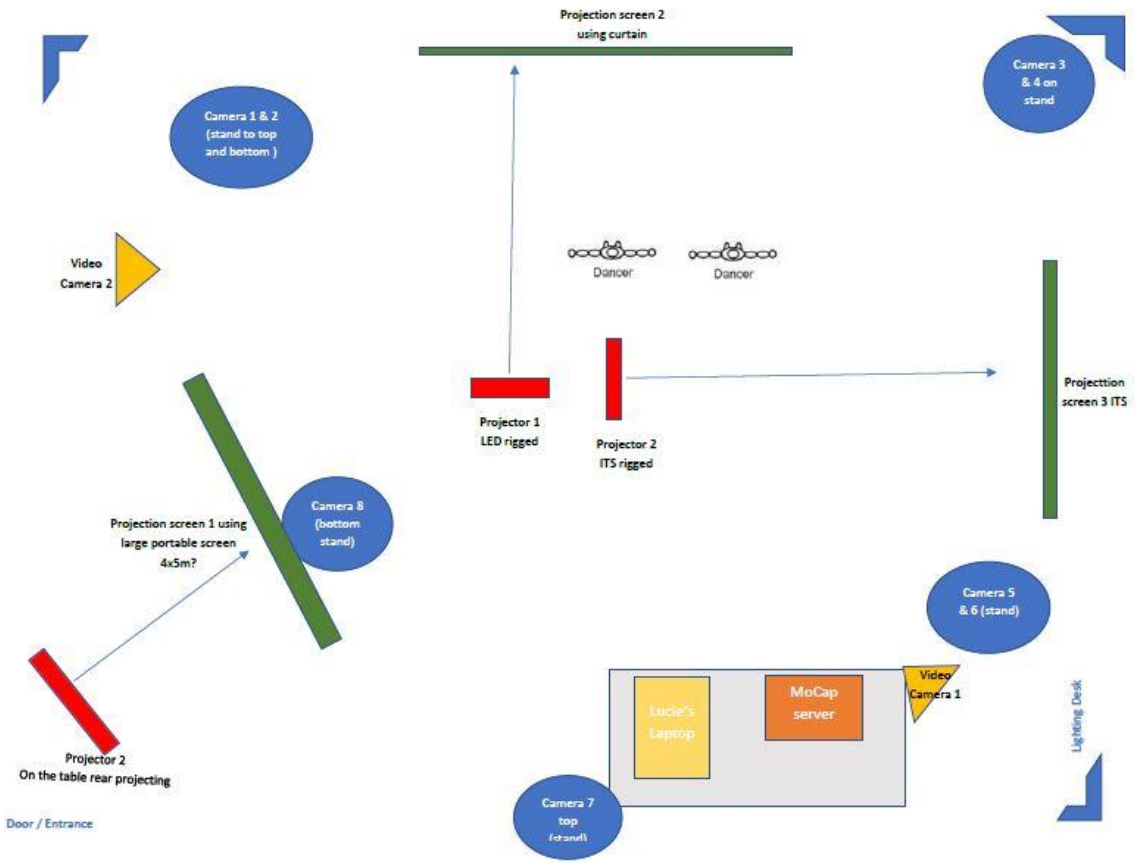



Figure 41 - Lucie's Floor plan of the new space with placements of cameras, projector, and projector screens.

Once I had set up the environment with the triangulation of projector screens to view the visualisation, I invited one participant to provide feedback on this developed set up. The participants' feedback was positive, and only one adjustment was made to the height of one of the projector screens. This triangulation of projectors enhanced the sense of space. It introduced an exciting space where the kinetic data are mapped between the physical and virtual and captured within the stage volume. As seen in Figures 42 and 43, I explored the layering of spaces to understand and sense the three-dimensional space in which the *Sculptural Qualities* exist. For example, the space triangulation of the projector screens (peach colour) is

experienced with 3D hexagonal prism (green colour) space. The improviser's experiential shaping exists within the spheric curving lines of the volume stage (blue colour). The spheric curving lines correspond with the camera's ability to capture within that space. The improviser stands in the origin (the centre of the volume) for the calibration process and beginning of each improvisational task.

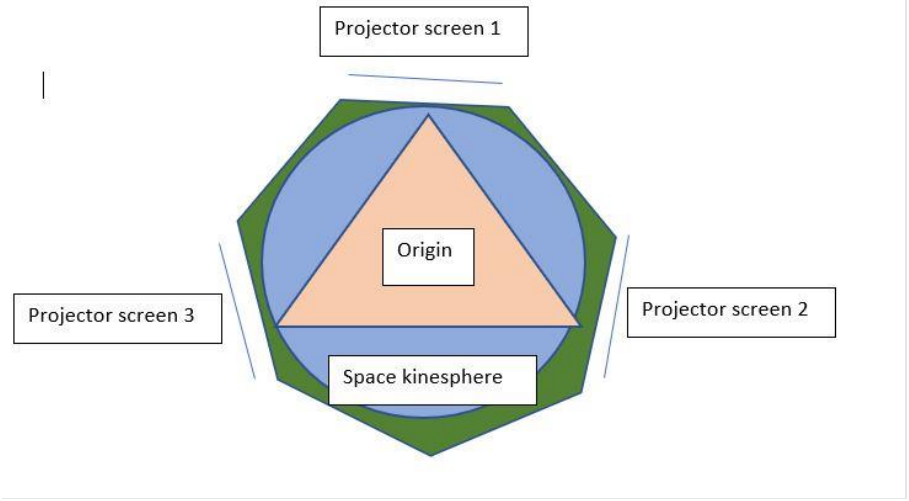



Figure 42 - Enhance the sense of space within the studio-space environment represented in 2D animation but experienced in a 3D environment.

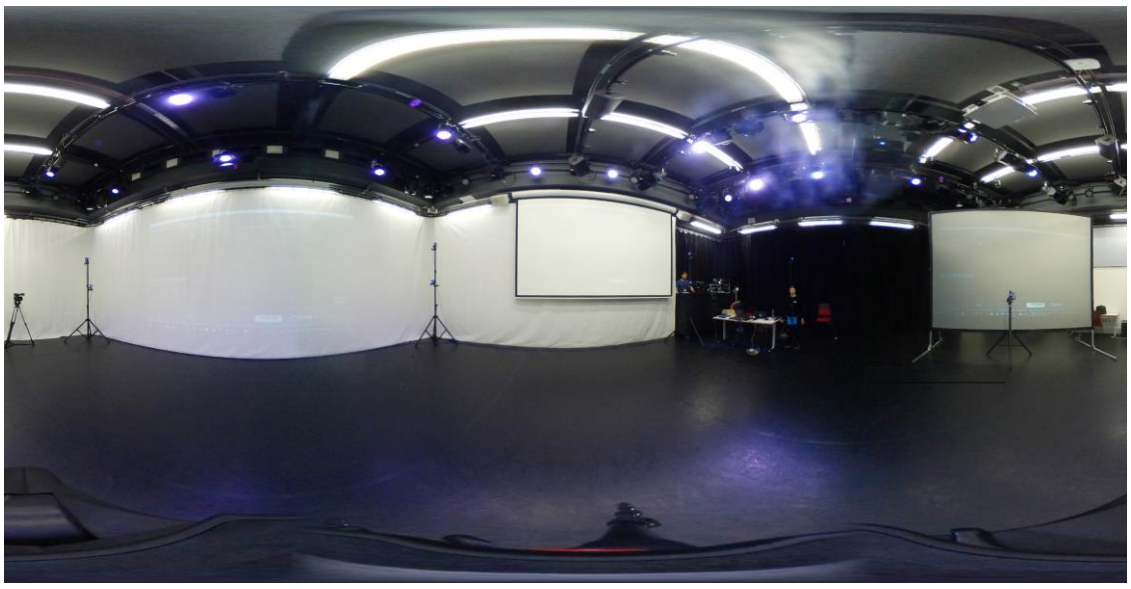


Figure 43 - The holistic active space set up within the studio theatre for Lucie's PaR – image in 360 views taken by Lucie.

Through experimentation with and development of the physical elements, I have created an immersive and engaging environment by creating this type of holistic space with various factors and carefully considering the spatial arrangements of projector screens. It is a space where shaping processes of *Sculptural Qualities* can be accessed and activated holistically for this practice. Furthermore, this type of space provided a sense of interrelationships to influence the design of warm-up and improvisation tasks to couple body-mind and the newly established environment, as discussed in the next section.

## 5.3 Workshop design with creative tasks

### 5.3.1 Warm-up and *Range of Coupling*

A warm-up was devised for this praxis, drawing on the attention-based and somatic improvisatory (see 2.2.1) explorations (Appendix 7). These exercises aim to create an active sensory-kinetic environment for participants to attend to their bodies in the space. In phase one, I explored kinesphere and dynamosphere and their relationship between tension and relaxation in the moving body, which was considered part of the element of force/energy (see 2.3.4). When exploring force/energy, the dynamic phrasing can be changed by the weight shifting from the core of the centre. The relationship between inner feeling and the outward form of movement expression creates movement qualities and patterns of weight-rhythm, of accented and unaccented parts of movement phrasing with six fundamental rhythms: sustained, percussive, suspended, swinging, vibration and collapsing. During phase one, these weight-rhythm movements enabled me to attend to the spatiality of the sensing-moving body. These weight-rhythm explorations provided a starting point for a creative response with *line visuals* (5.4.1) in phase one, and in phase two foundation for *Range of Coupling* sequence (discussed below).

During phase one I embodied explorative improvisatory tasks, I began to create connections with the Action Drive and Vision Drive[55] (capitals in original) (see 2.3.4). I explored the transitional drives and the Effort states[56] (incomplete states). Laban suggests that "bodily actions manifesting incomplete effort participation are expressive of a variety of inner attitudes" (Laban, 2011). Thus, the Effort states often appear as transitions between essential drives with a recovery function. I added the Awake state between the Action and Vision Drive to allow recovery and to enable awareness of the timing of actions (Table 2).

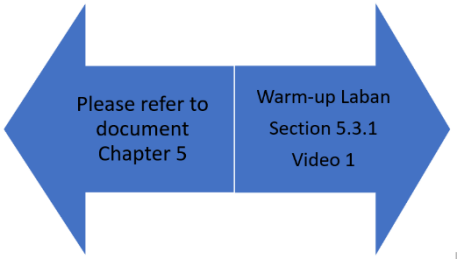
Table 2 - Lucie's Effort warm-up sequence.

| **Phase two**<br>**Preparation for in-readiness** | |
|---|---|
| **Action Drive (**Weight-Time-Space)<br>utilises practical movements involving actions which represent working with tangible objects. | **Awake state** (Space-Time)<br>transitional states introduce mental activities such as thinking, feeling, and willing(acting). |
| **Vision Drive** (Flow-Time-Space)<br>Relates to mental processes, freeing of the gravitational pull and encourages the body-mind to wonder – imagination and increases the attention. | |

On the one hand Action Drive utilises practical movements involving actions which represent working with tangible objects. On the other hand, the transitional states introduce mental activities such as thinking, feeling, and willing. This movement experience heightens the awareness of movement practitioner's inner attitudes and their bodies. By attending to that experience of moving-thinking-sensing in the moment, the *experiential couplings* (see 2.4.1) activate *Sculptural Qualities* with a sense of presence and cultivate the spontaneity in improvising bodies.

[55] Action Drive is designed as a foundation and enables combinations of three Effort motion factors: Weight, Time, and Space. When one of the Effort Factors is replaced by Flow, Action Drive transforms into either Spell Drive, Passion Drive, or Vision Drive (Longstaff, 2005). Each drive has eight different combinations of effort qualities. Thus, it creates a wide range of movement moods (Moore, 2021).

[56] Effort states have a combination of only two motion factors with three pairs of opposite such as Awake (space and time) and Dream (flow and weight); Remote and Near; Stable and Mobile.

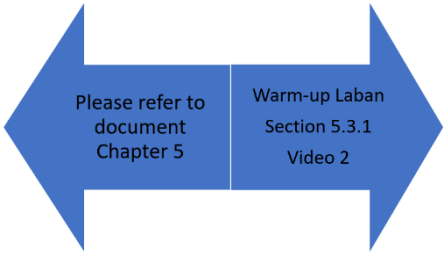



In phase two, I further focused on developing the warm-up (Appendix 8) by drawing on Laban's Effort drives. For example, in video 1 Mover 4 (phase two) walks directly towards the cameras or screens in space and explores short improvisation using direct-indirect/ sustained-sudden movements.

Following from phase two warm up explorations, in phase three, the spatial awareness between the body, the suit, and the surrounding space becomes accessed when body moves through, around, above. Laban suggests that moving the body creates a changing relationship with different body parts, an object, or a person (Laban, 1986, p. 66). He suggests three phases: a) preparation, b) actual contact, and c) release. Part of the preparation stage is 'looking'. The sense of looking movements is initiated from the different body parts such as face, hands, feet, and chest. The following elements are the meeting, approaching, or surrounding, explored with no physical contact yet with the other (object, person, body part). In this exercise, the improvisers walk directly towards the cameras, screens, points in space, and the other improvisers in the space. They take a shape with stillness as they move, meet, approach, or surround (Figure 44).

Figure 44 - Mover C and D creating shape with stillness.

Improvisers move through the space around the volume and explore shapes and lines within the volume. As the body goes through the space exploring different Effort qualities with Action and Vision drive and Awake, the two bodies interact.




For example, in video 2, Mover E and F walking directly towards an object or point in the space take a shape or line with indirect-sustained-free flow, direct and sustained, indirect-quick-free flow. They finish the exercises with a T-pose mirroring their suit placed on the floor.

The next part of the warm-up was to develop a sequence connecting the body and mind with the MoCap suit and the environment. During phases one and two, I worked intensively with the technology and became aware that the specialist suit with the marker sets plays a vital role in the whole experience. Forsythe once suggested that he “considered his computer the most precious tool for a

choreography: a time saver" (deLahunta cited in Bleeker, 2017, p.44). He teaches his dancers who join the company how to use a mouse and the computer. I explored how I could incorporate the attention on the suit and place the marker sets for movement practitioners. Douse (2013) suggests in her doctoral thesis

> On reflection, it might have been more appropriate to provide two separate, longer, warm-ups for each of the dancers after all the preparations and fitting of suits had been completed. This may have allowed them greater time to achieve the focusing and centring of attention they required and then enabled them to remain focussed without further distractions (p. 180).

Douse (2013) recognises that the warm-up sequencing before and after suiting up is essential for movement practitioners to focus on what will follow next. Similarly, Gibson (Whatley cited in Reynolds & Reason, 2012) suggests that "[d]ancers are often unfamiliar with the suit that they wear for the marker system, so they may overcompensate for the suit, thereby not responding honestly and authentically in terms of movement" (p.275). Within my research, I address these two elements in phase three with the warm-up exercises and a sequence I term *Range of Coupling.* When working with the motion capture system and the suit with markers sets, I argue that all the technological elements within the space are vital for the *Sculptural Qualities*; like for Forsythe (and Cunningham), his mouse and computer are vital for his choreographic process.

Firstly, the warm-up was developed through my attention to the mocap suit and its tactility within my explorative workshops in phases two and three. I developed a sense of a *gateway* - an extension - that the suit embraces in this research. Drawing on Clark's (2008) EXTENDED mind theory, which proposes that external components are included within the cognitive system, the suit and marker sets are an extension of the movement practitioner body coupled with the mind. Therefore, to enable this extension and make it available to the movement practitioner within my workshop, I draw on the somatic practice of Bonnie Bainbridge Cohen founder of Body-Mind Centering® method (American spelling). Cohen (2023) suggests that touch "… involves awareness, consciousness, attention, and intention". I explore the body-mind awareness of touch and tactility of the suit and markers in phases two

and three during the warm-up section, the movement practitioner begins by placing the suit on the floor in shape (Figure 45).

Figure 45 - Dancer E placing motion capture suit on the floor in the volume.

It connects the tactility of the textile with body-mind when unfolding the suits (for the first time) in the volume space. Therefore, the improviser explores the suit (and marker sets) through the multiplicity of receptors and skin and embodies the surfaces to perceive textural and shape information intertwined between the body, the suit, and the world.

Furthermore, unfolding the suit and placing it on the floor in a particular order and shape is unique to each improviser. The everyday gestural movement of placing a suit (clothing) on the floor transforms into a performative element. It engages the movement practitioners with their sensations. I propose that attending to these sensibilities creates a ritualistic approach to dance improvisation. The improviser's body-mind begins extending their bodily and cognitive experiences and their interaction with the suit and environment extends their mind - *embedding within* (connecting to the title of this thesis). Placing the suit in the environment prepares the improviser to enter (interoception) into experiential coupling that is physically and digitally augmented. After the action of unfolding the suit on the floor the improviser is asked to lay down on the suit (Figure 46).

Figure 46 - Dancer E lays on the motion capture suit and connecting his body to the texture of suit.

Once the improviser is settled on the mocap suit, in stillness, they begin attending to their breathing patterns[57]. The breathing exercise draws on the Laban/Bartheneiff shape flow. The improviser's torso is supported in breathing through the growing and shrinking of the internal kinesphere. Bartenieff speaks of movement, body-shape, and breath interconnectivity where

> [m]ovement goes out into space and creates shapes. But also there is inner space, and breath is an inner shaping experience. The body shrinks and grows with each breath. Inner breath changes can be supported by sound. Posture is not built by muscles but by the whole way you breathe" (Bartenieff cited in Konie, 2011, p. 2).

The widening and narrowing quality that the torso is moving through enables the improviser to acknowledge the small shifts within the inner kinesphere. In these short exercises, the improviser arrives and connects with their body, skeleton structure, breathing and attending to any muscle tensions to access the *I-body* elements (see

[57] Halprin discusses that "dance is the breath is made visible" dance experiences is created through the breath of an object brought to consciousness of the body (Argot Pictures, 2022).

2.4.1). Similarly, Cohen (2020) discusses the relationship of the internal physiological and psychological states that influences the ‘automatic breathing’ and how breathing rhythms are influenced by it and by external environmental factors. She suggests that “[t]he way we breathe also influences our behavior (American spelling) and physical functioning” (p7.) Attention to breathing is also essential in performance capture practice, where posture and alignment are exposed to readable motion data. Therefore, the attention to breathing qualities of expanding-shrinking prepares the improviser for that coupling connection with the digital model during and after the calibration process. The next element of the sculptural tactility is returning to the sense of touch with hand brush strokes, where the improviser takes the sleeves of the suit and tries to brush the hand across to the other side and wrap it around in a hugging gesture. Cohen (2012) suggests that a hands-on technique is embodied

> through touching in different rhythms, through placement of attention within specific layers of the body, through following existing lines of force and suggesting new ones, and through changes in the pressure and quality of our touch, we come into harmony with the different tissues and their associated qualities of mind (Cohen, 2020, p. 8).

Thus, the brush strokes have a different rhythm and different levels of force while holding onto the textile of the suit. Next, the movement improviser's attention to the shape's body is ball-like, pin-like, and wall-like (T-shape). Some improvisers naturally lie down in A-pose (a calibration pose for Vicon OptiTrack) and move through the different shapes, finishing in the T-pose shape. At this point, they are asked to stand up and mirror that pose (Figure 47).

Figure 47 - Mover C and Mover D mirroring T-shape position of the suit with their bodies standing up.

The element of mirroring introduces an element of body connectivity and extension. Laban/Bartenieff emphasise the interconnectedness of the body to the overall skeleton structure. The T-pose with arms, legs and spine forms a coherent structure and connects to the body and the suit in the environment. Furthermore, the mirroring is associated with embodied cognition, suggesting that cognition is deeply connected to bodily experiences. The mirroring in this instant is seen and experienced as an extension of the suit's T-pose on the floor in relation to the improviser's body T-pose standing up in the environment (deriving from Clark's EXTENDED concept).

The final exercises are influenced by puppeteer and sculpting drama exercises, like in performance capture, where the performer becomes the puppeteer of the digital animation, "which in turn puppets the skin of the animated avatar character" (Dower & Langdale, 2022, p. 23). In this research, both improvisers work together, connected through the imaginary strings and shaping one another through hand gestural cues. In this exercise, the improvisers first stood up and developed into mirroring each other, where one improviser lay on the floor and mirrored the others standing up (Figure 48).

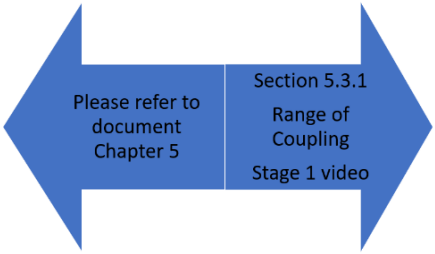
Figure 48 - Mover H and Mover G mirroring each other when working in pairs.

In developing *Range of Coupling (ROC)*, I draw on the Range of Motion (ROM) Performance Capture technique (see 2.2.1 and 2.3.1), which is an exercise with sets of movements that the actor moves through to test calibration to the character skeleton and to test the animated character. For example, to test how far the arms or head can move/turn before the calibration is broken (Delbridge, 2015). The ROM has also become part of a calibration process within the Vicon OptiTrack system. Thus, an actor needs to know these movements (they can be flexible in the order they are performed). However, I focused not only on movement but also on the overall holistic approach to calibration, ROM, and suiting up with marker sets, which became *Range of Coupling (ROC):* body-mind with suit, digital model, and environment. ROC is a short movement sequence where in phase one, I loosely used the six fundamental weight-rhythm exercises. In phase two, I developed a more focused approach, attending to the body-space and the environment, utilising these six fundamental rhythms: sustained, percussive, swing, vibration, impulse, and impact. Unlike ROM, where there is no pre-exercise in connecting with the calibration and PeCap experience, ROC enables participants to connect with the

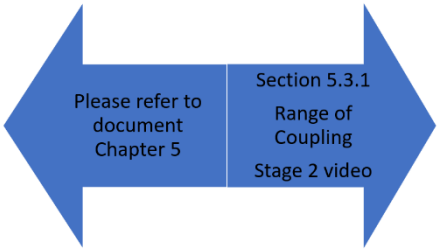
experience prior to calibration (Stage 1), after calibration (Stage 2), and with the digital model (Stage 3) (Figure 49).


Figure 49 - Lucies *Range of Coupling* (ROC) three stages.

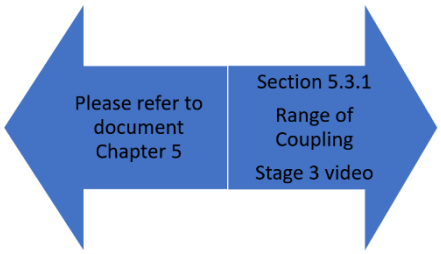
Therefore, during the warm-up, the improviser performs this short sequence without the MoCap suit first as seen in video 1 – stage 1




and once suited, the sequence would be repeated in stage 2 – as seen in video 2



and once calibrated, it is repeated with the calibrated digital model stage 3 as seen in video 3.




Thus, this short sequence was structured to connect and couple the body-mind with the volume, suit, and the digital model and the environment. In phases two and three, I added marker placement between stages 2 and 3. I extend the sense of touch where the improviser is guided by me, verbal and visual instructions, to place some marker sets on their suit (Figure 50).

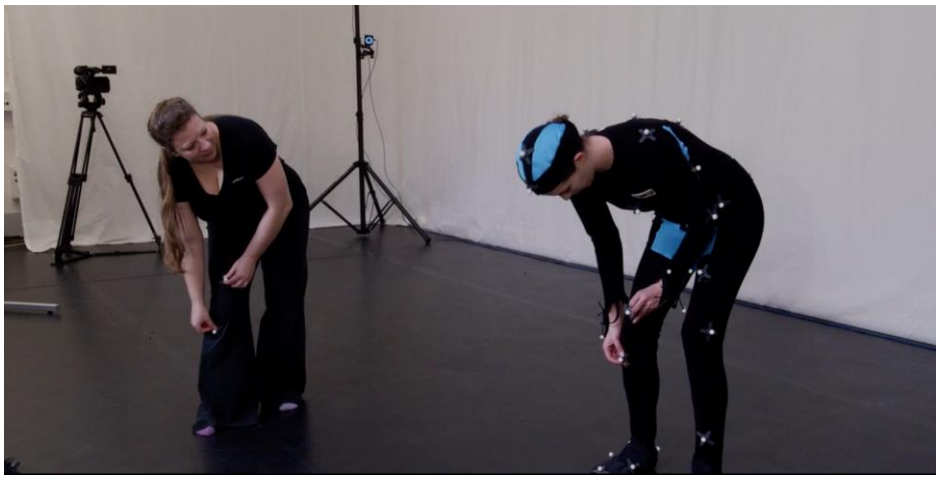


Figure 50 - Lucie is guiding Mover 4 to place marker sets on the motion capture suit.

Additionally, the short sequence for ROC introduces one of the key elements of activating *Sculptural Qualities*, which I discovered during phase one - the T-pose with Stillness (see 6.2) (Figure 51).

Figure 51 - Mover C standing in T-pose shape during the *Range of Coupling* (ROC) sequence - stage 2 of the ROC.

This calibration T-pose reveals the awareness of the T-like shape (wall-like) as a fundamental preparation for the body and mind to couple with the MoCap environment and the visualisation. Also, it builds awareness and a sense of the volume (captured space) the participant will be working in; the *I-body is* positioned in the centre of the space and towards the cameras and the viewing screens. It allows the *I-body* to activate the sensing-moving-thinking-responding elements of rhythmical patterns for *Sculptural Qualities*.

All the warm-up exercises connect to the *in-readiness* state (see 2.2.1) as a form of active listening to enable spontaneity in improvisation. Therefore, it prepares the movement practitioners to attune their I-bodies to the environment to engage with the improvisation that offers blurring of the physical with digital expressions; the *I-body* being-becoming environmentally embedded[58] (Clark, 2008c) within motion capture environments. It reinforces that the element of mind is not confined to the individual but is distributed across the interactions between the body, technology,

[58] Clark (2008) discusses the body-centrism to support the phrase that 'mind as embodied and embedded'. This phase seems to have been coined by Haugeland (1998) where he suggests that the "*Mind* is…. intimately embodied and intimately embedded in its world" (p. 236–237).

and surroundings. The movement practitioner attends to their awareness and connectivity to the environment. The environment is physical and digital, where improvisers embody the ecological awareness embedded in both environments and extending beyond the immediate body.

Based on these warm-up explorations, I have formulated a single framework (Figure 52 and for a larger view Appendix 9), which arose from the different phases of this praxis. This framework enables accessing *Sculptural Qualities* within a motion capture environment through warm up and preparatory exercises.

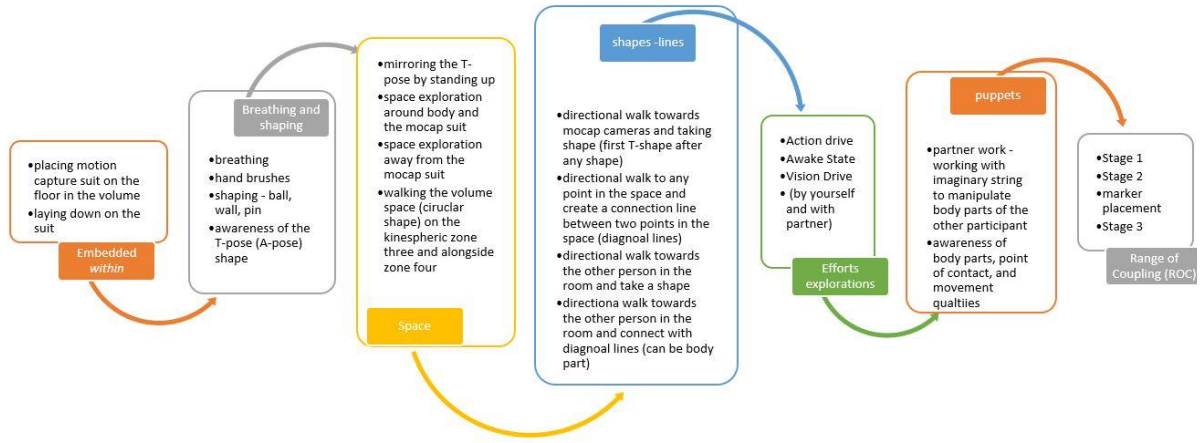



Figure 52 - Lucie's warm-up exercises framework to access Sculptural Qualities within motion capture environments. See Appendix 10 for a larger view of this framework.

In summary, awareness of the movement practitioner's *movement* is vital to activate mental and practical body-mind activities for this research. This framework enables the improviser to access *Sculptural Qualities* within motion capture environments. It prepares the *I-body* for the *Range of Coupling*, which in turn prepares the improviser for the improvisational tasks. The movement practitioners are attentive to the interconnectivity of their bodies with the environment and create physical choices that impact the articulation of inner attitudes. *Range of Coupling* (ROC) couples the body-mind with the MoCap suit, digital model, and the environment before, during, and after the calibration process with Motive software. These two *practical* exercises are woven into the environment to attend to body/mind and space dynamically and creatively. The warm-up exercises create an active environment, which engages the

embodied experiences of being-in-the-world. It enables the body-mind preparation for the improvisational tasks to enable improvisers to think on their feet in the moment of unexpected situations and to adapt to them with critical and creative thinking, discussed in the next section.

### 5.3.2 Improvisational tasks

I now move from the warm-up exercises and ROC explored in the above section into improvisational tasks within this research. Improvisation is the central movement method in this research (see 2.2.1). Creating an active space for improvisation to access *Sculptural Qualities* with various exercises or tasks can help develop spontaneity and awareness while improvising. Therefore, improvisation is embedded within the warm-up sequences (discussed above) and is experienced during the interactions with sculpting virtual improvisers and their digital traces. Within the traditional improvisatory approach, applying improvisatory tasks - explorative and experimental - can start from any point, such as moving from words and visual images and using your senses (Giguere, 2014). In this research, the movement practitioner begins from the T-pose with stillness, a state of witnessing-listening (see 6.2). The movement practitioner moves from the stillness state into the responding state and engages in the improvisational task of 'seeing-responding' (see 6.1) to different set of visualisations (Figure 53, and larger image Appendix 10), which happen after the ROC sequence. The seeing-responding in this context involves the participant actively observing (attending to) the relationship between the body, self, and the environment.

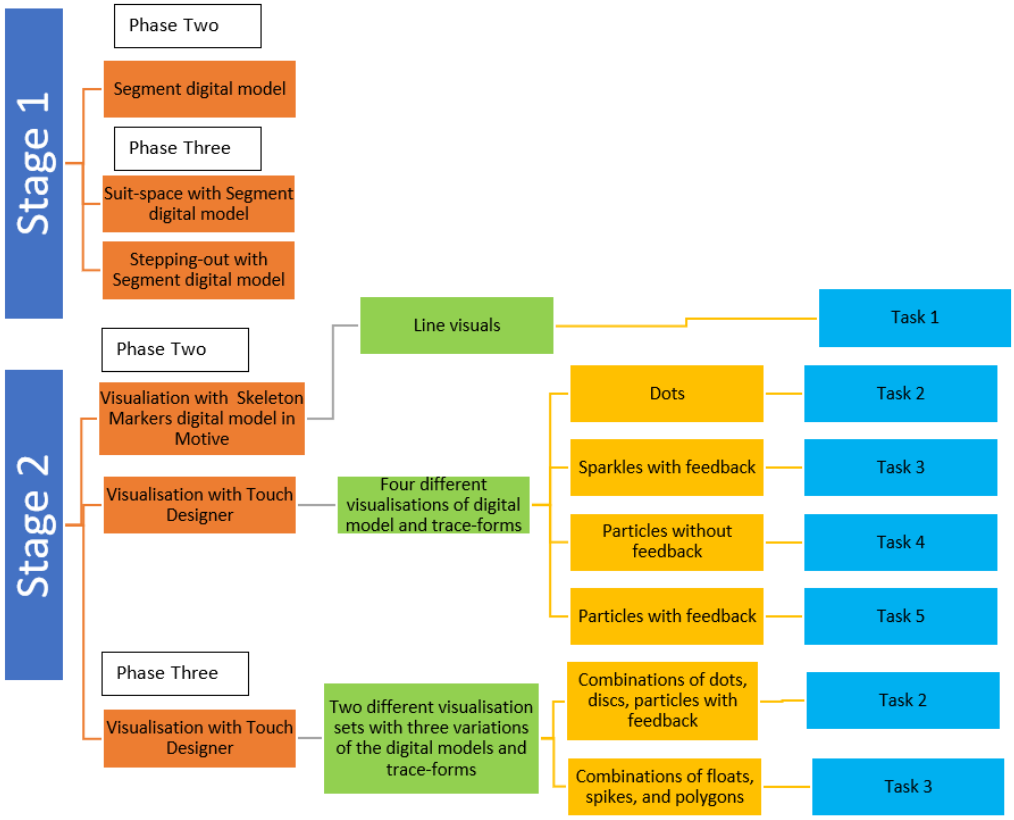
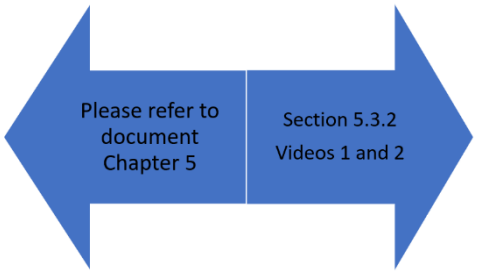
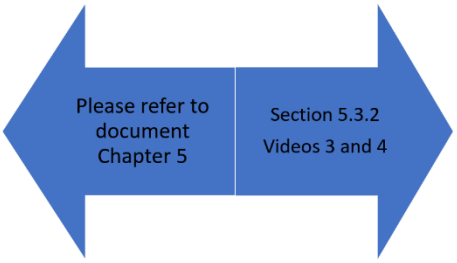



Figure 53 - Stage 1 and Stage 2 of improvisational tasks with different set of visualisations within motion capture environments.

There are two stages during the improvisation task of seeing-responding to a different set of visualisations. Each different set of visualisations is to examine the improviser's responses and sensitivities in relation to the three key research questions. Stage 1 explores the Segment skeleton digital model (see 4.4.1) and suit-space - the actor's suit space and its awareness (Delbridge, 2015).



In the videos 1 and 2 examples, Movers C, D and E, F explore the suit space and reflect in action. Similarly, to placing the suit on the floor at the beginning of the warm-up exercises, the suit space short exercise brings attention to the touch and felt experiences. The final step of stage 1 is the stepping-out exercises influenced by the kinespheric zone one – outside the sphere (volume).




In these two videos 3 and 4, Movers C, E and F reflect-in-action on their experience when their physical body leaves the kinespheric zone. Their virtual representations are visible in their sculptural (gestural) form – a freezing moment of stillness. Despite that, there seems to be a separation, the improviser's physical body is very much in a chiasmatic relationship with the virtual on the screen. The two perceptual modalities co-exist together. Because the improviser's actions and perceptions are not solely confined to the physical body, they extend into the virtual realm. Mover C, E, and F create a complex interplay between the two.

Stage 2 of the improvisational tasks is focused on responding to the variety of visualisations of digital models and digital trace-forms with Motive and Touch Designer software. It includes five improvisatory tasks with different visualisations in phase two and only three tasks in phase three (because of the combination of the visualisation for each task).

In phase one, I explored each improvisational task between one-to-three minutes and, at the later stage of phase one, between one-to-six minutes. The timings allowed me to develop responses to the feedback loop with different visualisations. During phase two, when Mover 1- 4 explored these visualisations, they improvised for between four-to-eight minutes. During my active observation of their improvisation, I decided when to ask prompt questions as part of their reflection-*in*-motion method (see 4.4.2). I sometimes made this decision based on the improviser's responses, where I wanted to capture and deepen their responses by reflecting on them in the moment. When I observed that improvisers were not

engaging and responding to the visualisation (at times, the participants confirmed that they were unsure what to do), asking them to reflect-in-action allowed them to describe what was not working for them at the given moment. Douse (2013) suggests that based on their participant's responses, the appropriate time for improvisation is three to ten minutes: three minutes not to lose interest in responding to the tasks, but up to ten minutes for participants who experienced the most significant flow. Upon observations and reflections, I found six to eight minutes appropriate for movement practitioners' kinaesthetic and attentive experiences. At times, once they were engaged in the reflection-in-action, they either stopped or continued to move, and the discussion continued over the eight-minute set time.

In summary, improvisational tasks within the workshop design allowed participants to engage with the sensing-moving experiences and challenge their perceptual experiences. They enable a focused approach to creating a spontaneous movement, which allows creative explorations of body-shape, space, and dynamic responses. These activations facilitate seeing and reacting when perceiving actual and virtual bodies. Arguably, it develops participants' awareness of their bodies and their understanding of being-in-the-world and other bodies within motion capture environments. In the following sections, I present the shifts in virtual body perception in both Motive and Touch Designer software and how it developed the visualisations in the three phases.

## 5.4 Phase One

### 5.4.1 Shaping of actual and virtual bodies

Phase one occurred at the beginning stages of this research inquiry (2019-2020). The starting point of investigating how to access the *Sculptural Qualities* of improvising bodies, the explorative stage, was introducing myself to using Motive software (as mentioned in 4.2.1) and establishing the calibration process with another technical workflow. After establishing the MoCap workflow, the focus was on exploring the perception of actual and virtual bodies. As previously discussed in chapter two (see 2.4.1), exploring the perception of actual and virtual bodies develops a deeper understanding of perception, spatial awareness, and creative spontaneity to access and activate *Sculptural Qualities*. Firstly, I explored the digital models in Motive software with four configurations of the digital models, such as 'Segment skeleton', which is set up as a default model (Figure 54) and Avatar (Figure 55) - represent the physical attributes of the 'real' body; Bone Skeleton (Figure 56) and Skeleton marker (Figure 57) – represent the bone and skeleton structure of the body. These digital models possess characteristics of physical attributes such as height, weight, and non-physical attributes, which are inherent within the Motive software.


Figure 54 - Segment Skeleton Configuration in Motive software.

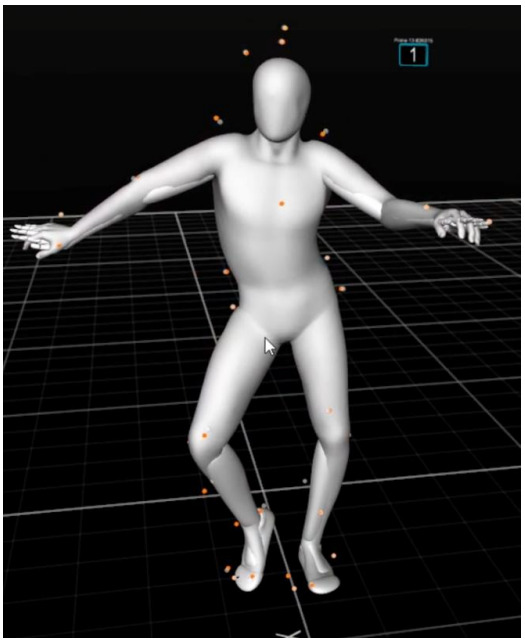


Figure 55- Avatar Configuration in Motive software.

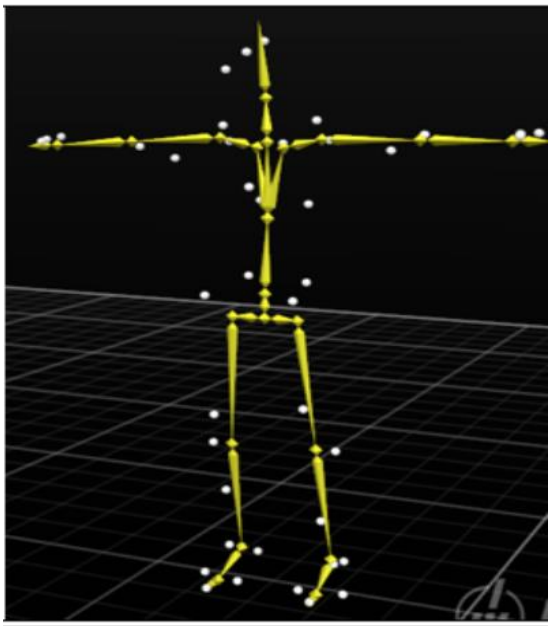


Figure 56 - Bone Skeleton Configuration in Motive software.

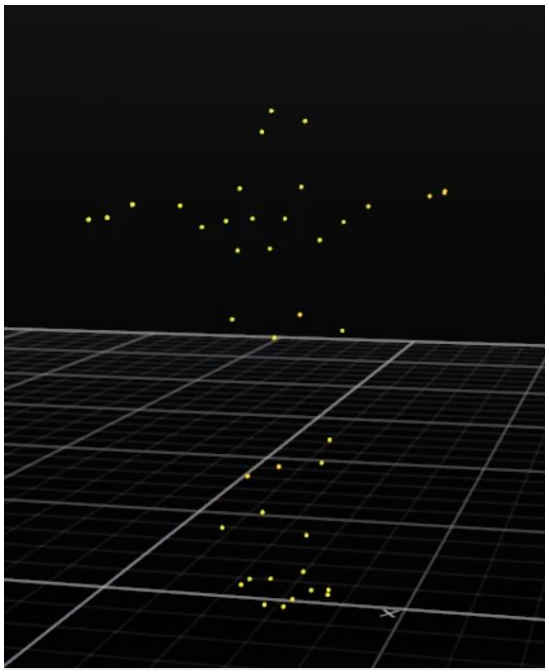
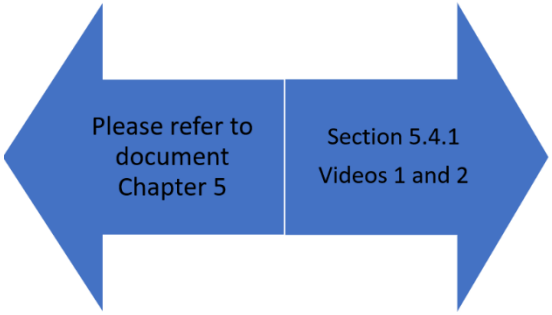
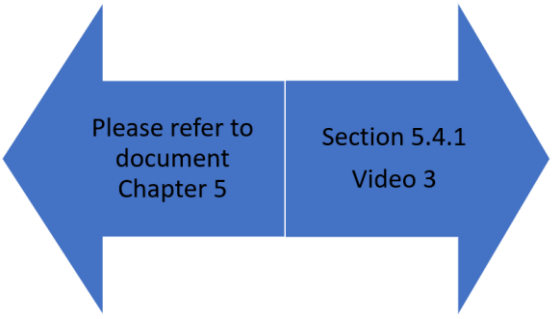


Figure 57 - Skeleton Markers configuration in Motive Software.

These digital models were my first interaction with the digital space, and I observed how I responded to these interactions. For example, when exploring movement with the ‘Segment skeleton’ - Videos 1 and 2 -



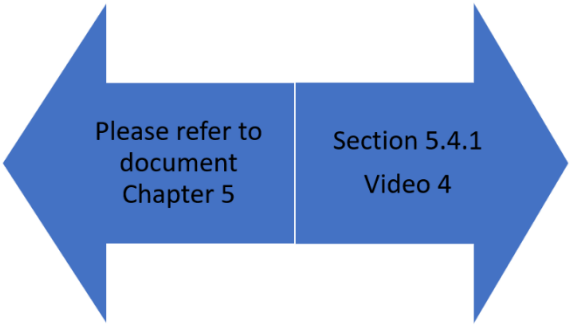

and ‘Avatar’ (Video 3) digital models in Motive,



My body adopted strong, bound, and sustained movement qualities, and the movement experience was instead about the characteristics of the body rather than a **dynamic** body-shape in space. Despite working and moving from within, it introduced a type of solidity and constraint in the movement. The movement choices led me to create an enclosed shape (as I later discovered, the opening activates *Sculptural Qualities*; see chapter six). In both digital models' examples, I perceived these as Other bodies – a character as the actor would for performance capture. Therefore, my technological-relation is hermeneutic

*I-body* ⟶ (mocap/digital model-world)

an experience *of* the Segment skeleton and Avatar (Ihde, 1975). The characterisation technique is applied in the performance capture method of creating video game animated beings and creatures (using Motion Builder, Maya, Unreal Engine and Unity). This technique requires the actor/movement practitioner to create appropriate movements for the character. As this research focuses on the shaping processes as a holistic approach to improvisation, I had to move away from this type of characterisation. Therefore, I began exploring the Skeleton marker set digital model.




Immediately, I felt the shift from experience *of* the digital model to experience *through* the digital model (embodied relations) which introduced also shift in perception from representation to abstraction of dots and points[59]. In space, it had a sense of an *outline* - a sculptural shape - of the body. I began a movement sequence

[59] Kandinsky and Rebay (1979) work emphasise the rhythmical law of displays of points and lines in composition of counterpoint enabling creative display of shapes, colours, and forms in harmony.

from my previous work, Moving Memories, to test the visualisation. However, as I performed these movements, I wanted to explore what I was experiencing and seeing freely. Allowing the body to move through the space with these points in an explorative way and with a sense of freedom to express it makes the movement qualities open, extended, and dynamic. These movement possibilities activated the spatial-temporal structure of curved shaped pathways.

> *The skeleton virtually outlines in its utilitarian and expressive movements the edges and inclinations of an invisible space crystal* (Laban cited in Wiesner, 2017-2018).

In this quote, Laban suggests that the skeleton, in its movement, has a sense of boundaries and orientation of an invisible crystallised space. Its movement is functional, intentional, and emotional contributing to the perception of space. The ‘edges’ can be represented with these outlines of the skeleton digital model. Outlines, in sculptural art, are not just static – they have a movement. For example, in Klee's work *A line is a dot that went for a walk* (1964), he discusses that if the line is conceptualised as a moving dot in any direction and speed, it creates a sense of tension within the artwork. He further suggests lines as a series of connected dots, and constantly moving creates a sense of movement dynamic and energy. The dynamic relationship resonates with using the Skeleton marker digital model, with its dots (representing markers) offering a sense of space, tension, and rhythm. When I am exploring these dots as sculptural *out-lines* (I separate *out* from *line* to suggest the foundation of the line), "I can" (see 2.4.1) shape sculptural movement in three-dimensional form with fluidity and natural movement, making it appear lifelike. The Skeleton marker enables the sculptural process by shaping the movement in a way that the movement practitioner can respond to with a wide range of expressive and aesthetic qualities. It evokes visual and spatial aspects of movement in accessing and foundation for activating *Sculptural Qualities* in this space. In the next section, I discuss the visualisation of the lines with the Skeleton marker digital model.

### 5.4.2 Visualisation with Motive software

My subsequent explorations were to establish how the looping feedback operates when experiencing the actual and virtual with Motive software. The discovery of a built-in function for visualisation in Motive software, which I call *line visuals* in this study (Figure 58), brought attention to the different weight-rhythm movement qualities.

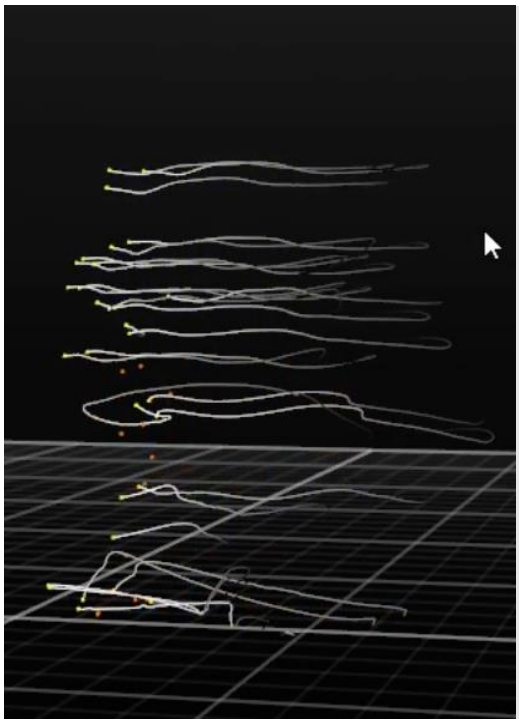
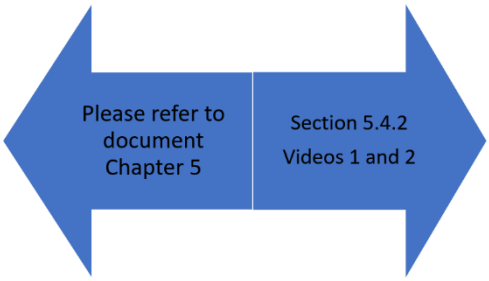


Figure 58 - Trace forms created in Motive Software by the dancer.

The *line visuals* are in real-time, departing from the *marker point,* leaving short pathways/traces behind and returning to the marker point. Usually, the trace-forms are invisible when the dancer moves in the space. However, in the digital environment, the skeleton marker allows me to emphasise the motion through pathways and make it 'visible' by representing these *line visuals*.




In video 1, I recognised that the *line visuals* have dynamic qualities and evoked in my body immediate kinaesthetic responses to dynamic Effort-shape qualities of combinations as follows: opening-rising, sinking-advancing, sinking-advancing-retreating, rising-retreating, and sinking-closing-advancing (these annotations can be viewed with the video 1).

In video 2, the *line visuals* leave an 'impression' of the embodied lived experience in the physical and virtual space. Embodying motion through *line visuals* establishes the dynamic link between lived experiences and the physical and virtual space. *Line visuals* act as a conduit for translating – reading – the richness of embodied experiences into the digital domain, and therefore, *line visuals* allow *Sculptural Qualities* to manifest in the virtual representations. I explored the *line visuals* further in the focused workshop design, discussed in the next section.

## 5.5 Phase Two

Due to COVID-19 restrictions at the beginning of phase two, the studio practice had to continue with my reflections (2020-2021). Once the COVID-19 restrictions eased halfway through phase two, I invited internal participants into the studio-space. Therefore, phase two is divided into two parts: the first part was conducted by me in the studio, developing visualisation strategies with Motive and Touch Designer software, and the overall workshop design with warm up and five creative tasks; the second part was conducted with participants engaging and responding within the studio-practice, with warm up and creative tasks of five different digital visualisations (Appendix 1).

At the beginning of phase two, I reflected on using the built-in visualisation function in Motive, which I call *line visuals* in this study. Unfortunately, this function is limited in allowing the *line visuals* to slow down, speed up, its trajectory, and perhaps

its colour. I used my knowledge from working with other software to manipulate the visualisation and set different parameters for each visual. I remembered that during task 2 of the workshop in phase one, I commented:

> *It was not much about what my body was doing; it was more about how I could make these lines move differently* (Sykes, 2020)

And to the question if I would prefer to stop and look at the visuals and then respond, I answered:

> *Yes and no. If there were a little, perhaps 1-2 seconds delay… (*Sykes, 2020)

Thus, having a delay as a controllable function for the *line visuals* would offer a wider range of opportunities to activate different *Sculptural Qualities*. The researcher-practitioner would have the ability to layer the experience in new, exciting, *unknowing* ways. Thus, I explored how I can incorporate with Motive software another visualising program, which would allow me to control more parameters (than those available in Motive) of the *line visuals* and perhaps open other visualisation possibilities of the trace-forms to develop looping feedback experience to shift the perception of actual and virtual. I began my exploration with Touch Designer (and hereafter TD), which is a note-based visual programming software. I established a new workflow between Motive and TD in real-time to support the creation of a visual representation of the body and trace forms, further explored in the following sections.

### 5.5.1 Shaping of actual and virtual bodies

When working with MoCap, the software allows you to capture the whole body with the marker sets or rigid bodies. Skogstad et al. (2011) defines the rigid body as "objects that will not deform and will simulate or monitor a body segment" (Marin et al., 2017). A rigid body "corresponds to clusters of reflective spherical markers" (Marin et al., 2017, p. 2) constructed with joint angles with at least three points to coordinate the centre of the joint (Figure 59).

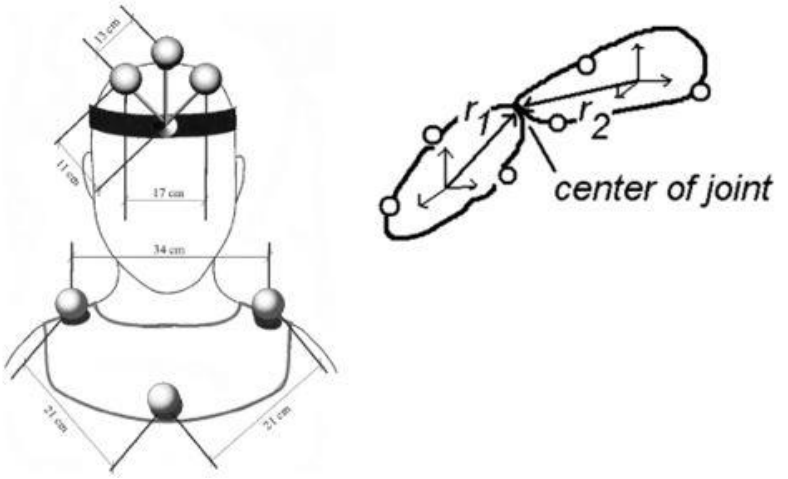



Figure 59 - Demonstration of rigid body readings: 3 markers on the head, three markers on the upper body, which counts the center of the joint, and three markers on the arm to create a center of the joint.

Unlike Motive, which works with individual marker sets or rigid bodies, Touch Designer works with only rigid bodies. The rigid body impacted the visualisation of the perceived virtual body. It defined joints' different rigid centre points and visualised them with dots (Figure 60).

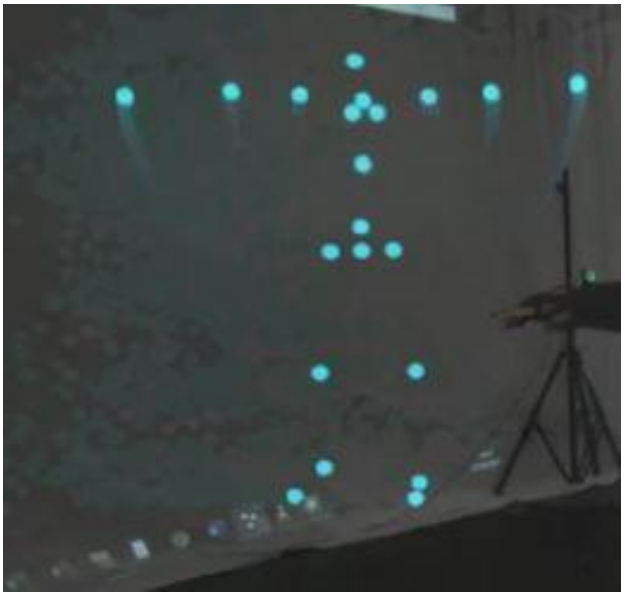


Figure 60 - Rigid body: Visualisation of virtual body represented with dots in Touch Designer.

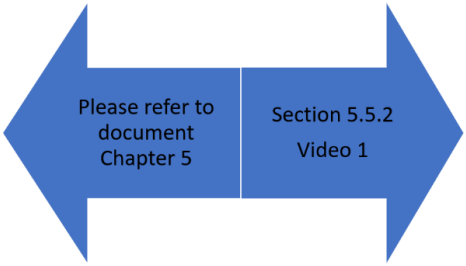
The points, or as Ingold (2015) would call "blobs", create skeleton-like features representing the physical body with what I call *in-line (*once again, I separate *in* from *line* to suggest the line as a foundation*).* Both *in-line* and *out-line* provide the digital representation with anatomical landmarks of the body (head, spine, shoulders, arms, hips, knees, front of the foot, and heels) with the Touch Designer, a simplified visualisation of these landmarks. I propose these blobs of the marker set of the *out-line* and the points of the rigid body *in-line* suggest a meeting[60] in the place, where the physical touches the virtual directly in the origination of the *Sculptural Qualities*. Within Motive, the *out-line* gives an impression of the space within the body, which some participants commented allows them to explore that space once the *line visuals* are not visible (task 1 see 5.3.2). Some participants commented that it is like body-being, a constellation of stars extending and connecting the body with the universe (which was also felt by Mover E task 1 in phase three). The *in-line* connects to its trace-forms. Depending on the visualisation of further parameters set up, it extends that body into the trace-forms to explore different movement qualities (see 5.5.2 and the videos in document 5.5.2). Out-line and *in-line* offer conceptualised line(s) in moving dot(s) and enable sculptural shaping with expressive qualities.

### 5.5.2 Visualisation with Touch Designer software

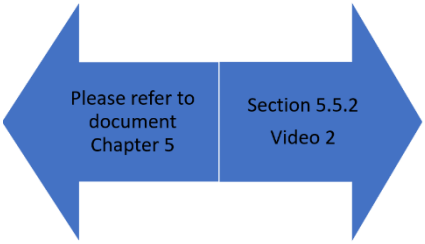
Once I established the *in-line* digital model with Touch Designer (TD), I explored the dot/blob *visuals* within this software. As opposed to Motive, where the built-in visualisation is uncontrollable (see 5.4.1), in Touch Designer, each component can be customised, with a unique set of parameters to gain control over the 'visualisation-imagery of the data' and its operation and processing in real-time. The customisation ability of the TD software allows me to develop the trace-forms behaviour with tempo, life expectancy, changing its colours, or control the timing with a slow or fast speed – in stage 2 of the improvisational tasks (see Figure 53 in 5.3.2). These trace-form behaviours affected the movement exploration of Effort-shape

[60] I draw on Klee's "image of a seed that has fallen to the ground [and] The relation to earth and atmosphere", where he states that the seed "As it grows, the germinal point – where once earth and sky had touched directly in the origination of a life – stretches out into a linear stem that now mediates their intercourse" (Ingold, 2015, p. 44). Therefore, the germinal point in this research can be taken as the point of out-line and in-line.

qualities such as opening-rising with sustained or sudden movements, introducing moments of stillness repetition, and evoking different types of imageries.

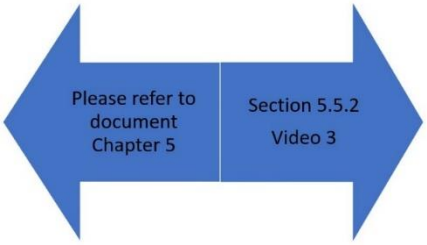



For example, in video 1 with reflection-in-action, I am exploring the *in-line* dots visualisation with feedback function and recognising the similarities with *line visual* (Task 1 with Motive). The feedback function in Touch Designer offers the echoing qualities of the dots. Exploring these introduces moments of stillness – watching and witnessing echoing dots travelling back to the primary dot. During the improvisation, I attended towards the dot's imprints – ink or engraved dots – creating patterns and repeatable elements within sculptural shaping. The echoing imprints of my *I-body* create depth and dimensions – making the experiential coupling visually and physically engaging. Furthermore, I attended to changing the colours while travelling, introducing the spatial relationship between the *I-body* and the volume.

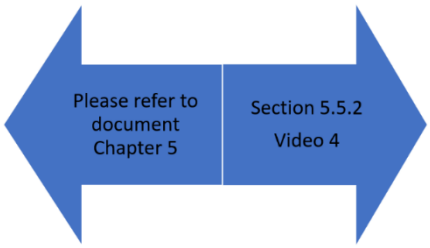



In video 2, still working with *in-line* and echoing dots, rising-sinking shape qualities were more present. Shaping together with these dots' qualities (and possibly the green colour) evoked imagery of seaweed, which introduces the embodied imagery experiences. The active engagement with the trace-forms coupling and extending the body-mind facilitating temporality, kinaesthetic and empathetic exploration, and the tactility of the imagery introduces sculptural form with stillness and repetition. These embodied imageries shaped my sustained movements, where I noticed the dots creating a line, and with sudden movements, the dots have a space between

each dot. With the awareness of these shaping qualities, “I can” move and explore different sculptural forms. Next, I developed the *dots/blobs* with feedback by introducing a particle system[61] in task 3 – placed on the right hand and left food.




In video 3, Mover 2 explores these particles where the different colours were triggered by the right-hand movements and their spatial relation to physical space. For Mover 2, it introduced circular movements (mainly with arms and the whole body – moving on a sagittal plane), emphasising the sculptural form and volume. Mover's 2 circular motions facilitate repetition and growth of the overall shape - offering organic shapes and rond lines. Once again, these trace-forms facilitated the opening-rising/ closing-sinking/ shape qualities and moments of stillness.




Similarly, in video 4, where Mover 1 explored particles with feedback (task 5), the opening-rising shape qualities moved between sustained and sudden Effort qualities. The sustained opening-rising introduced a pin-like shape and sometimes moved into a moment of stillness – where Mover 1 witnessed, observing the visualisations. In contrast, at times, Mover 1 responded to these visualisations with sudden opening-rising/closing-sinking-advancing movement explorations evoking continuous

[61] In Touch Designer, particle systems stimulation uses natural events such as rain and snow or effects like fireworks and sparks. Thus, "the points of the input geometry are used as the starting positions of the particles. An external force (gravity) and wind can affect each input point. “Particles collisional behaviour of bouncing off another object can be set impacting their life duration on the contact with the object or die at, limit planes set in X, Y and Z (Derivative, 2023).

expansions of the particles. During these shaping explorations, the Mover 1 engaged with (activated) T-pose with stillness qualities contrasting the sudden/direct-indirect movements.

In summary, phase two offered exciting developments with digital trace-forms (stage two) where Movers 1 - 4 explored and experimented with these visualisations in real-time. The observations of videos 2 - 4 demonstrate that the opening-rising shape qualities represented growth and extensions of sculptural forms. The shaping processes within phase two brought to the forefront the core elements of *Sculptural Qualities*, which I have identified in phase one and tested with movement practitioners in phase two. Therefore, Stillness, T-pose with stillness, repetition and accidental micro-intentions were developed through further Effort-shape analyses and conceptual understanding of how to access and activate *Sculptural Qualities*, with further development in phase tree.

## 5.6 Phase Three

Phase three occurred in this research inquiry's final stages (2021-2022). In the previous two phases, I explored the lines and particles to better understand the sculptural experiences of improvising bodies with only one participant at a time in the space. In the third phase, I developed the workshop design to accommodate two participants simultaneously with new visualisations of digital models and trace-forms. During the beginning of this phase, I developed technical workflow and gained confidence in calibrating two participants simultaneously using Motive software. Correspondingly, I developed further knowledge in Touch Designer through guided tutorials from digital artists 1 and 2 (see acknowledgement section). It allowed me to design a workshop with a set of different digital models (Figures 61 to 66 below) with different shapes and digital trace-forms for both physical bodies (discussed below). Additionally, it allowed me to add the floor grid (Figure 61) within this new set of digital visualisations to mirror the floor grid, which is already given by Motive Software (Figure 54), which was based on some informal feedback from the participants in phase two. I discuss those developments and their contribution to the development of *Sculptural Qualities* in the below section.

### 5.6.1 Shaping of actual and virtual bodies

In phase three I continued to utilise the Skeleton marker digital model with *line visuals* in task 1. Movement practitioners enjoyed exploring the Skeleton marker as Mover F suggests:

Mover F: *I am much more interested in this space here (mover F is highlighting the gaze/torso area mainly – the space inside the Skeleton marker)*

Researcher: *What would you call that space?*

Mover F: *I think it's ...Oh, that's really hard.*
*It's becoming Aware or being reminded of a space that you often neglect and don't spend any thought on.*

Upon reflection of the space, which the digital model can offer, I further developed other digital models with Touch Designer (TD) establishing how two models can be read simultaneously. I set out to develop a timeline scene (within TD) that can hold three different visualisations of the *in-line* with three different sets of trace-forms and be able to switch quickly between the three visualisations during the improvisatory tasks. This was a significant development as it allowed me to create a continuous environment for fluid improvisation without stopping and changing the visualisation. I was inspired by the artists (see 2.3.2 and 2.3.4) and their use of shapes, aesthetics, movement, materiality, and their relationship with the environment. This has loosely influenced the development of digital models and their trace forms. Firstly, I continued to use dots/blobs from Motive and Touch designer in phase two (Figure 61).

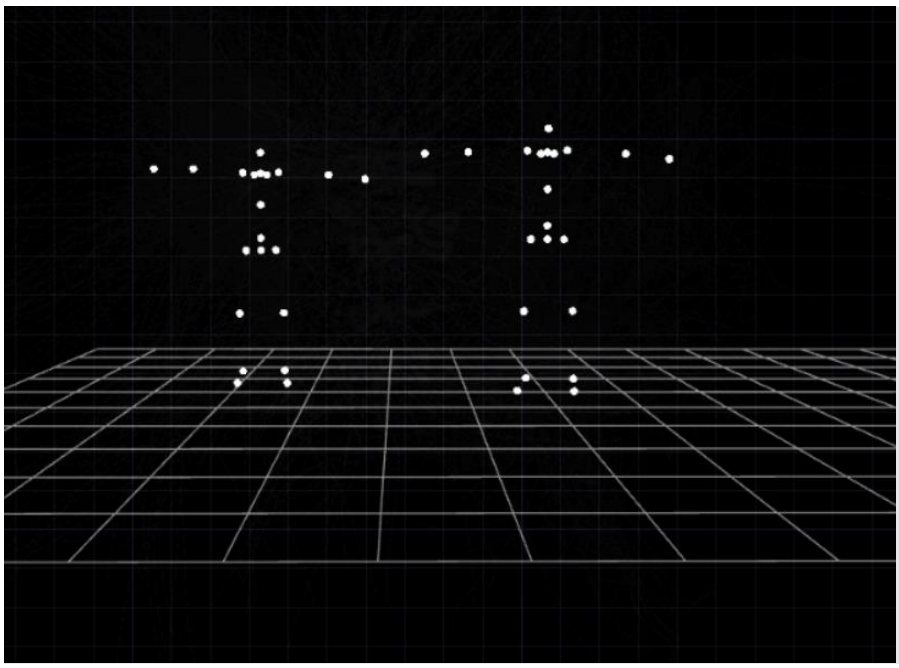


Figure 61 - Lucie’s two rigid bodies within Touch Designer utilising dots/blobs to represent the skeletal body structure.

Secondly, once I felt confident with the first digital model, I experimented with the parameters for the spherical shapes of the dots/blobs. Changing the sphere's radius of two axes, Rx and Rz, from 0.02 to 0.20 reshaped the dot/blob into the aesthetic appearance of a flat disc (Figure 62). Like Calder's mobiles employing different shapes and forms, it introduces an ever-changing interplay of movement, balance, and dynamic tensions.

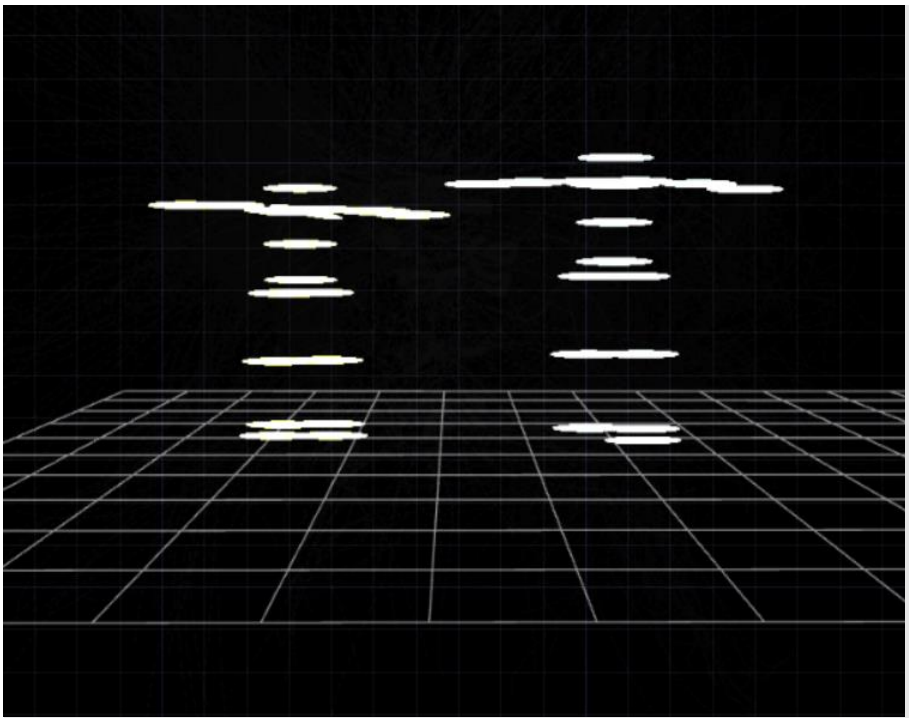


Figure 62 - Blobs changed to flat disc shapes for the digital models.

Additionally, the 'transform' switch gave me greater control over which digital model I could present to the participants, switching between the two separately for each body in the same space (Figure 63). Like Cragg's and Gormley's works, sculptural transformations often involve ordinary objects and materials transformed into intricate and visually compelling forms. Thus, the blobs transformed into flat discs, exploring the richness of the materiality, and encouraging the improviser to explore the boundaries between the physical and virtual.

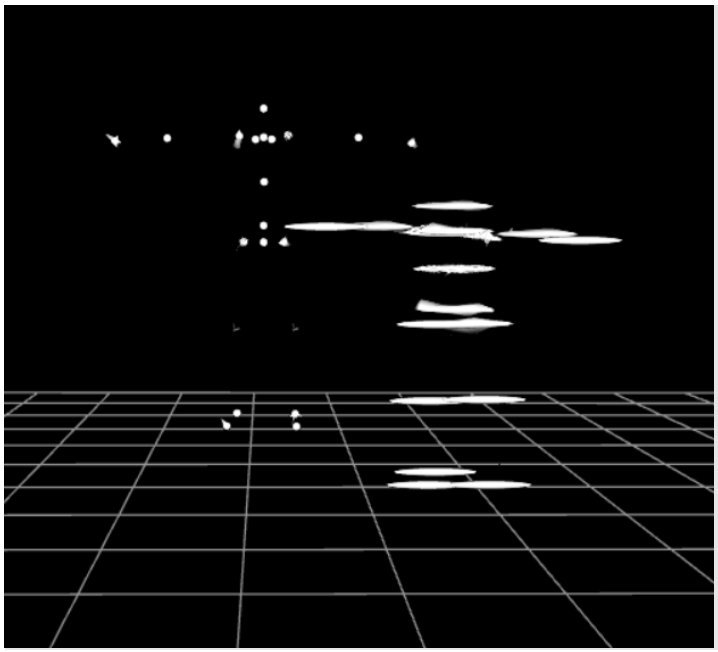


Figure 63 - Two digital models switched from one to another on individual bodies through the 'transform' component in the same scene.

While experimenting with the Touch Designer visualisations and parameters, I often discussed the fluctuating motion of the blobs. As in the current visualisation, each blob had an impression of being static, only mobile when the improviser actioned movement. The visualisation created tension between static and mobile. The digital artist 2 (see acknowledgements) presented an exciting shape that oscillated between expansion and contraction depending on the 'noise level' parameters. The noise level affected the material component and changed the aesthetic of the blob with fluctuating qualities: from dots to dot-line-dot connection to form a blob. Intrigued by the idea of the dot/blob being transformed into this ever-changing shape, I started developing a new scene (in software, each blank window is called a scene) with two more digital models. These two additional models were influenced by Gormley's sculptures of his life-size body being transformed through different materials and placed in various contexts and environments, blurring the boundaries between artwork, the viewer, and the surroundings. Therefore, when I transformed the blobs into shaping-reshaping motion, I challenged the blurring boundaries of what is perceived and the movement practitioner's responses. The shaping-reshaping of the spherical shape with its shifting (geometrical) points to create a

continuous oscillation introduces an interactive and dynamic dimension to the improvisation. The movement practitioner becomes an active participant in perceiving the overall digital model as an ever-changing shape. Additionally, the 'noise' component within the visualisation setting introduced interchangeable 'randomness' of various colours of each reshaping sphere (Figure 64). The random intervals would introduce an element of dynamic progression of *Sculptural Qualities*.

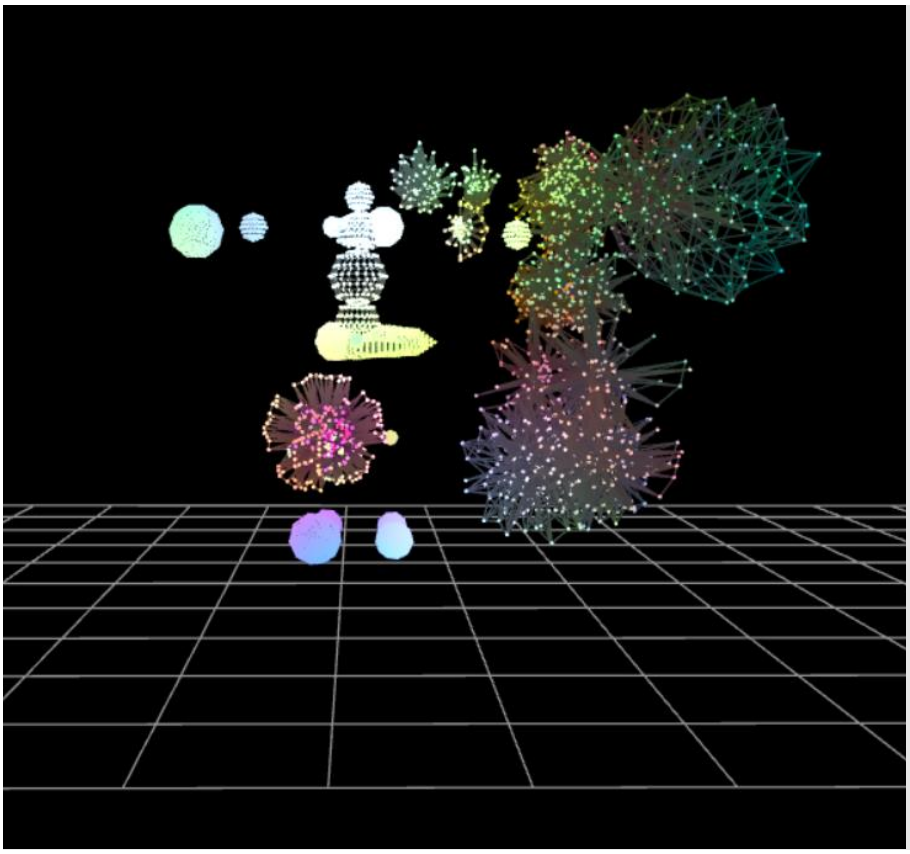


Figure 64 - Two digital models set up with the sphere, fractal, and noise components in the Touch Designer.

The above explorations with visualisation, I also experimented with changing the geometry material. Touch Designer provides this geometry component that operates and defines its 3D shapes using 3D surfaces such as polygons, particles, sprites, meshes and others. Once again, like Cragg, when he works with different materials, allowing him to blend forms to explore the richness of materiality, I felt compelled to investigate the settings of these surfaces. These surfaces can be shaded in a

material form (MAT) as solid shaded surfaces (Phong) or as wireframes (Lines) (Figure 65).

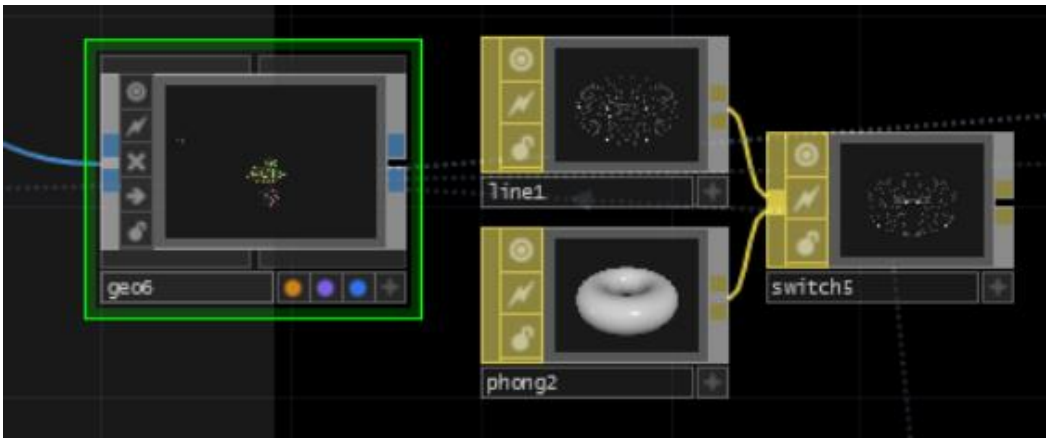



Figure 65 - Lucie utilising Geometry SOP to switch materials MAT as lines and solid surfaces (Phong) in Touch Designer.

In the first models, I mainly used the wireframe lines. I experimented with the solid shaded surface to create a solid-surface sparse, resulting in this fascinating texture of digital models (Figure 66).

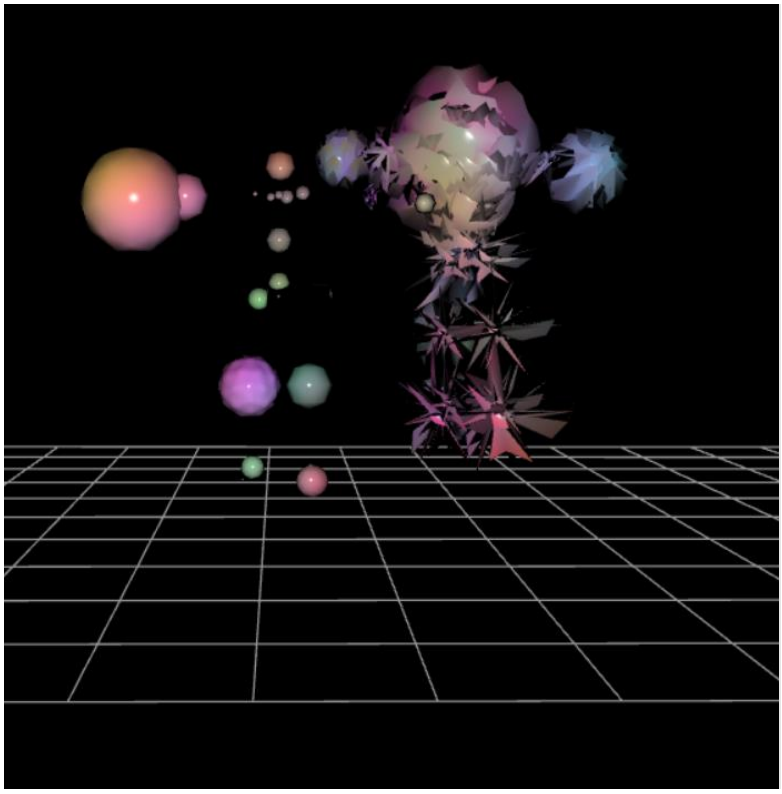


Figure 66 - Lucie's use of material MAT Phong to create a fascinating solid shape surface of the digital model.

These diverse visualisations of the digital models and trace-forms are essential for assessing *Sculptural Qualities*. The new sets of visualisations add interactive dimensions to *Sculptural Qualities*. The improviser actively perceives the visualisations from multiple perspectives and experiences their shaping and reshaping aspects. Different material explorations of the various visualisations might challenge the traditional notion of sculptural form and its function within motion capture environments. Therefore, participants can access *Sculptural Qualities* to shape their spontaneous responses and become aware of the different interactions and bodily sensations, which each visualisation evokes differently in each improviser. In the section below, I discuss the trace-forms visualisation for phase three.

### 5.6.2 Trace-forms visualisation

One aspect of Laban's movement analyses is the concept of trace-forms (see 2.3.4). Trace forms are patterns of movement that the body takes through space and can be observed in time. I am using Motive and Touch Designer functions to visualise trace forms within this research. Within Motive, I continued to utilise the built-in visualisation for making markers' history visible, which I call *line visuals* in this study (Figure 67).

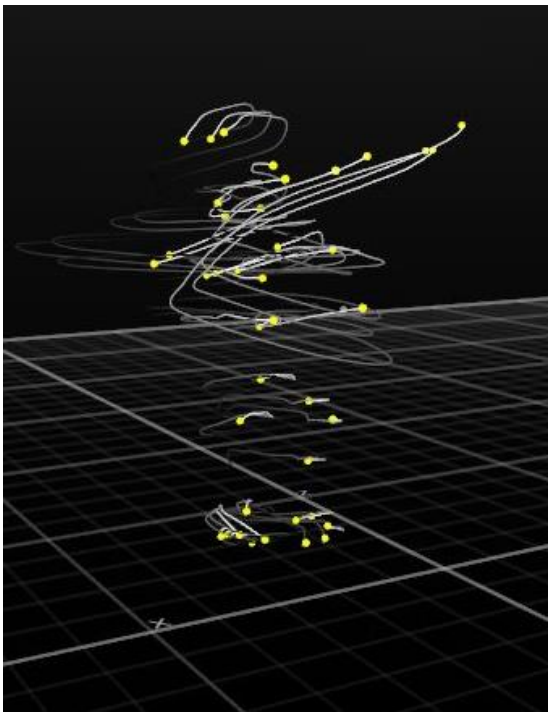


Figure 67 - *Line visuals* in Motive.

I also explored the trace-forms using the particle system in Touch Designer. The particle component can respond to movement in a more nuanced and expressive way. In phase three, I explored further trace-forms and shapes through particles and polygons inspired by Laban's trace-forms. The particle system can be programmed to follow specific paths, change colour or shape, and respond to movement, such as sudden changes in speed or direction (Figure 68).

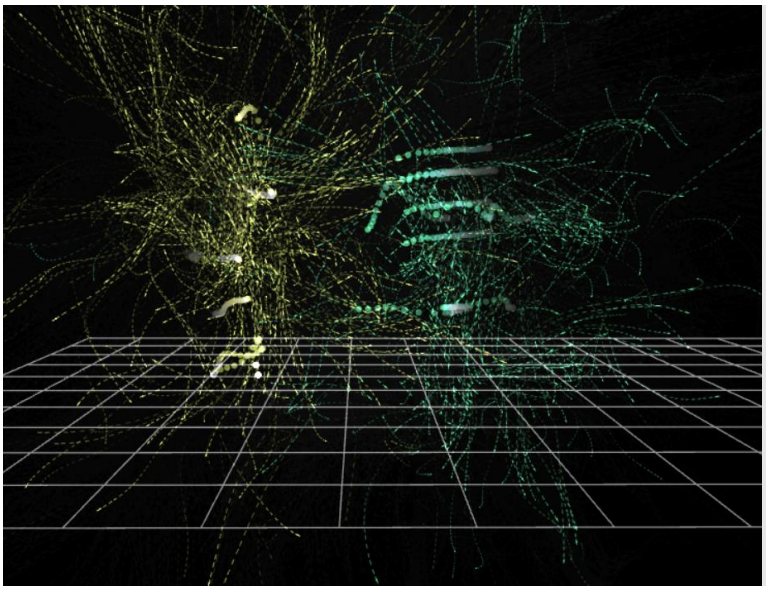


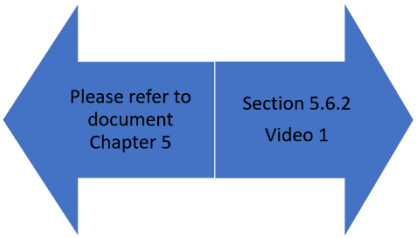
Figure 68 - Trace forms using a particle system and speed, direction, and life expectancy parameters in Touch Designer.

I examined the spherical component as a polygon with particle components. Laban uses polygons to identify and analyse motion (see 2.3.4). Within Touch Designer, the polygon is fundamental in creating a wide range of visual elements in simple or complex 3D shapes. Using a polygon, I created an instance that allows for different positions, rotations, and scales of the traced shape. Like Laban's drawing of polygons, it has influenced my explorations within these digital models as follows in Figures 69 to 73 below. Laban suggested that the polygon trace-forms are created by connecting three points in a rhythmic circle. Moore (2018) wrote in her imaginary interview with Laban:

> *CLM: A rhythmic circle is actually a polygon, isn't it?*
>
> *RL: Right. Polygons are still circles in the sense that they are closed forms. But a triangle accentuates three points in the circumference of a circle, a square, four points, and so on. Each accent means a rhythmic break and a slight change in direction.*

In this research, polygonal trace-form, as a technological medium, can influence the improviser in dynamic interactions and engage them with the sculptural form. In the context of extended embodiment, the technology enables the visualisation of these polygonal trace-forms in relation to volume. Therefore, Touch Designer can visualise

the points in the space in relation to the points on the body to create defined shapes and visually display them for the improviser to interact with. These polygonal trace forms enhance the sensory experience of the sculptural form and guide their attention to their specific lines, shapes, and behaviours. The improviser does not have to solve where the points are - the cognitive task has been *uploaded* (Constant et al., 2019-2022) onto the technology to visualise it and to support the improviser in focusing on the essential aspects of responding (and decision-making).




In video 1, an example of all three digital models with trace-forms behaviour enables the improviser to explore improvisatory movement with spontaneity and immediate experience facilitated by *cognitive uploading (offloading* – see 2.4.2).

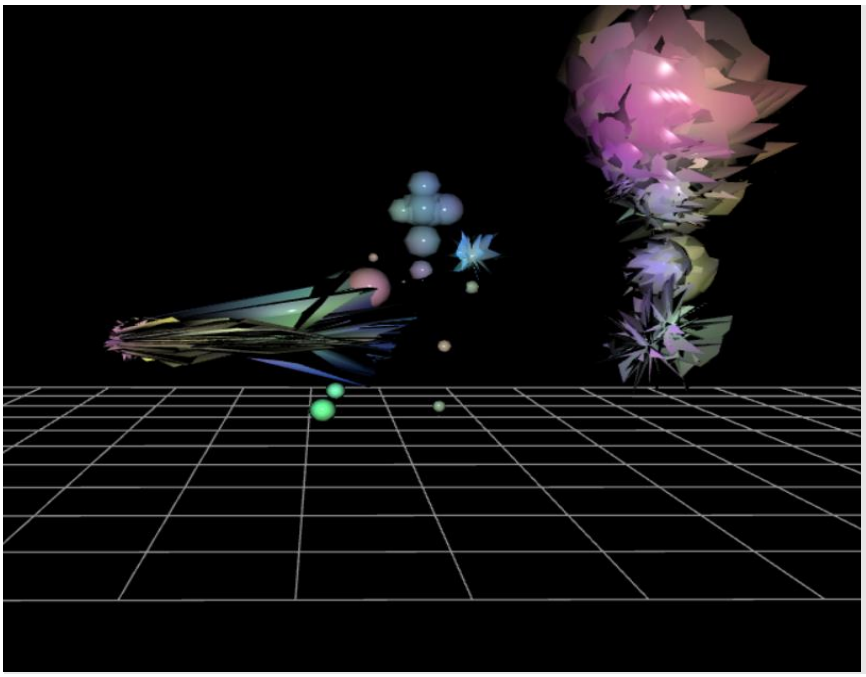


Figure 69 - Trace-forms spikes - using polygon of each digital model in Touch Designer.

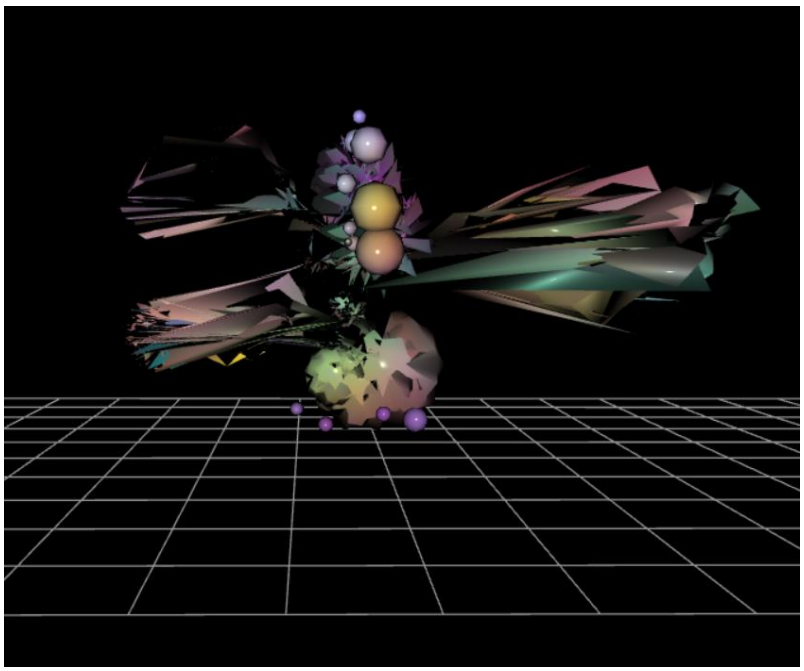


Figure 70 - Trace-form using polygon of both digital models in Touch Designer.

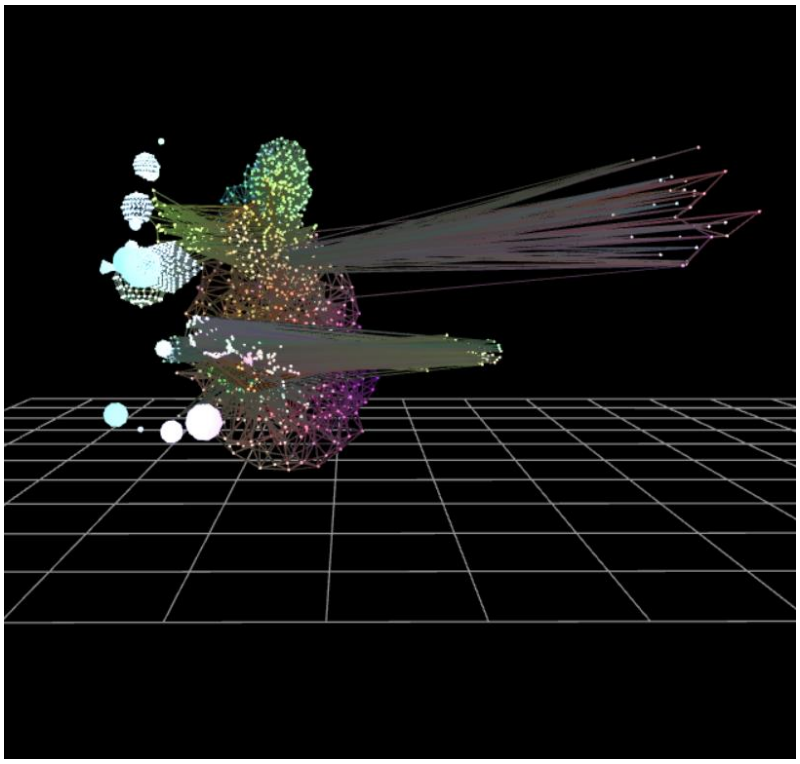


Figure 71 - Trace-form floats of dots-lines creating polygon shape left in space.

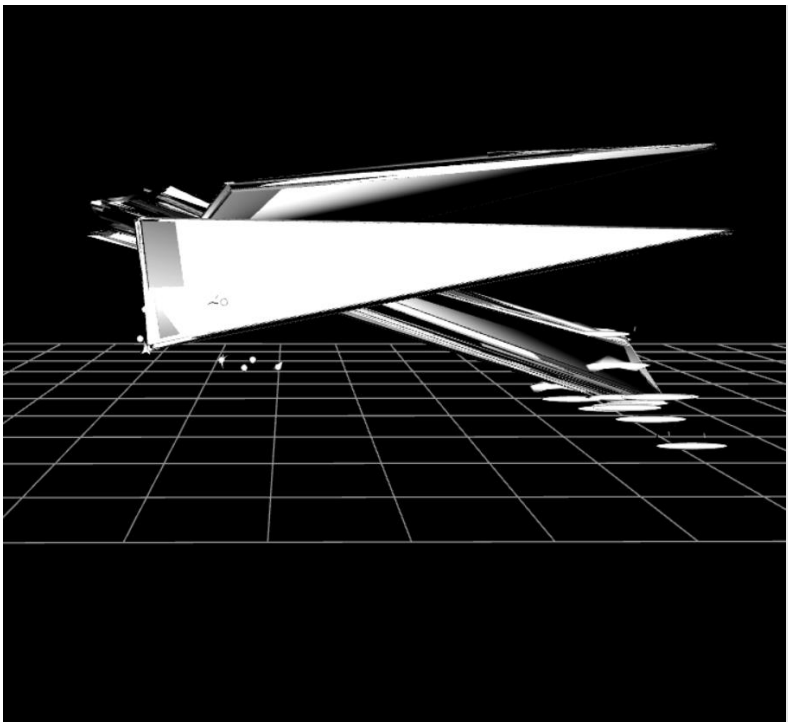


Figure 72 - Polygonal trace-form creating filled and sculptural form in space.

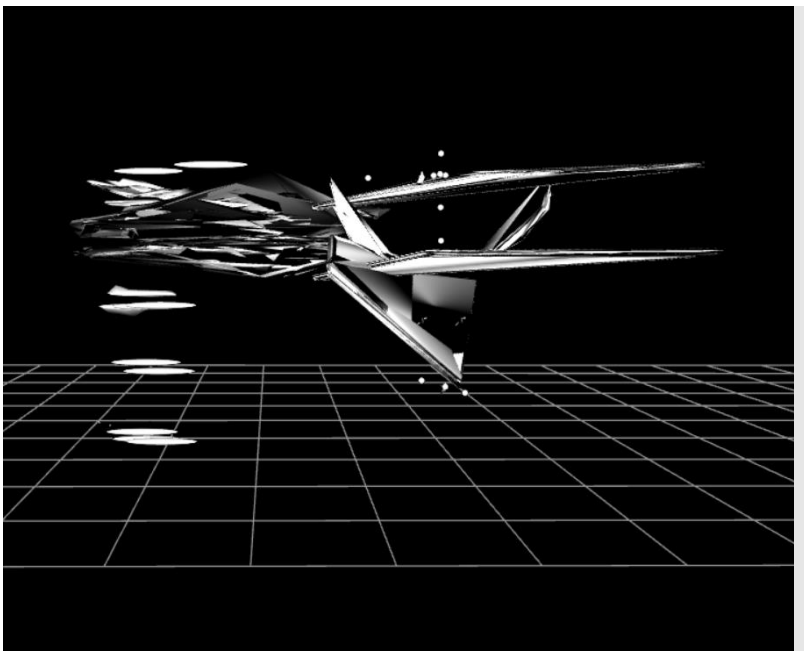


Figure 73 - Polygonal trace-form echoing in the space.

In summary, this chapter has outlined how I have developed the studio environment, workshop design and visualisations to explore how *Sculptural Qualities* can emerge when improvising in these environments. The body-mind-space relationship experiments are supported by PaR methodologies and conceptual theories (see chapter two). I have also discussed the workshop design, its warm-up, and improvisational activities and how they allow the dancer/movement practitioner to connect with the body-mind environment. I focused on the digital model developments and the rationale for their developments using the Motive and Touch Designer software. Using Laban's trace forms to influence the creation of variations and expressive pathways of movement offers an exciting relationship between movement and visual art. Each software offers a unique visualisation and, thus, different embodied possibilities for creating *Sculptural Qualities*. These setups, approaches, and practices are vital parts of the findings of this research, feeding into the framework of accessing and activating *Sculptural Qualities*, which are presented in chapters six and seven.

# Chapter Six: Activating *Sculptural Qualities*

*The feel of movement is, in these two poses, is concentrated on the symbolism which the shapes of space reveal to people sensitive to such impressions. In a state of concentrated inner attention almost everybody is sensitive to such impressions*.

- **Rudolf von Laban**
**(Laban & Ullmann, 1980, p. 86)**

## 6.1 Introduction

This chapter examines insights into emerging *Sculptural Qualities* and how to **activate** them. As discussed in the previous chapter, the framework for accessing *Sculptural Qualities* (see 5.2 and 5.3) offers set of methods and techniques as a foundation, a scaffold, for the next stage of exploring how *Sculptural Qualities* are activated within motion capture environments. Therefore, activating *Sculptural Qualities* involves attending to the intertwined relationships between improvisers' living experiences and the motion capture environments, which have rhythmical, temporal, symbolic, and dynamic qualities.

*Sculptural Qualities* emerge from practical investigations in the studio in combination with PaR methodologies (chapter four) and relevant theoretical underpinnings (chapter two). *Sculptural Qualities* encompass the shaping process, which is procedural and relational to embodied experiences within physical and virtual spaces. The expressive qualities of form, movement, environment, and embodiment resonate and extend beyond mere physicality, recognising the interconnections between the body, mind, and the technological environment. This chapter focuses on critical discussions and analyses drawing on audio-visuals document(ation) of the practical explorations and their visualisations - and the idiographic approach to interpretive phenomenological analyses (see 4.5).

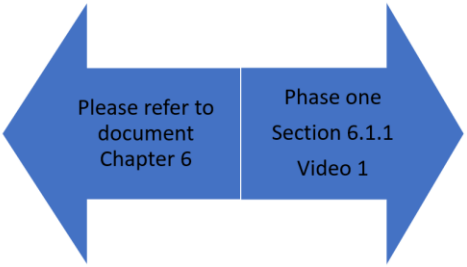
Phase one contains my experiments in the MoCap environment. It discusses and analyses the embodied experiences in the roles of a practitioner-researcher, observer-researcher, and performer-creator (see 4.4.1). During phase one, I arrived at four initial core elements that activate *Sculptural Qualities*: **repetition, accidental intentions, stillness (as a state), and stillness with T-pose.** These four core elements were the springboard for further experimentation within studio practice in phase two. Due to the continued restrictions of COVID-19, phase two has two parts: part one – experimenting with the role of the participants-researcher, observer-researcher, and performer-creator. Utilising the new visual programming software Touch Designer (TD) enabled me to design a workshop. Part two involves workshops with participants, observations and their reflections supported by semi-structured questionnaires (ethnographic methods). In response to workshops, movement practitioners demonstrated a profound active engagement with the explorations of *Sculptural Qualities*. They exhibited heightened awareness and

embodiment, embracing the interplay between their bodies and digital trace forms. The fusion of the different visualisations influenced their artistic expressions and enhanced the understanding of the four core elements developed in phase one and conceptually developed in phase two.

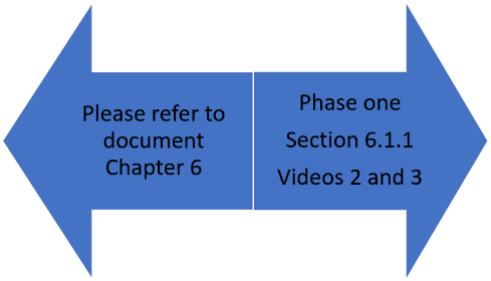
Phase three focused on exploring *Sculptural Qualities* with two movement practitioners simultaneously in the same space. It required further development of visualisation of digital models and trace-forms. Movement practitioners experimented with and accentuated form, shape, and their spatial relationship through these visualisations in real-time. As a result of these interactions, *Sculptural Qualities* emerge spontaneously with a sense of curiosity and openness, shifting the practitioners' perception and connecting the physicality of their bodies with digital traces and models. The participants' reflections developed the conceptualisation of the four core elements from phase two and contributed to renaming a few elements. For example, accidental intentions are renamed into **accidental micro-intentions**, and stillness as a state into s**tillness as a dynamic state. Repetition and T-pose with Stillness (not being renamed).** These core elements are explored in this chapter's sections 6.2-6.5. This chapter is supported by the video recordings of the studio-practice, accessible through the document – Motion Bank – and the video annotations enable the reader to view and prompt the moment of analysed movement and experience in relation to Effort-shape qualities.

### 6.1.1 Phase One - Findings

The activation of *Sculptural Qualities* was developed through focused improvisatory explorations with different visualisations (see 5.3.2) and is further discussed in chapter five. In phase one, I explored the *line visuals* and my immediate responses to those visualisations. As a dancer and improviser, sometimes I explore movement only with allocated body parts. I was interested in how these explorations with *line visuals* would transmediate into the motion capture environment and what it could offer to *Sculptural Qualities*. It was essential to consider each body part's inherent shapes and functions and their *Sculptural Qualities* as a whole.




For example, in video 1, the three markers on the hand were selected for *line visuals* to appear. I engaged the arms with the hands, mainly exploring movement from that body part and shaping circular movements, opening-indirect shaping, and curving trace forms. I observed the wall-like shapes with opening-direct/indirect-sudden qualities introduced circular shaping of the *line visuals* and with a sense of separate journeys. The circular trace-forms created an interest in repeating it in the same and opposite directions. The trace-forms evoked a playful game-like interest to see if I could create a full circle. The circular explorations began repetition discoveries with direct/indirect-sudden and bound flow. My movements were mainly within the kinesphere, and when I returned to the same wall-like shape position, it created the initial sense of stillness, even within the T-pose.




In video 2, I further followed up the repetition with elevation of the full body movements. Utilising the wall-like shape with opening-direct/indirect qualities, I moved into variations of repetition with hips twisting and opening-closing/rising-sinking (jumping jacks) movements. Additionally, my leg and arm swings or circular motions had returning-repeating patterns with dynamic shapes (Figure 74) (almost like an angel) with overt line qualities, and the *line visuals* being accented and some echoing of these accented lines. When analysing how these *line visuals* were created, in video 3, the accented lines were the re-new lines of the history markers, and the echoing lines (less visible) were the line history of the markers but less

visible (hence the echoing description of this sculptural motion). It introduced exciting tensions within *repetition*.

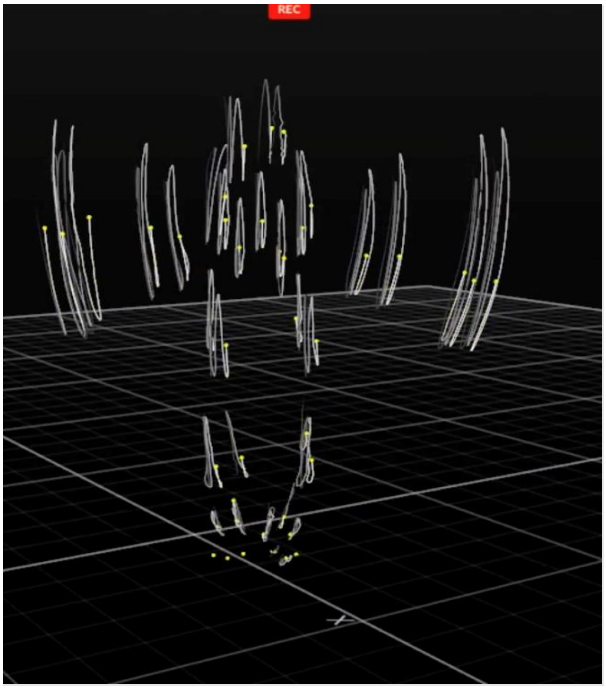



Figure 74 - *Line visuals* of the full skeleton in Motive. Movement elevations and repetition

Within the tension, the different body parts, arms and legs come into play, allowing variation in the elevation movement and developing the repetition in different shapes with a direction and volume in three-dimensional space. For example, in Figure 75, the *repetition* is experienced through *circular* and *curved* shaping with its qualities of opening-closing and rising-sinking (like an angel or butterfly wings).

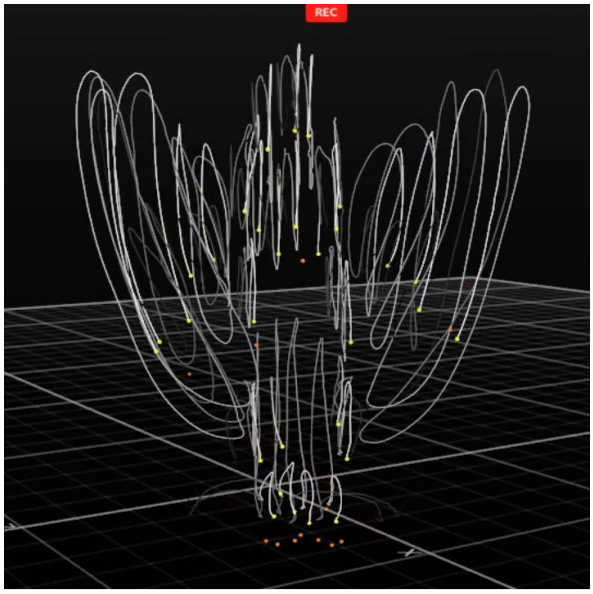



Figure 75 - Image of *line visuals* of moving body with body action - elevation and use of repetition, with arms circling curved pathways in space.

Moreover, when I introduced jumping (like jumping jacks), it had a feeling of extensions and expansion with the reach towards the edges of the kinesphere (Figure 75). In this example, my explorations were aiming to see what the visualisation would look like when I performed continued opening-rising and closing-sinking, and the emphasis again was on the opening-rising to continue the overall shape of these *line visuals* (evoking imagery of the insides of a walnut when it is halved as seen in Figure 76). These inter-relationships offered fluidity, transformation, and dynamic interplay to *Sculptural Qualities*.

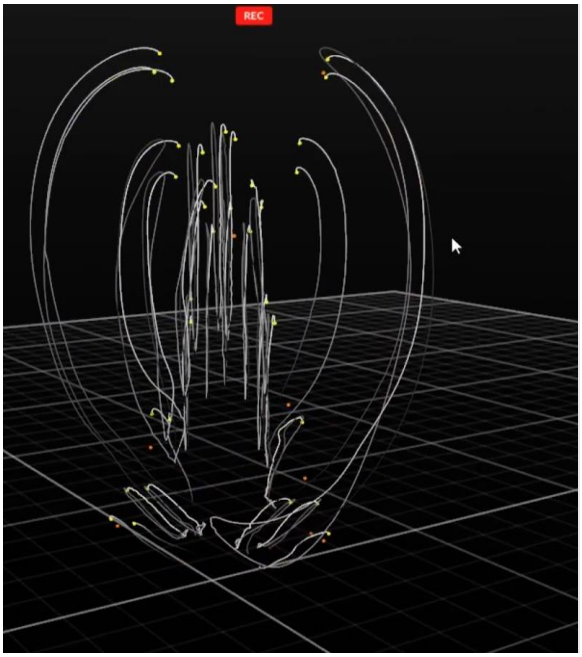
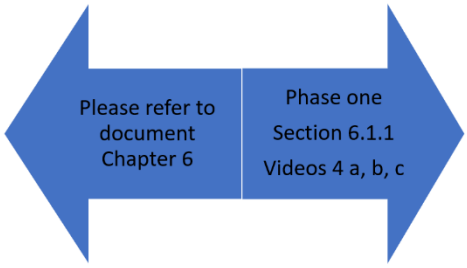



Figure 76 - Image of *line visuals* of moving body – body action in elevation and use of repetition

Upon observation, these shaping qualities were explored with whole body movements and 41 marker sets. These *repetitions* can differ depending on how I use my body and interact with the *line visuals*. Therefore, my body is active in a three-dimensional space, interacting with the volume of the environment. Upon viewing these images and snapshots of these experiences, I saw the connection between these shapes and Gormley's work *Clearing V* (2009) (Figure 77).

Figure 77 - Lucie's photograph of Gormley's work Clearing V in London 2019.

In this work, Gormley uses "over seven kilometres of thick, flexible, square section aluminium tube" (Smith, 2019), which expands into the space and is confined by the space simultaneously. The continuous loops and arcs define the perspectives of distance, ordered recession, and a vanishing point. The skeletal caverns enable possibilities of path or passage through its field. The visitor experiences it and tries to push past or step through these swaying coils that tremble when touched; its dynamic field of energy shifts/shaping. As the visitors' experience, their bodies become part of the work. I felt involved in these entanglements, exploring their pathways by walking through them. The experience of engaging with these loops of thick tubes was asking me to re-think (the relationship between the body and the loops) and re-shape my body as I walked through them. Similarly, when I shaped my experience with the *line visuals,* I felt connected and absorbed by its dynamic lines and shapes, expanding loops and arcs. Consequently, like *Clearing V*, I had a sense of drawing continuous lines in space with sensations of expansion and extensions with opening-rising qualities.




The experience of shaping *line visuals* has led me to explore the kinesphere with different body parts like the head (video 4a), knees (video 4b), and hips (video 4c) in the following exploratory tasks. What is important to note in videos 4a, b, and c is that my initiation to move was the *line visuals* (like stimuli) with the body part, and the rest of the body followed; thus, the whole body was involved. Only the *line visuals* were visible on the allocated body part. Indeed, the tempo has developed, and with knees and hips, I felt sudden movements, which influenced the lines shortening behaviour. Once again, the playful game-like actions of keeping the line visible as long as possible introduced the sudden qualities and repetitions. With head (and neck) movements, the *line visuals* were longer, and the action felt circular with curvy shapes.

In video 4a, three-*line visuals* moved with me as the head has three markers to track it in the space. After a while, I realised I had one *line visual* left. This has sparked my interest, and further investigation allows me to conclude that, at times, the *line visuals* are active and inactive[62]. Therefore, the history of markers is not visible (this does not affect the raw captured data of that marker). Inspired by the glitch, I continued further in movement explorations. Upon reflection on this experience, I termed *accidental intentions* as one of the emergent *Sculptural Qualities*, where both the body and the technology are shaping and reshaping through the active and inactive *line visuals* (see 6.5).

While exploring these elements of *line visuals* with *repetition* and *accidental intentions*, I became aware of stillness. A prompt question made me reflect on the interaction between my body and the *line visuals*. I asked:

Q: *Would you prefer to stop and look at the visuals and then respond?*

[62] I use the language of actively as they are alive and inactive as they are lifeless; therefore, it is not associated with the technical term of the 'active' markers in motion capture technology.

Researcher: *Yes and no. If there was a little, perhaps 1-2 seconds delay, perhaps, but you have in this kind of version when you stop moving, so you have the stillness, the kind of lines, because they still travelling and then come back to you, so there is a small quantity of delay isn't it, so you can actually stop and look. And as they return to the marker, you can move again*.

I was attending to these moments of being still, introduced to what Howell (2013) calls a stillness as a ground[63] (p.6), the foundation repetition and *is performed*, or what Kaplan (1986) calls waiting-watching "the unfolding nature of authentic movement (de Leon, 2008). This witnessing element contrasts the dynamic movements. By intentionally introducing these moments of stillness, the *line visuals* (and motion capture data) can draw attention to critical moments of sculptural motion or emotions. It also suggested the feedback loop, where stillness can be utilised to adjust the temporal aspects of the sculptural motion. I call this *stillness a state*[64] where I was actively aware - observing-listening-witnessing - to explore this stillness with playful trace-forms.

Through the awareness of these experiences, my body positions itself into a T-pose before moving and pausing after the phrasing with *line visuals*. This T-pose is a calibration pose within the MoCap/PeCap practices. At first, this was imposed on the body-mind due to this technical requirement. However, as the explorations developed, a deep connection was established with the T-pose at the beginning and the end; thus, it introduced an element of phrasing at first (and developed further in section 5.3). The body is perceived in a stable position-preparation, transitioning through an unstable position-action, and ending in a new stable position-recovery. The stillness was felt during this T-pose, and I later defined it as a starting point of exploration within section 6.3. In this instance, stillness can be interpreted as "an opportunity for experience of the symbolic" (de Leon, 2008).

In summary, this section discusses phase one explorations, which I undertook in a practitioner-research role and methods of self-observation and self-reflection. The

[63] Howell (2013) emphasises that Emma Hamilton's bursts of stillness and immobile sculptural attitude, in a short duration of tableaux, enabled her to transform the art of the model into an art in its own right in the 1790s.
[64] Howell (2013) suggests that the state of Zen is achieved through this stillness as a state. I interpret the state as active, where the improviser's body is engaged.

first movement explorations with motion capture technology allowed me to design a workshop to identify what *Sculptural Qualities* are emerging in these environments. Using *line visuals* as a digital trace-form of my pathways enables me to arrive at opening-rising movement qualities and *unfolding augmentations* as *Sculptural Qualities*' main characteristics. Because of its spatial expansions into the environment, it evokes a sense of openness and invitation to engage with the space in a dynamic, playful, and immersive way. Furthermore, these explorations with *line visuals* and the functionality of the history of markers (within Motive software) enabled me to identify some **core elements** that **activate** *Sculptural Qualities* within motion capture environments. These are **stillness (as a state), T-pose with stillness, repetition, and accidental intentions**. These core elements were the springboard for phase two and further development in workshops with participants to explore how these core elements worked for and with other dancers. The approaches and analyses are discussed in the next section on phase two.

### 6.1.2 Phase Two - Findings

Following on from phase one explorations and the foundation of initial findings of potential characteristics of *Sculptural Qualities* as temporal unfolding its core elements (see above), I found myself developing the studio practice with further:

1. Explorations of new visualisations with Touch Designer (see 5.3.2 and 5.5).
2. Exploration of a new space to improve viewing experiences with three larger projector screens in space (see 5.2.1).
3. Design a workshop for other participants to engage.

During the workshop design, I developed warm-up exercises and *Range of Coupling* (see 5.3.1).

The movement practitioners (M1-M4) participated in workshops that emphasised the experimentation between the bodies, actual and virtual, the digital trace-forms, and the environment. It allowed them to find themselves in a more profound moment of expressiveness with their bodies. For example, M2 commented in the final reflection of the workshop as follows:

Mover 2: *It is like opening up another door to dancing. It created a completely different way of thinking in body movements.*

*I know that technology can communicate with the body, but this is the actual experience myself. Knowing that means feeling that how it*

*connected together. So, make me reflect back to what I have seen before. I can understand more how they are connected* (Appendix 11, lxxv).

M2 suggests the connections between their lived experiences with the body and the technology. Also, it provided space for reflection and opened new possibilities for expressive movement and 'thinking-doing' within M2's body-mind.
M2 referred to the overall experience of the first two tasks with *line visuals* as the notion of *drawing* almost in a poet's way:

Q: *A few times at the beginning you said …the first three task you said you are drawing…How would you associate the drawing with the with the first few tasks? Because you kept saying: I wanted to draw a perfect circle*.

Mover 2: *Because the first two [tasks] have lines, and then I feel that lies in when we usually draw using the pen. So, I feel that line is coming out from that pen, so it creates lines that feel like drawing* (Appendix 11, lxxvi).

Similarly, M3 discussed in reflection-in-motion the 'drawing with my body' and 'my name' in task two (Touch Designer dots with feedback) – where the visualisation was changing colours. These changes of colours resulted from M3 moving through the physical space, and depending on where they moved, the colour changes from green to purple, to yellow, to red, and so on. Therefore, M3 reflects on the drawing explorations as follows:

Q: *How can you describe what you see when sensing-moving-observing-responding?*

Mover 3: *I am observing. Basically, it is a tool to draw using my body. I am sensing that the colours change, and therefore, the movement over here needs to be slower. Because of the colour, the movement over here seems faster; it just fits (Appendix 11, lxxxii).*

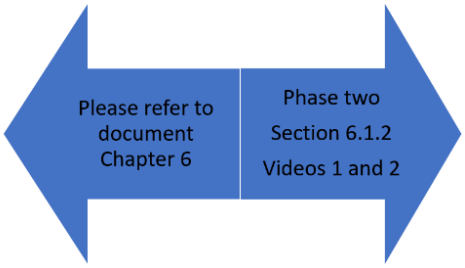
*I've also observed that I move slowly. I can draw a more distinct line, but if I move fast, it's a little bit more scattered. I tried drawing my name. I did not do a very good job.*

Within the same task with colours, M2 also felt it was like 'shaping a picture, with the different shapes and colours and reflects-in-action as follows:

Mover 2: *I don't feel like that's more like a drawing, more like energy and the spirit things. The last one is because it has colours, different colours and they collaborate.*

*And what the colour collaborates, and the shapes are collaborate, and that just reminds me and also creates shape when I'm moving. So, these are reminds me pictures like a painting. Like some of the contemporary arts you know, just using colours to create a paint (Appendix 11, lxxvi).*

By embodying explorations with these notions, movement practitioners can evoke specific visual and tactile elements in their movements, affecting visualisation. I reflect on the opening-rising shape qualities of M2 and M3 within this task 2 (dots/blobs with feedback).




For example, in video 1, when M2 responds to changing visualisations and colours, the advancing and retreating stepping or running travelling have a sustained shaping with some suspensions and opening-rising-sustained moments of stillness. The sculptural quality manifests as continuous unfolding reminiscent of fluid brushwork. In contrast, M3, in video 2, responds to these shaping changes of colours with sudden-direct qualities, jumping and hoping travelling, often sinking-sudden-direct and embodying vibration (rising or sinking) movements, evoking expression akin to making bold brush strokes.

Therefore, by intentionally incorporating these *Sculptural Qualities*, the movement practitioners activate a unique visual dimension to their movement performance, akin to painting-drawing with their bodies. During my Laban studies, I experienced improvisational exercise to 'paint the kinesphere' - the immediate space

around the body - with different body parts, prompting me to explore levels (high, medium, low) and Effort qualities. When I developed these exercises and pretended that there was a paint bucket with different colours to 'dip in' the body part as a paintbrush to start painting these pathways within the kinesphere, I could explore the different Effort-shape qualities. Not only painting-drawing the kinesphere but also the space and the pathways the body makes heightens awareness of spatial relationship and develop a sense of presence within a motion capture environment. Within task 1, M4 reflects on the 'shadowing presence' as follows:

Q: Can you describe what you are observing when sensing-moving?

Mover 4: It's like a shadow following me, it's almost like having a presence like you are walking and you are still there. Looks like delayed you part of you trying to catch up to you *(Appendix 11, civ)*.

In this sense, the movement qualities of *line visuals* give an impression of a delay and evoke a 'shadowing'[65] presence. This links to elements of Schlemmer's Stick dance work (see 2.3.4), where the dancer's body, dressed in black, blends with the black background. The long white sticks evoke the shadowing presence of the dancer's body. The presence of the body is felt in both examples, offering interesting elements for *Sculptural Qualities*. The temporal aspect of the visualisation (lines, dots/blobs, and particles) imbues the sculptural form and motion with continuous movement, which is shaping-reshaping. The improviser interacts with the shadowing presence as abstract visualisations, activating *Sculptural Qualities*. Therefore, the shadowing presence creates a seamless and captivating interactive experience – *experiential couplings* of *Sculptural Qualities*.

### 6.1.3 Phase Three - Findings

Phase two laid the groundwork for further developments in phase three. It is important to note that phase three workshops were designed for movement participants working in pairs. Working in pairs was a natural progression from phase two to expand this study's scope and potential impact. The workshops explored how

[65] Laban and Ullmann (1980) discusses shadow moves are movements revealing the inner attitude action-moods performed with a conscious or unconscious intention. Moore (2005) suggests the "small, fleeting action" (p.38) with the body, presents the elements of shadow moves.

*Sculptural Qualities* emerge, and are access, and activated between two movers and their improvising bodies, actual and virtual. Within this phase, I developed the warm-up exercises (see 5.3.1) to accommodate the interaction between both movers. For example, the exploring space, Laban elements, and the puppet were further developed where both movers interact, connect, and work together.

The dynamic relationship between the two participants facilitated insights into the emergence of *Sculptural Qualities*. For example, the confluence of movement expression with the notion of drawing-painting within phase two also emerged in phase three with MC, who reflected after task 2 as follows:

Researcher: *What did you find that you have attended to when responding to visualisations….?*

Mover C: *For me, that time I was a composer. I was an artist. And that what was being created on screen was my main job, if you like.*

Researcher**:** *What was it like to create these kind of visualisations?*

Mover C: *It was really satisfying like I was. Saying when we were doing it. It felt more that. I was an instrument rather than a presence. So, I was less present in my experience of what I was doing. But I didn't feel negative about that or feel like something necessarily was missing. It felt like I had a paintbrush and hits was it and I was creating a piece of art. The experience was very different to the middle one. But still very satisfying (Appendix 11, clxvii).*

MC suggests the body's position as an instrument[66] - a paintbrush - for the 'doing-moving' of a creative piece of art. Similarly, Mover E felt like a painter, in task 1 with *line visuals*.

Mover E: *I feel like I am a painter (Appendix 11, clxxxii).*

Like the pen and paper example by Clark (2008), these external instrumental tools become cognitive extensions for MC and ME in this explorative task within motion capture environments - the digital trace-forms produced through these interactions extend MC's and ME's artistic expression. The extension could suggest that *Sculptural Qualities* convey the 'satisfying' emotions of 'doing-moving' and act as an

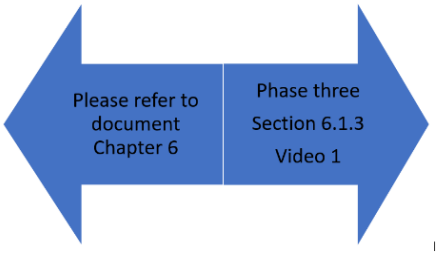
[66] The improviser is "composing an instrument" (Dudas, 2010, p. 29) where the digital models and trace-forms are pre-designed as part of the interactive *Sculptural Qualities* and mocap system.

external impression of the movement practitioner's creative process and imagination. Therefore, these digital trace-forms serve as a cognitive 'scaffold'[67] to improvisers' ability to shape their bodily intentions within these environments, much like the pen and paper outline the thoughts and ideas of a writer (or the paint and brushstrokes of a painter, or clay and hands to shape sculptor's thought and ideas into a sculpture). MC suggested that working with another mover in the space during task two brought an awareness of other bodies in space, which influenced the co-shaping of the experience together:

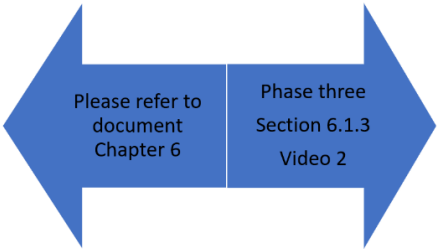
Mover C**:** *Yes, I felt that's the most aware of you. And I suppose you could say that's because it's at the end of the workshop until you've had more experience of it. And we spoke about. Acknowledging each other more so maybe those two things have influenced that, but it did feel it felt like we were composing together a piece of artwork. And that my ability to go form there to this space and to see these two places as the same place one of them digital and one of them physical felt so much easier because the processing of what I was seeing was much easier (Appendix 11, clxvii-clxviii).*

MC suggests that when moving with other bodies, physical and virtual, within this task, the composition of 'together a piece of artwork' was felt by MC. It proposes a collaborative approach to movement improvisation and co-creation with artistic expression. The spontaneous improvisational togetherness between two improvisers who are seeing-responding to their bodies and trace-forms in real-time, with verbal or non-verbal clues, can be considered a form of *comprovisation*[68] Cooke (2011) in the context of improvisational explorations and performance. Therefore, sculptural *comprovisation*, as a shaping process of witnessing, responding, augmenting, abstracting, and reshaping[69], can be influenced through interactions and spatial relationships between actual and virtual bodies within motion capture environments.

[67] Clark (2008) suggest that cognitive scaffold considers the cognitive processes and mental states to be externally scaffolded into the mechanical interactions - outside the human head.
[68] Dunn also refers to "compositional improvisation" as "improvisation/composition" (Buckwalter, 2010, p. 107) (Nikolai & Bennett, 2016).
[69] Holmes (Dudas, 2010) suggests that improvisation and composition include "listening, reacting, augmenting, and creating". In this research, the process of shaping can be associated with comprovisation.

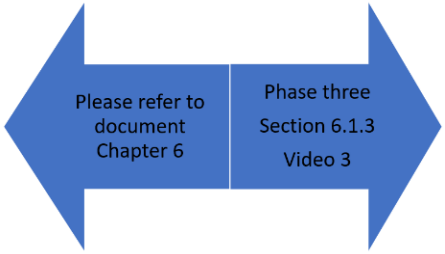



For example, in video 1, MC and MD were comprovising without verbal prompts. The shaping experiences of their bodies, trace-forms, and the environment bring them to co-create and improvise together in real-time. During these explorations, MC initiates the co-creation and MD responses with either mirroring movements or travelling patterns, and from spontaneous decision-making, shaping their intentional sculptural *comprovisation*.




Another example of sculptural *comprovisation* is in video 2, and I observed ME and MF in task 3 (visualisation with TD floats, spikes, and polygons) exploring their individual sculpting digital improvisers and digital trace-forms, then suddenly moving into a dialogue with each other and their visualisations. Their bodies (phenomenological and composed) were intertwined, exploring space around, over and under each other. ME and MF were weaving through each other like seaweed in the ocean water (or interwoven lines creating a meshwork (Ingold, 2011)), activating shaping, reshaping, and stillness and co-creating by observing and witnessing its impact on the visualisations. When improvisers explored spatial relationships between their bodies, they contributed to the evolving and temporal shaping experiences. They affected visualisations with arc-like and poke-like qualities and sculptural forms. Utilising the mocap and visualisation technology as the ‘enabler’, capturing the essence of the improviser’s lived experiences facilitated the shaping and reshaping while responding to floats and spikes visualisations in real-time. The

immediate feedback influences their ongoing collaborative improvisations – sculptural *comprovisation* - developed through *holistic and organic Sculptural Qualities* within motion capture environments.




Similarly, in video 3, Mover G started to respond to my line visual (Mover H) during task 1 (with *line visuals*). The spontaneous decision to chase my one-line visual, catching it, and pulling it back towards MG's body felt like a playful game-like experience. The interplay between spontaneity and structure enabled the shaping process to activate sculptural *comprovisation* between MG and me (MH). MG reflects on the experience:

Mover G: *I think we're very individual to start with and then it was what can we do with this? How can we make something performance of it? So, then it came secondary (Appendix, ccxvi).*

Mover G suggests that firstly we were both responding to *line visuals* individually in our own spaces. However, when MG lost *line visuals*, started to interact with my *line visuals* (MH) shaping improvisational responses to compose - co-shape – together and activate *Sculptural Qualities*.

All three phases contributed to the overall understanding and emergence of *Sculptural Qualities*. In phase one, I examined the first movement explorations employing Laban's Effort qualities and weight-rhythm movements with *line visuals* trace-forms to find ways to access *Sculptural Qualities* but also to seek how they emerge within the mocap environment. The initial findings of core elements of *Sculptural Qualities* were a springboard for phase two and three. Movement practitioners joined the studio workshops in phase two and three and engaged with developed visualisations of digital models and digital trace-forms. Participants were

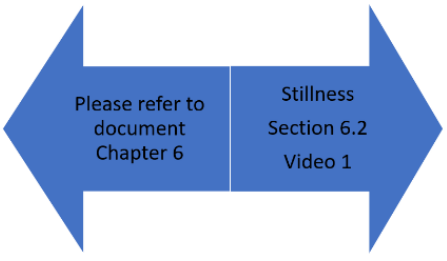
actively and exploratively forming connections between the physical and virtual, emphasising the interconnectedness with all the aspects - environmental components of bodies, digital trace-forms, and the environment. These interactions and relationships form the four core elements in activating *Sculptural Qualities* within motion capture environments: Stillness as a dynamic state, T-pose with Stillness, Repetition, and Accidental micro-intentions, discussed below.

## 6.2 Stillness as a dynamic state

> Movement is man's magic mirror, reflecting and creating the inner life in and by visible trace-forms, in turn also reflecting and creating the visible trace-forms in and by the inner life. The simplest visible element of this startling and paradoxical operation is the plate between the axial-stable and the surface-mobile bodily movements, or, in other words, the struggle between the binding power of a knot and the loosening power of an untwisting line with an intermediary lemniscate (Laban, 1966, p.104)

In other words, Laban suggests that movement is eternal change of stable and mobile states. Stability in dance facilitate the temporal state of stillness - equilibrium. On the contrary mobility aims towards flowing movements, the temporal loss of equilibrium. Therefore, creating a tension between stillness and moments of flow in dynamic space - where "movements flourishes" (Laban & Ullmann, 2011, p. 94).

As a dynamic state, stillness can be found in various practices such as somatic, spiritual, and phenomenology. It is important to note that different cultures and disciplines may explore stillness as a state with different perspectives. For this research, the exploration is of stillness as a dynamic state in its own right. I discuss this through the merging lenses of somatic movement, embodiment, and perceptual engagement and how it activates *Sculptural Qualities*.




In video 1, Mover M3, within task 3 (phase two), is noticing stillness as an act of watching – seeing – witnessing the visualisations on the screen, which Kozel (2007) refers to *being there*[70] in the digital space. M3 interpreting it as a delay, in this task, - being aware of that delay - encourages M3 to be still with opening-rising and pin-like shape qualities. As the improviser moves outward and with hand attending towards the edges of the body kinesphere, extending and the leg reaching towards the other side, it creates a tension within the moments of stillness. The association of watching could be interpreted as reading an image, in this case, reading the "fireworks" as M3 interprets the visualisation. During the active reading of the fireworks, M3 comments on the qualities of her movement and what effect it has on the fireworks

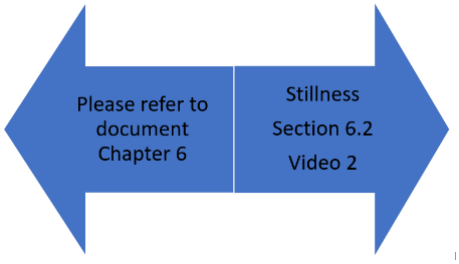
Mover 3: *When I move slowly, it seems like the fireworks are bigger. When I move fast… they are a little bit more dramatic at least (Appendix 11*, 218).

Similarly, Mover M3 felt the change of movement qualities in task 5 and reflected as follows:

Mover 3: *This is an interesting one. Because I definitely started out faster. And then I had a moment of stillness – slow flow. I would only describe this flow you know, because of the water image (Appendix 11, xcvii)*.

[70] The phenomenological lens interprets the state of 'being there' in reference to Heidegger (1962) concept *dasein.* The *dasein* concept is related to the nature of being; of being-in-the-world, a lived experience and something concrete and actual.

Here, M3 suggests that reading the 'water image' enabled the stillness in space and time. This sculptural water image is not motionless like it would be in the static art of sculpture. Instead, it is engaged, fluid, and oscillates between the lived bodies, the phenomenological one and the composed one (see 2.4.1).




In video 2, Mover 4 attends to stillness as a moment of witnessing the relationship between the body parts and the particles with opening-rising and pin-like shape qualities. The contrasting exploratory moments of closing-sinking-sudden movements emphasise the following instants of stillness. M4 comments in reflection on action in task 3:

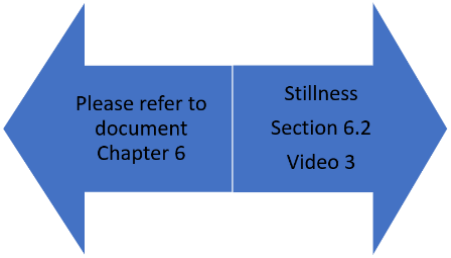
Mover 4: *To seeing how even when I'm still the visual doesn't stop it continues and which the other ones haven't. I don't feel like I've done that. Almost like even though I stopped moving and then the actual visual is continuous moving it doesn't stop. So, there's no room for stillness there's always something going (Appendix 11, cxiv).*

Moreover, M4 adds in writing reflection as follows:

Mover 4: *With stillness, the visuals grow and become clearer* (Figure 78).

Figure 78 - Dancer 4 in stillness with the visuals growing and becoming more explicit.

Thus, the stillness is in motion – continually growing qualities. It is also sensed, witnessed, and experienced beyond the functional movement.




The sense of 'beyond' is felt by mover M1 in task 5, video 3, where moments of rising-opening and pin-like shape are explored with stillness. The witnessing of the particles enables M1 to reflects in action:

Mover 1: *They keep, they keep going. It does not stop that it that's also held. But still.*
*Even then...It takes some doing and then it's really explosive.*

Similarly, Mover M3 (Figure 79) reflects on the action, in task 3, as follows

Mover 3: We are never *really still as dancers or as human beings by rest …the breathing. The body functions going. So, it's actually quite interesting getting the mind as well. I didn't think about that.*

*But like these this sort of sea urchin firework looking. Representation it really does show how the energy continues to flow outwards even when we are still (Appendix 11,* 221).

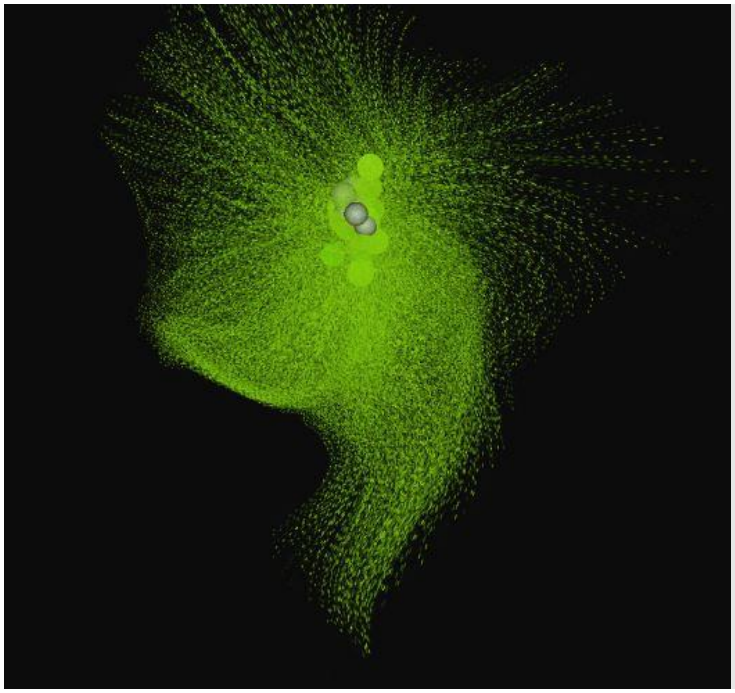


Figure 79 - Dancer 3 in stillness with visuals in task 5.

I reflect on the moments of breathing with stillness. Breath is part of body fundamental kinetic impulses from the moment of birth. Bartenieff suggests that

> Movement goes out into space and creates shapes. But also, there is inner space, and breath is an inner shaping experience. The body shrinks and grows with each breath. Inner breath changes can be supported by sound. Posture is not built by muscles but by the whole way you breathe (Bartenieff cited in Konie, 2011, p. 2).

Therefore, the breath offers rhythmical qualities of expanding and narrowing (of the ribcage) and brings attention to the rhythm of stillness (Reynolds & Reason, 2012).

With the improviser's breath (in most of the video recordings), the rhythm of stillness shapes intentional movement into sculptural forms; like in performance capture, breath signifies that the digital model/animation is alive (Dower & Langdale, 2022). In Gibson's work on capturing stillness, she suggests "how the technology may need to be adjusted or applied differently to support the reading and capture of the 'invisible', the labile, the dancer's 'inner landscape' and 'internal' processes" (Reynolds & Reason, 2012, p. 275). In this research, mocap technology with Touch Designer enables the visualisation of stillness and offers a visible representation of these inner processes by activating *Sculptural Qualities*. I reflect on observing these stillness experiences (and the Figures 76, 77) and proposing that sculptural stillness is *animating* the living-lived bodies with

growing,

glowing,

extending and

penetrating qualities.

Mover M1 notes familiar sensing of extensions in the final reflection on the overall experience:

Mover 1: *It is quite interesting in terms of, like you see, an extension of the body, so when that and you saw the stillness and the energy was happening, it was a good reminder that we exist beyond that.*

The 'beyond' the body and stillness that exists beyond the physical body, and the mere presence of movement acknowledges that the consciousness and being-in-the-world extend beyond the immediate physicality. Therefore, stillness, which emerged from the participants' responses in real-time, implies a specific embodied and extended experience with an awareness being active. It suggests that *Sculptural Qualities* are **activated** in moments of stillness as dynamic and active engagement with the *I-body* and the motion capture environments. The *I-body* remains receptive to the environment and its sculptural potential.

Observing these images, videos, and the above writing, I feel great connections to Gormley's figurative works exploring the body's relationship with space and the environment. When I visited his exhibition, I felt his works evoke a

sense of stillness - freezing moments - of bodily expressions and extensions. He invites the audience to engage with the human form in various spatial relationships. Similarly, within this research, the stillness invites the movement practitioner to interconnect with the self, body, and environment. Stillness invites the experience of existence beyond the physical, as movers' *I-body* becomes an extension of their perceptions and activates awareness of *Sculptural Qualities*.

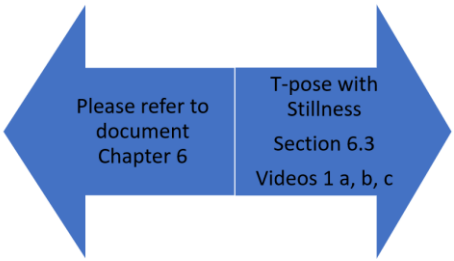
In summary, the moment of stillness adds a sculptural dimension to the temporal aspect of the *Sculptural Qualities*. Stillness presents an awareness of our body-mind's relationship with the motion capture environment and offers the emerging temporal aspect to co-create with the body. By activating the stillness with 'beyonding' qualities of bodies-*in*-space and time through looping feedback, its dynamic and temporal sculptural form is experienced as an instance of cognitive processes being extended into the environment and technology. The activated dynamic stillness also brought an attention to T-pose, like Mover 1, in the video 3, activating stillness with the T-pose offering opportunity for encounter with symbolic sculptural T shape, which is discussed in the next section.

## 6.3 T-pose with Stillness

During phase one, I became aware of the connections between stillness and T-pose while improvising within the MoCap environment. As previously mentioned in Chapter Four, T-pose was imposed on me as a technical element of performance capture when calibrating the actual body with a digital model. However, after intensive workshopping, I have become aware of its opening-wide shape, with a sense of dynamic presence. This T-pose became a vital part of the overall sculptural process. It introduced the starting point for the explorations as opposed to the temporal stillness as a dynamic state, which emerged through the movement exploration.

During phase two, T-pose with Stillness became the springboard for creating a warm-up technique, *Range of Coupling* (see 5.3.1), which became a critical method for accessing *Sculptural Qualities* within motion capture environments. As participants were guided through the ROC, for example stage 1, I used the term T-pose with Stillness. Thus, this element of *Sculptural Qualities* became part of the participants' experience instead of being naturally discovered by them. From this perspective, my reflection is formulated from my researcher-creator role to further understand the *state of presence* and how participants engaged with it.

Starting with the T-pose, which carries *Sculptural Qualities*, with arms outstretched horizontally, I have a sense of almost touching the *edges* of my kinesphere, with my middle finger being the further point from my centre. With feet slightly apart (in parallel position), this opened and wide shape creates a balanced bodily configuration. Similarly, like Gormley's practice of exploring the relationship between the body and the environment, the body shaped-T-pose as an *iconic symbol* of motion capture techniques offers awareness and points to new spontaneous movement explorations and artistic creation. I will return to the *iconic symbol* in a short while. Firstly, I would like to discuss the T-pose through a phenomenological lens. Inspired by Merleau-Ponty on embodiment, the T-pose offers a starting point for symbolised engagement with the environment.




In videos 1 a (mover E), b (mover F), c (mover C) (and myself in Video 2 which I discuss below) experience our T-bodies, their spatial relationship to the surroundings, and their potential for movement and action. In all the videos examples, the stillness is injected with attention and presence before we all start moving towards a moment of reflection. Through the spatial confrontation of the actual and virtual bodies within three-dimensional space, the sculptural T-pose is in a play with stillness qualities, animating the (Figure 6) *I-body-as-sensory-device*. Thus, *I can-I am T-pose with Stillness as a state of presence* (Figure 80) (Sykes, 2021).

*As I am 'still' in space, I am aware of number of things – my direct focus is intertwined in-between inner and the outer, the active listening-observing-sensing of inner still alertness, the continues drawing into interior – the extended freeze, I am attending to the immediate experience of this action and the relationship between my bodies the physical and the virtual, intentionally performing and sculpting my awareness to a rhythmical readiness and a meaningful 'stillness'.*

*I am - I can*

*Sensing, sense*

*Moving, move*

*Being, Be*

*I am - I can*

*T-pose with stillness as a state of presence.*

Figure 80 - Lucie's 'writing-dancing/dancing-writing' reflections on T-pose with Stillness.

Within this dancing/writing reflection, I experienced T-pose with Stillness as a) the state of being - attending to 'here and now', b) the sculptural sensibilities.

In the context of Clark's Extended theory, as the motion capture technology records the 'spatial data' and creates digital data of this position as a skeleton, it could be argued that it extends the movement practitioner's body into the virtual realm. Therefore, this extension exemplifies how technology becomes an integral

part of the cognitive process and the experience of existence. Furthermore, through this process, the performers' *I-body*-as-sensory-device becomes embodied within the virtual environment. Stillness, in this instance, provides a profound exploration of this 'extending' and perceiving their existence in both physical and virtual realms. Stillness emphasises and enriches the sense of *being.* This interconnectedness between the *I-body* stillness and its dynamic impressions activates awareness of the T-pose. It oscillates between being-becoming entwined *I-body-as-sensory-device* within the motion capture environments – shaping technological and extended embodiment (Figure 81).

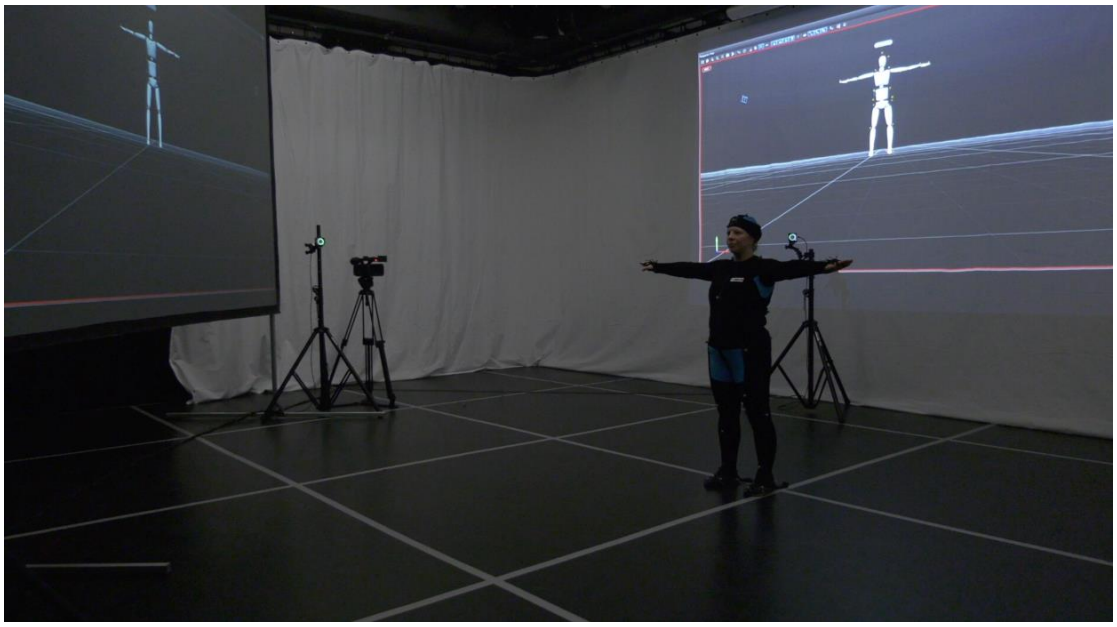


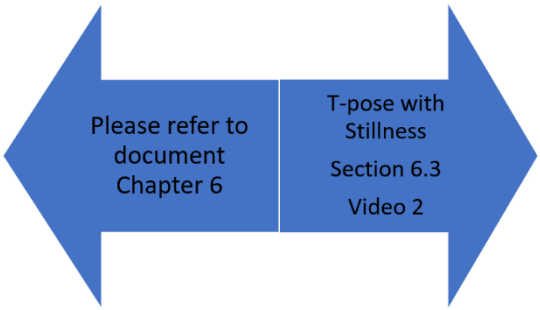
Figure 81 - Lucie's T-pose with stillness during calibration process in the volume in the studio praxis.

The T-pose, in the above image, has a specific purpose – to couple physical with virtual - within motion capture environments; I feel a sense of communal activity interconnecting all movement practitioners who perform this T-pose. In the above paragraph, I have written that the T-pose is an *iconic symbol* in the motion capture environment. As a symbolic-ritual gesture, performers adopted it as "[e]ach capture sequence starts and ends with a T-pose" (Dower & Langdale, 2022, p. 98). Therefore, this movement/shape has a ritual function for performance capture. At the same time, this T-pose connects individuals to their community – the performance

capture community – and reinforces social bonds amongst all mocap performers. When observing tableaux images from Mocap Vaults company, the tutors and performers always pose in the T-pose to summarise their training experience, often followed by an expressive monster-hero tableaux. Thus, this T-pose expresses the *symbolic* embodied ritual with significance to these mocap communities. The T-pose is rooted in this community's motion capture history and identity, where even Max Fleischer drew his famous Koko Clown in a T-pose with one continuous line. In dance and performance capture ecology, this T-pose plays a significant role in influencing and enriching the movement process. By including stillness as part of the T-pose ritual, I am inviting each mocap performer to sense sacredness as well as intentionally activate the *Sculptural Qualities* in the artistic process (Figure 82).

Figure 82 - Mover's E and F in their T-pose with Stillness coupling, connecting, and activating their Sculptural Qualities in the volume phase three.

Furthermore, in the last three years, I have performed the T-pose with Stillness in a performative demonstration during conferences and research sharing with and without the motion capture system (due to its availability and space).



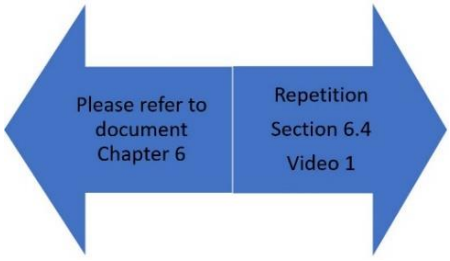

Video 2, is an edited short demonstration on how I engaged with the T-pose with Stillness in the presentation format (Sykes, 2021). On another occasion at the practice-as-research symposium (Sykes, 2022b; Sykes, 2023) organised by the University of Salford and *The Game On* (2022) (Sykes, 2022a), I asked everyone to join me in shaping their T-pose with Stillness. At the same time, I projected one of the images of the (virtual) body in the T-pose into the room. The extraordinary, embodied interconnection with mocap communities was felt by many. Similarly, during this research workshops for data collection, movers (M1-M4 and MA-MH) were engaging in a collective experience that can enhance the overall collaborative and creative aspect of *Sculptural Qualities* within a motion capture environment. Rituals are symbolic enactments creating an emotional connection, emphasising the body-mind coupling. Therefore, the *T-pose with Stillness has symbolic meaning beyond its functional value* within *Sculptural Qualities*.

As T-pose with Stillness became a ritual, it introduced the element of repetition within these studio-practice explorations. This repetitive use of the T-pose with Stillness enhances its symbolic embodied interconnectedness, adding another layer of dynamic repetition of improvising bodies. It also introduces its transformation, where movement practitioners and I can gradually modify the arms and body positions while maintaining the essence of the T-pose shape. Thus, this repetition adds complexity to *Sculptural Qualities* and demonstrates subtle reshaping in meaning within the ritual. As the movement practitioner explores the repetitiveness, it helps to refine and expand movers' creative ideas and discover new sculptural possibilities and themes discussed in the next section.

## 6.4 Repetition

Within the dynamic realm of motion capture environments, repetition emerges as looping interactions of sculptural explorations, shaping the essence of embodied expressions and digital creations while improvising. Laban suggests the importance of repetition in understanding human movement and expression. Laban's principles, such as Effort qualities (see 2.3.4), involve repetition patterns and variations to explore the full range of human movement possibilities. Thus, repetition becomes a fundamental tool for movement practitioners to refine and articulate their movements, and in this research, enhancing their *Sculptural Qualities* within motion capture environments.

In the context of extended embodiment, the technology extends the mover's body-mind and shapes their embodied experiences. When repetition is applied within motion capture environments, it develops mover's awareness of their sculptural digital trace-forms.

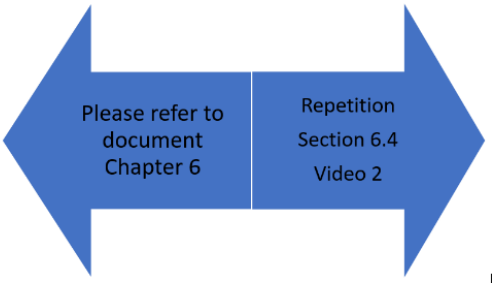



For example, Mover 1 in task 2 explores the dots/blobs with feedback trace-forms, engaging in repetitive movements across the space or challenging gravity with a handstand, rising, and sinking into a shape back towards the floor. M1's written reflection below suggested that awareness of the memory and tracing action of that reminiscence prompted repetition:

Mover 1 - Writing Reflection:

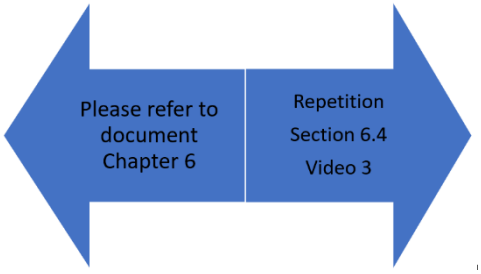
> *The discovery of the rainbow visuals prompted more expansive movement in the space. The memory/ tracing prompted* repetition. *The visual was full, so it meant the movement could be less full (Appendix 11, xcviii).*

The notion of tracing – the memory of the trace-forms - prompted the repetition in this task. The paths and shapes created by the improviser M1 through the interaction of the *dots/blobs with feedback* trace-forms and the immediate feedback loop enabled new possibilities of recurring patterns or cycles – activating *Sculptural Qualities* within motion capture environments – see video 2.




In video 2 and the reflection-in-action in task 3, M1 further suggested that repetition was led by explorations on how to replicate, improve or creates soundest version:

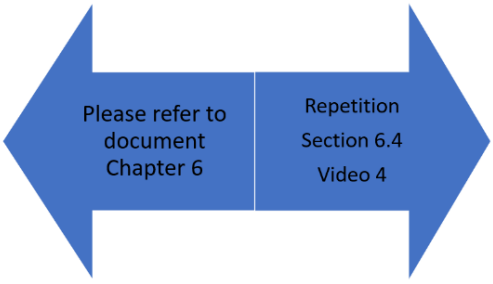
Mover 1: *Yeah, so the repetition. Try and find what that was to see it. Can you replicate it? How can you improve it? What is the best version of that? (Appendix 11, xlv).*




And in video 3, M1 explores repetition with variations of the movement patterns in task 4, with different set of trace-forms (larger blobs and particles without feedback) with similar account of questioning M1 have in reflect-in-motion during task 4:

Mover 1: *Through the repetition so that you..., I am clear of what it was, what's happening, or what it's [trace-forms] doing. I suppose with each repetition seeing what the possibilities are of that action (Appendix 11, xlviii).*

These questions suggest a few elements of improvising processes. Firstly, M1 is attentive to the details and subtleties of the recurring movement patterns, allowing the *sculptural qualities* to be reshaped. Secondly, the artistic exploration and experimentation with the repetition and the effect on the trace-forms, M1 may intentionally vary the timings and spatial pathways to create various dynamics. Thirdly, repetition encourages the kinaesthetic and emotional expression where M1 explores the richness of their embodied storytelling. Thus, repetition in motion capture environments can be experienced as an extension of the movement practitioner's cognitive and embodied abilities, as they repeatedly shape and reshape (to refine) their movement's possibilities and artistic intentions. Clark's perspective of EXTENDED theory invites us to view repetition as a distributed cognitive process that integrates the body, mind, and technology.




Similarly, in video 4, M2 explores *line visuals* in task 1, creating a repetition of circular, swinging movements and leg kicks. Mover 2 reflects on this task:

Mover 2: *I feel like I am using a repeating movement a lot.*

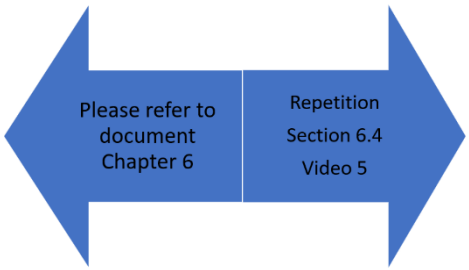
Q: *And how is the repetition for you? How's that repetition experience for you? Is it something you are trying to repeat because you want to see how it looks as well?*

Mover 2*:* *Yes. The reason I want to repeat is how I want. I want to see what kind of picture this can create more?*

Q: *Did you recognise anything with the repetition that you are creating something?*

Mover 2: *I didn't know I'm creating at the beginning until I see the picture starting to look like something and then I start to do more to make that look like it even more. How...what I thought it looked like (Appendix 11, lxi).*

M2 suggests intentional decision-making and the explorative nature of movement and emphasises the specific form, shapes, or poses, drawing attention to their movement's sculptural elements. In both examples from M1 and M2, there is evidence that repetition offers awareness and engagement with presence, mainly in the reflections on actions. They are both fully engaged in the present moment of those sculptural explorations and approaching it with curiosity and inquiry with temporal variations, which creates intriguing temporal sculptural forms, shaping of bodies, actual and virtual, that unfold over time.




What is interesting, in video 5, is that M2 was aware of the changes to their intentional repetition during reflection in motion in task 2 as follows:

Mover 2: *It is what's left behind in my movement. The shadows left behind.*

Q: *You sense your repetition, and when you are kind of trying to repeat the movement, and you see the visualisation, can you see its similar to the other task that has layers.*

*Is that something you're trying to attend to? You're trying to initiate that that you're creating those layers, or you attending to or more what it can do?*

Mover 2: *No, no, I'm really thinking of what this image can do rather than using the same thing I did before. As soon as I started to move, this image gave me a direct feeling, you know, to kind of telling me the way I want it to move.*

*And it is quite different to before. I would not be using the same (the dancer is referring to the same strategy as the previous task with repetition). Too much, yes.*

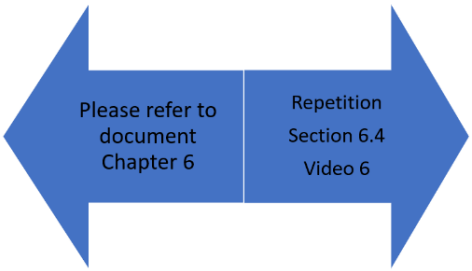
With the digital trace forms facilitating the process of repetition for M2, this suggests the layering process, which adds complexity and richness to *Sculptural Qualities* with space and the importance of the dynamic that visually references time and motion. M2 suggests that when having a '*direct feeling…telling me how I want it to move*…', they are in the collaborative exchange between their body, the digital trace-forms, and the environment. Consequently, exploring movement with dots/blobs with feedback in task 2, M2 used repetition to co-create an eagle-like image – see video 5.

Similar collaborative exchanges were felt by M4 in task 3 and reflecting in motion:

Q: *Are you using a lot of repetition?*

Mover 4: *Yes, definitely. fell into the same movements but almost like challenging myself to hold movements as well which is almost like challenging my own dancing technique and embodying that.*

This suggests that M4 entered into dialogue with the digital trace-forms, informing the decisions of 'challenging myself' and considering how these decisions resonate in the virtual space and influence the overall *Sculptural Qualities* of the informed improvisation. This mutual shaping is echoed in Ihde's embodied-enactive approach, highlighting the reciprocal relationship between humans and technology, where both mutually shape one another. Therefore, the influencing element of movers' responses reshapes the digital trace-form and informs the mover's subsequent movements.




In video 6, the moment of joined repetition by Mover E and F at the same time, is captured by the camera. It seems it was a spontaneous act of shaping responses to *line visuals* in task 1, that brought Mover E and F together to perform their own individual repetitions. ME suggested that the continuous dialogue back and forward

motion allowed for 'different ways of doing [the repeated movement]' in task 1 reflection in motion.

Researcher: *Do you have a sense of repetition?*

Mover E: *I do. I feel like I'm doing the same thing over and over again trying to figure out different ways of doing it. I feel like I'm satisfied with something and keep referring back to it.*

*Subconsciously line...*

Researcher: *And do you think when you are using repetition the visualisation is changing or staying the same.*

Mover E: *I feel like it's staying the same (Appendix 11, clxxxiii).*

On the contrary, the above was not felt by Mover A and Mover B in phase three, within task two (which had the visualisation incorporated together), where MA suggests in reflection on action that:

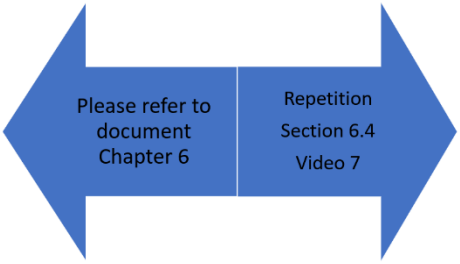
Mover A: *When I didn't know what I was doing mainly and with the same movement and the same tracer until the trace had changed, it got a little bit repetitive until my last one when I started doing a little bit different (Appendix 11, clxii).*

MA suggests that the first two visualisation and trace-forms within task two were prompting repetition because of the feeling of 'not knowing'. This may suggest the digital complexity and MA navigating the technological affordances with a search for familiarity. This is confirmed by MA in the final reflection interview on the overall experience of repetition:

Mover A: *Yeah, the followed the reputation was more like a safe zone as well for me at the same time. Because it was...while more comfortable to just process for a minute then come up with something different within that repetition at the same time (Appendix 11, clxvii).*

However, even this 'safe zone' of utilising repetition offers some insights into *Sculptural Qualities*. As MA shares this type of uncertainty through repetition, it also

demonstrates the openness to shape and reshape as part of the sculptural process. It is still a spontaneous response when balancing familiarity with novelty, which can be explored further when the next set of visualisations appears, and MA suggests that a new set of movements is in motion with the subsequent visualisation. Thus, repetition can form a foundation for *Sculptural Qualities* and what could represent Clark's cognitive scaffold process. This scaffold process supports the mover in exploring new visuals, and the repetition becomes a tool for the mover, supporting the transition from familiarity to unfamiliar visuals in a controlled and gradual manner.




Similarly, MB suggested that it also depended on the different visualisations they had to respond to; the repetition would oscillate between the familiar and new explorative processes. For example, in video 7, Mover B explores the disk-like digital model with circular movements, tortille and rond lines (formal shape qualities see 2.3.4), firstly stationary, and after Mover B travels (resembling familiar movement exercises sequence from a dance training). Mover B reflects on the repetition:

| | |
|---|---|
| Researcher: | *Did you feel that ...You saw and felt the repetition as well, and that goes for you, Mover A, as well. Did you feel that every time you repeated the visualisation, it was slightly different to, but your body was repeating the same movement? Did you feel it at some point or not?* |
| Mover B: | *For some of them, it was just the same as in... what I am trying to say... even if I was repeating the same movement, then the image would be slightly different, but then in certain if I repeat the same phrase and get the exact same image back, so it just depended on which...* |
| Researcher: | *On which visualisation you had.* |
| Mover B: | *Yes (Appendix 11, clxvii).* |

In contrast, Mover A explores the rond - spiralling lines, twisting movements and locomotion (floor explorations). In this last example with mover A and B, I observed that the mover may rely on the familiar movement in response to the digital complexity and uncertainty. Thus, the digital trace-form may manifest as a predictable or repetitive pattern as opposed to the more organic movement responses, which is introduced through the repetition by M1, M2, and M4 in the above discussions.

In summary, repetition activates a trace of the improviser's sculptural lived experiences. Through the active interactions with the shaping processes of digital models (sculpting virtual improviser) and the digital trace-forms, repetitions enable experimentation of movement patterns. By viewing the complex digital trace-forms and the environment as an extension of the cognitive process, the movement practitioners access the mutual shaping processes and activate *Sculptural Qualities* with repetition. Repetition offers an element of spontaneity, curiosity, intentional experimentation, and kinesthetic awareness of their sculptural shaping experiences. Also, at times, the mover found repetition as a foundation to explore further the complex digital trace-forms. In both cases, repetition activates *Sculptural Qualities* through movement exploration and experimentation. In the next section, I discuss how random intervals foster experimentations and further activate *Sculptural Qualities* within motion capture environments through micro-intentions.

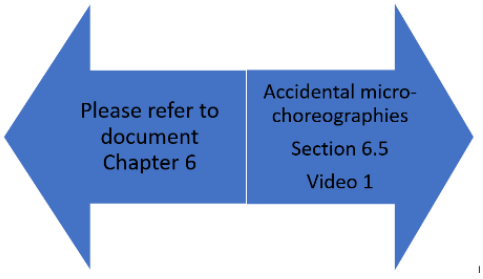
## 6.5 Accidental Micro-Intentions

Accidental intentions emerged in phase one, with the title's development to accidental 'micro-intentions' during phase three because of the short durational nature within the more extensive improvised explorations. As discussed in the first chapter and throughout this thesis, the aim is to explore the emergence of *Sculptural Qualities* through explorations between dance improvisation and motion capture environments. The nature of dance improvisation and its act of spontaneity, freedom, and awareness when improvising is facilitating these explorations. However, choreography is perceived as gathering and organising movements with a sense of fixed patterns and sequences (for performance). It might seem rather odd as a title for activating *Sculptural Qualities*. Therefore, the relationship between improvisation

and intentions aligns with De Spain's (Albright & Gere, 2003) intentional processes to emphasise the fluid and natural impulse responses (see 2.1.1).

In the context of this praxis, motion capture technology supports the emergence of movement through procedural shaping. The motion data of the improviser are transformed into digital trace-forms - *line visuals* - accessing *Sculptural Qualities* and, through Effort-shapes explorations, developing how they are activated within accidental micro-intentions. The process enables the improviser's attention to "drift to the processes of engagement, of lived experience or direct experience" (Bacon 2013:118 cited in Midgelow, 2020, p.13). This suggests that during the active interaction with the *line visuals*, the improviser continuously attends to the engagement process and the 'how'. Through feedback loops, the improviser tracks back and forth, making choices and changes of direction depending on the line's visual behaviour and visibility. This level of embodied responses suggests intentional choice-making. The improviser either stays with something or initiates a new movement response to different *line visuals* to change location in space or relate to others' *line visuals*. This intentional choice-making introduces the element of 'micro' as a means of short, rhythmical, and temporal responding with smaller localised direction systems (see 2.3.4).

As previously discussed in section 6.1.1, the *line visuals* in Motive have particular behaviour where the relationship between the active and inactive markers impacted on losing the visibility of the *line visuals* and enabled me to explore this through the notion of 'uncontrollable bug'. These *line visuals* represent the history of markers pathway with Motive, which is the built-in function.




In video 1, I observe that during movement explorations some of the active markers represented with a dot and with *line visuals* tracing the movement from that point are active - in yellow colour. Over time, the activeness of those marker is lost – in orange colour - and *line visuals* disappear (Figure 83). The displacement of the marker and

its inactivation impacted losing the visualisation of the *line visuals* and was mainly evident when using all 41 markers.

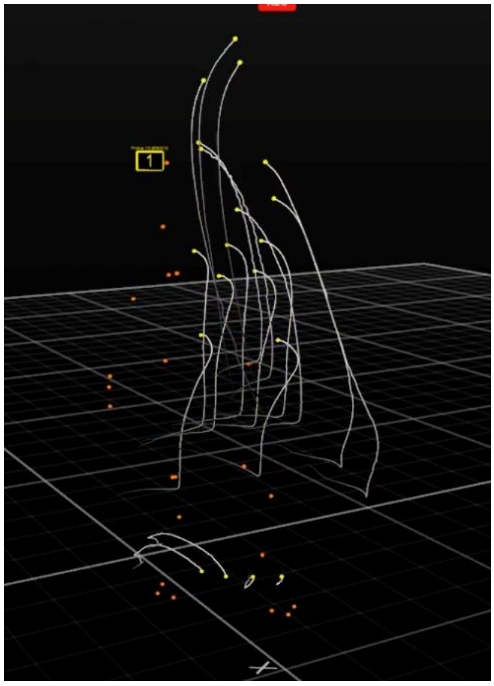


Figure 83 - Active markers dots in yellow colour with active trace-forms represented in white line; and non-active markers points visuals.

Therefore, during the improvisation, I moved with my whole body. Once I lost the *line visuals* on my left arm, I moved mainly with my right arm and the rest of the body. At times, I had to check which arm had the *line visuals*. I moved on to exploring *line visuals* with my feet and head. Once I moved my head down and back up, suddenly, the line was lost. After a while, I realised the loss of lines and followed my movements with my torso. The inactivation of the markers with *line visuals* might be a potential frigidity or so-called ‘uncontrollable bug’ of the Motive software. Because of the real-time responsiveness aided by the motion capture system, it introduces a "non-linear improvisatory system" (Rubidge, 2002, p. 1), and it creates the feedback loop and influences the improviser's movement responses, which in turn affects the subsequent movement choices by the improviser (see 2.4.2). The potential ‘glitch aesthetic’ lent itself to artistic exploration and questioning of what makes them an effective medium to activate *Sculptural Qualities*. Causey (2016) suggests that glitches are “ghosts in the machine that allow chance computational and electronic

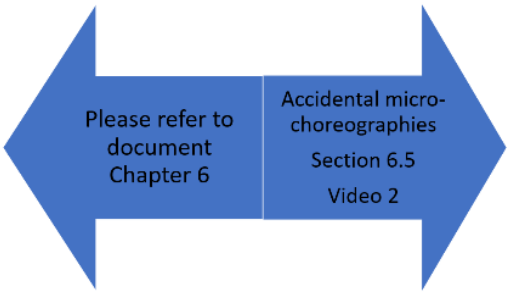
phenomena to appear and participate in the structure of the work" (p.454). Betancourt (2017) notes that these "technical failures" (p.9) open a gap for critical reflection and its use within an artistic domain. Thus, I utilise these 'random intervals' of the 'inactivation' as an emergent prompt to develop movement responses in real-time. For example, I improvised with the entire body of *line visuals*, and when the unexpected disruption happened, I moved only with the body parts where I still had the *line visuals* - making instantaneously decisions. Experiencing that some *line visuals* suddenly vanished and not knowing why allowed me and the participants to focus on a movement with another body part with the *live visuals* still visible. For example, Mover M1 commented on the 'unknown' experience:

Mover 1: *Does it keep changing depending on which sensor it is - feeling with?*

Q: *How do you think we get to this point because when you started, you had all over the body.*

Mover 1: *Watching by experimenting, seeing, moving. I was unsure if I should be affected by it, being initiated by the one that has the sensor on (the visible markers) …or wherever it is part of the trajectories of the movement. There is a thing you want to use it, you see it, it's kind of cool, it's nice- being in control of that in space (Appendix 11, xxxvii).*

Having the experience of *line visuals* being visible and invisible, Mover 1 is trying to understand how this changing and surprising element is activated the sculptural shaping with the visible trace-forms. Further, M1 suggests that this unexpected element can be embraced by responding to it or not and enabling adaptability and non-linear improvisation in real-time.

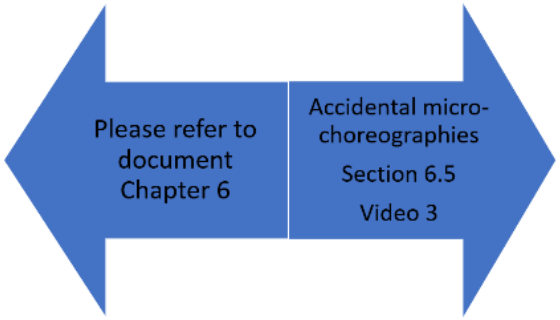



Similarly, in video 2, M2 explores the whole-body *line visuals* with fast circular movements, and then make a decision-making to work with just the active *line visuals* as a playful *emergent-construction*. M2 reflected-in-motion:

Mover 2: *I feel like if I want to draw like a really messy stuff and I speed up with my movements and then when I want to really see what I'm doing then I slow down and I'm really focusing on like what's moving or which dots and then which part, which is which, just trying to figure out (Appendix 11, lx).*

Therefore, in both cases, M1 and M2 were dealing with the glitches, requiring heightened awareness and sensitivity to these random, accidental intervals of surprising changes within the environment. This action proposes that movers become more attuned to themselves and the ever-changing environment that may arise from this uncontrollable bug. It leads to heightened interactions and collaborative exchange with the *line visuals*, like within repetition. Therefore, this 'digital bug' became integral to activating *Sculptural Qualities*.

Furthermore, it introduced the relationship of random intervals – to disturb habitual movements and decision-making. This layer of 'unpredictability' to the emergent construct amplifies the element of intentional responses in the continuous loop. Despite this frigidity from the external environment, it still acts as an extension of movers' creative process, influencing their decision-making, like with M1 and M2, and contributing to the emergence of *Sculptural Qualities*. Thus, each time the mover responded to these random intervals with different body parts or in variations, it renewed the improvisation sequences - intentions - formed in the moment. In Carter's (2000) views on 'improvisation for its own sake', where the dancer engages in improvisation for artistic exploration and possible satisfaction, these short micro intentions align with De Spain's intentional processes (Albright & Gere, 2003) and offer the explorative and often playful experiences of unfolding random and surprising *emergent-intentions.* Additionally, there were a few unpredictable moments with leaving-the-*line visuals* in the digital space. It does not happen every time during each improvisation, and it is always only one line left in the digital space.




In video 3, during the *line visuals* explorations in phase two, Mover 3 started with the whole body 41 markers and *line visuals* being active. After a while, there were inactive *line visuals* on feet, slowly disappearing from the other body parts, leaving with only the line visual on the head (with one marker). M3 performs a swivel head movement, and suddenly, the very last line detached from the head marker and was left in the virtual space. The visual line left a curved line in the digital space, and M3 walked around it in the physical space. Try to understand what has happened, M3 responds by tracing it with arms and, eventually, the torso – the virtual becomes the tangible (Kölmel & Ströbele, 2023). M3 reflects on action (task 1):

Mover 3: *I almost visualised that it was in the [physical] space, wherever it was, it just kind of felt like the last echo of this angelic movement is quite strange, and it is interesting that it was the head, you know, swivel as well, because it is almost as if…*

*The head went, and then that was the last of it, and then it was like, I am a bit unsure now. I do not really know what to do. I am just going to walk around with a little swivel that's left in the space.*

*Why was it the only one that was left? Out of all of my movements as well,*

*It would have been somewhere here (the dancer points in the physical space inside the capture volume). No, it is not actually here, but the spaces feel like they're connected. They don't feel separate (Appendix 11, lxxx).*

In this instance, the glitch provided an opportunity for an active collaboration exchanging intersection between the physical, the 'echo' visualisation, and the digital space. The visualisation was described as an "echo of this angelic movement," suggesting that M3 experienced a connection that resonates between the digital

visualisation and the physical head movement as the shape of a 'swivel'. Further, the term 'angelic movement' could imply a sense of quality as graceful and lightness in that movement. Thus, the head movement of almost impulse quality resulted in digital visualisation with a dynamic and responsive relationship between the two. These interactions between the digital visualisation and physical movement of M3 suggest embodied and extended relationships. These experiences offered a new perspective on the moving-sensing experiences and provided opportunities for artistic explorations and possibly self-discovery.

Furthermore, the moment when the M3 decided to walk around the 'swivel line' left in the digital space like it was present in the physical space offered a fascinating intersection between the body, visualisation, and the environment. The physical is interwoven with the digital, adding the element of unpredictability and an opportunity to explore. This encounter felt almost like M3 touching the swivel line in the physical space, like I walked around and through Gormley's *Clearing V* expanding lines in the space. The encounter introduces an element of organical and sculptural forms of the unplanned outcome, which M3, and not even I, could have anticipated when I began these sculptural explorations. This encounter embraces the openness and rising occurrences and allows them to influence the mover's responses and directions of these explorations. Thus, accidental micro-intentions activate the awareness first, and following the unplanned encounters, it can develop accessing the spontaneous act of improvisatory responses. Therefore, the “non-linear improvisatory system” is introduced to unfolding accidental micro-intentions when movement practitioners embody and harvest on the 'randomness' and 'not-knowing' of this phenomenon, the “non-linear improvisatory system” (Rubidge, 2002, p. 1) is introduced to unfolding *accidental micro-intentions*. Unfortunately, this element of visuals being left behind did not happen every time, only on a few occasions. Moreover, some improvisers ignored it when it happened until I prompted them to respond to it like ME and MF. Despite that, the accidental micro-intentions were still present during the *line visuals* improvisational tasks.

In short, accidental micro-intentions have emerged through the glitch – a temporal fault - of the *line visuals* and their relationship with the markers in digital space. As the *line visualisation* randomly becomes invisible for the improviser to respond to,

they evoke gestural responses with different body parts. These processes activate *Sculptural Qualities* as micro-intentions of spontaneous and temporal shaping.

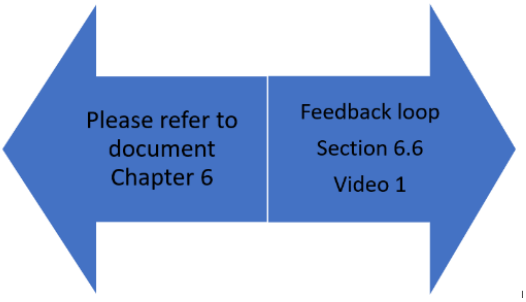
So far, this chapter has introduced the four core elements that activate *Sculptural Qualities* within motion capture environments facilitated through the interaction of feedback loops in real-time. The relationship between movement, technology, and body-mind connections exemplifies the embodied interaction through the active feedback loop and is discussed below.

## 6.6 Feedback Loop

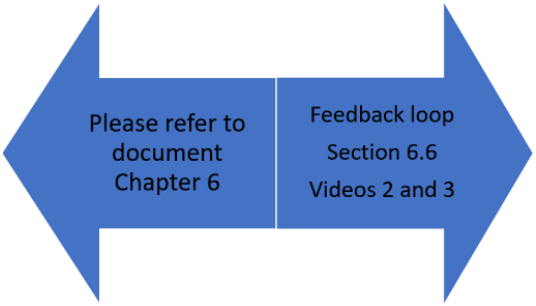
The interaction between the movement practitioner's embodied experiences and motion capture environment offers an interesting outlook on how *Sculptural Qualities* can create open and closed feedback loops within these environments. Drawing on Clark's (2008) EXTENDED theory, where the mind leaks into the environment, I identified open and closed feedback loops[71] in relation to perception, movement, and cognition within mocap environments. The feedback loop is formed through the cognitive loops of perceiving and responding, which is vital for shaping the process of improvising bodies. The improviser perceives the digital trace-form and responds, which affects their subsequent movement responses - creating a feedback loop.

Upon reflection of the workshops with participants, I observed that, at times, they were moving without directly seeing and responding to their movement transforming into visualisations of digital forms. Their movement responses were emphasising the internal responses of their bodily sensations, rather than affected by the digital representations and the motion capture environment. It had a feeling of separation from the wholeness of the experiences. For this purpose, I have termed this feedback loop *closed*, as the interaction between the improviser and the digital environment is not coupled.

[71] The close and open feedback loop relates to the feedback loop in real-time between the improviser's movement responses and the digital visualisation. These feedback loops are not associated with feedback loops in information technology, such as positive/negative or feedback loops in cybernetics (Dixon, 2019).




For example, in video 1, Mover A and B turns their head (and eyes) away from the visualisation (mostly down); it disconnects the direct active awareness, and therefore, their primary responses come from natural bodily impulses rather than being influenced by the mediated visualisation. The direct connection of the head and eyes with the visualisation is vital in forming immediate responses in relation to the mocap environment (see 2.4). Therefore, when the improviser moves their head and eyes away from the visualisation, it creates *a reduction* (Ihde, 1975) of the coupled system (*I-body* with the environment) established through the conditions set out in accessing *Sculptural Qualities* (see 5.3.1). The closed feedback loop reduces the primary experiences of the extended and embodied relations. It means *Sculptural Qualities* cannot be activated when the improviser engages with the closed feedback loop within motion capture environments.




On the other hand, in videos 2 and 3, the constant quality of 'here and now' is evident with Mover B (video 2) and Mover 4 (video 3). When the improviser is directly seeing-responding to the real-time temporal visualisations of their movements, the *Sculptural Qualities* are activated, emphasising the interaction as a primary point of intentional movement responses. I call this feedback loop *open*. I define the open feedback loop further through Ihde's embodiment relation (see 2.4.2) where the MoCap technologies extend the improviser's sculptural sensibilities and

perception in an interactive and active process resulting in deeply embodied and extended experiences. The real-time interactions act as abstracted sculptural extensions influencing the shaping and reshaping of movement explorations. The open feedback loop couples with movement practitioners' abstracted extensions and their cognitive system 'leak[s]' (Clark, 2008) into the environment, activating *Sculptural Qualities* through stillness, repetition, T-pose with stillness, and accidental micro-intentions. Upon the open feedback loop observations in all these elements, it became evident that this coupling is characterised by Effort-Shape qualities of opening-rising movement qualities affecting their spatial and dynamic presence with spontaneous self-discoveries and attentive awareness. Through the continuous real-time interactions between seeing-responding, the improviser attends to a collective, dynamic, and complex loop. The complex loop is where the sensory and cognitive processes are shaped and immediately reshaped into new sculptural experiences, thus creating a dynamic and open feedback loop where the improviser's bodies and MoCap technologies are coupled with the system – creating holistic embodied and extended experiences.

## 6.7 Research questions revisited

The above discussion on feedback loops - open and closed - aligns with the research questions of this praxis. The initial research on the embodied dance improvisatory approaches of *Sculptural Qualities* led me to define the *sculptural* aspect as a *shaping process* and direction of the attention towards the real-time movement (see 2.3) of improvising bodies. The shaping intentions and *in-readiness* (see 2.2.1.) explore the spatial relations of three-dimensional sculptural shaping experiences in relation to space and time and being both objects and an event of *the experiential unfolding* of improvisers' lived experiences. Further, I identified that *sculptural motion* is a pathway of movement - a 'trace-form' (Longstaff, 2018; Laban & Ullmann, 2011) - as an embodied and extended body-mind; and that *quality* is a means of explicit expressive movement quality with a sculptural aesthetic.

The embodied approaches to improvisation allow spontaneous movement, evoking bodily sensations within motion capture environments. As this involves the 'here and now' approach, the role of the feedback loop and its real-time responses

were investigated, emphasising the dynamic and interactive form of artistic expression in dance improvisation. Through these relations the first research question was addressed as follows:

## RQ1

**What *Sculptural Qualities* are revealed through a looping feedback method when experiencing the actual and virtual?**

As a holistic approach to embodied improvisatory explorations, the *multi-layered shaping processes* of *Sculptural Qualities* were established through the PaR methodology. It involves four main shaping layers interwoven together as follows:

**Experiential perception and feedback loop**

This layer directly addresses the concept of a feedback loop in this praxis. It explores the interaction between movement practitioners, digital sculptural forms, and the environment. These interwoven interactions contribute to the emergence of *Sculptural Qualities*. The improviser's movement explorations are transformed into the digital realm and experienced through the visualisation in digital trace-forms. The trace-forms were vital in the improviser's sculptural responses, providing a visual and interactive feedback loop that guides, influences, shapes, and reshapes the ongoing collaborative process. These trace-forms aesthetics and behaviours were explored in studio practice (see 5.4.2, 5.5.2, and 5.6.2). The improvisational tasks of seeing-responding (see 5.3.2) enabled the improviser to actively engage with sculptural trace-forms (see Figure 53). For example, the *line visual* contributed to identifying accidental micro-intentions and repetition as core elements to activate *Sculptural Qualities* (see 5.4.2, 6.1.1 and 6.5). The particles with feedback enabled the improviser to acknowledge the *beyonding* qualities and activate stillness (see 5.5.2 and 6.2). The dots/blobs prompted them to activate repetition (see 6.4). Within phase three, two movement practitioners engaged in the movement composition and improvisation, forming *comprovisation* (Cooke, 2011; Dudas, 2010) in real-time (see 5.6.2 and 6.1.3). The real-time application of the mocap is a vital tool for improvisation and composition, layering the shaping processes and forming the *experiential couplings*. The continuous looping exchange between the improviser technology and the environment shapes the evolving temporal *Sculptural Qualities*.

The feedback loop exchange highlights dynamic shaping processes, the response to reshaping sculptural forms, and the reciprocity between the performer-creator.

**Embodied Cognition and Extended Mind**

The motion capture technologies transcend the improviser's physical motion and extend the boundaries of the spatial dimensions (see 5.2 and 5.6.2). The technological expansion and its dynamic relationship between the physical and virtual offer a canvas in which *Sculptural Qualities* can manifest and evolve. Therefore, this layer enables the exploration of *Sculptural Qualities* in relation to embodied and extended dance improvisation and its looping feedback. In the context of embodiment, this research draws on Merleau-Ponty (1945, 2002) and his approach to embodiment and perception as an essential understanding of human actions. Within these bodily actions, he suggests that the body as "I" senses, observes, recognises, experiences, and feels through related organs. Coupled with Ihde's (2002, 2009) discussion on body two, which I presented as *I-body* (see 2.4.2), which includes the physical body, brain, central nervous systems and the phenomenological and composed body (see next section).

Through Clark's EXTENDED mind theory, the interactive digital trace-forms blur the boundaries between the movement practitioner's *I-body* and the virtual realm. This research suggests that the improviser's cognition is not solely contained within their brain or body but is distributed across the improvising bodies and their interactions. The expanded notion of cognition reinforces that the improviser's body-mind is intertwined with the digital trace-forms, influencing their subsequent shaping of *Sculptural Qualities*, and creating a continuous loop of feedback and adaptations. Thus, the continuity of the loop emphasises the fluidity of actual and virtual bodies merging and interacting and incorporates the environment and external tools as a way of being-in-the-world.

**Phenomenological and Technological *I-body***

This layer offers insights into the *I-body* and acknowledges the nuanced relationship between the improviser's lived experiences and shaping process. Drawing on Ihde (2002) philosophy of 'techno-fantasies', the exploration of *Sculptural Qualities* enables profound understanding of how the embodied *I-body* functions as a phenomenological entity. I acknowledge that the *I-body is* body one - the

phenomenological one, and the body two - the composed one (virtual) (see 2.4). For Ihde (2002) the *body two* is utopian body of techno-fantasies and seeks to integrate *body one*. In this research, the *body two* is associated with the technological progression, extending improviser's embodied sculptural experiences - which I call *sculpting virtual improviser* (see 2.4.2). The intertwined relationship between the *I-body*, sculpting virtual improviser, digital trace-forms, and the environment shapes the movement practitioner's perception. In the studio practice, the sculpting virtual improviser is explored through visualisations utilising markers sets digital model (see 5.4.1), dots and particles (see 5.5.1), and floats, spikes, and polygons (see 5.6.1). Essentially, the sculpting virtual improviser is inviting this research to 'rethink' dance improvisation and invites the improvisers to co-create sculptural expressions with the technology (see chapter six). Guided by the feedback loops, it fosters a continuous dialogue of actions-reactions, shaping-reshaping, and ongoing improvisational *Sculptural Qualities*.

**Environmentally embedded**

This layer relates to knowledge of environmentally embedded experience and is vital in facilitating the emergence of *Sculptural Qualities*. It contributes to the awareness of the feedback loop, extending its reach beyond the improviser's movements to encompass the environment. The focal point of this layer is the exploration of how the environment becomes an active co-contributor to *Sculptural Qualities*. It emphasises the dynamic interaction among the improvising bodies, transcending visualisations and the surroundings in real-time. As motion capture technology enables us to transcend the improviser's movements into digital sculptural form, this layer highlights the immersive nature of the feedback loop and its impact on emergent *Sculptural Qualities*. The feedback loops and their dynamic relation enable active interactions between the improviser's bodies, technology, and the environment – shaping *experiential couplings* (see 2.4.2). I have identified two feedback loops through studio-practice observations: open and closed (see 6.6). The closed feedback loop is a self-contained interaction between the improvisers and the environment, with minimal external influences. It occurs when the improviser diverts attention from the screen and visualisation. Therefore, the improviser responds to internalised intentions of their movement explorations, which may have started with the visualisation but then pursued their movement explorations without the extended

visualisations. On the other hand, in the open feedback loop, the improviser is directly and actively engaged with the visualisation and responding in chiasmatic exchange, affecting the subsequent actions and shaping the evolving *Sculptural Qualities*. An open feedback loop offers dynamic interaction where *Sculptural Qualities* are *comprovised* through the continuous reciprocal feedback loop.

In summary, within these four layers, the mover's interactions become a sculptural quality of reciprocal inspiration, where shaping processes oscillate between the physical and digital domains. The role of feedback loops in the shaping processes is vital to accessing the *Sculptural Qualities* of improvising bodies within motion capture environments. As the improviser actively interacts with and responds to the evolving *Sculptural Qualities*, they experience the continuous feedback loop. The temporal and continuous unfolding transforms the improvisers' lived experiences into dynamic shaping and reshaping processes and accessing their *Sculptural Qualities*. In relation to these temporal unfolding and how to access *Sculptural Qualities*, I propose conditions (methods) to enable me to answer the other two research questions as follows:

## RQ2

**How are these *Sculptural Qualities* accessed within motion capture environments?**

In this research, accessing *Sculptural Qualities* refers to a set of holistic conditions – a framework – developed through studio praxis, detailed explicitly in workshop design in chapter five. The framework (Figure 52) (see 5.3.1) includes setting up the studio environment with the motion capture cameras and other technological tools, the warm-up exercises from embedding *within* the environment to initiating the movement practitioner's body-mind awareness and 'couplings' exercises between the physical and virtual *I-bodies*. Improvisatory tasks follow these methods with the visualisations utilising Motive and Touch Designer software (see 5.3.2).

Firstly, in the setting up of the studio-practice environment I have identified four kinespheric zones (see 5.2) influenced by Laban's concept of 'living architecture' - emphasises space organisation to enhance dynamic and harmonious interaction

between body and space (environment). The expansion of spatial boundaries creates a shared kinesphere and transports the physical kinesphere into the virtual one (see 2.3.4). It reinforces the sense of presence, as movement practitioners can move and interact within an infinite digital landscape **beyond** their immediate physical surroundings. As the volume becomes a canvas for creating *Sculptural Qualities*, I identified kinespheric zones within the volume, outside the volume, alongside the volume and on the volume (see 5.2). These zones emphasise spatial awareness and enhance the intentional movement explorations and interaction with the volume. These zones extend the improvisers' body-mind beyond their movement, intertwining with the motion capture environment. For example, the zone outside the volume influenced the 'stepping out exercises' where the improviser explored sculptural forms between the physical body and the digital model and their relationships.

From the moment they enter the studio-practice environment, movement practitioners become attentive to the shaping process through which they embed themselves *within the* space, technology, and the world. In this research, the movement practitioner is embedded *within* a technological and mechanical motion capture environment, where wearing the specialised suit and placing markers enables haptic experiences with sculptural sensibilities (see 2.3.3). The mocap suit and markers (and the overall technological environment) become a gateway to the sensory and sculptural experiences of the improviser and *couple* them in the responsive, collaborative exchange between the body, visual digital trace-forms, and the evolving environment (see 5.3.1). The improviser begins by placing the mocap suit on the floor in the volume. This action emphasises the interconnectedness between the improviser's body-mind and the technology. It extends the improviser beyond the environment and contributes to shaping experiences.

Moving into the initiation stage of bringing awareness into the body-mind through various breathing and shaping movement exercises was developed throughout the three phases as part of the warm-up sequences (see 5.3.1). The improvisers focus on their breathing rhythms and hand brush stroke movements to build on the connection between the body-mind and the mocap suit. Furthermore, they attend to different types of shapes like ball, wall, and pin shapes (see 2.3.4) to emphasise awareness of the T-pose (wall-like) shape – a neutral position serves as

the fundamental reference for motion capture practices. The improvisers' spatial awareness prompts the extensions and interactions with shapes and lines within the volume. Attending towards the different shapes involves engaging with Effort-shape qualities (see 2.3.4) developed by Laban to describe movement dynamics. These Effort-shape qualities directly influence activating *Sculptural Qualities* (see chapter six). The puppet exercises require improvisers to work together in attending to their body's movements – shaping, lines, form, tension, and balance. In this exercise, the improvisers engage naturally in the sculptural narrative, forming dynamic, collaborative relationships with each other (see 6.1.3). It supports access to *Sculptural Qualities* with intentionally enriching pathways promoting *comprovisation* with sculptural artistry within dance improvisation.

The *Range of Coupling* (ROC) is vital in accessing *Sculptural Qualities*. ROC is established through the awareness of the T-pose shape, rhythmical qualities with spatial movement explorations, tactile interaction with the mocap suit and placement of the marker set on the suit (see 5.3.1). It includes exercises and movement sequences, which are performed before the calibration process (the cameras see the markers on the body and determine the position and orientation of the body in the volume/virtual space), once suited with the marker sets, and after the body is calibrated. When bodies are coupled closely and intertwined with the motion capture environment, it influences the kinesthetic experience of *Sculptural Qualities* that emerge. By coupling the physical and virtual, it fosters movement intentionality and interactions, offering a pallet of shaping processes to the improvisers and enabling them to access *Sculptural Qualities*. These warm-up exercises foster an experiential journey for the movement practitioners, embodying and embedding their body-mind within the motion capture environments. It heightens their awareness and facilitates the creation of *Sculptural Qualities* that are expressive and dynamic, resonating with artistic dimension.

Through this praxis, movement practitioners discovered the sculptural elements of their art, where digital forms echo the improvisational tasks of their bodies through visualisations. (see 5.3.2). Through studio-practice movement, practitioners engaged in improvisatory explorations with different visualisations of digital trace-forms such as *line visuals*, dots/blobs, and particles (utilising Motive and Touch Designer visualisation software). These digital trace-forms are imprints of

spatial explorations oscillating between being-becoming a testament to the tangible intertwined with the digital. Through the feedback loop, the *Sculptural Qualities* fostering spontaneous movement, where access is not just a path but a journey of experiential wonderings and infinite growth of the improvisatory approaches within a motion capture environment.

Furthermore, these sculptural responses suggest a dynamic connection between Effort-Shape movement qualities where **opening-rising** is more prominent, exploring imprints of shaping improviser's lived experiences. Its natural fluidity guides the improvisers' expressive responses. As the improviser observes – witnesses, and reads the dynamic visualisation, it offers moments of stillness (see 6.2, 6.3, and 6.5) and whole-body presence. The unpredictability element of the *lines visuals* in Motive impacted glitchy notion and the improviser responded with intentions, which were localised depending on the body parts in which the *line visuals* accidental disappeared (see 5.4.2 and 6.5). Furthermore, the development of the technical requirements like the T-pose (see 6.3) which allowed for movements of stillness to connect to the wholeness of the experience over the time as a symbol and ritual. These core elements in accessing *Sculptural Qualities* bring me to the final research question:

## RQ3

**How are these *Sculptural Qualities* activated through improvisatory approaches within motion capture environments?**

Activating *Sculptural Qualities* in this research involves setting in motion the shaping process. The activation emphasises a heightened awareness - a sense of presence, embodiment, and real-time responsiveness within motion capture environments. In the context of embodiment, it involves movement practitioners exploring their movement possibilities through *attending towards* (see 2.4) active engagement of their perception. Their lived experience shapes bodily experiences in the situated motion capture environments (see 2.4). Through the reflective and interpretive methods (see chapter three) and analyses (see chapter six), I arrived at four core elements of *Sculptural Qualities*. They are Stillness as a dynamic state, T-pose with Stillness, repetition, and accidental micro-intentions (see chapter six).

In this research, stillness is a dynamic state (see 6.2) that requires the intentional arrangement of form, space, and time. It involves shaping the *I-body* into expressive elements such as the spatial composition of bodies, actual and virtual. The interconnection between bodies, digital trace-forms, and the mocap volume (environment) contributes to the emergence of stillness. Stillness is connected to presence – a heightened awareness of here and now. By embracing the moments of stillness, the improvisers witness their bodies and trace-forms and acknowledge these sensations as a sculptural canvas of energies, waiting for the improviser to interact with them. The improviser engages in stillness through active listening, activating *Sculptural Qualities* of dynamic shapes and motions. When considering time and duration within stillness, the 'deliberate' pausing or moments of stillness within the improvisation introduces a sculptural and temporal aspect of embodied improvisatory explorations.

Repetition and Iteration create rhythmical patterns that have *Sculptural Qualities*. These visually captivating patterns evoke emotionally embodied narratives of fireflies, birds, water, sparks, and fireworks to mesmerise and shape improvisers' experiences and sculptural form. The movement practitioner becomes conscious of the nuances and variations in their actions. It encourages self-reflection and facilitates a deeper understanding of the sculptural movements within motion capture environments. It allows them to experiment with subtle changes and adapt their improvisations.

Furthermore, elements of repetition occurred, seemingly paradoxical in spontaneity, and became instead a catalyst for embodied narratives. Movement practitioners realised that repetition was not only repeating the same movement pattern but also a transformative process of expressive embodied metaphors in relation to drawing and painting processes. Therefore, the newly shaped pathways of the *I-body* and digital trace-forms reveal hidden layers of creativity with unfamiliar shapes into familiar images of butterflies, fireworks, firefly air, water, and sparkles within the open feedback loop. These varieties of digital forms and their interactions with the movement practitioner in real-time enabled spontaneous and expressive qualities of *beyonding* (see 6.4).

The T-pose with Stillness is a neutral active position where arms are extended sideways with legs slightly apart, immersed in a moment of witnessing a sculptural “T” shape. The awareness of mechanical breathing processes is experienced in this

pose of stillness. Its bodily sensations of coupling extensions attuning with the virtual bodies initiate awareness towards the notion of 'here and now'. The 'I am – I can T-pose with Stillness' (see 2.4.1) becomes a ritual experience and connects the individual to the community of performance capture practices. The ritual experience brings awareness to the calibration process (see 5.3) - the mechanics of setting the physical into virtual - through the markers as enchanted fireflies within the forest of lines, dots/blobs, and particles (see 6.3).

Accidental micro-intentions are shorter durational movement explorations (see 6.5). They allow improvisers to explore a variety of movements, shapes, and dynamic relationships between the bodies, *line visuals* of digital trace-forms, and the environment. Exploring the uncontrollable bug or glitch within the Motive software introduces the randomness of visible and invisible *line visuals*, encouraging improvisers to explore variations and movement qualities with **opening-rising** and extending into the edges of the shared kinesphere. It activates *Sculptural Qualities* with heightened awareness and sensibilities to the environment.

As a final note, accessing and activating *Sculptural Qualities* is an ongoing shaping process in dance and motion capture practices. It involves curiosity and openness to explore and be present in the moment, which can lead to a richer improvisational experience of *Sculptural Qualities*.

The overarching RQ1 question encapsulates the focus of this praxis. It involves understanding the temporal and dynamic *Sculptural Qualities* as a process of shaping. A feedback loop emphasises the embodied and extended relations between movement, perception, and the motion capture environment. In RQ2, I investigate the conditions by which these *Sculptural Qualities* organically come into being during the shaping process of improvising bodies. For example, the *Range of Coupling* (ROC) predominately offers new knowledge on accessing *Sculptural Qualities* within these digital and ever-evolving motion capture environments. Also, the studio-practices experimentations developed visualisation methods - a set of digital models and various digital-trace forms which access *Sculptural Qualities*. Lastly, the RQ3 addresses the role of extended and embodied theories and practices, encompassing motion capture technology as a tool to conceptualise a framework for activating *Sculptural Qualities*. The movement practitioners and I

engaged actively with digital models and trace-forms, experimenting with our expressive responses. Through the observational, reflective, and interpretive methods of this praxis, I arrived at four core elements that activate *Sculptural Qualities* in this research: stillness as a dynamic state, T-pose with stillness, repetition, and accidental micro-intentions. To summarise, *Sculptural Qualities* propose a holistic, embodied, and extended approach to dance improvisation within motion capture environments. *Sculptural Qualities* provide a transformative experience and lens through which improvisers, artists, and researchers can perceive and engage with movement and artistic dimensions.

# Chapter Seven: Thesis Conclusion

*To understand is to experience harmony between*
*what we aim at and what is given,*
*between the intention and the performance –*
*and the body is our anchorage in the world.*

- **Maurice Merleau-Ponty (2002, p.167).**

In this PhD research, I sought to explore the emergence of *Sculptural Qualities* of improvising bodies, actual and virtual, within motion capture environments. I focused on the movement practitioners' lived experiences and the intertwined relationship between the body, self, and the world while improvising within these environments. Throughout this holistic investigation, dance improvisatory practice has been a fertile ground for *Sculptural Qualities* to emerge and offer new insights into utilising motion capture technologies in enriching the artistic and expressive creations of improvisatory movement.

Scholars and choreographers explore the relationship between dance and MoCap technologies and often have a choreographic or archival-pedagogical output or lack examination of the improviser's lived experience within these environments. I have aimed to address this gap through the Practice-as-Research (PaR) methodology with qualitative methods to gather and interpretive phenomenology analyses to understand the multimodal knowledge. Within the studio-praxis, I asked: What *Sculptural Qualities* are revealed through a looping feedback method when experiencing the actual and virtual? How are these *Sculptural Qualities* accessed within motion capture environments? How are these *Sculptural Qualities* activated through improvisatory approaches within motion capture environments? In the process of answering these questions, I arrived at three key areas of findings as follows:

1. A conceptual understanding of *Sculptural Qualities* as a shaping process and its extended and embedded sculptural phenomena within motion capture environments.
2. A framework for accessing *Sculptural Qualities* through an embodied understanding of body-mind interconnected relationships to spatiality, temporality, and three-dimensionality within motion capture environments.
3. A holistic approach to exploring dance improvisation within motion capture which facilitates the interactions and relationships between movement practitioners, the environment, and the world.

During this research I have explored the embodied approaches to improvisation within motion capture environments, bringing attention to these practices through practice as research methodologies. I examined how these approaches are experienced by practitioners and allow for the emergence of the *Sculptural Qualities* Framework. By placing praxis at the centre of this research, I emphasised the importance of creative studio practice and conceptual explorations in understanding *Sculptural Qualities*. The integration of praxis enabled a holistic examination of the movement practitioners' lived experiences in relation to extended embodied theories within the digital realm of motion capture. It celebrates the practical experimentations of the phenomena and the 'being-doing-thinking' relationships of the movement practitioners within the shaping process. Dance students, scholars, choreographers and researchers in dance and performance, digital performance, somatic practices, performance capture, in health and arts domains will find value in this thesis and engage in the ongoing dialogue I have continued into improvisational movements.

## 7.1 New Knowledge

The emergence of the *Sculptural Qualities* Framework offers a shaping-sculpting process at the frontier of embodied practices that transforms the modes of dance improvisation towards holistic relationships *within* digital environments. Within chapter three, I examined Karreman's (Butterworth & Wildschut, 2017) four overlapping categories and I proposed that *Sculptural Qualities* research offers a new classification to these categories as a holistic, extended, and embodied artistic dimension as part of knowledge creation utilising MoCap technologies (see 3.2). In this new category, the *Sculptural Qualities* Framework offers innovative engagement and understanding of embodied practices in digital environments. It fosters improvisational and creative possibilities that are explorative and expand sculptural vocabularies.

I argue that while dance improvisation is a self-sufficient practice, this study offers the sculptural phenomenon and themes that contribute to the vast newly emerging practice in the digital and post-digital age (excluding the AI practices for now, as further research needs to be conducted). Therefore, I propose that *the Sculptural Qualities* Framework reshapes the evolving somatic and expanding practices *by understanding* the complex relationships between body, self and the

world. These embodied practices are undergoing a shift in rethinking somatic practices with innovative interpretations, thereby transforming these domains into newly refined sculptural and performative forms. As an improviser and movement practitioner, I propose that the new refined knowledge has a significant shift towards self-discoveries and the development of a heightened awareness within these digital environments. Thus, any movement practitioner, animator, and technical demonstrator who encounters themselves in the volume (MoCap environments) can take a moment to appreciate its significance to their mastery of improvisational movement and technical workflows as an active and transformative knowledge as part of transformative education.

As technology is increasingly integrated into the dance and choreographic world, *Sculptural Qualities* Framework opens new avenues for artistic expression, challenges traditional notions of performance, and invites us to explore the intersection of the physical and the digital realms. This dynamic interplay prompts movement practitioners to reconsider the conventional boundaries of dance and technology, inspiring innovative approaches to improvisation and pushing the boundaries of what is possible within the art form. With the technological advancements since COVID-19, the momentum that MoCap technologies are gathering is focused on generating 'accurate' data creating realistic meta-humans and extending our realities into everyday life through XR technologies. However, the embodied experiences gained while 'making the data' are often forgotten or overlooked. Thus, I argue that integrating the MoCap technologies into 'making *within* and *through*' is a *gateway* to new knowledge by considering the post-phenomenology lens. By providing time and space for re-thinking and experimenting, the *Sculptural Qualities* Framework is a tool to examine these relationships in-depth. It explores what the post-human condition feels like, inviting us to step into the unknown and allowing for a shift in knowledge - reshaping our self-discoveries. The *Sculptural Qualities* Framework provides a conduit for communication and interaction that are interwoven between the physical and virtual.

I have demonstrated that the *Sculptural Qualities* extend the improvisers' body-mind emphasising that the technology, motion capture suit, and marker sets are a *gateway* to extending and intertwining the physical with the virtual (see 2.4 and 5.3.1). These abstracted living extensions become characteristic of *Sculptural Qualities* within this research. The *gateway* notion presented in this thesis (see 5.3.1)

is novel thinking, since a holistic understanding of the embodied relations between the body, technology, and the environments contribute to the continued discussions on these practices. Integrating concepts such as *in-readiness* allows us to access the *Sculptural Qualities* through active listening. In these moments, the improviser's body-mind is actively listening and seeing-responding to their intentions through a dynamic and an extending temporal feedback loops with *opening* qualities. The feedback loop processes allow the improviser to activate the core sculptural elements such as stillness, T-pose with Stillness, repetition, and accidental micro-attentions. I propose that *in-readiness* allows for holistic approaches to improvisation to emphasise the physical and virtual perceptual improvisers' experiences.

Within this research, I contribute to the evolving landscape of the dance and technology relationships that are continuously redefining and reshaping our understanding of the intricacies of dance improvisation that emerge when they intersect with technology. At this intersection sits the innovative knowledge within a framework of *Sculptural Qualities*.

## 7.2 Bridging the dance pedagogy and its new knowledge

The *Sculptural Qualities* Framework offers pedagogical strategies that invite dance students, scholars, and researchers to develop improvisational movements in innovative ways. Throughout this study, I have argued for the holistic approach where the volume is part of the system, which might be problematic with conventional dance training. Since volumes are specialised and technical spaces, it requires one to re-think how movement pedagogy can be delivered in these spaces. The dance practices already explore movement from a site-specific perspective and engage *with the site* as adaptive and responsive. Thus, exploring improvisation with *the Sculptural Qualities* Framework could offer a fluid and organic environment to experiment with and within. For example, what became clear from this research is that 'being *in* and *with the* volume' the improviser's real-time interaction with the environment allowed for transformative processes of dance knowledge. The dance knowledge is embedded in the *doing,* which is developed *through* this praxis of experimental, attentive, and active approaches to improvisation. These processes shape the improvisational awareness towards the reflective process of self-realisation as a movement practitioner within the MoCap environment. Additionally,

these *being-doing-thinking* processes in this praxis become part of the *loopiness* of knowledge, intertwining with the improviser's understanding of the self, body, and the world and shaping their sensing and responding interactions. These interactions are dynamic and temporal to emphasise the interconnectedness between the body-mind and the MoCap environment.

Furthermore, the movement practitioners emphasise the educational contribution of *Sculptural Qualities* to dance in their overall experiential reflection after the workshop. For example, M1 and M2 responded that these mocap explorations are a 'good tool' to visualise the kinesphere, extending and understanding it from the embodied practices.

Mover 1: *I think in terms of teaching, I think it is a good tool in terms that, and I think I have written it somewhere about going beyond, you know, we talk about the kinesphere and going beyond the kinesphere, but it is not very tangible. As you can see.*

*I often talk about sending the energy out through the space, or I sometimes talk about in terms of magic that you send.... whoosh. So, in terms of teaching, it actually is a visual representation of how that works...*

Correspondingly, M2 emphasises the 'new way of thinking' where the body is coupled with the motion capture technology and the environment and enabling experiential understanding of these connections:

Mover 2: *It is like opening up another door to dancing. It created a completely different way of thinking about body movements.*

*I know that technology can communicate with the body, but this is my experience myself. Knowing that means feeling how it connected together. So, make me reflect back to what I have seen before. I Can understand more how they connected.*

Similarly, M3 felt that this experience allowed her to explore the interactive element and how she could improve on the movement responses. Therefore, *Sculptural Qualities* offered her the reflective processes immediately.

Mover 3: *I have never danced with technology in this way. I suppose the first thing I have learned is that there is a whole new world of technology and that it could be really helpful with dance. And it should be looked into, I think, especially after doing this; it is just really interesting, and you know, a lot of the questions got me thinking as well about, like, how I interact with what's around me and then when adding technology to the mix, how can I improve the experience as well. So that would be my probably biggest takeaway is that you know, we have all this technology, and we probably should be using it and developing it. And you know, working to have a better dance experience all around because of it.*

M4 felt that the experience enabled an explorative environment to challenge the boundaries of improvisatory movement. At the same time, the awareness of the dynamic visualisations allows for expressive movement responses in a directional manner as follows:

Mover 4: *I think just how well it works like I was trying to challenge the visuals, as much as I am trying to challenge myself to see if it would actually pick it up, and then I realised that the slower I went, the more visual it was and the more control I had over my improvisations then, rather than just going mad and crazy.*

These reflections suggest that *Sculptural Qualities* can significantly contribute to pedagogy in dance. *Sculptural Qualities* provide a tangible and interactive explorations for movement, expression, and creativity.

In summary, as a movement practitioner and improviser, this journey has demonstrated a potential for further explorations within these embodied practices and will undoubtedly continue to inspire and challenge these evolving relationships between dance and motion capture technologies. This praxis exemplifies how motion capture technologies can foster embodied and extended connections, accessing and activating new forms of expression, collaboration, and creativity that push the boundaries of artistic dimensions. The resulting shaping process of *Sculptural Qualities* is a testament to an innovative framework in extending these experimental couplings of multi-layered improvisers lived experiences. The complexity of these layering experiences offers a playful journey as it arises when I-bodies merge in the sculptural shaping processes of movement. Therefore, this is an exciting time for my

research to contribute to pedagogy and collaborative approach to dance and performance practices within these settings.

## 7.3 Implications for further research

Apart of pedagogies in dance performance this research has an impact and carries valuable contributions to other disciplines and wider research communities inviting further explorations of *Sculptural Qualities* framework within performance capture, virtual production, and health preventions.

Firstly, the *Sculptural Qualities* framework shows a great potential to be integrated into the performance capture practices. As improvisation is essential tool to enhance the dramatic development of the storytelling for screen actors, the *Range of Coupling* (RoC) and activating core *Sculptural Qualities* offer possibilities to strengthen their skills in improvisational responses in the moment. Langdale suggests that “the actor’s ability to improvise and, improvise *live* [italics in original], promises to be the distinguishing factor and has the potential of great currency” (Dower and Langdale (2022) and p.210). The *live* aspect is evident in the *Sculptural Qualities*' framework emphasising the movement practitioner's active engagement with MoCap environment in real-time through the feedback loop. For example, during my research I was fortunate to develop teaching practice for performance capture with MA screen acting students at the University of Salford. For students, it was essential to see-respond in the moment of their storytelling scenario, and *Sculptural Qualities* provided the framework for understanding these complex relationships between body, movement expressions, and volume. Conceptually, performance capture actors need to build an awareness that the ‘game player’ has control over the animation; therefore, actors have to actively listen to those relationships with that ‘imaginative’ player. With the significant rise of AI-driven motion capture solutions and integrations into mocap workflows, performers must develop their skills further to offer performative value for the industry.

Secondly, *Sculptural Qualities* could further conceptualise extended embodiment within a virtual production (VP) environment. Story Future Academy (Bennett et al. 2021) emphasises developing various skills, including previsualisation, production, and post-production (Skills *Mandela Map,* Bennett et al. 2023). At the centre of this VP ecosystem is the performer and offers the potential to

develop new research on MoCap (film-game) integration into VP for real-time interaction. I have already started contributing to these discussions at the *International Symposium 2024 at Academy of Live* Technology to emphasise the Sculptural Qualities framework to be built into the VP curriculum for previsualisation and on-set knowledge and skills to close the gap in skills. Therefore, understanding the key elements of accessing and activating Sculptural Qualities could be explored on how its application can impact the interactive narrative experiences shaped by the performer and on-set VP artists and foster innovation with cross-industry applications.

Recent advancements in digital technologies and MoCap are shaping the current and future landscape of healthcare, particularly in ergonomics, biomechanics, and aiding in the diagnosis of neurological disorders (McManus et al., 2019). By exploring how the *Sculptural Qualities* Framework can be seamlessly integrated into existing therapy approaches presents promising prospects for enhancing health provision. For example, during my research phases, I presented my research as part of *Game On* (Sykes, 2022a) and delivered a movement workshop focusing on body-mind connections utilising the warm-up exercises highlighted in chapter five (see 5.3.1). Through these attentive exercises, individuals can become aware of their behaviours, which may impact on their stress level, and develop healthier coping mechanisms. I further contributed with a paper to the publication of the outcome of this event, which serves as a practical guide to an awareness of gambling harms. The paper emphasises the mindful and embodied approaches and fosters the creative use of motion capture technologies to develop a deeper relationship between the body, self, and the world (Sykes et al., 2023).

In conclusion, exploring *Sculptural Qualities* as an embodied and extended approach to dance improvisation within motion capture environments offers an innovative framework for enriching movement vocabularies for movement practitioners, scholars, researchers, and health and art provisions. Through the attentive approach of sensing-responding, the body-mind is coupled with the MoCap environment, allowing for spontaneous and responsive sculptural forms between the physical and virtual. It involves openness and curiosity to explore and access those sculptural intentions and new possibilities by activating the core *Sculptural Qualities* in the moment. By integrating new cutting-edge technologies like MoCap technologies in

real-time it is essential for understanding these complex relationships and sensibilities for future dance and performance capture practices. The *Sculptural Qualities* Framework offers immense potential for further development and integration into virtual production (VP) and AI-driven MoCap environments. By embracing these new advancements, this research shapes dynamic and engaging landscapes for the dance communities and other disciplines, expanding beyond the boundaries of creativity, embodied experiences, and artistic expressions.

*Dear Praxis,*
At the beginning of this journey, you have invited me to
move
experience
write
In the attentive moment of reflections of stillness,
I invite you to embrace the sculptural intentions, sensibilities, and forms,
Which lies in the centre of the improvisers living experiences

To understand is to harmonise interwoven dance between
the *I-body* and *sculpting virtual improviser*

Within motion capture environments - here and now embrace the
*I-body-as-a-sensory-device* grounded *within*
shaping
opening
extending rising
sculptural unfolding and temporal experiences
through the temporal and dynamic sculptural rhythm
reshaping
through repetition, and accidental discoveries
To witness
listen notice this dance of *Sculptural Qualities*.

*Dancer-Practitioner-Researcher.*

# Appendices

## Appendix 1

**Motion acquisition – technical workflow set up**

As highlighted in chapter four, the studio-practice is working with optical motion capture system - OptiTrack Motive software. The first task in phase one was to learn how to set up and operate the motion capture system. Including preparing the capture area by clearing the space of unnecessary obstacles, ensuring we had the correct lighting for the infrared cameras, and covering any reflective objects within the space. The set up of four cameras on the rigging poll, body height and the other four cameras were already rigged above on the bars.

Further set up required the *load-balanced* of the eight cameras with required system components such as 12-port PoE + Switch and eSync and connected them to the host PC through an Ethernet cable. OptiTrack Motive only works on Microsoft Windows, and firstly I was working with version 2.0, alternatively I used v 1.9 and 2.2. Once the initial setup was established, I learned how to *calibrate space*, which required masking, wanding (Figure 84) and setting the ground plane.

The calibration window displayed the wand calibration results (Figure 85 and Figure 86). Once the satisfactory percentage was applied, the setting ground plane with calibration square (Figure 87) is an essential process for the system to see the floor and place cameras above the floor. The next step was to *marker up,* which meant for the dancer to wear a specialised black suit with a hat and footwear (bootie) to place markers onto the dancer's body—utilising the Baseline window to help accurate placement of the markers on the body (Figure 88). These markers support how the Motive software derives the positioning of each body segment through these markers placed on the suit.

Figure 84 - A wand with three active markers for the wanding process part of calibration in Motive

.

Figure 85 – Calibration window in Motive:Body software.

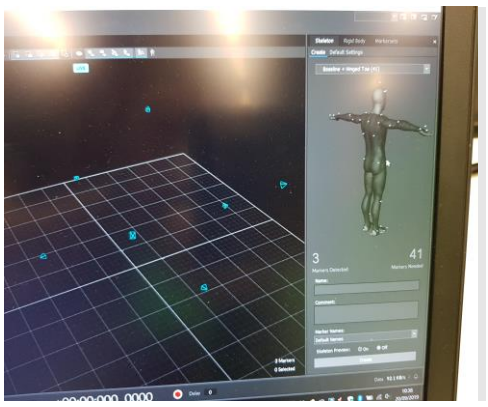


Figure 86 - Camera array view after the calibration process in Motive:Body software.


Figure 87 - Setting the ground plane with calibration square.

I used 41 body markers to explore the software's capacities and how it will be visually displayed on the screen. The placement of the markers required me to stand in the middle of the already calibrated space – volume - with both arms stretched to the sides, legs slightly apart, forming a "T" pose. This allowed the selection of desired markers, in this case, all 41 markers, to create a skeleton of my body and map it onto a digital model in the three-dimensional space.


Figure 88 - Calibration of 41 body markers in Motive:Body software.

## Appendix 2

**Phase one and two development of semi-structured reflective prompt questions with interview questions.**

The purpose of this interview is to learn more about the activation and to access sculptural quality through embodied experiences of sculptural motion within the digital environment and looping feedback method.

I hope that we can talk about your experiences further.

This interview is part of a practice led PhD research project. Therefore, the original video and the transcript will be stored on a PC and some parts of it shared within the final thesis submission.

The researcher sees this interview to be a collaborative effort and is very interested in what you have to say.

The interview will be facilitated by the researcher with use of Schön (1983, 1987) "reflection *on* action" and "reflection *in* action".

**Reflection *in* Action Questions**

Questions- Prompts *in* improvisation

Prompts group 1 phase one:

- How can you describe what you are observing while sensing-moving?
- What are you attending to right now?
- What are you aware of -being conscious - of when improvising?
  - Where is this attention located in your body on your body or in space?
  - Are you aware of any tensions between your actual and virtual bodies and between you and the visualisations?
- What is your intention when responding to the visualisations?
  - Do you feel you are acting in response to the energy of the moving visuals?

Additional prompts group 2 phase two:

- Taking time to note any images or associations that each combination might call up for you?
- What details sticks out/resonates with you while responding and connecting?
- How do you perceive the virtual self how does it change your perception of your physical/ actual body?

Additional prompts group 3 phase three:

- Are you aware of moments of stillness? If yes what is your experience of stillness when sensing- moving
- What meaning it has for you when experience the T-pose with stillness?
- Have you sensed any repetition with your responses to visualisations?
- Do you think you were improvising? Did you feel you were improvising?

## Appendix 3

An example of the prompt's questions for *Reflection on Action* utilising Schon's reflective method (see 4.4.2).

**Questions prompt for video diary reflections 2-5 minutes**

What did you find that you have attended to (had intention/attention/ when responding to the visualisations?

When responding - Did you attend to

- your body natural impulses or
- or the other body in space
- the visualisation (colour shape change in dynamic)
- or the environment)

What was it like to produce this type of imagery and visualisation?

What changes in movement qualities have you experienced over the time any other comments?

What have you learned about yourself as a dancer/movement practitioner through this experience?

Did you acknowledge the other body in the space?

Was your attention towards to the physical or virtual bodies?

Was your attention towards to the physical or virtual space?

**Phase three additional prompt**

When working together with the other dancer did you felt the "give-and-take" approach over time, a "dialogue" between your two physical bodies and the virtual once too?

## Appendix 4

An example of the prompt's questions for *Reflection on Action* utilising Schon's reflective method (see 4.4.2).

**Reflection *on* Action**

**Question prompts for Free Writing Reflections (2min)**

What is the meaning of the surprising and/or accidental discoveries for you when sensing-moving-connecting-responding?
How has the experience changed/shifted your perception of the actual body?

**Reflection *on* Action**

**Questions prompts for Free Drawing Reflections (2min)**

Draw this experience of sensing-moving-connecting-responding?
You can use any pens, pencils, and colours.

## Appendix 5

I applied the six stages of the IPA analyses and cross-referencing with the movement analyses (video recordings). Stage one of the IPA analyses to read and re-read the transcript, re-listened the interview on its own, and re-listened the interviews with the video recordings (the reflection-in-action transcripts). The initial notes and observations were noted on a Word document and videos were annotated (see 4.4.3).

Stage two is initial noting with the explanatory comments and a descriptive element, linguistic and conceptual comments of the lived experience. In the example table 9, the comments are as follows: watching and interpreting it as a delay are descriptive elements, the (seeing-witnessing) and (noticing delay) in brackets relate to a conceptual linking, and fireworks look at the linguistic metaphoric elements of lived experiences (Table 3).

Table 3 - Transcript example with IPA analyses – thematical selection stage two.

| Transcript text of Mover 3 | Exploratory comments:<br>Researcher's interpretation notes with highlighting text suggesting themes |
|---|---|
| Mover 3:<br>This time, stillness is more because I am watching the screen as well to see what is happening when my body moves it. It is like a delayed response this time , and so on. Also, when I move slowly, it seems like the fireworks are bigger. When I move fast, it's just like.<br><br>I don't know. Maybe they're not better, but they're a little bit more dramatic, at least. | Stillness – watching (seeing- witnessing) interpreting it as a delay (noticing delay on it) – there is more of it as the mover is watching the screen more<br><br>Noticing the change of quality in the fireworks – when moving slowly – sustain, and when moving fast – fireworks are dramatic, at least. |

Stage three is to develop emerging themes – Table 4. For example, the stillness and noticing – create the concept of stillness and awareness arrived from stage two, see Table 5.

Table 4 - Transcript example with IPA – thematical exploration stage three.

| **Researcher's interpretive notes** | **Themes/concepts** |
|---|---|
| Stillness watching (seeing- witnessing) | Stillness - sensing |
| Noticing the change of quality in the fireworks<br><br>When moving slowly – sustain, and when moving fast – fireworks are dramatic, at least. | Awareness (of the behaviour)<br><br>Movement quality - change of quality |

Stage four allows the themes to be subsumed in search of connecting across the transcript and collating them with related concepts (see table 11).

Table 5 – Transcript example with IPA – thematical explorations stage four.

| **Researcher's interpretive notes** | **Themes/concepts** |
|---|---|
| Fireworks/ air/ explosions | Metaphor |
| echo with the light lingering within that echo and noticing the break in them. | Metaphor<br>Awareness<br>Aesthetic – movement quality |
| sparks | Metaphor for visualisation |
| | |
| – image with an emotional attachment | |
| behaviour of fireworks | Movement quality |

Stage five is moving to the next participant's transcript and applying the same stage one-four. Stage six examined the concepts through "common meaning for several individuals of their lived experiences of a concept or a phenomenon" (Creswell, 2013, p. 76) across the three phases.

## Appendix 6

For example, in Table 6-9, I have utilised the IPA notes on the left-hand side in a transcript Mover 3, task 3 in phase two, the reflection in action Table 6, the reflection -on-action Table 7, the drawing reflections Table 8, and the writing reflections Table 9. Table 10 demonstrates the overall thematical elements from the overall transcripts.

### Reflection-in-action:

Table 6 - Transcript example for IPA notes analyses.

| **Reflection-in-action Mover 3 -task 3.** | |
|---|---|
| Transcript text of Mover 3 | Exploratory comments:<br>Researcher's interpretation notes with highlighting text suggesting themes |
| Q: How can you describe what you are observing when sensing-moving? | |
| Mover 3:<br>Definitely the biggest word is fireworks. Fireworks are what I'm observing and what I'm making through my movement. I'm just sensing a bit more air around me. And seeing how the lights and the explosions changed the air around me.<br><br>A lot of my movements are, I think, flicking or like explosion sort of movements. | Comments that the fireworks are the biggest word – she is also sensing bit more air around her – and seeing the changes in the air when she interacts with the lights and explosions.<br><br>The flicking movements is to interpret the explosions |
| Q: What are you aware of then? What you being conscious of? | |
| Mover 3:<br>I'm aware of the screen this time. Definitely. I get a little bit more of an image, a little bit more emotion attached....<br><br>Only one of my arms is a firework and the other one is that scene tracing from last time, but I'm more worried about the firework arm fireworks out of the body. I guess you could say. Then the just tracing one. | Mover 3 is aware off the screen – image with an emotional attachment (Laban – qualitative changes = emotion)<br><br>Noticing that only 1 arm has the firework – noticing more the tracing element of the firework |
| Q: I see again, repetition. What does that repetition mean for you? | |
| Mover 3:<br>This repetition is more a sense of....<br>Well, I would say kind of experimenting with the patterns again. But this one has | Repetition for the mover 3 is experimenting with patterns – and have feel and sense of direction (than task 2). |

| | |
|---|---|
| a little bit more direction to it as opposed to the last one. | |
| Q: Are you paying attention to the colours? Or is it more the fireworks? | |
| Mover 3:<br>More the fireworks. I like the colour down in this corner.<br><br>But back here, it doesn't seem to pick me up, so I'm not using the backspace as much as opposed to last time. | Noticing more the fireworks then the colours – but is attracted to one colour in the space (spatial relationship) |
| Q: What stillness has meaning for you in this improvisation? | |
| Mover 3:<br>This time stillness is more because I'm watching the screen as well to see what's happening when my body moves it. It's like a delayed response this time and so. Also, when I move slowly, it seems like the fireworks are bigger. When I move fast, it's just like.<br><br>I don't know. Maybe they're not better, but they're a little bit more dramatic at least. | Stillness – watching (seeing- witnessing) interpreting it as a delay (noticing delay on it) – there is more of it as the mover is watching the screen more<br><br>Noticing the change of quality in the fireworks – when moving slowly – sustain and when moving fast – fireworks are dramatic at least |
| Q: Do you have any image association with this one? | |
| Mover 3:<br><br>Just fireworks and like a dark night sky. And it just the way the fireworks go. There's a little bit of an echo. And as it's like the light lingers behind a little bit.<br><br>Which happens every time I go to see fireworks as well. They linger and you can see it whenever the there's a break in them. | Image association – just the fireworks – dark sky the – noticing echo with the light lingering within that echo and noticing the break in them.<br><br>Association with memories of experiencing fireworks – the behaviour of fireworks– lingering in the sky and the break in them. |
| Q: Do you think you improvise link do you? Do you think you're experiencing improvisation? | |
| Mover 3:<br><br>I don't think I'm. I'm improvising at the moment. I think I'm free moving. The first task I was definitely improvising the second task free moving on this task.<br><br>Definitely free moving. | Free moving x improvising (improvising more in the 2nd task) not improvising due to missing connection – more feeling of responding to the visuals – and noticing some thoughts at that moment which makes is more free moving then |

| | |
|---|---|
| Improvising, I feel like I need some sort of connection within in order to be truly improvising. | improvising (suggesting that improvisation does not have thoughts?) |
| Q: So there's this missing connection here then? | |
| Mover 3:<br><br>Definitely, not as much connection, just responding to the visuals. There's like a little bit more thought at the moment than I would have if I was improvising. | |
| Q: How much are you aware the physical space? | |
| Mover 3:<br><br>Right now, the physical space is this room. It's not the virtual reality. This time the physical space is definitely me in a room free moving with the monitors around, not so much me in the task or in what we're doing. | noticing - Physical space and the environment (tools, equipment) |

## Reflection-on-action:

Table 7 - Transcript example for IPA analyses reflection-on-action.

| **Reflection-on-action Mover 3 -task 3** | |
|---|---|
| Transcript text Mover 3 | Researcher's interpretive notes |
| Q: What did you find engaging when responding to the visualisation? | |
| Mover 3:<br><br>The one that's sparked the very specific firework one. Not so much the tracing from before. | Noticing the behaviour of the visualisation – sparked (visual quality) – responding to that – not tracing like in the previous task<br><br>(can have emotional responses) |
| Q: Could allocate those sparks then on your body? | |
| Mover 3:<br><br>It's my no. The right side of my body the right side of my body had the sparks and wherever I was pointing is where it would come out from.<br><br>So a lot of like pointed direct movement like poking and stabbing. I would say it | Noticing which body part has the sparks |

| | |
|---|---|
| movements. | Noticing directions of the fireworks – pointed direct movement & poking stabbing quality |
| Q: What lead you first to responding? Was it the visualisation the sparks? | |
| Mover 3: Definitely. | Agreeing that the sparks were initiating the movement responses |
| Q: Did you feel that the visualisation leads you, and then you were leading and then the visualisation was leading again so it was changing? | |
| Mover 3:<br><br>Back and forth, yeah, this one. There was a bit more back and forth than the last one.<br><br>I think sometimes I would go into a bit more dancing movement as opposed to just kind of letting the visualisation lead me. It's a bit different from last. | Agreeing that the leading was interchangeable between the mover's body-mind and the visualisation – interpretive feedback loop) |
| Q: What was it like to produce that is kind of imagery? | |
| Mover 3:<br><br>Definitely fun, I would say. Seemed very like light-hearted. I would say always my you know fingers leading or my toes so they like external reaching in the kinesphere sort of body parts so that felt big. It felt a little bit more reaching external, definitely.<br><br>External, yeah. | Enjoyable experience – playful<br>Noticing which body part was leading/initiation the movement<br>External reaching into kiensphere with different body parts – feeling of enlargement – (extension) |
| Q: Did you felt anything internally kind of in the last free exercise? | |
| Mover 3:<br><br>The first exercise a lot of internalization. And the second exercise all external. And then this one kind of a half and half like some internal and some external, but mostly external. | Comparison of to the first exercise with *line visuals* where mover 3 felt it was more internal, and second one felt external, this third task felt more somewhere in between the internal and external – but mostly towards the external. |
| | |
| Q: What kind of changes of movement qualities you have experienced through this. | |
| Mover 3:<br>More like sort of …. whoosh... | Sound interpretation of the visualisations and possibly the movement |
| Q: impulse/impact? | |

| | |
|---|---|
| Mover 3: Yes. | Agreeing on the movement qualities – rhythm of both impulse/impact |
| Q: Any other comments? | |
| Mover 3:<br><br>I thought it was interesting that only one side was the fireworks, and I think that changed my quality of movement. This side was only the tracing. | <br><br>Noticing that only one side / body part had the fireworks attached to<br>In response to that the movement quality changed<br>The other side of the body – was only tracing |
| Q: So, it's on your one hand and the...? | |
| Mover 3:<br><br>Oh, the toes.... kind of fireworks, isn't it? | <br><br>Noticing – correcting that other body part not just the hand had the fireworks on |
| Q: I thought the very first moment when you did you actually did this, and I thought you did that on the other one as well. And I thought 'she already recognized that it's on her arms'. | |
| Mover 3: Interesting ... | Mover 3 finds researchers observations interesting |
| Q: Stillness as you are still. The body is still, but the visualisations keep going because ….? | |
| Mover 3:<br><br>Well, I mean when we are still, we're never really still, aren't we. and I think that's a really good representation of that, because even if we're still standing like even in the T pose.<br><br>I mean breathing and a lot of dancers will also tend to like reach or kind of find like that pose movement that kind of end pose sort of movement and were never.<br><br>Really still as dancers or as human beings by rest the breathing. The body functions going. So, it's actually quite interesting getting the mind as well. I didn't think about that.<br><br>But like these this sort of sea urchin firework looking. Representation, it really does show how the energy continues to flow outwards even when we are still. | <br><br>Mover 3 analysing the stillness<br>Pointing out that where body is still it is never really still<br>And the fireworks are a good representation of that<br>Even in the T-pose position<br><br>Breath is noticed –<br>Noticing the functionality of a reaching pose within dance practice<br><br><br>Through the breath the body functions are going, thus we are not still.<br>Noticing the mind connection to the body – where when moving mover 3 doesn't think about that in that moment.<br><br><br>Interpretation of the visualisations and the emotion/feeling – of sea urchin firework looking<br>Noticing the energy which continues and flows outwards even when in stillness. |
| | |

## Writing Reflection:

Table 8 - Transcript example of IPA analyses - drawing reflections.

| |
|---|
| **Mover 3 wrote:**<br>Surprising discovery in that the fireworks were only on certain body parts - it seems like the dynamics of those body parts have to be different, have to be specific. Makes for a more challenging task. My body is not just one whole responding to the task, it's different parts with different qualities. Much more complex. Free movement, not improvisation knowing which hands/ feet/etc are which visual changes the movement itself. |
| **Researchers' interpretation notes**<br>The mover 3 found this explorative task as a surprising discovery with noticing that fireworks are allocated on a certain body part – therefore it had an effect on the dynamic movement of those body parts<br>Feeling of a challenge in this task<br>Noticing that not just the whole body responding but also different body parts and thus different qualities are introduced<br>Feeling complexity in this task<br>Free movement rather than improvisation – in knowing which body parts have the visualisation on – and that the visualisation is changed by the body part movement. |

## Drawing Reflection:

Table 9 - Transcript analyses example of IPA analyses - drawing reflections.

| **Mover 3 draw** | **Researcher's interpretive notes** |
|---|---|
|  | There are dots, some green, one blue, and they are dark, filled in, lots of layers over them to make them stand out<br><br>From the green dots lines are opening up into the space, the dot function as a centre point from which the curvy elongating lines moving outwards from the centre into the space – creating a circular shape – with he curves almost moving/spinning shape<br><br>With the blue dot small dotting lines are spreading out only to one side, creating like a triangular shape aging outwards from the blue dot as being the centre<br><br>At the bottom of the image there are few more dotting dots/short lines some just spread out all over some more in a cluster similar to the large green once. |

## Thematical Coding:

Table 10 - Thematical Coding utilising IPA.

| Researcher's interpretive notes | Themes/concepts |
|---|---|
| Fireworks/ air/ explosions | Metaphor |
| echo with the light lingering within that echo and noticing the break in them. | Metaphor<br>Awareness<br>Aesthetic – movement quality |
| sparks | Metaphor for visualisation |
| | |
| – image with an emotional attachment | |
| behaviour of fireworks | Movement quality |
| flicking movements | Movement quality |
| when moving slowly – sustain and when moving fast – fireworks are dramatic at least | Movement quality - change of quality |
| behaviour of the visualisation – sparked (visual quality) | Movement quality |
| patterns | Movement quality |
| Aware Noticing | Awareness |
| noticing - Physical space | Awareness of the environment |
| | |
| tracing | Action - a copy of a drawing or pattern |
| Repetition | making meaning in dance choreography<br>creating intention in dance<br>using a different Dynamic or rhythmic variation |
| | |
| feel and sense of direction | Spatial relationship - sensing |
| space | Spatial relationship |
| Stillness watching (seeing- witnessing) | Stillness - sensing |
| feeling of responding to the visuals – and noticing some thoughts at that moment which makes is more free moving | |
| | |
| sparks were initiating the movement responses | Intention / Intentionality |
| leading was interchangeable between the mover's body-mind and the visualisation | Intention / Intentionality |
| Enjoyable experience | Playful experience |
| External reaching into kiensphere with different body parts – feeling of enlargement – (extension)<br><br>internal and external | Exteriority – Intentionality<br>Kinesphere – Movement/ spatial relationship<br>Extensions<br><br>Interiority/Exteriority – Intentionality |
| whoosh | Sound interpretation and possibly movement quality |
| T-pose position | Shape - wall |
| Breath | Internal - somatic |
| functionality of a reaching pose | Shape change - action<br>Functionality |

## Appendix 7

The studio-practical exploration tasks I have defined in phase one with the movement explorations utilising Laban/Bartenief Effort-Shape fundamental of rising-sinking/opening-closing/advancing/retreating (see 2.3.4). These Effort-Shape movement qualities were explored with Motive software - utilising markers' history to create *line visuals* (see 5. 4).

| **Phase One** | | |
|---|---|---|
| Task 1 | Explore rising/sinking.<br>Explore extension relates to awareness of space – open/close and<br>the range from open to close | Using only Motives – *line visuals* |
| Task 2 | Explore kinesphere – establishing the personal space. | Using only Motives – *line visuals* |
| Task 3 | Explore weight and rhythm – percussive, impulse, impact, swing, sustained, vibration.<br>And the range from rising to sinking. | Using only Motives – *line visuals* |
| Task 4 | Explore the degree of tension – light and firm; and<br>The range from light to firm. | Using only Motives – *line visuals* |
| Task 5 | Explore impulse – reflexive movement. | Using only Motives – *line visuals* |

**After each task Reflect:**

- 2min video diary (reflection first thoughts with no question prompts)
- 2min writing nonstop reflection (no question prompts)
- 2min drawing reflection.

## Appendix 8

The studio-practical exploration tasks I have defined in phase one were springboard for phase two. I developed further utilising the Body and Shape fundamentals with the movement explorations utilising Laban/Bartenief Effort-Shape qualities of rising-sinking/opening-closing/advancing/retreating (see 2.3.4). These Effort-Shape movement qualities were explored with Motive software - utilising markers' history to create *line visuals* (see 5.4) and Touch Designer (see 5.5 and 5.6).

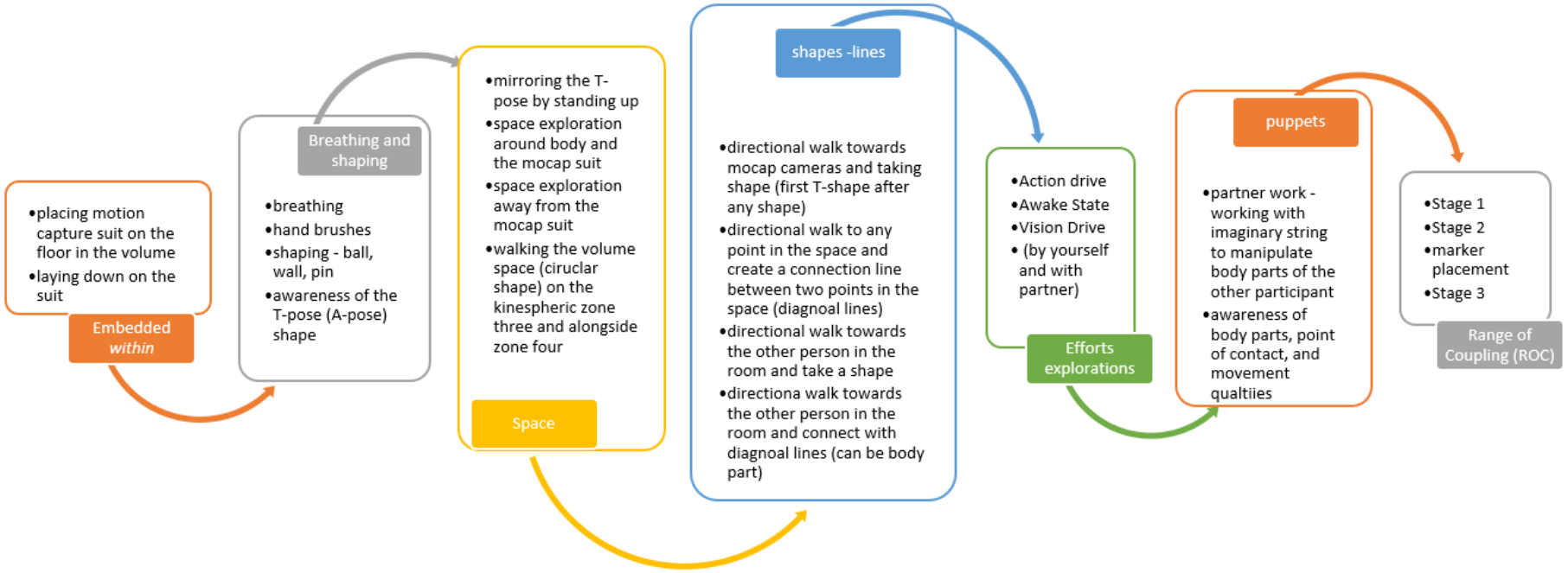
| | |
|---|---|
| Walking the room – directions around the space | |
| Oval walk pattern<br>Observe<br>Floor<br>Walls<br>Ceilings | 3min |
| Triangles – directions towards each camera<br>And those 3 screens<br><br>Zig zag –journeys directed<br><br>Direct quick<br>Direct sustained<br>Indirect quick<br>Indirect sustained | 3min |
| Working with your own kinesphere<br><br>**Action drive directions** | 5-8min |
| Action =Press-pulling with sustained<br>Awake = Direct sustained<br>Vision = Indirect – sustained free | |
| Action = slashing strong, indirect, quick<br>Awake = direct quick<br>Vision = indirect quick free flow | |
| Stretch – what you need to strengths | 3-5min |
| Teach the sequence – without mocap suit | 5-8min |

| | |
|---|---|
| Rhythm sequences include T-pose with stillness<br>- using Laban's rhythm patterns (impulse, impact, swing, monotone -sustained) percussive, vibration) | |
| Teach the sequence – with the mocap suit | 10min |
| 1x Do the sequence again with mocap again with Dim the light | 2min |
| Total | 40min |
| T-pose for MoCap | |
| TASK 1<br><br>First Mocap with<br>*Line visuals*<br><br>All body<br>Explore the visuals<br>Accidental choreo (unknown)<br><br>Different body parts | 5-8min |
| Break | 5min |
| TD | |

| **Phase Two** | | |
|---|---|---|
| Warm up | Using Laban's elements of shape, lines, efforts, and relationships | Development from the phase one |
| Task 1 | Line-visuals with Motive | *Line visuals* – whole body to start |
| Task 2 | Touch Designer – visualisation 1 | Similar to line-visuals = Dots |
| Task 3 | Touch Designer – visualisation 2 | Sparkles with feedback |
| Task 4 | Touch Designer – visualisation 3 | Particles with Open close |
| Task 5 | Touch Designer – visualisation 4 | Particles with feedback |

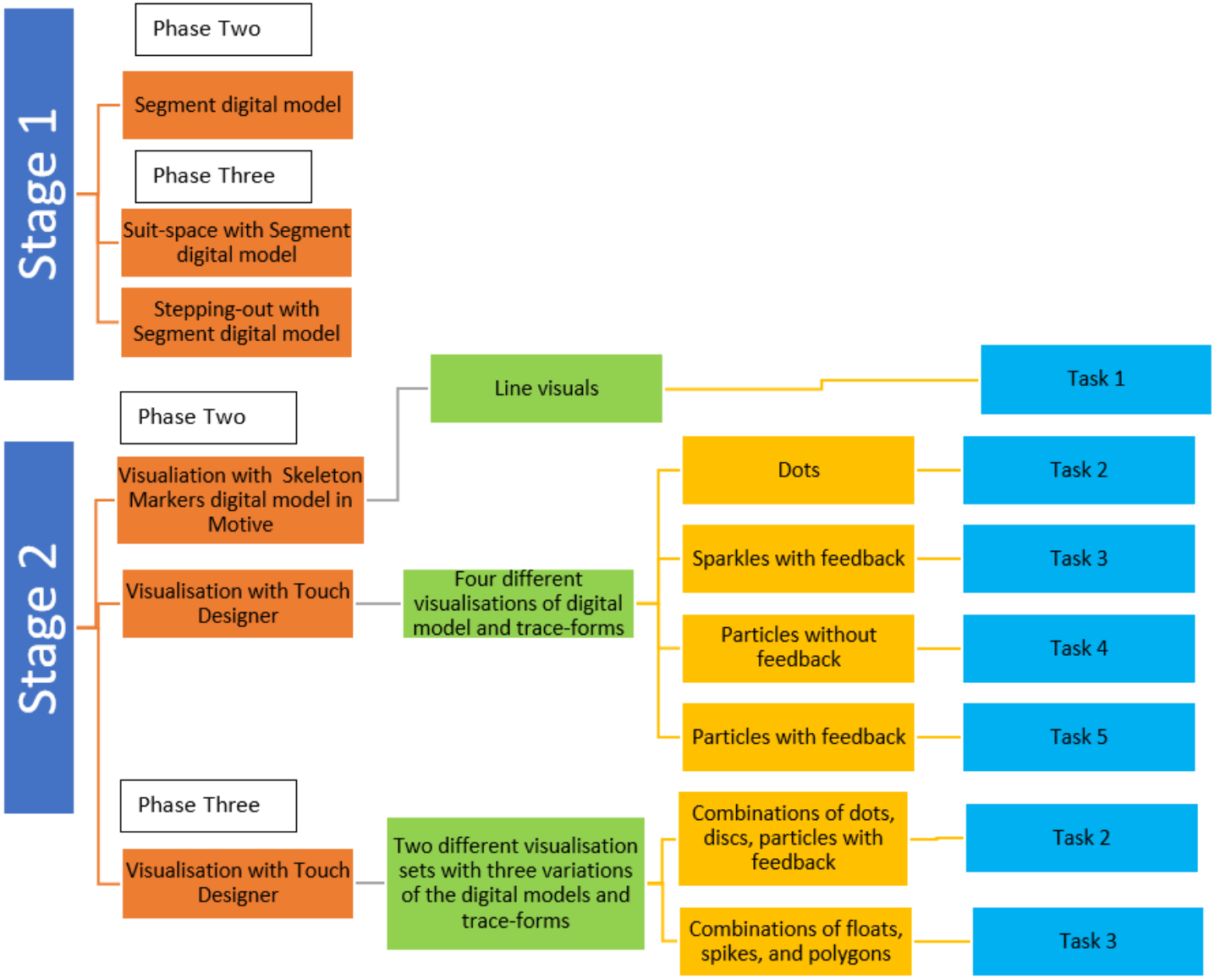
## Appendix 9

This image represents the framework for accessing *Sculptural Qualities* within motion capture environments. The framework consists of seven steps discussed in chapter five (5.3.1) before the improvisational tasks (see 5.3.2).



## Appendix 10

This image represents the improvisation tasks framework. The improvisational tasks are divided into two stages. Stage one is working with motive–*line visuals* in phase one only. Stage two is the development of visualisation with Touch Designer and the different sets of visuals such as dots/blobs, particles, etc. (see 5.3.2).


Stage 1
Phase Two
Segment digital model
Phase Three
Suit-space with Segment digital model
Stepping-out with Segment digital model
Stage 2
Phase Two
Visualiation with Skeleton Markers digital model in Motive
Line visuals
Task 1
Visualisation with Touch Designer
Four different visualisations of digital model and trace-forms
Dots
Task 2
Sparkles with feedback
Task 3
Particles without feedback
Task 4
Particles with feedback
Task 5
Phase Three
Visualisation with Touch Designer
Two different visualisation sets with three variations of the digital models and trace-forms
Combinations of dots, discs, particles with feedback
Task 2
Combinations of floats, spikes, and polygons
Task 3

## Appendix 11

Due to the nature of the three-hour-long workshop with sixteen participants over the last three phases of this research, the collation of transcripts became over 400 pages long. Upon reviewing how best to view and facilitate the original transcripts, I decided to separate transcripts from the main body of this paper. Therefore, if you wish to print off the thesis, it will only include the appendices with relevant information within the main paper. The transcripts are in a separate PDF file entitled Appendix 11. The transcripts are not published in this thesis and are in the repository: Sykes, Lucie (2024). LSykes Thesis Appendix 11 - Transcripts 2023. University of Salford. Dataset. https://doi.org/10.17866/rd.salford.26319160.v1

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