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***Deep Flow:***  
***a tentacular worlding of dance,***  
**biosensor technology, lived experience**  
**and embodied materials of the**  
**human and non-humankind**

**by**

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# ABSTRACT

How to find relations between lived experience and biosensor technology in dance practice? This PaR presents a novel methodology, *tentacular worlding*, to explore Embodied Dance practice as lived experience, using phenomenological methods and biosensor technologies to better understand experiential aspects of dance more fully, by *looking inwardly*. It challenges dance practice intersecting with biosensors that visualise invisible physiological events such as heart rate, in external mediated environments, to which dancer's respond. These ocularcentric practices illustrate only certain aspects of a dancer's bodily engagement with technology thereby privileging vision over bodily experience. *Looking outwardly* neglects the vast storehouse of lived experiences that technologies used instrumentally, cannot capture.

To explore the strategy of *looking inwardly*, a relational methodological approach *tentacular worlding* is applied. This inspires an interdisciplinary study of the human body in dance practice, phenomenology, technology, and ecofeminist posthumanism. Phenomenological dance methods are used to; explore whole bodily experiences; investigate bodily interactions with differing environments; and discover human relations with biosensor technologies and differing materials. It challenges ocularcentrism by blindfolding the practitioner to augment bodily sensing in the absence of visual information. Multimodal qualitative and quantitative methods are used to interpret these experiences and methods of analysis emphasise *tentacular* relations between lived experience, the heart, and biometric data.

*Tentacular worlding* gave birth to the Embodied Dance practice *Deep Flow*, to foreground relations between lived and bodily experiencing, meditation, fascia release and heart rate variability. By *looking inwardly*, within an ecology of embodied experience, visible and invisible, tangible, and intangible materials, *Deep Flow* collapses binary notions of inside and outside, subject and object, an *embodied materiality*. It proposes; *a return* to bodily experience and embodied states of *flow*, to construct knowledge from a first-person perspective and to explore the complexity of relations between the heart, the human and nonhuman.

I hereby declare that the work presented in this thesis is entirely my own and has been composed by me and that the work has not be submitted for any other degree or professional qualification.

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June 2021

# PREFACE

As a young dancer and choreographer living in South Africa, in the 1980's, I explored my body as a site of resistance, to express my anger against Apartheid. Later, I used digital and interactive technology, to explore my body's digital materiality. From 2010, I began collaborating with phenomenologist Susan Kozel, exploring how Screendance and augmented reality (AR),<sup>1</sup> mediates affect.<sup>2</sup> More recently we have been collaborating with choreographer Margrét Sara Guðjónsdóttir, who created the *Full Drop*, an Embodied Dance practice that substitutes the rigour of physical training and performance with *body-mind* integration and the experiences we have when listening to bodily cues. The collaboration opened a new era of Embodied Dance practice and research for me. This enabled me to explore interiority, mindfulness, and body-mind integration and led to this PhD research. Here I have developed my own Embodied Dance practice, *Deep Flow*, using phenomenological and meditation methods, turning my attention to bodily experience, the pre-reflective and direct experiencing intersecting with technology. A heart rate monitor (HRM)<sup>3</sup> is used to record how the heart and central nervous system (CNS)<sup>4</sup> respond to the state of *Deep Flow* and how this data supports and deepens the practice. The practice aspires to reinstall a trust in one's own subjectivity, sense perception, presence, and embodiment,<sup>5</sup> whilst interfacing with technology.

The thesis is an account of the research that developed *Deep Flow*, using dance and cultural studies as the main disciplines of the research. It draws on methods from the

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<sup>1</sup> AR: Augmented Reality is an app that overlays digital content such as video, imagery, text, or sound on a hand-held device such as a mobile phone, enhancing the user's physical world.

<sup>2</sup> Affect is often thought of as human emotions; however, they are, according to Kozel (2007), dynamic flows or intensities that are felt by the body and occur between bodies and things. They are felt as nuanced sensations that arise from being in a situated body. Using Merleau-Ponty, Kozel (2007, p. 287) describes affect as "an acknowledgement of our being embedded in the fabric of the world alongside others" through the senses, with no division between self and world.

<sup>3</sup> HRM: A heart rate monitor is a personal monitoring device that allows one to measure and display heart rate (HR) in real time or record HR for later study. It gathers HR data to detect the electrical signals produced by your heart each time it beats, whilst one is performing various types of physical exercise.

<sup>4</sup> CNS: The central nervous system controls most functions of the body and mind. It consists of two parts: the brain and the spinal cord. The brain, the centre of our thoughts and the interpreter of our external environment, is connected to the peripheral nervous system via the spinal cord, to the sensory organs and other organs of the body, muscles, blood vessels and glands.

<sup>5</sup> Embodiment is a term used in phenomenological theories to describe our subjective selves, experiencing, and perceiving the world with and through our bodies, our senses and social presence.

social sciences and philosophy, namely phenomenology, to supplement the investigation, including theories of technology and feminist cultural studies to articulate and interpret relationships of the body to dance and technology within an ecology of human and nonhuman materials. The thesis is divided into seven chapters. Chapter 1 describes the rationale for the research. It examines three case studies, technologically informed dance practices that use biosensor<sup>6</sup> technology and interactive software to visualise and represent responses of performers in external media environments. Chapter 2 describes bodies through phenomenology and how this gives rise to Somatic and Embodied Dance practice. Chapter 3 discusses how dance performance uses technology, code, and interactive software and how this affects performing bodies and their mediation. Chapter 4 discusses the effects of wearable technologies and self-tracking, how they have become part of our subjective experience, framed by postphenomenological and feminist posthuman cultural studies. Chapter 5 explores *a tentacular worlding*, a metaphor to describe the PaR methodology that was created to conduct the research. Chapter 6 reveals the methods and findings from three studies, and the main finding *Deep Flow*, using multimodal methods of practice, data collection, and data analysis. Chapter 7 is an overview of the findings from the studies in relation to current cultural studies and reveals further development and conclusions about *Deep Flow*.

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<sup>6</sup> A biosensor is a wearable analytical device which captures and converts physiological and electrical activity of the body, such as heart rate, into data.

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# CONTENTS

<b>CHAPTER 1.....</b>	<b>1</b>
<b>AN INTRODUCTION .....</b>	<b>1</b>
1.1 <i>Rationale: looking inwardly.....</i>	<i>1</i>
1.2 <i>Case studies: performance using biosensor technology .....</i>	<i>3</i>
1.3 <i>Research questions.....</i>	<i>18</i>
<b>CHAPTER 2.....</b>	<b>20</b>
<b>BODIES IN... DANCE PRACTICE.....</b>	<b>20</b>
2.1 <i>Bodies in... phenomenology.....</i>	<i>20</i>
2.2 <i>Bodies in... somatic dance practice .....</i>	<i>26</i>
2.3 <i>Bodies in... embodied dance practice .....</i>	<i>31</i>
<b>CHAPTER 3.....</b>	<b>37</b>
<b>BODIES IN... PERFORMANCE TECHNOLOGY.....</b>	<b>37</b>
3.1 <i>Technologies in performance extending the body .....</i>	<i>38</i>
3.2 <i>Interactive and telematic mediations of the body .....</i>	<i>42</i>
3.3 <i>Cyborg performance.....</i>	<i>45</i>
3.4 <i>Ecosystemic performance.....</i>	<i>47</i>
<b>CHAPTER 4.....</b>	<b>53</b>
<b>BODIES IN... EMBODIED TECHNOLOGIES .....</b>	<b>53</b>
4.1 <i>Wearable technologies in performance .....</i>	<i>53</i>
4.2 <i>Nonhuman instrumentation.....</i>	<i>55</i>
4.3 <i>Embodied interactions.....</i>	<i>59</i>
4.4 <i>Self in the data.....</i>	<i>63</i>
4.5 <i>Embodied materiality .....</i>	<i>64</i>
<b>CHAPTER 5.....</b>	<b>70</b>
<b>TENTACULAR WORLDING – A METHODOLOGY .....</b>	<b>70</b>
5.1 <i>Cat’s cradling – a metaphor for activating the PaR.....</i>	<i>71</i>
5.2 <i>PaR – know-how, know-that, know-what.....</i>	<i>72</i>
5.3 <i>R-reflexivity – a reflexive methodology.....</i>	<i>76</i>
5.4 <i>Phenomenology and improvisation as methodologies .....</i>	<i>78</i>
5.5 <i>Liquid knowledge.....</i>	<i>80</i>
5.6 <i>Praxis – a tentacular worlding.....</i>	<i>81</i>

<b>CHAPTER 6</b> .....	<b>88</b>
<b>THE STUDIES: METHODS AND FINDINGS</b> .....	<b>88</b>
6.1 <i>Methods</i> .....	90
6.1.1 <i>Methods of practice</i> .....	90
6.1.2 Qualitative multimodal data collection methods .....	95
6.1.3 Quantitative biometric measuring methods .....	105
6.1.4 Data analytic methods.....	106
6.2 <i>The studies and findings</i> .....	110
6.2.1 Pilot studies .....	112
6.2.2 Study one.....	113
6.2.3 Study two.....	130
6.2.4 Study three .....	133
6.3 <i>Main Finding: Deep Flow</i> .....	147
<b>CHAPTER 7</b> .....	<b>151</b>
<b>DISCUSSIONS AND CONCLUSIONS</b> .....	<b>151</b>
7.1 <i>The rationale for the studies</i> .....	151
7.2 <i>Bodies of knowledge in the findings</i> .....	155
7.2.1 A segue before study one.....	155
7.2.2 <i>Withdrawing and expanding</i> in study one .....	156
7.2.3 <i>Dwelling and formlessness</i> in study two .....	159
7.2.4 <i>Formlessness, immersion and fusion</i> in study three .....	162
7.3 <i>Deep Flow: a relational embodiment</i> .....	165
7.4 <i>Deep Flow: an embodied materiality</i> .....	167
7.5 <i>A few reflections on the research process</i> .....	171
7.6 <i>Some final thoughts about Deep Flow</i> .....	175
<b>REFERENCES</b> .....	<b>180</b>

## LIST OF FIGURES

**Figure 1.** Harrison, N. (2016) Costumes and Masks for *Human Sensor* [Photograph]. Available from: <http://www.keytoalef.com/kasianet/index.php/the-human-sensor-2/> [Accessed 28 January 2020].

**Figure 2.** Molga, K. (2016) Audience watching *Human Sensor* [Screengrab]. Available from: <https://www.facebook.com/watch/?v=1108205999251680> [Accessed 11 May 2020].

**Figure 3.** Moore, L. (2015) Numerical score in *PULse 03* [Screengrab]. Available from: <https://lornam77.wixsite.com/lornamooreartist/single-post/2015/01/28/PULse-03-HDVD-Human-Digital-Video-Device> [Accessed 28 January 2020].

**Figure 4.** Moore, L. (2015) *Digital-Other* in *PULse 03* [Screengrab]. Available from: <https://lornam77.wixsite.com/lornamooreartist/single-post/2015/01/28/PULse-03-HDVD-Human-Digital-Video-Device> [Accessed 28 January 2020].

**Figures 5 and 6.** Jaimovich, J and Morand, F. *Emovere* (2015), [Screengrab]. Available from: <https://youtu.be/HD5jouu-po8> [Accessed 22 July 2020].

**Figure 7.** Eddy, M. (2009) *A brief history of somatic practices and dance* [Image]. Available from: <http://wellnesscke.net/downloadables/AbriefhistoryofSomaticanddance.pdf> [Accessed 21 January 2020].

**Figure 8.** Ginslov, J. (2017) Dancer Laura Siegmund in *Conspiracy Ceremony – HYPER SONIC STATES*. [Photograph].

**Figure 9.** Ginslov, J. (2017) Dancer Suet-Wan Tsang in *Conspiracy Ceremony – HYPER SONIC STATES*. [Photograph].

**Figure 10.** Glasier, F. (1902) *Portrait of Loie Fuller*. [Photograph]. Available from: [https://commons.wikimedia.org/wiki/File:Loie\\_Fuller.jpg](https://commons.wikimedia.org/wiki/File:Loie_Fuller.jpg) [Accessed 12/10/2019].

**Figure 11.** Schneider, E. (1926) *Costumes by Oskar Schlemmer* (Bauhaus) for the Triadic Ballet, at Metropol Theater in Berlin. [Photograph]. Available from: [https://www.thefutureperfect.com/present\\_tense/articles/oskar-schlemmer](https://www.thefutureperfect.com/present_tense/articles/oskar-schlemmer) [Accessed 30/07/2020].

**Figure 12.** Schlemmer, O. (1928) *Stick Dance*. [Photograph]. Available from: <http://socks-studio.com/2017/07/19/when-body-draws-the-abstract-space-slat-dance-by-oskar-schlemmer/> [Accessed 30/07/2020].

**Figure 13.** Bennet, M. (2003) Stelarc in *Muscle Machine* [Photograph]. Available from: <http://stelarc.org/?catID=20231> [Accessed: 21 January 2020].

**Figure 14.** Wayne McGregor, *Becoming* (2014) [Screengrabs]. Available from: <https://www.youtube.com/watch?v=I0ELub4W6vI> [Accessed 1 February 2020].

**Figure 15.** Cartwright, L. (1995, p. 25, fig. 2.4) Comparative tracing of cardiographic pressure changes recorded by J.B.A. Chauveau and Etienne-Jules Marey. From Marey (1879), *La Methode graphique* (Paris).

**Figure 16.** Cartwright, L. (1995, p. 34. Fig. 2.5) Drawing done from a photographic study of human gait. From Marey (1894), *Le Mouvement* (Paris).

**Figure 17.** Cartwright, L. (1995, p. 34, fig. 2.6) Diagram taken from a photographic study of human gait. From Marey (1894), *Le mouvement* (Paris).

**Figure 18.** Haraway, D., (2016, p. 14, fig. 1.2) *Ma'ii Ats'áá' Yílwoí* (Coyotes Running Opposite Ways) [Photograph].

**Figure 19.** Nelson, R. (2010) *Dynamic Model for Practice as Research* [Illustration]. Available from: <https://slideplayer.com/slide/6515157/> [Accessed 30 April 2020].

**Figure 20.** Ginslov, J. (2020) *Tentacular worlding* [Illustration].

**Figure 21.** Daksha, P. (2017) *Signal / Noise: Imaging/Drawing* [Drawing]. Available from: <http://lifespace.dundee.ac.uk/exhibition/signal-noise-imaging-drawing> [Accessed 18 August 2020].

**Figure 22.** Ginslov, J. (2020) *Tentacular worlding praxis* [Illustration].

**Figure 23.** Straiotto, B., (2019) Images from Motion Capture Animation [Still frames].

**Figure 24.** Ginslov, J. (2017) Under Tay Road Bridge – a noisy damp location on the banks of the River Tay.

**Figure 25.** Ginslov, J. (2017) Top of Tay Road Bridge – a noisy and windswept bridge used by cars, cyclists and pedestrians over the River Tay.

**Figure 26** Ginslov, J. (2017) Chandler's Lane – previously home to Harbour Metal Workshops in 1837 and 1850.

**Figure 27.** Ginslov, J. (2017) The High Street of Dundee – a busy street filled with pedestrians.

**Figure 28.** Ginslov, J. (2017) The A92 opposite the V&A Design Museum on a busy road linking Dundee to other cities.

**Figure 29.** Ginslov, J. (2017) My home – a flat in Eden Street, the lounge.

**Figure 30.** Ginslov, J. (2017) Broughty Ferry Beach – a popular beach.

**Figure 31.** Ginslov, J. (2017) The Dundee Law –the highest point in Dundee, situated on an extinct volcano with a war memorial at its summit.

**Figure 32.** Ginslov, J. (2017) The Vision Building – an empty office space.

**Figure 33.** Ginslov, J. (2017) Edengrove Close – the stairway to a flat.

**Figure 34.** Ginslov, J. (2017) Accelerometer in pouch and with one biosensor on left wrist with another attached on L6 vertebra [Photograph].

**Figure 35.** Ginslov, J. (2017) Ginslov wearing a GoPro and mini microphone [Photograph].

**Figure 36.** Ginslov, J. (2019) *Movement hieroglyph* study one: Top of Tay Road Bridge [Photograph].

**Figure 37.** *Ginslov, J. (2019) Movement hieroglyph* study one: Vision Building [Photograph].

**Figure 38.** Ginslov, J. (2019) *Figuring-figures* study one: Top of Tay Road Bridge [Photograph].

**Figure 39.** Ginslov, J. (2019) *Figuring-figures* study one: Vision Building [Photograph].

**Figure 40.** Ginslov, J. (2019) Camera and location of study three: Ginslov's Home, Dundee [Photograph].

**Figure 41.** Ginslov, J. (2019) Camera and location of study three: Ginslov's Home, Dundee [Photograph].

**Figure 42.** Ginslov, J. (2020) *Movement hieroglyph* study three: 19 June 2019 [Photograph].

**Figure 43.** Ginslov, J. (2020) *Movement hieroglyph* study three: 20 June 2019 [Photograph].

**Figure 44.** Ginslov, J. (2020) *Figuring-figures* large drawing study three: 19 June 2019 [Photograph].

**Figure 45.** Ginslov, J. (2020) *Figuring-figures* large drawing study three: 20 June 2019 [Photograph].

**Figure 46.** Ginslov, J. (2020) *Figuring-figures* small painting study three: 19 June 2019 [Photograph].

**Figure 47.** Ginslov, J. (2020) *Figuring-figures* small painting study three: 20 June 2019 [Photograph].

# GLOSSARY

Abbreviation	Description
<b>AI</b>	<p><b>Artificial Intelligence</b></p> <p>AI emphasises the creation of intelligent machines and software that work, react, and mimic the capabilities of humans. This it does by learning, recognizing objects, understanding, and responding to language, making decisions, solving problems and by combining these perform functions to assist humans. Google search engine is one of the most popular AI applications.</p>
<b>APP</b>	<p><b>Application</b></p> <p>Mobile apps or applications are software applications designed to run on a mobile device such as a phone, tablet, watch, laptop, or desktop computer, that you download from the Internet.</p>
<b>AR</b>	<p><b>Augmented Reality</b></p> <p>This is an app that is used on a mobile phone or tablet to trigger and overlay digital content such as video, imagery, text, or sound on the device's screen, enhancing the user's physical and visual world.</p>
<b>ANS</b>	<p><b>Autonomic Nervous System</b></p> <p>This is an unconscious control system in the body that regulates bodily functions, such as the heart rate, digestion, respiratory rate, pupillary response, urination, and sexual arousal. This system is the primary mechanism in control of the fight-or-flight response.</p>
<b>ANT</b>	<p><b>Actor Network Theory</b></p> <p>ANT aims to make visible the continuity between humans and nonhumans in the material world and includes the linguistic, social-political, cultural, scientific, and technological. Through co-constitution, all kinds of entities and objects in the world and together with human experience and agency, constitute a world (Latour, 2005).</p>
<b>ATE's</b>	<p><b>Active Technological Environments</b></p> <p>ATE's are formed by information and communication technologies that are embedded in mobile devices and wearable technologies such as GPS tracking or biosensors and are also part of the material environment in which we live such as smart streetlights, that switch on upon detecting movement.</p>
<b>BPM</b>	<p><b>Beats per minute</b></p> <p>The number of heart beats detected in one minute.</p>
<b>CNS</b>	<p><b>Central Nervous System</b></p> <p>The CNS controls most functions of the body and mind. It consists of two parts: the brain and the spinal cord. The brain, the centre of our thoughts and the interpreter of our external environment, is connected to the peripheral nervous system via the spinal cord, to the sensory organs and other organs of the body, muscles, blood vessels and glands.</p>
<b>ECG</b>	<p><b>Electrocardiography</b></p> <p>Electrocardiography is the process of producing an electrocardiogram, a recording of the electrical and rhythmic activity of the heart using a biosensor placed on the body.</p>
<b>EMG</b>	<p><b>Electromyography</b></p> <p>This is performed by an accelerometer, that measures and records the electrical activity produced by the skeletal muscles and the forces of direction and acceleration of the body when moving.</p>
<b>GPS</b>	<p><b>Global Positioning System</b></p> <p>GPS is a global navigation satellite system that provides location, velocity, and time information on your smartphone for example.</p>

<b>HCI</b>	<b>Human-computer interactions</b> HCI focuses on the design of computer technology and the interactions humans have with computers and all other mobile, wearable and information technologies.
<b>HR</b>	<b>Heart rate</b> HR is the speed of the heartbeat measured by the number of contractions or beats of the heart per minute.
<b>HRM</b>	<b>Heart Rate Monitor</b> A HRM is a personal monitoring device that allows one to measure and display heart rate in real time or record heart rate for later study. It gathers HR data using sensors to detect the electrical signals produced by the heart each time it beats.
<b>HRV</b>	<b>Heart Rate Variability</b> HRV is the physiological phenomenon of the variation in the time interval between consecutive heartbeats, measured in milliseconds.
<b>IoT</b>	<b>Internet of things</b> IoT is a network of objects or 'things' connected to sensors, software and other technologies, to exchange information and data with other devices and systems using the Internet.
<b>ISDN</b>	<b>Integrated Services Digital Network</b> ISDN is a high-performance service that delivers broadcast-quality voice and continuous, extremely reliable data transmission using a set of communication tools that use digital transmission to make phone calls, video calls, transmit data and other network services over the circuits of the traditional telephone network.
<b>LED</b>	<b>Light-emitting diodes</b> An LED is a semiconductor light source that emits light when electrical currents flow through it.
<b>Max/MSP</b>	<b>Max/MSP</b> Max/MSP is an interactive software programme that uses a visual programming language with a toolkit of virtual objects that allows you to connect them together using virtual patch cords.
<b>MET</b>	<b>Material Engagement Theory</b> MET is a synergistic process where bodies, agentic actions, and tangible materials merge without the need for mental representation. An example is the potter working with clay, his hands, and the centrifugal forces of the potter's wheel. None of these actions are separate but are seen as whole <i>body-self-technology-agency-world</i> experiences.
<b>ms</b>	<b>Milliseconds</b> There are 1000ms in a second.
<b>PSNS</b>	<b>Parasympathetic nervous system</b> Sometimes called the rest and digest system, the PSNS calms the body by slowing the heart rate, increasing intestinal and gland activity, and relaxing sphincter muscles in the gastrointestinal tract.
<b>PaR</b>	<b>Practice as Research</b> A methodology that creates knowledge by 'doing' research and practice.
<b>POV</b>	<b>Point of view</b> POV is the perspective from which a narrative is told. This can be told from a first, second or third person POV. In filmmaking it is known as a first-person shot or subjective camera, that shows what a character is looking at, that is seen in the camera lens.
<b>QRS</b>	<b>The QRS complex</b> This is the combination of three of the graphical deflections seen on a typical electrocardiogram. It is the main spike seen on an ECG line.
<b>QS</b>	<b>Quantified Self</b>

	The QS is about self-knowledge through numbers and the quantification of our bodies using self-tracking and self-monitoring practices that afford the user a way to improve their well-being, productivity, and fitness progress.
<b>RMSSD</b>	<b>Root Mean Square of the Successive Differences</b> This is a measurement that represents the root mean square of successive differences between normal heartbeats. The value is obtained by first calculating each successive time difference between heartbeats in milliseconds. Each of the values is then squared and the result is averaged before the square root of the total is obtained.
<b>R-R</b>	<b>R-R interval</b> This is an indication of the time elapsed between two successive heart beats or two successive QRS spikes on an electrocardiogram

# CHAPTER 1

## AN INTRODUCTION

Chapter 1 discusses the rationale and significance of this PhD enquiry, within the field of dance practice interfacing with biosensor technologies. Three case studies are presented as examples of performance collaborations within this artistic research field. These are examined and discussed in depth, evaluating what they contributed, and critiqued on what they may have overlooked. The chapter then discusses how this PaR is different to the Case Studies. Three research questions follow, describing what remains unanswered and what further research this PhD will address.

### **1.1 Rationale: *looking inwardly***

Biomedical instruments such as biosensors, namely breathing, brain and HRMs, as well as accelerometers,<sup>7</sup> make invisible physiological events in the body visible. These instruments have been adopted and reapplied in the practice of dance, art, and live performance since the start of the 21<sup>st</sup> century (Birringer, 2008; Broadhurst and Machon, 2012; Salter, 2010; Sutil and Popat, 2015; Baker and Sicchio, 2017). During this time, software engineers using biosensors and interactive software have developed ways to visualise and interact with hidden aspects of the performing body such as the electrical activity of skeletal muscles, the heart, brain, or breath. These performances visually illustrate how a dancer interacts with their own physiological experiences, blurring to some extent, the inside and outside of their own bodies. Not

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<sup>7</sup> Accelerometers measure acceleration forces of the moving body, that is the measurement of the change in velocity, or speed, divided by time.

only do they visualise and demonstrate a dancer's agency, but they also provide a way for audiences to see how dancers interact with technologies mediating the inside of their bodies.

Making the *invisible visible* in such ways, is however problematic, as these types of technologically informed dance practice often use biosensor technologies instrumentally, implying that they quantify and represent only certain aspects of a dancer's experience in external mediated environments. Furthermore, this form of engagement with interactive technology and mediated imagery occurs outside a performer's body requiring the visual senses of the performer for the interaction to take place. The media then responds and in turn reshapes the dancer's responses. Such ocularcentric practice privileges vision over the other bodily senses and neglects the vast storehouse of bodily experience originating from within the body, that technologies, used instrumentally, cannot capture.

The PaR therefore sets out to address these issues by firstly, *spiralling inwardly* (Fraleigh, 2018), to explore *dance as experience* (Ibid.), to what I am referring to hereafter as *looking inwardly*. This attempts to expand a dancer's bodily awareness and the lived experiences of her practice through her bodily senses. Secondly, it explores novel phenomenological methods to investigate alternative relations and interactions with biosensor technology, not based on ocularcentrism or *looking outwardly*. These concepts guide and inform the investigation and research.

To find out if this rationale could present an original contribution to knowledge, other practitioners in the field researching similar performance practices and technologies

were investigated. It was found that performances exploring HRMs and HRV are not paradigmatic and were difficult to trace. However, three technologically informed dance practices were found and selected as case studies, to demonstrate how biosensor technologies in performance make the *invisible visible* and how they are different to this PaR. This is discussed below.

## **1.2 Case studies: performance using biosensor technology**

The works of Kasia Molga (2016), Lorna Moore (2017) and Javier Jaimovich and Francisca Morand (2019) were selected as case studies, examples of how dance practitioners and software engineers, use biosensor technologies to visualise specific invisible physiological events of the body, such as breathing, heart rate (HR)<sup>8</sup> and heart rate variability (HRV),<sup>9</sup> in external digital media environments. Responding to or interfacing with interactive software systems, the performers trigger light, sound, or video in urban, mediated and stage environments. The works reveal shared experience, expressions of personal agency and the emotions of performers in response and in relation to external digital mediations.

In the first, Molga (2016) uses biosensor technology to monitor the breathing rate of performers and interactive software to indicate levels of polluted air of urban environments, in which they perform. Digital sensors visualise and externalise physiological responses of the dancers for audiences watching the performance. In the second case study, Moore (2017) uses a HRM to measure a participant's heart rate, enabling them to interact with a video. Using a gamified point scoring system

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<sup>8</sup> HR: Heart rate is the speed of the heartbeat measured by the number of contractions or beats of the heart per minute.

<sup>9</sup> HRV: Heart rate variability is the physiological phenomenon of the variation in the time interval between consecutive heartbeats, measured in milliseconds (Elite HRV, 2020; Polar, 2020).

heightens the participant's agency in relation to the video projected in front of them. Lastly, the work of Jaimovich and Morand (2019) explores relations between human emotions and HRV, using HRMs and interactive software to mediate emotional responses between dancers and digital media. This is mediated by projected imagery and sound to which the dancers respond and audiences watching the work begin to see relations occurring between bodies, emotion, and technology.

### **Case study 1 – *Human Sensor***

Molga is a media artist, designer, environmentalist, and creative coder working at the intersection of art, science, design, and technology, who creates environmental digital performance. Her research explores various processes of transmitting environmental and biological data to create interactive, immersive, visual, and spatial narratives made of living and non-living materials. Molga's environmental digital performance *Human Sensor* (2016) was selected as it reveals how biosensor technology can illustrate levels of polluted air and how breathing connects the physiological body to polluted urban environments. According to Molga, the work reconsiders binary notions such as inside-outside, experience-perception, as merging with each other, using technology and the performance of breath to indicate this.

*Human Sensor* (2016) is site-specific and performed in city spaces. Dancers wearing biosensors and light-emitting diodes (LEDs)<sup>10</sup> embedded in their costumes are designed to be activated by the dancers' breathing rates and changes in the chemical composition of the air. Made in collaboration with atmospheric scientists at King's

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<sup>10</sup> LED: This is a semiconductor light source that emits light when electrical currents flow through it.

College London, Molga developed the costumes and masks to change colour from purple to white in the presence of polluted air (Figure 1).



**Figure 2.** Harrison, N. (2016) Costumes and Masks for *Human Sensor* [Photograph]. Available from: <http://www.keytoalef.com/kasianet/index.php/the-human-sensor-2/> [Accessed 28 January 2020].

This is created by pocket-sized aerosol monitors linked to a global positioning system (GPS)<sup>11</sup> watch and a small Raspberry Pi computer that enables pollution data to communicate with the LEDs. Biosensors responding in real time to the dancer's rhythms of breathing also trigger the LEDs. The performance could be described as “a story of the air written by our breath, translated by these wearable costumes worn by people whose health is affected by climate change” (Molga, 2016, para 2).

According to Molga (2016), the work highlights how bodies may become sensors for diagnosing the condition of the air, the health of our bodies and the environment. It presents a dialogue between audiences and the source where the data originates so

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<sup>11</sup> GPS: The Global Positioning System is a global navigation satellite system that provides location, velocity and time information on your smartphone for example

that the representation of that data becomes a novel language derived from the urban landscape and polluted air. As breathing is an interface connecting the inner body to the outside, the environment, and our *inner selves* (Molga, 2016), the work makes audiences aware of pollution levels in the city in which they live and breathe and how their own bodies may be affected by the polluted air (Figure 2).



**Figure 2.** Molga, K. (2016) Audience watching *Human Sensor* [Screengrab]. Available from: <https://www.facebook.com/watch/?v=1108205999251680> [Accessed 11 May 2020].

Whilst *Human Sensor* is a powerful indicator of pollution levels in urban areas affecting the *inner self* (Molga, 2016), the work displays how a dancer's breath has become instrumental, turning lights on and off, through wearable technologies and clothing, to indicate the presence of polluted air. By making invisible pollution visible, the dancer's bodies and costumes have become simply, sensors, as the title indicates. When used instrumentally in this way, the dancer's subjective experiences in relation to polluted environments and technology, are found missing. Seemingly only their physiological responses are captured to represent collective physiological reactions to polluted air.

The work also implies instrumental *one-to-one mapping*, or direct links between breathing bodies and digital representation, demarcating causal relations between

bodies, technology, and the environment. One could argue that the instrumental notion is found in the title and that a programmed sensor could easily have replaced the dancers to indicate the quality of air. However, as *Human Sensor* (2016) involves audience reception, the work is far more affective and transformational for an audience as they breathe the same polluted air that the dancers are breathing. Perhaps it is the audience's subjective experience that is more important here and may have been the intention of the work. The use of external visual representation could stimulate agency in an audience and change their behaviour in relation to the world and climate change. In this way *Human Sensor* reveals how relations between environments, bodies and technology are not that direct but far more porous, shared, and complex.

## **Case study 2 – *bodyworks: PULse***

Moore's series, *bodyworks* (2014–2015) explore the merging of subjectivity and agency, interwoven with biosensor technology. Moore (2017, p. 31) refers to this merging as "the bleed" reflecting how bodies spread across or interact with biosensor practice, how the body seeps into the materiality of digital technologies and how this produces a new form of interactive digital aesthetics. Drawing on the concepts of phenomenology, she explores what happens when audiences participate and interact with real-time video performance and what impact these interactions have on their subjectivity, agency, and the way they feel (Moore, 2015).

One of Moore's *bodyworks*, *PULse 03* (2015), was selected as it demonstrates how HRMs may combine with interactive video technology to visualise human agency and corporeal reactions such as HR, to trigger digital imagery. In *PULse 03*, the audience as participant, manipulates a video of water being poured into a glass that is controlled

by their resting HR. If beats per minute (BPM)<sup>12</sup> are over 70, the video speeds up and the water overflows the glass. If below 70, the pouring of water slows down to a stop. If kept below 70 for 10 seconds, the participant is in the zone, reflecting Mihaly Csikszentmihalyi's work on "flow' ... of be[ing] in the moment as an in[bod]ied experience" (Moore, 2015b, para 2) [emphases in original]. According to Moore participants can also see and interact with numerical values of their BPM allowing them to *read* themselves, into the live data feedback (Figure 3). This biofeedback<sup>13</sup> system, "create[s] a loop between the interior of the body interpreted through physiological data on a video screen in real time" (Ibid., p. 38) and is a portal to see an inner hidden world of experience. It enables the subject to control their own heart rate, to become active agents, using their corporeality and biodata to affect change outside their bodies.



**Figure 3.** Moore, L. (2015a) Numerical score in *PULse 03* [Screengrab]. Available from: <https://lornam77.wixsite.com/lornamooreartist/single-post/2015/01/28/PULse-03-HDVD-Human-Digital-Video-Device> [Accessed 28 January 2020].

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<sup>12</sup> BPM: Beats per minute. The number of heart beats detected in one minute.

<sup>13</sup> Biofeedback is a technique one uses to learn to control some of the body's functions, such as heart rate, by using a HRM to view the heart's physiological activity.

For Moore (2017, p. 32), the participant is caught up in both the corporeal and the digital, a *digital-Other*. This is a syncretic self, the real self, entwined with the digital mediated self, through a technological device. She suggests that this form of *self* is an in-between condition, implicated within the binary code of pixels, becoming a composite of digital media and bodily materials, with the mediated imagery reflecting back an-*Other* version of oneself. Participants do not lose a sense of self as they engage in the game with personal agency, that is found in their mediated *digital-Other*.

However, *PULse 03* may be seen as quantifying the body to exercise control over corporeal experiences through visual scores, in the *digital-Other*. Presumably, this requires a *one-to-one mapping* between heart rate and external digital media that allows the participant to control their bodies, through quantification, and competition. In this way, the interaction is gamified, as one follows rules to score points, to compete with the self. However, using technology in this manner reveals a reductionist and binary perspective of lived experience at the interface of technology, with the participant as subject *looking outwardly* at things in the world outside, as object.

One could argue that the participants use felt and sense experience to do this, but this is quantified and determined by point scoring, represented symbolically in external visual media. The participant is in competition with themselves, attempting to improve and control their physiological skills through objective numerical data (Figure 4). The compelling sense of competitiveness influences their interactions and emotions, how they are feeling, but is never alluded to. Overall, despite using notions of subjective agency and sensory engagement to improve physiological control through a *digital-*

*Other*, the work may be overlooking pre-reflective experiences that undoubtedly occur within interactive systems.



**Figure 4.** Moore, L. (2015a) *Digital-Other* in *PULse 03* [Screengrab]. Available from: <https://lornam77.wixsite.com/lornamooreartist/single-post/2015/01/28/PULse-03-HDVD-Human-Digital-Video-Device> [Accessed 28 January 2020].

### **Case study 3 – *Emovere***

The work *Emovere* (2015) meaning moving through emotions, is a collaborative, interactive dance, and sound piece by researcher/sound artist Jaimovich and dancer/choreographer Morand. Unlike the other case studies, it attempts to explore the emotional states of performers, within an expressive bio-relational feedback system.<sup>14</sup> This system responds to the changing emotional states of the performers wearing HRMs, and quantifies HRV and muscular tension, to trigger audio-visual media. It enables gesture, agency, choreographed movement, emotion, and data from HRMs to relate and interact with each other.

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<sup>14</sup> A bio-relational feedback system is an interactive system that allows different materials such as gesture, choreographed movement, emotions, and data from biosensors to relate and feedback on each other and the performers.

Jaimovich and Morand (2019) claim that *Emovere* demonstrates how physical gesture and emotions are internally articulated rather than how they are seen and performed. It reflects how human emotions are shared, expressed, and feed back on each other in a recursive loop, as the expressive and interactive technological components are always related to the body through, its biology, physiology, emotions, and the voice (Figures 5 and 6). Furthermore, it emphasises subjective and bodily agency of the performers involved in creative and dialogical performance, where dancers physically interact with human emotion, and send, receive, or interact with biophysical information within the system.



**Figures 5 and 6.** Jaimovich, J and Morand, F. *Emovere* (2015), [Screengrabs]. Available from: <https://youtu.be/HD5jouu-po8> [Accessed 22 July 2020].

According to Jaimovich and Morand (2019, p. 42), the bio-relational feedback system was designed to interpret the effects of emotion on muscular activity and HRV that are “the drivers and modulators of the sound environment”. These bio-signals are mapped

to *sound patches* in an interactive software programme, Max/MSP,<sup>15</sup> connecting the signals to a series of random algorithms in the software, to effect and replicate the variable responses of the performers. As each performer is mapped simultaneously or sequentially with one or several interactive features, such as sound or HRV signals, the sound of their heartbeats are also changed, and become part of the composition of sound. To a certain extent, the “fixed and structured [choreographic] materials are intertwined with materials that are variable and emerging” (Ibid., pp. 49–50), within a system that is in continual flux and transforming in non-linear relationships. The idea is:

Not to transform the body into a sort of machine with full control, but rather to measure and amplify the variations that occur ... while performing so that they [can] be expressed in the piece’s sonority, whether they [are] the product of choreographed actions, the performer’s intentions, or other changes experienced by their bodies. (Jaimovich and Morand, 2019, p. 42).

*Emovere* (2015) demonstrates a good example of a bio-relational feedback system using *Alba Emoting*, that was invented by neuroscientist Susannah Bloch (2006) and personally experienced by this researcher. *Alba Emoting* is a method for inducing and expressing basic emotions using *effector patterns*,<sup>16</sup> however the performance of emotion in relation to HRV in *Emovere* is problematic. Firstly, there is an overwhelming emphasis on physical interaction between the dancers and the biofeedback system,

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<sup>15</sup> Max/MSP is an interactive software programme that uses a visual programming language with a toolkit of virtual objects that allows you to connect them together using virtual patch cords.

<sup>16</sup> Emotional effector patterns are precise breathings and muscle manipulation patterns linked to six basic emotions. Each effector pattern has a specific breathing pattern, a facial expression, and postural tension. When all three patterns combine, they elicit an authentic universally understood emotion in the practitioner (Bloch, 2006; Ginslov, 2004).

rather than a deep investigation of emotions and how they are produced. The dancers *perform* their emotions theatrically, sometimes signing them representationally. As a result, their emotions seem forced and inauthentic, and undervalue the complex and sensitive nature of mixed emotions. Their exaggerated actions overshadow subtle emotions that they could have shared with others within the system. Besides if HRMs are so sensitive, having the capacity to measure miniscule electrical changes in the heart's activity (Jaimovich and Morand, 2019), then the gestural patterns need not have been so extreme, choreographed and staged. Secondly, there seems to be very little investigation on the significance of HRV and how it plays a role in the expression of basic emotions through the parasympathetic nervous system (PSNS).<sup>17</sup> Moreover, the sonification fields are too loud and dramatic, and mask the subtlety of emotional shifts found in lived experience. Generally, the work emphasises exaggerated emotional display projected outwardly within a system and uses HRV instrumentally to activate a bio-relational feedback that is not sensitively investigated by the dancers and researchers.

Overall, the case studies are ocularcentric works based on quantification, causality, control, and representation, despite using methods to counteract these issues. Using computational interactive systems they visualise, sonify and project physiological processes such as heart and breathing rate, *outwardly*. Despite the creators claiming that the performers or participants exercise their own agency, the audio-visual technologies seem to have some form of control over the performers, as the projected media affects their responses. This oversimplifies relations between bodies, materials

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<sup>17</sup> PSNS: The parasympathetic nervous system is called the rest and digest system, it calms the body by slowing the heart rate, increasing intestinal and gland activity, and relaxing sphincter muscles in the gastrointestinal tract.

and subjective experiences that are always *entwined* and forever unfolding with the world (Merleau-Ponty, 1964) and, when situated in relation with technology are far more complex, unstable, and interwoven (Ihde, 1993; 2002; Rosenberger and Verbeek, 2015; Van Den Eede, 2015).

The case studies demonstrate *one-to-one mapping* techniques that are problematic in many ways. They may be thought of as being more traditional, symbolic, dialogic, and concept-driven models (Höök, 2018) as they quantify human agency, emotion, and movement through visual or aural mediation. In this regard they use technology instrumentally, giving an impression of a direct link between one physiological event, such as a heartbeat, and a digital image or sound (Naccarato and MacCallum, 2016). Such techniques only represent certain aspects of a dancer's experience within a closed system. This results in binary relations between two events, cause and effect, often occurring between a body and instrumental technology, such as a light switch. *One-to-one-mapping* techniques and causal relations thereby provide inadequate expression of a person's *whole-body* experience and offers the audience and performer a limited impression of lived and bodily experience.

*One-to-one mapping* also requires predictable and stable samples of heart rate, derived from a still body. To accommodate this, software engineers adopt strategies of sampling and averaging HR rate whilst the dancer is motionless, so that changes in HR appear smooth and predictable (Naccarato and MacCallum, 2016). With these strategies, HR is represented as an even metronomic pulse from a *stable* body. However, a healthy cardiac system is extremely adaptive, rhythmically complex and demonstrates variability (Mc Craty, 2016; Moore, 2020; Polar, 2020). Being entangled

with human experience, the cardiac system cannot be not considered as being *stable*, nor predictable. The material body, agency and subjective lived experience enfold with each other in messy multiple relations with the world, technology, and people, making lived experiences unpredictable, and change predictable (Merleau-Ponty, 1964; Grosz, 1994; Kozel, 2007; Overton, 2008; Ihde, 2010; Manning, 2016; Braidotti, 2013; Haraway, 2016).

In addition, according to Teoma Naccarato and John MacCallum (2016), precise *one-to-one mapping* is impossible. Firstly, HRMs using electrocardiography (ECG)<sup>18</sup> register other electrical signals from muscles around or near the heart. Secondly HRMs may be ineffective for recording continuous HR and HRV during dynamic and unpredictable movements found in dance as interference from straps attaching the HRM to the body, typically results in *noisy* data. Thirdly, biosensors have copyrighted software based on the assumption by the manufacturers that biosensors are used for the “repetition of predictable motions, e.g., running or cycling” (Naccarato and MacCallum, 2016, p. 18). Moreover, Bluetooth, Wi-Fi and sensors in the biosensor often provide varying degrees of bandwidth and latency, providing corrupted data feedback. To remedy these issues, systems running the HRM apps<sup>19</sup> use digital filters, to subtract *noise*, but causes an averaging out of the data implying that *one-to-one mapping* is not a true reflection of what is happening inside the physiological body.

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<sup>18</sup> ECG: Electrocardiography is the process of producing an electrocardiogram, a recording of the electrical and rhythmic activity of the heart using a biosensor placed on the body.

<sup>19</sup> App: Mobile apps or mobile applications are software applications designed to run on a mobile or desktop device such as a phone, tablet, watch or computer, that you download from the internet.

Lastly, the use of biometric data<sup>20</sup> in these performances reflects contemporary culture, where physical activities such as running, are quantified, enhanced, and shaped by data feedback. Subjective, situated, and pre-reflective experiences are lost within these relations. This form of self-knowledge, according to post-phenomenologists Don Ihde (1993; 2002), Yoni Van Den Eede (2015), and Robert Rosenberger and Peter-Paul Verbeek (2015), needs to be gained *self-reflexively* by interacting with technology, materials and “our experiences of being-in-a-world” (Ihde, 2010, p. 41).

To overcome these issues presented by the case studies, this PaR presents a novel methodology to explore technologically informed dance practice. Firstly, this encourages dancers to *look inwardly*, to explore dance as bodily and lived experience and, secondly, sets out to investigate technologically informed dance practice, to interrogate alternative relations and interactions, not based on ocularcentrism. This is avoided by the practitioner using an eye mask, to amplify experiencing bodily senses in the absence of visual information. Lived and bodily experience is thereby foregrounded through experiential and meditative dance practice rather than artistic performance outcomes. In addition, there are no external digital mediations to which the dancer responds in real time, and HRV data is not referred to during the practice but afterwards, where it is read self-reflexively.

Lastly this PaR enables novel phenomenological methods of practice, to slow down bodily processes to explore and understand body-mind integration, subjective bodily

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<sup>20</sup> Biometric data is the technical term for body measurements and calculations such as heart rate, measured by an HRM.

experience, and *states of being*, as forms of knowledge. This changes ways of seeing our bodies, to ways of experiencing, originating from within the moving body. It implies exploring *dance as experience*, and embodied consciousness, or *the mind in the body* (Merleau-Ponty, 1964b) through the *felt-sense* (Gendlin, 2003). The *felt-sense* is a bodily knowing that “is not an immediately identifiable specific emotion or sensation, but something ‘fuzzy’ and difficult to pin down, yet also clearly ‘there’ inside you, telling you about your situation” (Boden and Eatough, 2014, p.162). This shifts literal modes of *seeing* and knowing to modes of *sensing* and knowing. In this way it constructs knowledge from a first-person perspective and pushes the experiential to the fore, avoiding visuality that is often assumed as being the only way to verify knowing something. These strategies thereby avoid *one-to-one mapping*, causality, and the instrumental use of technology.

As these bodily and lived experiences are often difficult to write about, this specific PaR uses analogue imagery and verbal description to translate these bodily experiences. In addition, biometric data from an HRM in relation to the practice is explored, as the research is concerned with our ways of being in a world increasingly driven by quantified data and external digital representation (Van Den Eede, 2015). It therefore proposes ways to read, translate and interpret biosensor data, in relation to the *Lifeworld*<sup>21</sup> of a dancer within their situated lived experiences of a performance. Technology used in this way may then become part of a performer’s phenomenal *lifeworld*, as this is “where our perceptions, actions and practices are shaped” (Höök, 2018, p. xxi). Through these methods, and by *looking inwardly* exploring relations with

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<sup>21</sup> *Lifeworld* is how an individual experiences and expresses themselves in the world through their immediate experiences, activities, and relations that make up their world, such as selfhood, embodiment, temporality, spatiality or mood (Ashworth, 2006; Husserl, 1989).

human and nonhuman materials, this PaR asks how these strategies may become a feedback mechanism to expand and provide a better understanding of lived and bodily experience.

In summary, through the disciplines of dance, philosophy and technology, this PaR sets out to investigate how to *look inwardly* to explore *dance as experience*. It aims to challenge technologically informed dance practices based on visibility, causality, control, and representation. Ultimately it seeks to find alternative interactions and bodily relations with technology, HRV, felt experiences and materials. These methods change ocularcentric artistic practice based on visual perception, to ones of experiencing, and sensing. Bodily and lived experience as a form of knowledge is focused on by *looking inwardly* and lies at the heart of this practice.

### **1.3 Research questions**

The following research questions serve to guide the aims of this research, and support the conceptual framework, the methodology and the methods leading to findings that may not yet have been explored in the field of dance performance using biosensor technology. The research questions therefore ask how we may use methods of dance practice and biosensors differently:

- How can biosensor technologies be used in dance practice, to understand our embodied experience and interactions with different environments?
- How may the use of biosensor technologies expand our understanding of subjective experience of a dance practice?

- How may dance, using biosensor technologies, assist in finding relations between the body, the *felt-sense*, subjective experience, and human and nonhuman materials?

To answer these questions, the following chapters (2 to 4) describe the literature to help investigate the questions and provide background information for the PaR methodology and methods. The chapters are set within a conceptual framework, *Bodies in...* the epistemologies of dance practice, philosophy, technology, and feminist cultural studies. This is done to better understand bodily and subjective experience in dance practice that uses biosensor technology to explore these relations.

## CHAPTER 2

### BODIES IN... DANCE PRACTICE

Chapter 2 is about *Bodies in...* Somatic and Embodied Dance practice and education. Somatic Dance practice trains dancers to focus on *how* they move, and the qualities of movement, rather than *what* the movement looks like, deepening a dancer's understanding of their own body in movement. Embodied Dance practice on the other hand adopts phenomenological methods, to explore dance *as experience*, through the *felt-sense* and lived experience. This offers a philosophy of the body relative to a dancer's first-person experience of their body in movement. *Bodies in...* phenomenology is therefore discussed first as it provides a context to discuss Somatic and Embodied Dance practice, as well as providing a background for technologically informed dance practices described later in Chapter 3.

#### **2.1 *Bodies in...* phenomenology**

This section describes how the human body and lived experience are viewed through a phenomenological lens, a *subjective turn*, that requires a return to immediate experience by *looking inwardly*. The pioneering philosophies of phenomenology by, Edmund Husserl (1859-1938), Martin Heidegger (1889-1976) and Maurice Merleau-Ponty (1908-1961) are used to describe this *subjective turn*. They presented philosophies about the body, subjectivity and meaning making processes that challenged nineteenth century philosophies. These were positivist, reductionist, based on disembodied rationality, that sustained a rigorous Cartesian separation of the mind and the body.

Phenomenology on the other hand is a branch of philosophy centred on the study of subjective experience, the integration of the mind and body and the validity of first-person lived experience as the basis for the construction of knowledge. It is “interested in our encounters with phenomena as they appear to us in consciousness” (Boden and Eatough, 2014, p. 160), and for dancers this philosophy may be used to attend to bodily experiencing. A phenomenological approach in dance supports the exploration of internal awareness, unfiltered thoughts, phenomena or felt experiences flowing through the body. It enables the dance phenomenologist-practitioner to experience their *felt-sense*, not through theoretical systems, but through their own situated body, as a method for describing the experience of *being-in-a-dance* pre-reflectively and reflexively without prejudice or expectation. It becomes a methodology for engaging in dance *as experience* and a method for dancers to become more aware of their own subjective experience and presence by *looking inwardly*.

Husserl, the founder of phenomenology, established a transcendental philosophy, to reject René Descartes’s dictum “I think therefore I am” that emphasised the mind and body as being separate, a world of physical reality and mental experience. Instead, Husserl focused on the perception of subjective experience combining the mind and body. To accomplish this, he famously argued that we should go “back to the things themselves” (Husserl, 1970, p. 168) or phenomena that arise in lived experience. This takes place through *bracketing*, a means for focusing on and engaging in our subjective experiences, recognising how they appear and how they are experienced and transformed into an object to reflect upon, in our consciousness. This occurs by suspending any interpretation and experiences should be described exactly as they are experienced by the subject. This vantage point starts with the body, the objective

material *Körper*, the *Null Punkt* or *zero point* (Husserl, 1989, pp. 62, 166), from which all lived experience is realised and oriented.

*Leib* or the *lived body* starts from the *Null Punkt*, through which subjective experiences of the surrounding immediate world is sensed as a continuous stream of feedback. For Husserl (1989, pp. 85–86), this is our *Lifeworld* where “each thing of my experience also belongs to my ‘environment’ and that means first of all that *my Körper* is part of it precisely as body”. Here “a person is precisely a person who represents, feels, evaluates, strives, and acts and who, in every such personal act, stands in relation to something, to objects in his *surrounding world*” (Ibid., p. 195) [emphasis added]. A person uses *intentionality*, or a mental construct, aimed at things *outside* their body in the world, to make sense of them. This is also experienced by the person’s sense organs, the *Body Schema*<sup>22</sup> and the psychophysical co-functioning, “grasp(ing) consciously in some other way and posited by the subject in his intentional lived experiences with the sense-content of the moment” (Ibid., p. 196). When this occurs, the *Lifeworld* is experienced as being in continual transformation, as the bodily senses, somatosensory and proprioceptive modalities are constantly updated by bodily and subjective experiences being in “continuous alteration” (Ibid., p. 30).

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<sup>22</sup> *Body Schema*: To guide the movement of the body through space, the brain must constantly monitor the position and movement of the body in relation to nearby objects through the *Body Schema*. This refers to a representation of the positions of body parts in space, which is updated during body movement. This typically does not enter awareness and is primarily used for spatial organization of action. The *Body Schema* is therefore a central representation of the body’s spatial properties, that includes the length of limb segments, their hierarchical arrangement, the configuration of the segments in space and the shape of the body surface...Crucially, the *Body Schema* integrates tactile information from the body surface with proprioceptive information about the configuration of the limbs in space (Haggard and Wolpert, no date). *Disorders of Body Schema*. Available from: <http://cbl.eng.cam.ac.uk/pub/Public/Wolpert/Publications/HagWol04.pdf> [Accessed 27 August 2019].

Heidegger's (1962) hermeneutic phenomenology, however, challenged Husserl's mentalist approach with a more pragmatic emphasis based on a situated self that is "thrown into the world" (Heidegger, 1962, p. 400). This is an existential ontological state of *being-in-the-world* or *Dasein* (ibid.) where one interacts in relation to an everyday world, objects, language, tools, culture and so forth. In *Being and Time* (1962) Heidegger argues that humans are active agents engaged in their own situated world, through relations and the overlapping nature of their interactions with this world.

Merleau-Ponty (1945), shares the notions of Husserl's *Lifeworld* and Heidegger's *being-in-the-world* but emphasises the body's role in mediating internal and external experience. Merleau-Ponty considers *Körper and Leib* as combining, experienced as self-experience, which he named *embodiment*. *Körper and Leib* are not treated as being independent and autonomous but are unified in a state of consciousness that is *embodied*. Using this *gestalt theory*,<sup>23</sup> Merleau-Ponty posits that meaning making does not take place exterior to the body using *intentionality*, but through the union of the subject and the body, a unified whole, inseparable from consciousness and the world. Human experience in a situated world cannot therefore exist outside embodied subjectivity, as *embodiment* is its condition of existence.

In his later work, Merleau-Ponty (1964a) relies less on anatomical and proprioceptive accounts of perception and more on "artistic and poetic ones" (Kozel, 2018, p. 2). He

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<sup>23</sup> *Gestalt Theory*: "The Gestalt Principles (*Gestalt* is German for "unified whole") are a set of laws arising from 1920s' psychology, describing how humans typically see objects by grouping similar elements, recognizing patterns and simplifying complex images" and "represents the culmination of the work of early 20<sup>th</sup>-century German psychologists Max Wertheimer, Kurt Koffka and Wolfgang Kohler, who sought to understand how humans typically gain meaningful perceptions from chaotic stimuli around them" (Interaction Design Foundation, no date). Available from: <https://www.interaction-design.org/literature/topics/gestalt-principles> [Accessed 27 August 2019].

breaks his previous ties to subjective consciousness philosophy, changing perceptual notions of *being-in-the-world* to ones of *entwining* with it. He proposes a *chiasmus*, a never-ending and twisting figure of eight, entangling *body-self-world*. Here you are *entwining* with the *flesh of the world*:

Visible and mobile, my body is a thing among things; it is caught in the fabric of the world...they are encrusted into its flesh, they are part of its full definition; the world is made of the same stuff as the body. (Merleau-Ponty, 1964a, p. 163).

The *flesh of the world* is the place for living experience in which the dualistic Cartesian subject-object relation blurs, forming the *chiasmus*. This *chiasmic* relationship is between *body-self-world*, our corporeal and subjective immersion in the world which includes the objective body or *Körper* and the lived body or *Leib*. Here, you are caught up in the world and the world is caught up in you, for “where are we to put the limit between the body and the world, since the world is the flesh[?]” (Ibid., p. 138). It is here we should “reject the age-old assumptions that you put the body in the world and the seer in the body, or, conversely, the world and the body in the seer as in a box” (Ibid.). If each body is “irrevocably stitched into the fabric of the world, our perception of the world is no more, and no less, than the world’s perception of itself - in and through us” (Ingold, 2011, p. 12). To be sentient is to be open to the world and “to yield to its embrace” (Ibid., p.12). The *chiasm* therefore “forbids us to conceive of vision as an operator of thought that would set up before the mind a picture or representation of the world” (Merleau-Ponty, 1964a, p. 162), as vision is embodied, with all the other sense modalities. One does not just see things and act upon seeing them. One is caught up in the world, with one’s vision, *felt-sense* and actions that are affected by people and things in the world (Kozel, 2007).

The *chiasmus* then is a place of mutual, overlapping, and reversible exchange where the sensing body and the *things* sensed are mutually interchangeable, a structure of mediation between the felt and seen, the visual and the haptic, where the boundaries between these *things* start to break down. Here the senses intermingle, seeing, feeling, and touching become interdependent and entwine with the outside world. “I touch and am touched by objects...just as I see and what I see, sees me back” (Kozel, 2007, p. 37). “Since the same body sees and touches, [the] visible and tangible belong to the same world” (Merleau-Ponty, 1964a, p. 134). The body is not seen and felt as a separate object in the world, as it is immersed in the world through an intermingling of our sensing, seeing, feeling, and touching where we are sensed, seen, felt, and touched by the world.

Merleau-Ponty’s (1968) concept of the *chiasmus* later led to ontological concepts of *the visible and invisible*. This involves the visible corporeal body and our invisible experiential untouchable aspects of lived experience or states of Being. Here the visible is always working as a reversible relation with the invisible as “the ‘lining’ of the visible” (Kozel, 2007, p. 41), where it is “impossible to distinguish between what sees and what is seen” and is felt as a resonance (Merleau-Ponty, 1968, p. 167). According to Susan Kozel, the goal is not to render the invisible visible to comprehend it, nor to strip it of its obscurity, as the invisible is so close to our bodies and our subjective experience. For Kozel (2007), the invisible is interconnected to the deeper recesses of the body, the fascia or connective tissue, that is entwined with the pre-reflective, and the perception of one’s lived experience, an interiority that is tacit.

Willis F. Overton (2008, p. 3) describes this interiority as a *relational embodiment*, where “(e)mbodiment is a concept of synthesis, a bridge that joins broad areas of inquiry into a unified whole (e.g. the biological, the phenomenological, the sociocultural and environmental) as relative standpoints that together constitute the whole”. These entities flow into each other as a relational unit through “relational thinking” (Ingold, 2000, p. 4), where the dancing body and mind exist in relation to each other, with the culture, the anthropological, biological, and environmental world in which it exists. The dancer experiences this *relationism* as a form of lived experience with the whole body which is the dancer’s *Lifeworld*, “co-constituted by the sociocultural and environmental context” (Overton, 2008, p. 5), the dance studio or performance environment. Here the dancer transforms and collapses Cartesian binaries pertaining to the inner and outer world by finding relations between them in the process of embodying them as well as the phenomenal experiences that are found in a dancer’s *Lifeworld*.

## **2.2 Bodies in... somatic dance practice**

This section describes the multi-stranded field of Somatic Dance practice, its history and theories that underpin the methods of dance practice in the pilot studies (Chapter 6). Since the 1970s, dancers have studied mind-body techniques called Somatic studies, or simply Somatics, to supplement their dance training. Once considered too esoteric, it is now an essential part of a dancer’s training, moving beyond the studies of movement found in anatomy, kinesiology, and biomechanics. Somatic studies are referred to as body-mind integration, movement awareness, a mind-body discipline, bodywork or movement *(re)education* (Batson, 2009). All these systems encourage a sense moving more ‘naturally’ through sensorial engagement.

The principles of Western Somatic Dance education “are rooted in a philosophical revolt against Cartesian dualism” or body-mind dualisms (Ibid., p.1), thereby linking Somatics to the notion of embodiment. In 1970, philosopher, dance practitioner and founder of the field of Somatics, Thomas Hanna, coined the term from the Greek word *soma* meaning the whole body, perceived from within, through first-person perception (Hanna, 1986). Somatics explores a unity of mind and body together with one’s own personal inner narrative and movement as a fundamental guide for human life. It therefore provides dancers a new language of consciousness and bodily knowledge through movement, self-awareness, and self-guidance (Batson, 2009).

The *soma* is experienced through one’s own proprioceptive and sensorimotor systems as “*soma* is not a ‘body’” and “not a ‘mind’, ‘spirit’, ‘soul’, or any other such human projection” (Hanna, 1993, p. 7), but sensation experienced through the whole body. It is a process to understand not the “what” of life but the “how” of life that the subject in a human body experiences (Ibid., p. 8). This is found through immediate feedback from the proprioceptive and sensorimotor systems, providing unique sensory data as ongoing feedback. The *soma*, inseparable from the environment (Varela *et al.*, 1991; Overton, 2008), is thereby a source of lived data within a moving body. This reflects Merleau-Ponty’s (1945) and Maren Wehrle’s (2019) *gestalt theory* of embodiment, that emphasises the union of the body and subject with the world, using the *Body Schema* as a place of learning and adaptability. Francisco Varela *et al.* (1991) calls this *embodied action*, where movements, experiences, emotions and thinking occur concurrently, relate to, and affect each other in an ongoing adaptive dynamic process, providing subjective experiences and a desire to move or act.

The early stages of Somatic Dance can be traced to the end of the mid nineteenth and early twentieth century in Europe and North America. This was an era where rationalism was influenced by existentialism, Eastern philosophy, and phenomenology, shifting theoretical support for “experiential learning and sensory research [...] in parts of the academic and scholarly culture” (Eddy, 2009, p. 6). It flourished during the time of Expressionism in dance and art that reflected personal expression in relation to the *angst* of the period, brought on by the First World War. Personal expression was “buoyed by the ground-breaking work of Sigmund Freud, Carl Jung and Wilhelm Reich in psychology, François Delsarte, Rudolf von Laban and Émile Jacques Dalcroze in cultural studies (art, architecture, crystallography, dance and music), [...] John Dewey in education, and [...] Edmond Jacobson in medical research” (Ibid., p. 6). Thecla Schiphorst (2008) cites the Delsarte Method of movement integration as the precursor to Somatics, emerging in Europe in the mid-1800s. Delsarte (1811-1871) created a system of integrating movement, speech, and gesture, enhancing physical expression of emotions in connection with speech and thought. This was “radical for its time as it emerged from the Victorian era of the court dance” (Schiphorst, 2008, p. 52) that was physically and emotionally constrained.

In the twentieth century, Modernism and the industrial era, Somatic Dance practitioners saw the rise of the machine and the *technologised body* (Salter, 2010), revealing the tension between the mechanical from without, and expression from within. This prompted a desire by dance practitioners to dissolve body-machine dualisms and physically express emotion, like Isadora Duncan’s (1849-1922) barefooted expressive dances. By closely observing their own body signals and movement behaviour, they adapted the established studies of human movement and



Both flourish outside academia and are in pursuit of personal autonomy and self-awareness, thereby undoing mind-body dualisms found in classical and traditional dance forms. However, the two systems differ somewhat. Somatic Dance Therapy is grounded in massage techniques and emotional release whereas in Somatic Dance practice, the *(re)education* of a dancer's body takes place. Here dancers consciously engage with scores, visualisations, and self-awareness, to facilitate change in habitual movement patterns enabling them to perform more efficiently. Both systems, however, seek to replace the "reigning ideology of rigor in physical training with a more 'natural' approach based on listening to bodily cues arising from breath, touch, and movement" (Batson, 2009, p. 1). These are found by using structured movement lessons where anatomical relationships are designed to improve, for example, coordination, such as Irene Dowd's "kinaesthetic anatomy" (Batson, 2009). This calls for "the conscious cooperation of the person through movement awareness or imagination as catalysts for changing motor/movement behaviour" (Ibid., p. 1).

Somatics is also influenced by dance *improvisation*, such as *contact improvisation*, the Joan Skinner Release Technique and other forms of "release" work exploring not only movement but also "imagery, touch, voice, music, and even technology [that] could become the primary creative stimulus for helping expand the arena of mind-body training" (Batson, 2009, p. 2). Other examples of current Somatic practice include the Alexander Technique by Frederick Matthias Alexander, The Feldenkrais Method® by Moshe Feldenkrais, Body-mind Centering® by Bonny Bainbridge Cohen, and Ideokinesis by Mabel Todd and Lulu Sweigard.

All these techniques use internal sensory awareness experiential approaches to self-organisation through movement and visualisation techniques to improve the *Body Schema* through self-exploration rather than tactile or verbal correction (Batson, 2009). Above all, they create an internal awareness of healthier pathways for movement, retraining the CNS, to repattern the body's habitual movement pathways and reconnect the mind, body and physical sensation found in dance practice. Through Somatic Dance the dancer becomes more aware of their own subjective sensations whilst moving, in contrast to classical ballet or contemporary dance that emphasise performance determined by external concepts made for observation by an audience.

### **2.3 *Bodies in...* embodied dance practice**

Embodied Dance practice arose in the twenty-first century. It is characterised by dance practitioners, educators, performers, and researchers exploring the porous boundaries between Somatic Dance education, Eastern philosophy, and embodied practices such as yoga, Buddhist meditation practices and martial arts, *capoeira*, *tai chi*, or *chi gong*. Embodied Dance practice goes beyond the more pragmatic approaches of Somatics by using phenomenological methods to explore *dance as experience*, by focusing on *being* in a dance practice and entwining with the *fabric of a world*, echoing Merleau-Ponty's (1968) notion of the *chiasmus* (Kozel, 2007; Fraleigh, 2018; Midgelow, 2018). Using internal visualisation techniques and *fascia release*, focusing on letting go, without much physical activity, the sensory motor, neuromuscular and skeletal systems seem to *dissolve*, the body is perceived as becoming invisible and the dancer sometimes experiences an entwining with the world, a perceptual experience.

To achieve these states of *being*, techniques such as *directed attention* and *flow* are practiced. “Learning to access and direct attention is a central theme” in Embodied Dance practice (Schiphorst, 2009, p. 5). For Batson (2009, p. 2) it is used to “quiet[en] the mind-body ‘chatter’ in order to focus attention on the body’s sensory stimuli (from breath, muscle tension, contact of the body with the floor, etc.)”. Csikszentmihalyi’s (1990; 2004) states of *flow* are used to describe the fusion of mind and body in a unified temporal zone (Hefferon and Ollis, 2006). Here the dancer experiencing *flow* is so engrossed *in* what they are doing that the environment around them *disappears*. During states of *flow* (Csikszentmihalyi, 1990; 2004) a person’s or a dancer’s *Körper* becomes an implicit medium, and because she is so fully and temporally absorbed in what she is doing, she no longer experiences her body as being explicit.

In both techniques, emphasis is placed on *listening to the body* (Kozel, 2007; Eddy, 2009), self-acceptance and *being*, rather than achieving. One is fully responsive and receptive to the moment of movement free from form, shape or any rigid holding patterns that may consequentially become “constraints that bind thought, feeling, and action” (Batson, 2009, p. 2). Pausing, reflecting, sensing, and slowing down for prolonged periods of time allows one to explore sensory feedback, intuition, inner sensations, and sensualities that arise when one is still or moving slowly, free from any goal-oriented processes.

Current Embodied Dance practice has given birth to the *Full Drop* that innovator Margrét Sara Guðjónsdóttir (2017, n.p.), defines as part therapy and part artistic practice to discover “new subjective sensorial experiences”. The *Full Drop* draws on the Danis Bois Method (2020), a perceptual enrichment and fascia therapy practice

that evolved from osteopathy and *myofascial release*.<sup>24</sup> It also includes sensorial introspection, internal visualisation techniques, Buddhist meditation and verbal dialoguing that aims to guide participants towards a so-called *Full Drop* into the experiential body. This enables a dancer to experience emotions as emotional *hyperstates*, and pre-reflective states of experience, allowing them to directly experience phenomena arising in their *felt-sense* through their entire body (Figure 8).



**Figure 8.** Ginslov, J. (2017) Dancer Laura Siegmund in *Conspiracy Ceremony – HYPER SONIC STATES*. [Photograph].

The *Full Drop* requires an “intensive deep inner listening and surrendering to inner body systems and rhythms” (Guðjónsdóttir, cited in Kozel *et al.*, 2019, p. 4). Through the meditation, dancers are released from the “*outside eye* that observes, judges and separates the dancer from the inner experience” and this makes one more “conscious of that which goes on *within*” (Guðjónsdóttir, 2017, p. 1) [emphases added].

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<sup>24</sup> Myofascial Release is a hands-on technique that involves applying gentle sustained pressure into the myofascial connective tissue to eliminate pain and restore motion. <https://www.myofascialrelease.com/about/definition.aspx> [Accessed 02.01.2020].



**Figure 9.** Ginslov, J. (2017) Dancer Suet-Wan Tsang in *Conspiracy Ceremony – HYPER SONIC STATES*. [Photograph].

The *Full Drop* (2017) meditation is practised seated or lying down with eyes closed (Figure 9), *doing nothing*, while visualising melting one's bones, fascia, and skin to surrender your will, agency, control, and intention. What *comes up* in the *mind's eye* as sensation or thought, *comes up*, be they moods, feelings, or physical sensations. Here one witnesses these experiences: "that's all you do...You're not doing an exercise. You're just having these thoughts, these visualisations, and then you observe, you allow yourself, to observe, from this neutral eye" (Guðjónsdóttir, 2017, p. 2).

*Bodies in...* Somatic and Embodied Dance practice show a progression of dance methods from Dalcroze to Guðjónsdóttir. It begins with the physical expression of emotion, to the integration of *soma*, body therapy and the kinaesthetic sensorimotor system, to practicing *dance as experience*. There are however important differences between the two systems.

Somatic Dance practice is more concerned with retraining habitual movements of dance practitioners who are highly attuned to experiences of movement through their own corporeality, temporality, spatiality, motility, subjectivity, and kinaesthesia (Fraleigh, 2018). Whereas Embodied Dance practice is more about the use of phenomenological methods to explore bodily and subjective lived experiences in dance practice. It thereby shifts the pragmatism of Somatics to embodied experiencing through the *felt-sense* and the perception of phenomena on “the horizon of experience” (Merleau-Ponty, 1945, p. 255). Here the dancer becomes more absorbed in how they are experiencing modalities that exist as states of pure temporal presence and *flow*.

In these states a dancer may explore a multitude of perceptual overlapping experiences. *Intentionality* directed outwardly into the world is redirected inwardly, by going *back to the dance itself* (Fraleigh, 2018), to implicit states of embodiment that are ongoing, morphic and flowing. These arise in the dancer’s consciousness, the numerous sense modalities as well as the *felt-sense*, internal visualisations, imagination, and perceptual qualities that overlap and mix, becoming relational. Meaning making takes place within this relational embodied self-reflexivity that accommodates and makes conscious, the flowing living present entwined with bodily experiences, that feel morphic. In this way Embodied Dance practice steps away from kinaesthetic enquiry or performance expressed outwardly for an audience. It is not about live performance and artistic outcomes but focuses on implicit bodily experience, as an experience that is found by *looking inwardly*. Through this the dancer discovers a multiplicity of relational sense perceptions, originating from within

the experience of being in a dancing body, immersed within a situated *Lifeworld* or praxis.

The following Chapter 3 addresses how dance practice explores technology to extend the *Körper*, and merge with a dancer's lived experience, asking how *invisible* felt experience may be made *visible* through interactions with technology and how these interactions may expand our notions of *being*, immersed in a world filled with technologies.

## CHAPTER 3

### ***BODIES IN... PERFORMANCE TECHNOLOGY***

This chapter describes how technology has changed live performance and the way we see bodies in performance. Dance, art, and media practitioners have used technology to make *invisible* events in the body *visible* since the early twentieth century. Technologies, from the analogue to the computational – from the dances of Loïe Fuller, in the early 1900s using silk cloth to contemporary dancers using computational responsive environments – entangle bodies and live performance to; extend the body, visualise motion, agency and physiological processes of the human body. As tools of technology have become more refined and wearable in the twenty-first century, performance practitioners and software engineers using biomedical instruments and soft and hardware interactive technologies, have collaborated to mediate and visualise the inner workings of the body and human agency in external media environments (Salter, 2010). This history of dance performance, the development and different uses of technology reveals a shift in the ways that we understand the corporeal body, lived experience, perceptions of embodiment and human expression.

The chapter highlights how analogue technologies extend and merge with performers' bodies or *Körper* and how their lived experience or *Leib* is altered. Furthermore, it describes how bodies interact with digital performance technologies (Salter, 2010),

how they become virtual through telematic<sup>25</sup> mediations and interactive systems, blurring perceived boundaries between bodies, movement, and the experiences of *being-in-a-world* (Merleau-Ponty, 1945; Heidegger, 1962). Two concepts of bodies, *Body Schema* and *Body Image* are used to describe this phenomenon. These are useful for understanding this blurring of boundaries between bodies, technology, and experience, within an ecosystem of the human, technology, and the nonhuman, shifting the discussion from the phenomenological, the postphenomenological to feminist posthumanism (Braidotti, 2013; Haraway, 2016).

### 3.1 Technologies in performance extending the body

In the early twentieth century, during the rise of the machine and the technologised body, dance, art, and theatre practitioners, extended their *Body Schema* by merging their *Körper* with analogue technology, according to Chris Salter (2010). He cites Fuller's (1862-1928) dance works as an example of her extending her *Body Schema* into the billowing silk screens that she held up with bamboo poles, creating undulations of luminous splendour, by using projections of coloured lights.<sup>26</sup> Through these extensions, she not only challenged the notion of traditional dance performance, but also that of early cinema. Rather than using a static scenic background to frame her performances, she merged her body with the bamboo poles (Figure 10), beyond the limits of her *Körper* into an expressive silk screen, to mediate "the expressive materiality of [her] bodily movement" (Schiller, 2005, p. 3). This transformed the analogue materials into moving metaphors. The so-called disappearance of her

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<sup>25</sup> Telematics is an interdisciplinary field that refers to the transfer of information using telecommunications, GPS navigation and tracking systems using information processing and electrical engineering. Telematic performance refers to live performance that makes use of telecommunications, information technology, the internet, online media platforms, video projectors and monitors through which the performers interact, creating a virtual performance space (Birringer, 1999).

<sup>26</sup> Fuller's *Serpentine Dances* were popular throughout the United States and Europe in the 1890s for which she developed and patented her "Garment for Dancers" (1894) (Salter, 2010, p. 227).

*Körper* challenged the “spectator’s perception of where [her] dancing body would end and [where] the screen began” (Salter, 2010, p. 227).



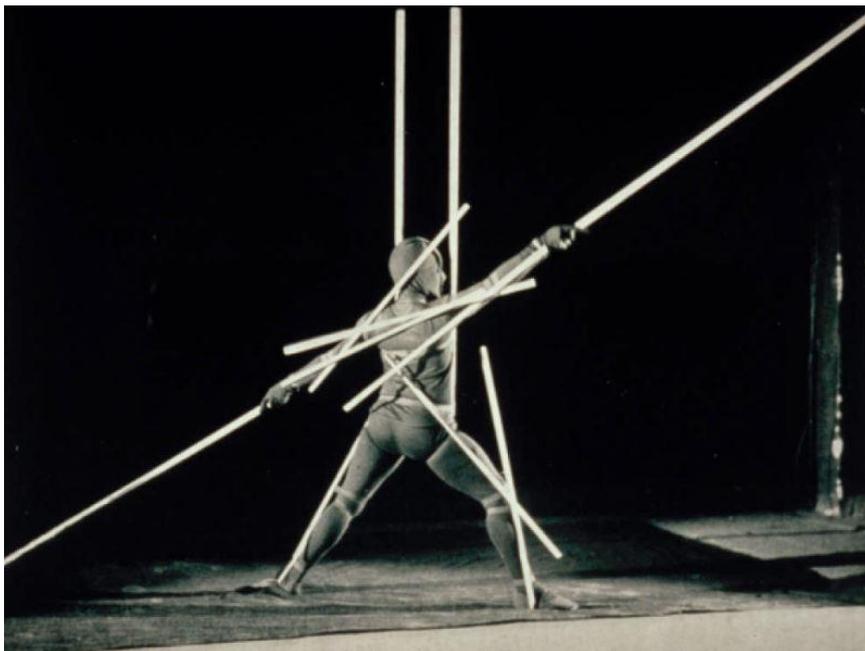
**Figure 10.** Glasier, F. (1902) *Portrait of Loie Fuller*. [Photograph].

Available from: [https://commons.wikimedia.org/wiki/File:Loie\\_Fuller.jpg](https://commons.wikimedia.org/wiki/File:Loie_Fuller.jpg) [Accessed 12/10/2019].

The Futurists in the early twentieth century also explored going beyond the muscular possibilities of the body and extended the body, by imitating the actions of engines, using machinic gestures and analogue materials to extend the body (Salter, 2010). Filippo Tommaso Marinetti (1876-1944), leading the Futurist Movement, was inspired by automatic guns, shrapnel, and flight, and explored this through the fusion of human and machines in his works. Oskar Schlemmer (1888-1943), associated with the Bauhaus school, radically changed the perception of the human body on stage, using mathematics to create abstract geometric space and shapes. Sourcing various materials to augment the body’s shape and biomechanics, he created mechanised stages and costumes (Salter, 2010), (Figures 11 and 12), that altered the shape and perception of the human body. Schlemmer extended the *Body Schema* of the performer by merging the *Körper* with the technological.



**Figure 11.** Schneider, E. (1926) *Costumes by Oskar Schlemmer (Bauhaus)* for the Triadic Ballet, at Metropol Theatre in Berlin. [Photograph]. Available from: [https://www.thefutureperfect.com/present\\_tense/articles/oskar-schlemmer/](https://www.thefutureperfect.com/present_tense/articles/oskar-schlemmer/) [Accessed 30/07/2020].



**Figure 12.** Schlemmer, O. (1928) *Stick Dance*. [Photograph]. Available from: <http://socks-studio.com/2017/07/19/when-body-draws-the-abstract-space-slat-dance-by-oskar-schlemmer/> [Accessed 30/07/2020].

All these performances may be analysed by using Heidegger's (1977) notion of *readiness-to-hand*, where there is a merging of the body with technology. He cites an example of a carpenter using a hammer, where the carpenter is so familiar with the

tool that he no longer maintains a conscious awareness of *how* to use it but is only aware of hammering. Engaged in this action, the hammer becomes perceptually transparent, and is an extension of his *Body Schema*. The hammer transforms in a “world-revealing way in which humans are involved with their environment” (Heidegger, 1977, p. 108) as the tool withdraws from being a separate object to the artisan and is drawn into the action that is being performed. Here the carpenter’s *Body Schema* adjusts to the technology, creating an intuitive relationship with it, such as one experiences when riding a bicycle.

Using Merleau-Ponty’s (1945) phenomenological views, Fuller’s analogue technology could also be described as becoming *incorporated* through use. Fuller *incorporates* the poles and screen into her *Körper* and the lived experience of her performance. Similarly, the Futurists and the Bauhaus performances using mechanical materials to extend their bodies and actions, augmented not only their bodies, but also their lived experience of their technologised performance. Merleau-Ponty (1945) explains the *incorporation* of technology using the thought experiment of imagining a blind man navigating a street with a cane. He begins by questioning where the blind man’s self begins in relation to his material engagement of the cane. Is it at the tip, the handle or halfway? It is however found in the circuit of material engagement between the cane, the environment and the man’s perceptual experience. Stick, man, and pathway form a circuit of information. The stick, an extension of his *Body Schema*, is a perceptual tool that transmits material differences in the environment which he feels through the cane, to which he adapts. Once mastered, the stick becomes transparent and withdraws from his focal awareness to become an element of his “motor-perceptual repertoire” (Besmer, 2015, p. 58). The man incorporates the stick into his *Leib*, as it is

inseparable from his *Body Schema*. Taken literally, by tapping on the ground, he brings information into the *Body Schema*, through *incorporation*, and by doing so creates a bodily *extension*, extending his *Körper* and *Leib* through the materiality of the cane.

Fuller, the Futurists and the Bauhaus technological performances therefore reveal a *readiness-to-hand* and an *incorporation* of technology. Through these performances they created the emergence of a new bodily synthesis with technology that expanded their “perceptual powers and extended their capacities for agency in the world” (Besmer, 2015, p. 59). These performances are useful in underpinning the rise of electronic, digital, and interactive technologies that emerged in the 1960s in the USA, after a waning of experimentation in culture in post-World War II Europe due to the rise of fascism. They paved the way for understanding the development of technology in performance and interactions with technology that further changed ways of *being* and performing with technology.

### **3.2 Interactive and telematic mediations of the body**

In 1965, John Cage, Merce Cunningham and David Tudor in *Variations V* (1965) explored the use of “chance procedures” and multimedia electronic technologies to exploit the possibility of real-time interaction between performers, musicians, and semi-autonomous electronic systems. In *Telepos I* (1972), choreographed by Cunningham, dancers wore wireless sensing technologies and radio transmitters that triggered sound on stage (Birringer, 2008). The dancers, considered as technological extensions of the sound scores, marked the beginnings of interactive dance and the synthesis between human and nonhuman systems in performance. Movement became increasingly viewed as not choreographed by a sole human creator but co-

constituted with nonhuman machines or computer programmes created by computational mathematics.

In the late 1980s, electronically connected bodies emerged in digital performance (Birringer, 2008). The development of new electronic and computer technologies further encouraged hybrid dance and media work concerned with new constructions of subjectivity and identity through technological digital mediation. From the 1990s, digital media technologies such as video cameras and projections using telecommunications, played a major role in reformulating and remaking the dancing body, establishing *telematic* performance and *mediadance*.<sup>27</sup> This is reflected in Kozel's participation and embodied experiences in the work *Telematic Dreaming* (1992) by Paul Sermon. This was a live telematic video installation, linking two remote sites via a 2MB ISDN<sup>28</sup> telephone line. Using this system, the video image of Kozel lying on a bed was sent and projected onto another bed at another site. Audiences were encouraged to interact with Kozel's projected image, and this was mediated via a camera back to Kozel, who then responded. After spending much time in the installation, she started experiencing sexual and violent encounters with visitors to the installation. These virtual experiences were felt as being real and impactful as her real

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<sup>27</sup> *Mediadance*, coined by Gretchen Schiller (2003), is seen as an artistic practice belonging to the fields of dance and technology, interactive arts or Screendance, and refers to "movement-based interactive arts practices which integrate digital technology into choreographic work", and are "characterised by hybridism at the intersection of dance, moving image, digital technologies, and information and communication technologies (ICT)" (Misi and Pimentel, 2016, p. 557). It integrates computer and screen-based technologies within "technologically mediated systems, which include interactive-art, CD-ROM based interactive art, virtual reality, netart, telematics, and technologically mediated performance and video gaming" (Schiller, 2003, p. 12). It also includes "computer graphics software, video-editing, 3D animation, and any other available digital technology for moving images and/or interactivity" (Misi and Pimentel, 2016, p. 558).

<sup>28</sup> ISDN: Integrated Services Digital Network is a high-performance service that delivers broadcast-quality voice and continuous, extremely reliable data transmission using a set of communication tools that use digital transmission to make phone calls, video calls, transmit data and other network services over the circuits of the traditional telephone network.

body responded with strong physical and emotional qualities. Hence the real body in telematic performance is not obsolete.

For Kozel (2007, p. 99), telematics does not draw “consciousness out of the body and into an electronic construct”, but extends the body, not losing or substituting it. Reflecting Merleau-Ponty, Kozel’s intuition is that “the virtual body is entwined with the fleshly body” (1994, p., 3) with both bodies feeding back visceral qualities and bodily sensations to each other. This for Kozel is a form of *intelligence amplification* (IA) rather than artificial intelligence (AI).<sup>29</sup> Rather, IA sees “technology as an extension of the body’s existing abilities, a building upon what exists, rather than a digital replacement” (Ibid., p. 3), reminiscent of the *digital-Other*, where *Körper*, *Leib* and mediated imagery co-exist in each other.

These forms of *digital othering* or IA, reflect Merleau-Ponty’s (1945) phenomenological version, the *Body Image*. This is an imagined visual image of self, that belongs to the experience of one’s embodied self. Resisting the traditional Cartesian separation of mind and body, *Body Image* belongs neither in the mental realm nor in the sensorimotor, mechanical-physical realm, but exists in both *my* body and *my* engaged actions with *things* that I perceive in the world and with other people. Merleau-Ponty (1945) describes this idea using an image of a woman wearing a feathered hat. Negotiating the doorway, she uses her *Body Image*, by imagining the height of the doorway, gauging when the feather and doorway may touch. Through imagining a

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<sup>29</sup> AI: Artificial Intelligence emphasises the creation of intelligent machines that work, react and mimic the capabilities of humans. This it does by learning, recognizing objects, understanding, and responding to language, making decisions, solving problems and by combining these perform functions. Google search engine is one of the most popular AI applications.

virtual image of the feather, she entwines her sensory awareness and *Body Schema* with her *Body Image* and negotiates the doorway. The feather becomes an extension of her awareness, an imagined “quasi-extension” (Ihde, 2002, p. 7). With this she may *see-feel-experience* this as an imagined visualisation that she also physically experiences, a crossing over of real body and the internalised virtual body, manifested imaginatively. *Body Image* therefore extends and assists *Body Schema* through an imagined body.

According to Ihde (2002, p. 5) however, *digital othering* does this imaginary work for us and produces the ability to see and perceive ourselves from two distinct and different points of view, a “bi-stability”. Here we see/feel from within the *Body Schema*, and a disembodied digital “quasi-other”, a spectacle-like visual objectification of self and bodily experience. When this occurs, we *see-feel* ourselves becoming virtual, external to our lived experience, yet connected. The ‘here’ and ‘there’ body, the material body and the virtual digital visual object, are experienced inter-relationally as they slip in and out of each other through optical and felt interactions (Ihde, 2002; Kozel, 2007). These interfaces of the body with technologies “augments reality, passes through materiality and thus becomes a new composition of other dynamic materials and media” (Misi and Pimental, 2016, p. 569).

### **3.3 Cyborg performance**

By 1991, post human ecofeminist Donna Haraway further set the conceptual stage for a new generation of artistic performance practices that looked to fabricate hybrids across boundaries between machine and organism: the *cyborg* (Haraway, 1985). This sought to blur boundaries between “the natural, the artificial, the biological and computational”, becoming the posthuman body (Salter, 2010, p. 249). With this

posthuman body, international performance artists used new techniques ranging from digital imaging, sensors, muscle-controlling actuators and machine implants and the internet to augment and transform their bodies.

Johannes Birringer (1999, p. 365) cites performance artist Stelarc's performance of *Ping Body* (1993) as an example of a *cyborg* that extended and animated his *Body Schema* by "plugging himself into the World Wide Web via electrodes connected to his body". He notes that Stelarc's nervous system interacted with the Internet and was stimulated by the external ebb and flow of data, "testing the human machine interfaces of our so-called cyberspatial future" (ibid. p. 365). This reflected the concern with the notion of cybernetics or a hybrid of machine and organisms at the time (Haraway, 1985). These "cyborg performances" or body manipulation practices (Salter, 2010, p. 251) reflect Stelarc's belief that the body is obsolete. His artistic and theoretical research investigated how to "extrude agency" from a body's awareness that was neither 'all there' nor 'all here' (ibid., p. 251). The body was simply an objective evolutionary structure that could be enhanced through technological fusions, beyond its normal physical limitations.

After the mid-nineties, Susan Broadhurst (2012b, p. 226) cites the development of digital performances transforming "a fundamentally passive, recipient relationship of performer to media devices, into one of reciprocity and joint enterprise" through increased computing power. As the technology becomes more *incorporated* into the body, the experience of the *Body Schema* is "not fixed or delimited but extendable to the various tools and technologies" (ibid., 2012a, p. 9). Citing *Muscle Machine* (2003) by Stelarc, she states that "the body is coupled with a variety of instrumental and

technological devices that are appropriated by it” (Ibid., 2012b, p. 229). Using interactive and operational systems, Stelarc created a walking robot, extending his *Body Schema*, (Figure 13), “translating human bipedal gait into a six-legged insect-like motion” (ibid. p. 229). Mirella Misi and Ludmilla Pimentel (2016) view Stelarc’s experiments with prostheses as an example of how technologies extend his body *Körper*, and restructures his *Body Schema*, an instrumental use of technology.



**Figure 13.** Bennet, M. (2003) Stelarc in *Muscle Machine* [Photograph]. Available from: <http://stelarc.org/?catID=20231> [Accessed: 21 January 2020].

### **3.4 Ecosystemic performance**

With the development of the Internet, advances in computer programming, coding, instrumentation, and the miniaturisation of technology in the beginning of the 2000s, the notion of extending the body through technologies changed. Ecosystemic approaches between human and nonhuman objects, online and in the real world, were explored against the background of posthumanism (Braidotti, 2013).

For Rosi Braidotti (2013, p. 49), the posthuman subject is defined within a philosophy of multiple belongings, “a relational subject...that works across differences and is also internally differentiated” grounded and accountable. Posthuman subjectivity expresses an embodied and embedded human, “based on a strong sense of collectivity, relationality” and “proposes an enlarged sense of inter-connection between self and others, including the nonhuman or ‘earth’ others, by removing the obstacle of self-centred individualism” (ibid., p. 49). The merging of the human with the technological is a “post-anthropocentric posthumanism”, resulting in a new form of subjectivity in an ecology with multiple layers of interiority and exteriority and “everything in between” (ibid.). *Becoming-posthuman* according to Braidotti (2013, p. 193) “expresses multiple ecologies of belonging, while it enacts the transformation of one’s sensorial and perceptual co-ordinates”.

Posthumanism affected *mediadance*, and with this, artist-researchers explored physical bodies in the real world, immersed in hybrid technological, virtual, interactive, relational biofeedback systems and immersive environments, using technologies such as motion capture, augmented reality, virtual reality, 3D projections, biosensors, and AI for example. The development of new hard and software technologies as well as wearable technologies have given rise of new artistic collaborations exploring ecosystems of the materiality of bodies, embodiment, and technology, in relation to data and code.

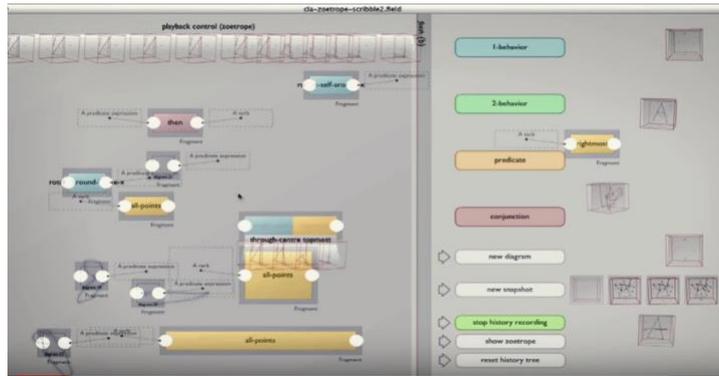
The work *whisper: wearable body architecture* by Schiphorst and Kozel (2003-5) is an example of an ecosystem, an immersive digital and movement-based installation. Kozel cites this as the work that got “close, closer, closest” (Kozel, 2007, p. 270) to

cutting through the “inner and outer” (Ibid. p. 270). The work was reliant on distributed embodiment across varying degrees of human and nonhuman materials and experiential perspectives, starting from a first-person phenomenology and ending within an “ecosystemic approach” (Ibid., p. 179). This was brought into being through phenomenological exchanges between audiences’ bodies and technologies in an ecosystem of visual media technologies, wearable pulse and respiration sensors and garments embedded with small wireless computers, small fans, and vibrators. Audience members wearing the garments, entered the space defined by light, sound and movement. Using biofeedback systems, they could access their own breath and heart rate data, and through simple gestures shared this intimacy with or sent this data to other audience members who felt this in their own garments. Here, the relationship to self and others in the ecosystem was fundamental to the experience of the work, as it highlighted new modalities of paying attention to one’s own body as “a state of listening and attending to the biological and affective flows” (Ibid., p. 291) between others. Through this, the installation played with Merleau-Ponty’s (1964) notion of the *visible* and *invisible* where physiological data was rendered visible, yet the “full richness of the body was left implicit” (Ibid., p. 291), through the distribution of invisible affective states that was shared by the audience members.

Kozel (2007) describes this artistic process in Heideggerian (1977) terms as a place where tools, craft and artistic actions brings forth a *poiesis*, something which an artist brings into being that did not exist before. For Kozel (2007), this place of *techne* reflects Heidegger’s (1977, p. 20) notion of technology in arts practice as an “enframing” for Being, implying that the technology in the installation was used to discover an amalgam of relationships between *self*, others, within the ecosystem. The

participants experienced internal flows and rhythms through three notions of *self* in the work: between “self and self, self and other and self and ecosystem” (Ibid., p. 288). In other words, the relationship between oneself and one’s own physiological data, the sharing of this data with others and finally, when viewed as a whole experience, an ecosystem, a community of others and objects, needing their participation and interaction, to activate it.

*Becoming* (2014), by Wayne McGregor, may be viewed as developing Kozel’s ecosystemic approach by using the AI software, *Choreographic Language Agent*. This uses algorithms, machine learning and an interactive digital object, to create an interactive AI object. This takes the form of a *data dancer*, that appears on a screen in the studio. The software “generates unique solutions to choreographic problems to augment the dance maker’s own creative decision-making processes” (McGregor, 2020). McGregor reimagines the *data dancer* not as an object, but more as a body, the eleventh dancer in the studio and “a choreographic agent, for the unique blend of physical and mental processes that constitute dance and dance making” (ibid., n.p.). Like the human dancer, the *data dancer* modifies its own body and movements in relation to the dancer performing in front of it. It then retrieves archived dance material in the software that it uses to generate new movements for the dancer to learn. Through this interface it elicits kinaesthetic choices and agency in the human dancer. The human dancer experiences this as a dynamic ecosystem of relational agency, a conjoining of the *self* with the *data dancer*, as shared actions and responses between the human and nonhuman (Figure 14).



**Figure 14.** Wayne McGregor, *Becoming* (2014) [Screengrabs]. Available from: <https://www.youtube.com/watch?v=l0ELub4W6vI> [Accessed 1 February 2020].

McGregor (2020) claims that as the work incentivises a dancer's creativity, inner intention and responsiveness, and the interface is experienced as a *poiesis*. The human dancers experience themselves within an ecosystem co-constituted with nonhuman intelligence, reflecting the posthuman ecofeminist views of Braidotti (2013) and Haraway (2016). Using Moore (2017, p. 32) one could describe this as "interweaving self/other, where the materiality of the body seeps into the fabric of these emerging technologies".

Understanding the body in these ways helps to discover the recurring themes in dance and performance evident in the use of analogue technologies in early twentieth century dance, to contemporary performance using digital, virtual, interactive and AI technologies. Using a variety of analogue technologies, digital mediations, telematics and immersive ecosystems, the body has been extended, enhanced, multiplied, augmented, and reconfigured to becoming a virtualised digital body (Broadhurst and Price, 2017). Nevertheless, the body is still identifiable as a body, "linked with our everyday mode of 'being' tied to our locatable and temporal existence" (Ibid., p. 2) that emphasises the tactile and sensual nature of the human body.

However, in contemporary society and dance practice, humans are forming new relations and experiences with technology due to the rise of more wearable, invisible and ubiquitous technologies. These technologies are changing ways of thinking about technology, subjectivity and lived experience and, because of this, ways of *Being* within ecosystems of the human and the nonhuman are changing. This will be discussed in the next chapter, Chapter 4.

## CHAPTER 4

### ***BODIES IN...EMBODIED TECHNOLOGIES***

This chapter investigates performing bodies interfacing with wearable biosensor technologies, such as HRM's, and examines how embodied technologies shift and shape a dancer's understanding of their bodies in *dance-tech* practice. Furthermore, the chapter discusses how subjectivity is found in the relations between bodies, and wearable technologies and how these relations affect, change and shape our experiences of dance, in a posthuman world. Lastly, the chapter discusses how contemporary technologies have become more intangible and in so doing are changing notions of embodiment, thereby contributing to ways of *looking inwardly* in Embodied Dance practice.

#### **4.1 Wearable technologies in performance**

In a world of rapidly changing, expanding, and accelerated use of wearable technologies, robotics, AI, and machine learning, visualising digital technologies are being replaced with instrumental interfaces in mediated societies (Ihde, 2002). With these changes, theories of subjectivity, ways of *seeing* our bodies, of *being-in-the-world* and in performance in relation to these technologies are also changing. Over the last decade, this has been evidenced in many experimental collaborations between dance practitioners, academic researchers, designers, and software programmers. Numerous academic research publications (Salazar-Sutil and Popat, 2015; Birringer, 2008; Broadhurst and Machon 2012; Baker and Sichio, 2017; Broadhurst and Price, 2017), describe these collaborations as intersections of dance, philosophy, science, performance, digital, instrumental and software technologies.

Salter (2010) calls this *dance-tech*, artistic technological practice that result from the interface of moving bodies using wearable biomedical instruments, computer software interfaces, the Internet and code.

*Dance-tech* practitioners have embraced this new range of technologies, such as wearable biosensors, as they are made for mobility. Given the fluidity of their dancing bodies, where spatiotemporal relations and embodied experiences with the environment are constantly shifting, *dance-tech* practitioners wear biosensors, to trigger events by simply being in motion. This liberates dancers, enabling them to perform and interact with others without the need to stop and look at a static screen that requires some form of clicking and waiting for it to answer back. These third wave human-computer interactions (HCI)<sup>30</sup> (Höök, 2018; 2019), created by programming languages and AI to accommodate the issues of mobility, are more concerned with user experiences and interaction. According to Elena Marcevska (2010, p. 60) this enables the exploration of interaction and agency between bodies, technology, and their environments as “interactivity and performativity are crucial elements of experiencing new technologies”.

In *dance-tech*, wearables demonstrate *multistability* (Ihde, 2010), as they are primarily designed for sports and biomedical practices but are re-purposed to perform as interfaces between dancers, media, and their environments. A short description on the development of wearable biosensors, provides a background to discuss *multistability*

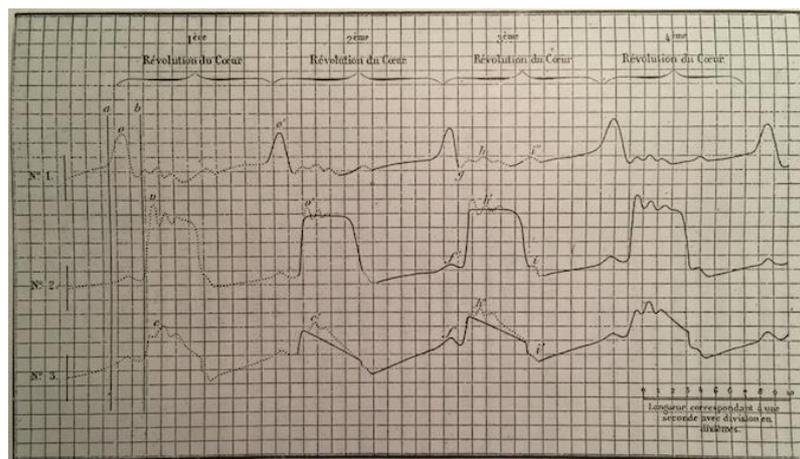
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<sup>30</sup> HCI: Human computer interaction focuses on the design of computer technology and the interactions humans have with computers and all other mobile, wearable and information technologies

how dancers use them, to *experience* themselves *through* them, rather than *seeing* themselves *mediated* by them.

## 4.2 Nonhuman instrumentation

Biomedical instrumental mediations were first explored in the experiments of Etienne-Jules Marey and Jean-Baptiste Auguste Chauveau (1878), who invaded the interior of bodies using measuring instruments, rather than scalpels to open bodies for observation. The extraction of invisible rhythms and fluctuations of HR was carried out by implanting measuring devices directly into the heart chambers of a living horse. Mechanical sensors inserted into the heart collected barometric information about the changes of pressure in each chamber. Transducers converted this information, and an inscription device graphically notated the invisible interior movements of the horse's heart (Figure 15). This conjoining of machinic inscription to a living body, emphasised a shift from observing a body through vivisection, to “generating living processes through technologies of inscription” (Cartwright, 1995, p. 26).



**Figure 15.** Cartwright, L. (1995, p. 25, fig. 2.4) Comparative tracing of cardiographic pressure changes recorded by J.B.A. Chauveau and Etienne-Jules Marey. From Marey (1879), *La Methode graphique* (Paris).

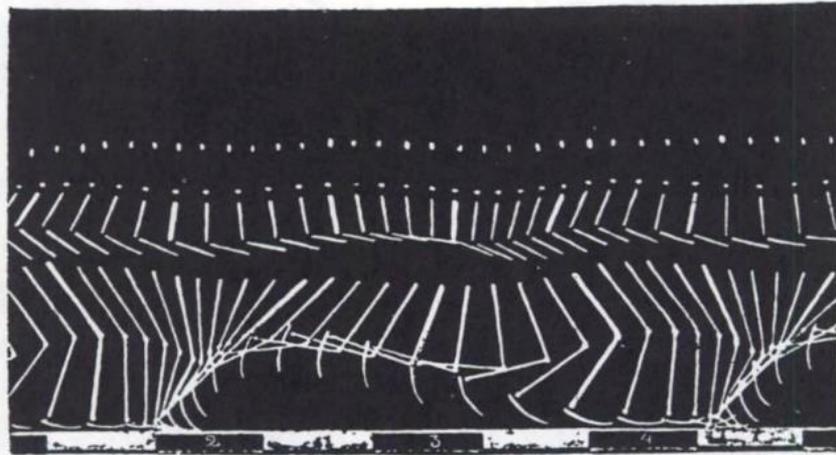
Similarly, Marey (1894) using photographic techniques, grid, and graphical systems,

stripped images of meaningful and emotional content, to only record and trace patterns of human movement. This could “supplement the human condition’s inability to perceive the ever-changing nature of movement” (Schiller, 2005, p. 6). By detaching the human body from its spatiotemporal and emotional condition, Marey could better analyse its quantitative material nature. To do this, he created a black background against which he placed his moving subjects wearing black costumes with white optical markers (Figure 16) which highlighted the subject’s movement patterns.



**Figure 16.** Cartwright, L. (1995, p. 34. Fig. 2.5) Drawing done from a photographic study of human gait. From Marey (1894), *Le Mouvement* (Paris).

This “‘movement-mapping’ technique” (Schiller, 2005, p. 2) transformed human movement into two dimensional, linear sequential representations, transforming analogue photographic imagery into arbitrary signs, amplifying shapes and lines of in-between-movements usually unseen, according to Marey (1894), by the human eye (Figure 17). Qualitative lived, felt, and emotional experiences were omitted in this way.



**Figure 17.** Cartwright, L. (1995, p. 34, fig. 2.6) Diagram taken from a photographic study of human gait. From Marey (1894), *Le mouvement* (Paris).

Contemporary biomedical instruments such as biosensors perform much like Marey's technical mediations, but instead use code to produce data, that is abstract information about human physiology and movement. However, biosensors do not mediate. They act as interfaces, performing "intrusions" (Braidotti, 2013, p. 89) and extrusions to "extrude agency" (Salter, 2010, p. 251), with or without the person's awareness or direct human handleability. Biosensors, when embodied, become perceptually transparent to the frequent user accustomed to wearing them; however, they reveal hidden aspects of the body in data and code that need to be read and interpreted.

Ihde (2010) states that instrumental interfaces, such as biosensors, stem from the *Second Imaging*<sup>31</sup> revolution and this has produced *second-sight imaging* techniques, to make invisible events in our bodies, such as heart rate, visible. Biosensors employ "infrared and ultraviolet ranges of the optical spectrum – beyond ordinary visual

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<sup>31</sup> The *Second Imaging* revolution introduces instruments that can receive signals from "that part of the wave spectrum that are unperceivable to humans, converting these to perceivable (non-isomorphic) images" and data through computerised enhancement (Von Den Eede, 2015, p. 150). Here there is a structural difference between the original data and the constructed image. The *First Imaging* revolution was "epitomised by the telescope, visual magnification, and mediation, with the object greater and clearer but remaining isomorphic with the original object." (Van Den Eede, 2015, p.150).

capacities but [are] translated into visible patterns” (Ihde, 2002, p. 47) or data. Through these translation techniques, the micro-perceptual and phenomena that lie beyond literal vision, such as HRV, are translated and made readable. *Second-sight imaging* thereby moves away from *seeing* the body in a monomorphic visual representation (Ihde, 2002). Rather one *reads* the *self* in different formats, such as data or graphs, providing “a polymorphic way of seeing” (Ihde, 1993, p. 86) the *self*. Joanna Zylińska (2017, p.17) describes these ways of *seeing* as stemming from “non-human vision” that is produced by nonhuman interfaces, such as the actions of surveillance cameras that are used without the subjective guidance of a human. Here there is no direct human involvement mediating an object through a visualising technology, such as a camera (Zylińska, 2017). Furthermore, Zylińska argues, all visual mediation is nonhuman as it is the camera that takes the picture. However, one could argue that the design of cameras and biosensors are “products of machines that are themselves the product of texts, e.g., research engineering” (Flusser, 2000, p. 17), a human endeavour.

Nonetheless, “non-human vision’ is a better way of looking not just in an optical, but also in an ethico-political sense”, allowing “us to reorient our embodied human eye that is stuck in its own present spectacle” and “narcissistic parochialism” (Zylińska, 2017, p. 17). This provides a radical rethinking of the dominance of human visual mastery, and ocularcentrism that is found in Western culture, as being the purveyor of unequivocal *truths*. By reorienting visual mastery over things in the world, humans may become more dependent on their *felt-sense* and embodied experience rather than gazing into a digital-*Other* or a smart mobile phone and social media, where they

inscribe themselves onto platforms, creating self-identity and shareable recognition (Colebrook, 2014).

*Nonhuman vision* and *second-sight imaging* therefore provides ways for dancer-researchers to explore invisible aspects of themselves, such as HRV, in relation to their Embodied Dance practice without reverting to external image-based technologies or ocularcentrism. With this form of practice, the eye and visuality no longer dominate and control the dancer, as it is the body that mediates lived experience, and wearable technologies extrude data that is read and interpreted specific to the practitioner. This supports dancers wanting to focus *inwardly* on dance as lived experience and the *felt-sense* with the whole body, without the need to literally *see* or *look outwardly*, to validate those experiences. Additionally, in support of this inward-looking focus, interfaces with wearable biosensor technologies occur through situated interactions that are embodied. This is discussed below.

### **4.3 Embodied interactions**

For Paul Dourish (2001) and Kristina Höök (2018) interfaces with wearable technology and computer systems are *embodied interactions* as they are situated in our world and are intimately connected with our bodies as heuristic tools acting on and interacting with our bodies. The key to *embodied interactions* with computing is the fact that we, “are always in the world, with our bodies, sociality, and practices” (Höök, 2018, p. xxi). Our actions are embodied elements of our phenomenal world that include “interactions with computer systems that occupy our world, a world of physical and social reality” (Dourish, 2001, p. 3). In other words, computer systems and wearable technologies have become part of our *Lifeworld*. Here we embody interactions with interactive technologies without sometimes actually getting our hands on them, such as smart

streetlights. Wearing a HRM whilst moving for example, *embodied interactions* occur with the technology through *nonhuman vision*, without subjective and visual guidance.

Ihde (2002), drawing on his pragmatic postphenomenological perspective, proposes that *embodied interaction* is a *re-embodiment*. This emerges through the “incorporation” (Ihde, 2010, p. 42) or *mutual constitution* of contemporary technologies that actually “*re-embody* our fleshly experience” (Ibid. p. 111). *Re-embodiment* (Ihde, 1990; 1993; 2010; Besmer, 2015, Kozel, 2017), occurs through human-technology relations, everyday user experience that form unique relations along a continuum with the technology, allowing us to access new forms of embodiment beyond our ‘naked’ bodily senses. Ihde (2009; 2010) classifies our relations with technology as:

- a) *Embodiment relations*: here there is a symbiosis or unity with the technology as it is embodied into the user’s *Body Schema*. When familiar with its use, the user’s experience is reshaped through the device and becomes perceptually transparent. Eyeglasses are an example, where you look through, rather than *at* the technology.
- b) *Hermeneutic relations*: are relations in which humans read and interpret how technologies represent their world and body. This is reflected in the reading and situated interpretation of biometric data generated by HRMs, for example.
- c) *Alterity relations*: are relations where human beings interact and experience technologies, as a *quasi-other* such as an ATM or Siri<sup>32</sup> for example. They require direct and focal attention.

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<sup>32</sup> Siri is a virtual assistant part of Apple’s Inc. iOS that uses voice queries from the user to make recommendations, searches and perform requests to a set of internet services.

d) *Background relations*: are understood as *present absences*, not directly experienced, but a context for human life, like the automated home heating system or the internet, continuing to shape a person's experience in the home.

For Ihde (2010, p. 42), these human-technology relations are produced by “inter-relational and reflexive” experiences and *embodied interactions* with technology. They primarily focus on individual experience in relation to individual technologies, making Ihde's (2010) *I-technology-world* definition clear. With these interrelations “*embodiment* replaces *subjectivity*”, where subjectivity and “self-knowledge must be gained reflexively and in strict interaction with our experience of being-in-a-world” (ibid., p. 41) and in our personal interactions with technology. Interrelations with technology thereby create a form of “motile consciousness” (Ibid., 2010, p. 39), a consciousness that is embedded in our interactions with technologies, such as a typist using a typewriter, where the technology becomes perceptually transparent. As such, they renew and augment the *Body Schema*, human perception, agency, and cognition. We therefore find that we are no longer a subject in a closed body but experience our subjectivity, from a first-person perspective, through our relations with technology.

Rosenberger and Verbeek (2015, p. 19) position *embodied interactions* as being guided by a relational ontology, as technologies, “post-phenomenology holds, are to be understood in the terms of the relations human beings have with them, not as entities ‘in themselves’”. However, this relational approach does not give up the distinction between the human and nonhuman, as *things* are not symmetrical to humans and interactions with materials form all kinds of relations without losing human experience. To do “justice to human experience of being subjectively ‘in a world’, it

remains very relevant to make a distinction between humans and things” (Ibid., 2015, 20). When one gives up this distinction one also gives up “the phenomenological possibility to articulate (technologically mediated) experiences ‘from within’” (Ibid., p. 20). These interrelations thereby transform and shape the user’s experience, as the device is *incorporated* in the user’s bodily awareness and the world that they are experiencing. This is seen in *dance-tech*, with the convergence of dancer, wearable technology and biometric feedback revealing human and machinic choreographic thinking.

Braidotti (2013, p. 3) views these ideas as central to the post-anthropocentric predicament as embodied relations with technologies create “new forms of subjectivity” and degrees of intimacy. HRMs, for example, replace visual isomorphic modes of representation with “sensorial-neuronal modes of simulation” (Ibid., p. 90). They are micro-electronic embodied machines of contemporary society, that have become embodied, and fused with our human CNS to record the electrical signals stemming from the heart causing the heart to contract and relax. The HRM, using ECG, extrudes this electrical activity and represents HR and HRV as biodata. This actualises the “relational powers of a subject that is no longer cast in a dualistic frame but bears a privileged bond with multiple others and merges with one’s technologically mediated planetary environment” (Ibid., p. 92). The merging of the human with this *machinic vitality* (Ibid., p. 91), enables the formation of interrelations with the human and nonhuman with multiple connections. It however requires a qualitative shift in human thinking, a rethinking of the human being as a privileged species in our relations with the nonhuman.

*Embodied interactions* with biosensors for dancers then, may enhance a way for dancers to explore their own CNS, subjectivity and lived experience of a dance practice from which they may articulate and shape new embodied experiences from a first-person perspective. They are no longer guided by external *digital-Others* but perform *self-reflexively* through embodied technologies and *embodied interactions*. This affords the dancer freedom of movement to experience the *felt-sense* without having to observe representational imagery in external representations as a source of validation of their subjective experience. In this way, ocularcentric and dualistic notions of seeing the self in motion are overcome.

#### **4.4 Self in the data**

Ihde (1993; 2002; 2009, 2010) and Van Den Eede (2015), propose that HRMs offer a way of reading the embodied *self* in the data, as HRMs do not mediate images isomorphic to the human heart. Through a self-reflexive reading and interpretation of the graphs, data or text, the embodied self is found in the data, as it is the user who has produced the data. This is reflected in the cultural practice of *self-tracking* through numbers, the *Quantified Self* (QS)<sup>33</sup> situated in *Metric Culture*.<sup>34</sup>

Here the user reads their embodied self-reflexively, through a *data double*, “an objectified version of [their] embodiment” (Van Den Eede, 2015, p. 151). This forms a

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<sup>33</sup> QS: The *Quantified Self* was first introduced in 2009 by Gary Wolf and Kevin Kelly, two *Wired* magazine journalists. QS is a synonym for self-tracking or lifelogging practices (Lupton, 2016; Lupton and Smith, 2018). With a motto of *self-knowledge through numbers*, this *data driven life* (Wolf, 2010), is about measurement and quantification using self-tracking and self-monitoring practices that afford the user a way to improve their well-being, productivity, and fitness progress.

<sup>34</sup> *Metric Culture* (Ajana, 2018) reveals a growing cultural interest in numbers, humans being increasingly shaped by numbers and new ways of *seeing the self* in numbers. This has escalated through “accelerated globalisation [and] the concomitant influence of information technologies” (Cox and Lund, 2016, p. 10), as well as networked informational technologies, online social media platforms, cloud computing, mobile software, robotics, artificial intelligence, self-tracking wearable technologies and data-generating software, for example.

symbiotic relationship between self as user and the *data double*, where the subject doing the measuring is also producing the material to be measured, interpreting the data, and acting upon it. However, the constructed data includes “not only textual interpretation but also visual hermeneutics” (Von Den Eede, 2015, p. 150), meaning that mediated scientific imaging practices are interpreted by the user and by doing so become “fully multisensory and embodied” (Ihde, 2002, p. 59). Visual hermeneutics involves a personal interpretation of data that feeds back to a person’s situated and embodied being. The user re-embodies the information through self-reflexive processes of reading and interpreting the data outcomes and, as they concern that person’s embodied being, may affect, or transform them (Van Den Eede, 2015).

Dorthe Brogård Kristensen and Carolin Prigge (2018) suggest that *self-reflexivity* provides insight into the self as it changes people’s perception of themselves. Using *self-reflexivity* dancers may then read themselves as being situated in the extruded data where they hermeneutically interpret their embodied selves. By interpretatively *reading* themselves in the data long after their performance, dancers perform a *self-reflexivity*, that may provide invaluable insight to their sense of *self* within *embodied interactions* with biosensor technologies.

#### **4.5 Embodied materiality**

Technologically informed dance practice is not only about embodying technology, and *embodied interactions* but is also about embodying materials, be they tangible or intangible, physiological or phenomenological, human or nonhuman, and form, what I am referring to hereafter as, an *embodied materiality*.

The notion of materiality is about the quality or the experience of a material and occurs when design, artistic or aesthetic practices interact with different kinds of materials. From the practitioner's perspective, when materials are interacted with and embodied through practice, materials shift qualitatively. They become invisible, immaterial, or intangible when they encounter the thought and action, subjectivity and the felt experience of the practitioner. When viewing an artwork, for example, one often experiences the quality of the materials used by the artist as a resonance or feeling in the body. Furthermore, in arts practice materiality is extended beyond physical matter and the work's material existence, to encompass all other information, such as studio practice (Mills, 2009). This includes the *know-how* of the arts practitioner, which is in some sense intangible, but also includes the more tangible aspects of the practice such as the tools the artist uses. These tangible tools remain materially outside the artist's body, but once *embodied* or *incorporated* from frequent use, they become perceptually invisible and bring about human agency. In this thesis, such human-technology engagements were described as extending the *Body Schema* through the *incorporation* and interaction with the tangible materiality of walking canes, poles, and silk cloths for example.

Ciano Aydin *et al.* (2018) use *Material Engagement Theory* (MET)<sup>35</sup> to describe such material interactions. This theory unveils human engagement with tangible materials, tools, and environments as “taking on a form of agency themselves, in our engagement with them” (Ibid., p. 328). Here, the emergent product of material

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<sup>35</sup> MET: Material Engagement Theory is a synergistic process where bodies, agentic actions, and tangible materials merge without the need for mental representation. An example is the potter working with clay, his hands, and the centrifugal forces of the potter's wheel. None of these actions may be separated but seen as whole *body-self-technology-agency-world* experience. Sometimes the potter consciously moves and shapes the clay and at other times movement is happening to the potter, where agency is a “property or possession neither of humans nor of nonhumans”, but “is the relational and emergent product of material engagement” (Aydin *et al.*, 2018, p. 330).

engagement is a “hybrid containing both human and non-human elements” (Ibid., p. 333), forming a *dance of agency*, in “which human and material agency are interwoven and help to shape each other” (Ibid., p. 334). This is a synergistic *dance* or process where bodies, agentic actions, and materials merge, without the need for mental representation or *intentionality*. An example is where the potter works the clay with her hands, her thinking and the centrifugal forces of the pottery wheel. None of these actions may be separated but are felt as *body-self-technology-agency-world* experiences. Just like the carpenter, the potter no longer registers the actual clay in her hands but creates a pot by interweaving though, action and clay together. They become *an embodied materiality*. Working with tangible materials therefore shape our lived experience of them and changes our sense of embodiment, just as much as we shape them for our own practice.

However, in our increasingly technological and bio-mediated world, technologies such as HRMs, Wi-Fi, wearables, and the *Internet of things* (IoT),<sup>36</sup> are becoming more invisible and intangible. As previously described in Chapters 2, 3 and 4, our bodies and interactions with these technologies and the world have become more porous and relational where embodiment is increasingly viewed as being co-constitutive and co-emergent with nonhuman materials and technologies. Consequently, a dancer’s *embodied interactions* with biosensor technologies may be viewed as embodied relations with intangible materials as they do not physically handle the technology but wear them without perceptually being aware of them. Invisible embodied interactions therefore emerge within an ecology of relations between tangible and intangible

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<sup>36</sup> IoT: The *Internet of things* is a network of objects or things connected to sensors, software and other technologies, to exchange information and data with other devices and systems using the Internet.

objects and materials such as the Internet, Wi-Fi, GPS, or smart technological environments, that Aydin *et al.* (2018) call *Active Technological Environments* (ATE's).<sup>37</sup>

Similarly, Kozel (2017) working and teaching in the field of physical computing,<sup>38</sup> wearables, haptics, and networked devices for transmitting bodily data, states that “many computer programmers and designers work with the intuition that materials talk back to their hands and thoughts and shape their processes” (Ibid., 2017, p. 109). To explain this, Kozel references Jane Bennett’s (2010, p. 34) ideas on New Materialism where “assemblages of vibrating matter”<sup>39</sup> and materials are “not passive, dull or inert” (Kozel, 2017, p. 109) but have the capacity to affect us. This viewpoint is extended to invisible materials, found in networked devices, such as Wi-Fi, Bluetooth, and wearables, that according to Höök (2018) and Kozel (2017), are both tangible and intangible but have an effect on our material and embodied experience. For Kozel (2017, p. 109) embodiment then “needs to be redefined as a materiality and embodied interactions as material interactions”. Furthermore, “[w]hat seems to be the disintegration of bodies is actually a form of re-materialisation. Bodies are not dissolved into the digital and rendered easier to control, protect and preserve, in fact

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<sup>37</sup> ATEs: Active Technological Environments are formed by information and communication technologies (ICTs), smart environments (SmEs) and the *Internet of Things* (IoT) that are not only “embedded in devices that we explicitly ‘use’”, such as GPS tracking, mobile phones or biosensors, but are also “increasingly becoming an intrinsic part of the material environment in which we live” (Aydin *et al.*, 2018, p. 322), such as smart streetlights that switch on upon detecting movement.

<sup>38</sup> Physical computing refers to the activity and building or creating of tangible physical artifacts and giving them behaviours through a combination of physical materials, interactive software and hardware systems, computer programming, and circuit building, connecting sensors and actuators that can sense and respond to the analogue world.

<sup>39</sup> “Assemblages of vibrating matter” (Bennett, 2010) stems from New Materialism, a term coined in the 1990s which holds the view that all things, including mental states and consciousness are the result of vibrant material interactions occurring as vital materialities flowing through and around us. Bennett (2010, p. 13) describes these as forming assemblages, a “knotted world of vibrant matter” kept alive through agentic actions occurring through relational actions of the vibrating materials within the assemblage, thereby reducing felt and lived experience of the human and nonhuman.

their materiality only becomes more complex” (Ibid., p. 109). Bodies here, do not become invisible or unimportant. Their materiality is seen as being layered with human and nonhuman materials that affect and provide an insight into the complex relations between the physiological, the phenomenological and the technological, the tangible and intangible.

*Embodied materiality* then, is a *relational embodiment* of the intangible and tangible, the human and nonhuman, co-existing in continuous relationships with each other. Agency within this *relational embodiment* is a property neither of the human nor the nonhuman, but a co-constitutive outcome of material engagement through *embodied interactions*. This understanding may increase a dancer’s awareness of embodying interactions of the tangible and intangible, the human and nonhuman and demonstrates a form of materiality that is embodied, co-constitutive and co-emergent, without *looking outwardly*.

In conclusion, the chapters *Bodies in... Dance Practice, Performance Technology and Embodied Technology* have revealed ways that technologies have extended the performing body, blurred their boundaries, and have become embodied and embedded in each other. These actions have revealed ways of *being in the world* through dance practice by *looking inwardly* to focus on inner experience and the *felt-sense* without the need to look outwardly for validation. Rather, trusting the *self* and inner invisible lived experiences found in Embodied Dance practice is assisted by embodying and interacting with human or nonhuman materials. This form of *embodied materiality* transforms and shifts the ways we think, move and experience *dance-tech* practice. Embodying relations and materials of the human and nonhuman, the lived

and the felt, provides ways of illuminating something that was not there before, that is derived by *looking inwardly*.

The following chapter discusses a PaR methodology a *tentacular worlding*, to enable an interdisciplinary study of *Bodies in...* dance practice, performance technology and embodied technology. The PaR proposes ways of finding out how they relate to each other, how they may be used to foreground methods of *looking inwardly* during dance practice and why this requires multimodal qualitative research methods and analysis for the studies that follow.

## CHAPTER 5

### TENTACULAR WORLDING – A METHODOLOGY

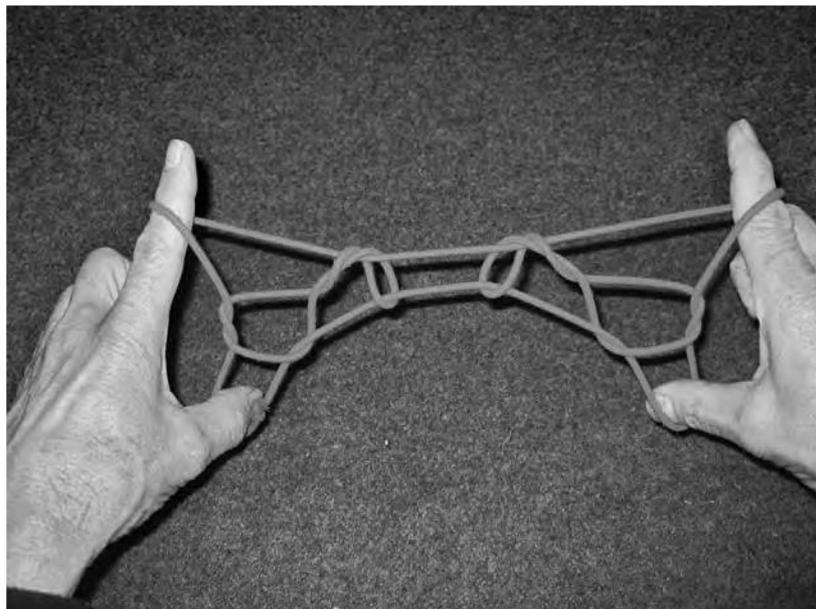
This chapter describes *tentacular worlding*, a unique PaR, a methodology to explore *dance as experience* by *looking inwardly* whilst embodying biosensor technology. The etymological origin of *tentacular* stems “from the Latin *tentaculum*, meaning ‘feeler’, and *tentare*, ‘to feel’ or ‘to try’” (Haraway, 2016, p. 31), whereas *worlding* describes the subjective experience of *being-in-a-world* as a *re-worlding* (Braidotti, 2013; Haraway, 2016) of the human and nonhuman. Together they are used metaphorically to *try* new methods in dance practice to explore the *felt-sense*, to *world* emergent lines of thinking, and forge inter-relations between different knowledge sets found in Embodied Dance, *dance-tech*, and ecofeminist philosophy.

Several methodologies make up *tentacular worlding*, an interdisciplinary approach that stresses interrelated ways of *knowing*. Firstly, Robin Nelson’s (2013) PaR methodology encourages the practitioner to construct knowledge whilst *doing* their practice. Secondly, it is inspired by *R-reflexivity*, that Mats Alvesson and Kaj Skölberg (2009) suggest pays attention to personal interpretations of the researcher, as qualitative knowledge cannot be separated from the one creating this knowledge. Thirdly it is augmented by *phenomenology as a methodology* (Kozel, 2007; 2010; 2013b) to better understand *dance as experience*, from a first-person perspective. Lastly, it is inspired by *formlessness* (Ingold, 2000) and *improvisation* (Middelw, 2018) to seek new knowledge through intuition and the pre-reflective. This is framed within the notion of *re-worlding*, an eco-feminist posthumanism perspective, an onto-epistemology to study *being* and *knowing* through *doing* phenomenology and

reflexivity, that is itself about *being* that includes *knowing*. Specific elements in this chapter describing the methodology *tentacular worlding* in action, are signposted using footnotes throughout the chapter leading the reader to significant events in the portfolio that narrates the development of the main finding *Deep Flow*.

### 5.1 *Cat's cradling* – a metaphor for activating the PaR

To activate a *tentacular worlding*, the term “cat’s cradling” is borrowed from Haraway (2016, p. 14), as a metaphor to enliven this PaR. *Cat’s cradling* is one of humanity’s oldest string games, a relational and interactive game, requiring physical movement and agency to shape and reorganise string figures (Figure 18). This continuous weaving is an emergent process, a way of “*staying with the trouble*” (Ibid., p. 13) as its structuring is always emergent.



**Figure 18.** Haraway, D., (2016, p. 14, fig. 1.2) *Ma'ii Ats'áá' Yílwoí* (Coyotes Running Opposite Ways) [Photograph].

*Cat's Cradling* is not only a game but reflects processes of “*thinking* as well as *making* practices” that could be applied to “pedagogical practices and [...] performances”

(Ibid., p. 14) [emphasis in original], in other words they are performative. For Haraway (Ibid.), *cat's cradling* is about "giving and receiving patterns, dropping threads and failing but sometimes finding something that works relating connections that matter". *Cat's cradling* is never still. As soon one string figure is created, the next one is about to take shape in the mind of the player. Through a weaving-like process, novel performative actions of thought and agency result in new string figures. This agency drives the players forward, shaping, thinking, and enacting in collaboration, identifying new shapes and ideas as they shape them, revealing that "it matters what knots knot knots, what thoughts think thoughts, what descriptions describe descriptions, what ties tie ties" (Ibid., p. 12).

*Cat's cradling* is used as a lively metaphor, a playfulness, an agency, or fire that ignites passion, much needed for the rigour of PaR. It stimulates and facilitates working across, within, between and around the conceptual framework, *tentacular worlding* that guides the research. However disorientating this form of research is at times, *cat's cradling* sustains it. It reflects a "performative turn" to uncover "dynamic and transformative events through an iterative and citational practice that brings into being that which it names" (Bolt, 2018, p. 4), a *worlding* that is *tentacular*.

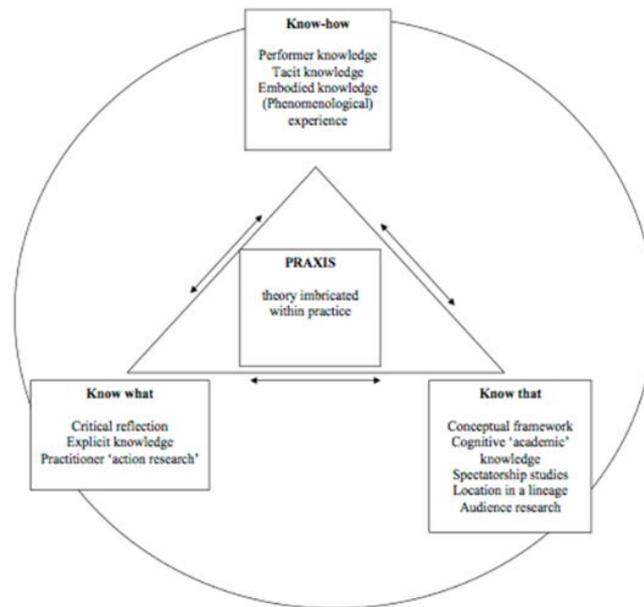
The end of the PaR process also requires passing on scholarship "in twists and skeins that require passion and action, holding still and moving, anchoring and launching" (Haraway, 2016, p. 10). This thesis provides such scholarship that in turn may be *cat's cradled* into other Embodied Dance research and practices.

## **5.2 PaR – *know-how, know-that, know-what***

The methodology of PaR defined by Nelson (2013, p. 40) is used in this research as a form of *doing-knowing*, rather than conducting research by “looking from above” (Merleau-Ponty, 1964, p. 160), as in scientific research. Reading and reflecting, the more traditional methods of research, are also fundamental to this “discovery through doing” (Nelson, 2013, p. 40), making tacit intelligence and embodied knowledge (see Chapters 2, 3 and 4), often beyond verbal expression and description, visible and readable. It gives expression to *things* that can only be felt or sensed through artistic means. These expressions may provide new insight into previous knowledge sets, adding new knowledge, new techniques and practices that evolve in iterative processes encouraged by PaR. For Nelson this form of knowledge “might primarily be demonstrated in practice – that is, knowledge which is a matter of *doing*” (Nelson, 2013, p. 9) [emphasis added]. *Doing* finds relations between concepts and specific knowledge sets in different research areas and practice, weaving related ideas and patterns of thinking, possibly mixing old with the new, which one may undo or re-do, as “it matters which ideas we think other ideas with” (Haraway, 2016, p.12).

Nelson (2013) advocates researching between three types of learning, three different modes of knowledge making processes: “*know-how; know-what and know-that*” (ibid., p. 38) [emphasis added] a multi-modal epistemological process. Combined and interrelated, they inform and form a *praxis* where, practice and knowledge merge and work together. This is reflected in Nelson’s (2013) *Dynamic Model for Practice as Research* (Figure 19), a three-dimensional form within a sphere that represents a confluence of interlocking spheres from differing or interrelated academic knowledge sets or artistic disciplines, such as philosophy and Embodied Dance practices. Mostly these are derived from, as Nelson (2012) summarises, the artworld, the media sphere

and the academy. However, the more scientific or phenomenological may also be inculcated if they are part of an interdisciplinary research enquiry.



Prof. Robin Nelson: Dynamic Model for Practice as Research (Revised 15 Feb 2010)

**Figure 19.** Nelson, R. (2010) *Dynamic Model for Practice as Research* [Illustration]. Available from: <https://slideplayer.com/slide/6515157/> [Accessed 30 April 2020].

*Know-how* is described by Nelson as “procedural knowledge, following the schema of learning through *doing*” (Ibid., p. 41), a tacit knowledge gained by *knowing-doing* that is often beyond verbal explanation.<sup>40</sup> This type of knowledge is gained incrementally through embodied practice such as riding a bicycle, for example. Specialist training, such as dance, is also a form of *know-how*, as its particularities and demands of technique, become “inscribed in the body” (Ibid., p. 42) of the practitioner. *Know-how* is not only an accrual of knowledge through repetitive body skills but also skills that

<sup>40</sup> This is demonstrated in the portfolio (p. 6) in the section: *A segue before study one*, that explores the *Full Drop* on an exercise ball to discover states of *flow* and in study 3, the documentary video (p.23).

one is not overtly aware of or consciously aware of having learnt, such as cultural mannerisms, judgements, and feelings towards something.

*Know-that* is cited by Nelson as traditional academic knowledge, as well as the knowledge gained through written reflective notes of a practice. Knowledge created this way makes tacit knowledge found in dance more explicit, feeding into *knowing how*. These forms of knowledge materialise through a *cat's cradling*, of *know-how* and *know that*.

*Know-what* is that which is gleaned through an “informed reflexivity about the processes of making and its modes of knowing” (Ibid., p. 44) or, simply put, *know-how* combined with *know-that*.<sup>41</sup> It arrives through critically reflecting on one’s PaR and *know-how*, thinking about what one has been *doing*, what happened and what it may mean. *Know-what* needs to be the result of rigorous, critical, reflexive, and iterative reflexive processes to produce knowledge about what works, how it was constructed, what methods were used, and what was achieved. It also attempts to ask what needs to be further researched to reach full reflexivity.

This provides a dynamic template for “an intellectual diagnostic rigour in the critical reflection on practice, in the movement between the tacit *know-how* and the explicit *know-what* and in the resonances marked between *know-what* and *know-that*” (Nelson, 2013, p. 60). It requires relational dynamic and fluid movements between the knowledge sets of *know how* that may affect *know that*, or vice versa. For example, in

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<sup>41</sup> This is shown in the portfolio study 2 (p.17), where there was a realisation the HRM needed to become embodied for *Deep Flow* states to emerge.

this PaR, the *know-how* of Embodied Dance practice affected the choices of *know-that*, academia and the selection of case studies that situated the research in a lineage of dance research and practice. However, research in *know that* led to further research in phenomenology and encouraged the inclusion of phenomenological methods into *know how*, the methods of dance practice.

### **5.3 R-reflexivity – a reflexive methodology**

*Tentacular worlding* includes *R-reflexivity*, a methodology that Alvesson and Sköldberg (2009) suggest is a way to include personal, alternative, and critical views of the researcher. The *R* refers to the reconstruction and re-presentation of “truth” by the researcher who interprets knowledge they have learned from *within* a research practice, illuminating what is left out or marginalised. *R-reflexivity* encourages the researcher to start in some part of the study who tries tentatively to relate it to the whole, which then inspires the researcher to delve deeper into the matter of concern, alternating between part and whole “which brings progressively a deeper understanding of both” (Ibid., p. 92).<sup>42</sup> These reconstructions offer alternative paradigms, metaphors, perspectives, political values, and vocabularies that aim to “open up new avenues, paths and lines of interpretation to produce ‘better’ research ethically, politically, empirically and theoretically” (Ibid., p. 313).

*R-reflexivity* is grounded in practice through case-study research and by doing so is *abductive*, avoiding *explanation* through authoritarian statements. Researchers begin to understand *things* “*from the inside*” (Alvesson and Sköldberg, 2009, p. 93) [emphasis in original] by using subjective and insightful experience to generate

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<sup>42</sup> This is evidenced in the portfolio in the pilot study 2 (pp. 4 & 17), and the segue before study one (p.6).

knowledge.<sup>43</sup> Here “the empirical area of application is successfully developed, and the theory (the proposed over-arching pattern) is also adjusted and refined” (Ibid., p. 4) [brackets in original]. Through participation, the researcher focuses on underlying patterns, becoming reflective and finally reflexive, about how their subjective perspective, research methods and findings, interplay. Knowledge is created by collapsing notions of knowledge *out there* and *in here* which is implausible from a phenomenological perspective, as subjective experience is connected to the *Lifeworld* of a situated individual. The two co-exist and feed into each other, supporting the overall research aims of this research, which *looks inwardly*.

*R-reflexivity* includes an *alethic*<sup>44</sup> poetic hermeneutics or the researcher’s interpretations that are concerned with “*the revelation of something hidden*, rather than the correspondence between subjective thinking and objective reality” (Ibid., p. 96) [emphasis in original]. *Alethic* hermeneutics uncovers hidden narratives within the researcher, who are part of those narratives, as there is “no such thing as unmediated data or facts” (Alvesson and Sköldbberg, 2009, p. 12). These interpretations reveal a multiplicity of “voices”, understandings, or non-positivist “truths”, reflecting postmodern *polyphony-driven* modes of research. It avoids grand narratives, causal relations, absolute truths, fixity of subjectivity, singular theories and researcher-authority approaches to explain *everything*. *R-reflexivity* needs to be adapted to the researcher’s personal abilities, competences, and conditions, to be connected to what the researcher has practised, read, and studied, reflecting Nelson’s (2010) PaR.

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<sup>43</sup> This is evidenced in the portfolio in the pilot study 3 Verbal translation of live verbal feedback whilst in a state of *Deep Flow* (pp. 23-24).

<sup>44</sup> *Alethic* was invented by Sköldbberg and Alvesson (2018, p. 96) from the Greek word “*aletheia*, or uncoveredness – the revelation of something hidden” (Heidegger, 1977, p. 102).

## 5.4 Phenomenology and improvisation as methodologies

To *look inwardly* in dance practice requires the inclusion of phenomenology as a methodology (Kozel, 2013). Kozel suggests sliding across the words, method, and methodology, as method refers to *how* to do research and phenomenology is a methodology that:

Has at its root: phenomenon, which means something that happens. It is one of the subjective, experience-based methodologies that [...] is used to anchor practice within research, to overcome unhelpful divides between theory and practice, between the mind and the body and between my solitary experience and shared experiences. (Kozel, 2013, pp. 4–5).

*Doing* a phenomenology (Kozel, 2007), is a metaphor to discover an ontology by exploring it as something one experiences on a practical level, in experimentation.<sup>45</sup> This shifts ontologies from being abstract philosophical knowledge, to ones that are *performed into being*, allowing a dancer to ask questions about what *things* are and how they exist. It challenges text-based ontologies, as ideas are corporeal and “resonate and reverberate through our embodied existence” (Kozel, 2010, p. 219) and enable a dance researcher-practitioner to “create content as well as a way for you to reflect upon it in an academic or critical mode” (Kozel, 2013, p. 4).

Kozel’s starting point for a methodology takes Merleau-Ponty’s (1945, p. viii) stance on phenomenology that exists “as a movement before arriving at complete awareness of itself”. One starts by “doing”, then one becomes aware of “doing” and finally one selects “a line of thought, a line of questioning” (Kozel, 2007, pp. 50–51) using a

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<sup>45</sup> This is described in the Appendix A in the portfolio, The score for reaching *Deep Flow* (pp.33-37).

process of “describing, not of explaining or analysing” (Merleau-Ponty, 1945, p. viii) it. This is different to normal analytic thought, as pre-reflective experience is unrestricted by universal and abstract rationalist notions of *truth* but operates “through resonance” (Kozel, 2013, p. 7). A phenomenological methodology thereby respects sensations and *inner voices*, visualisations, liminal qualities, affects, unformed ideas that emerge directly from the experience of dance. However, one does not sever all ties to cognition but finds ways for cognition to “coexist with inner and outer experience” (Kozel, 2007, p. 51). Sondra Fraleigh (2018, p. 28, 32), calls this an “applied phenomenology” that reveals “experiential truth”, through “embodied ways of knowing – or embodied epistemologies – subject to interpretation”. This makes use of interpretation and the subjective position of the author articulating meaning through experiences. If used in dance practice, it requires that dancers give up the *mastery* of movement in favour of *listening* and *discovery*. It is found by exploring the soma and the pre-reflective before it is discovered in committed actions of dance controlled by the mind.<sup>46</sup>

Ingold (2000, p. 158) describes this as a state of *formlessness*. This occurs in “our immediate, sensory experience, a formless and continuous flux in which nothing is the same from one moment to the next” and is associated with the pre-reflective, the pre-conceptual and pre-articulate. Finding *formlessness* may be found in dance through improvisation, which Vida Midgelow (2018) suggests is a methodology for discovering *unpredictability* in modes of moving and thinking and finds alternative ways to construct new knowledge. As *improvisation* is a present-centred approach, it encourages the dancer to notice and experience *formless states of being*, that are

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<sup>46</sup> See the documentary video from Study 2 in the portfolio (p.20)

open to shifts and temporal changes so that one never knows “where it is going”<sup>47</sup> (Midgelow, 2018, p. 59). These strategies offer articulations of experience that are pre-theoretic and prelinguistic, “undertaken through touch, bodily awareness and physical action” (Midgelow, 2018, p. 76). In other words, through movement practice, knowledge arises by following what emerges and takes shape in the present moment without predetermination and traditional *intentionality*. It aims to “manifest a rich articulation of the *Lifeworld* or lived experience as it is in the making” (Ibid., p. 61) [emphasis added], giving rise to a multiplicity of perceptual articulations upon reflection. Midgelow (2018) sees this as a *retooling* of conventional procedures focused on writing and language-based description. They help develop one’s intuitive skills, for *letting go* fixed thinking (Midgelow, 2018) and results in the emergence of *formlessness* that accompanies emergent *ways of being*.

## **5.5 Liquid knowledge**

Previously, methodologies of science provided the golden standards of knowledge, making them fixed and absolute. However, since the latter half of the nineteenth century, positivism and *the scientific method* have developed considerably, to include “subjective elements [that] cannot be ruled out in the process of positioning, analysing, and measuring phenomena” (Nelson, 2013, p. 39). Today it has become untenable to assume that knowledge is based in objectivity and neutrality, hinging on the dualisms that exist in positivistic models such as “subject-object, rational-emotional, and concrete-abstract [and] theory-practice” (Ibid., p. 52). This is due to the interrelatedness between subject, object, and context, that modifies the “complete supposed separation between observer and observed in the classical scientific

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<sup>47</sup> This is shown in the documentary video study 3 in the portfolio (p.23).

method” (Ibid., p. 53). This results in what Nelson calls “liquid knowledge” (Nelson, 2013, p. 60), a form of reflexion.

*Liquid knowledge* is produced by *cat’s cradling* methodologies creating a *bricoleur* effect (Gray and Malins, 2004; Alvesson and Sköldbberg, 2009) or a tapestry of knowledge that crosses over and affects other knowledge sets.<sup>48</sup> This *bricoleur* effect is informed by multiple perspectives, from multiple practices and contexts where the researcher pays attention to them all from a meta perspective and understands how they interplay with each other in relation to the whole without letting any of them dominate. It is an emergent structure of complex, dense interpretations, understandings, and outcomes of competing, overlapping, developing perspectives, methodologies, and paradigms.

*Bricolage* inspires a fluidity of knowledge with multiple perspectives rather than cold, hard facts. As a result, knowledge becomes adaptable, fluid or liquid, flowing between disciplines, no longer hierarchical, shifting from a surface-depth model to the model of Gilles Deleuze and Félix Guattari’s (1987) *rhizome*, with interconnected horizontal roots. Accordingly, the model for this PaR seeks to articulate *liquid knowledge* through situated and embodied practice, a *soft knowledge* that nevertheless resonates “with the harder *know-that* of established conceptual frameworks” (Nelson, 2013, p. 60).

## **5.6 Praxis – a tentacular worlding**

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<sup>48</sup> This is evidenced by the portfolio. The portfolio is a bricolage of *liquid knowledge*, *what* that shows the development of a praxis and dance practice gained from *know how*, *know that* and *know what*.

Acknowledging that phenomenological praxis and research emerges without a “single phenomenological method”, Fraleigh (2018, p. 27) and Kozel (2007) recommend that dance researchers and practitioners should devise their own methodological approach as *doing* a phenomenology is not a prescriptive method. Practitioners should set up their “own phenomenology” (Kozel, 2013, p. 9) based on the project that they are developing. Consequently, this researcher devised a novel PaR model, a praxis, *tentacular worlding* to *try out* and feel new practices in performance, to interlace different lines of thinking. It therefore follows a hybrid approach to explore *looking inwardly* by *cat’s cradling* the methodologies of PaR, *R-reflexivity*, phenomenology, *formlessness*, and *improvisation*. At its base *tentacular worlding* uses phenomenology to make sense of phenomena that arise in subjective experiences of *looking inwardly*, to explore those experiences in their own terms, by going *back to the things themselves*, rather than using predefined abstract concepts to explain them.<sup>49</sup>

The term *worlding* not only reflects Heidegger’s notion of *being-in-the-world*, but also Haraway’s ecofeminist stance (2013 & 2016), of *re-worlding*, that is critical of Heidegger’s notion of *being-in-the-world* as being too anthropocentric,<sup>50</sup> endorsing human exceptionalism. Haraway’s *re-worlding* eschews referring to our current epoch as the Anthropocene, preferring to conceptualize it as the Chthulucene,<sup>51</sup> one in which the human and nonhuman are inextricably linked by *tentacular* practices. The Chthulucene, requires making-with, that includes all living critters or “companion

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<sup>49</sup> This is observed in the pilot study 2 in the portfolio (p. 4) and the documentary video and verbal translation study 3 (p.23).

<sup>50</sup> Anthropocentric viewpoints regard humankind as the central or most important element of existence. It marks the commencement of significant human impact on Earth’s geology and ecosystems, including climate change.

<sup>51</sup> Chthulucene: a word derived from *chthon*, meaning “earth” in Greek, and is associated with things that dwell in or under the earth (Haraway, 2016).

species” in which “natures, cultures, subjects and objects do not pre-exist their intertwined worldings” (Haraway 2016, p. 13). This ecofeminist stance makes us aware of the prevailing legacy left by the Anthropocene<sup>52</sup> and the Capitalocene,<sup>53</sup> that have exploited and abused the Earth’s natural resources. Haraway calls for a return of the Chthulucene to acknowledge a *Terrapolis*, our relations with the Earth and the Earth within us, our humanity, to counterbalance human exceptionalism with its inherent ecological, cultural, political, societal abuses and imbalances.

Haraway’s, *re-worlding* reflects a *sympoietic* system<sup>54</sup> or *rhizomatic*<sup>55</sup> structure where both the human and nonhuman engage in processes of *becoming with* a world. A *sympoietic system* reflects a *relational ontology*, where entities are subordinate to relations (Wildman, 2006), where the content is relational<sup>56</sup> and non-hierarchical, underpinning a relational conceptual background for practical and academic research. Reminiscent of *cat’s cradling*, this creates a performative, reflexive ecology of concepts, practices, and theories: *a tentacular worlding*. The *tentacular* actions keep it ever evolving reflexively, emergent, reflecting the need for dance practitioners to interact with a variety of disciplines to gain a better understanding of human experience within Embodied Dance practice, biosensor technology and contemporary

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<sup>52</sup> The Anthropocene is described as the time during which humans have had a substantial impact on our planet.

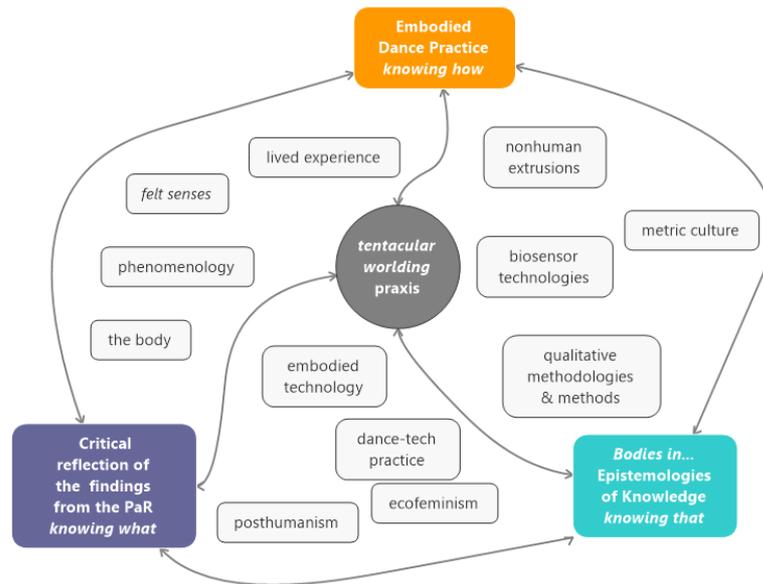
<sup>53</sup> Capitalocene: understood as a system and abuse of power and the earth’s resources for profit and re/production (Haraway, 2016).

<sup>54</sup> Sympoietic systems are characterized by cooperative, amorphous qualities. They recurrently produce a self-similar pattern of relations through continued complex interactions among their many different components. Rather than delineating boundaries, interactions among components and the self-organizing capabilities of a system are recognized as the defining qualities [...] The concept emphasizes linkages, feedback, cooperation, and synergistic behaviour rather than boundaries. The system trajectories do, however, have the potential for making dramatic and surprising changes (Dempster, 2000, pp. 11, 44). Additionally, they do not have self-defined spatial or temporal boundaries. Information and control are distributed among components within the system.

<sup>55</sup> Rhizomatic, described by Deleuze and Guattari (1987) in *A Thousand Plateaus*, is theory and research that allows for multiple and non-hierarchical knowledge sets and interpretations.

<sup>56</sup> Relational: an aspect or quality that is characterised or constituted by relations, that connect two or more things or parts working together. Merriam-Webster Dictionary (2020) Available from: <http://www.merriam-webster.com/dictionary/reational> [Accessed 3 February 2020].

culture, as “it matters what knowledges know knowledges [...] what relations relate relations [...] what worlds world worlds” (Haraway, 2016, p. 35).



**Figure 20.** Ginslov, J. (2020) *Tentacular worlding* [Illustration]

The image above (Figure 20), illustrates this PaR praxis, a *tentacular worlding* of *know-how*, *that* and *what*, feeding into and affecting each other through relations within a *sympoiesis* that informs the praxis:

- *know-how* is first-person knowledge of embodied and somatic dance practice using phenomenology and improvisation;
- *know-that* is accumulated academic knowledge about dance, embodiment, technology, materiality, and philosophy; and

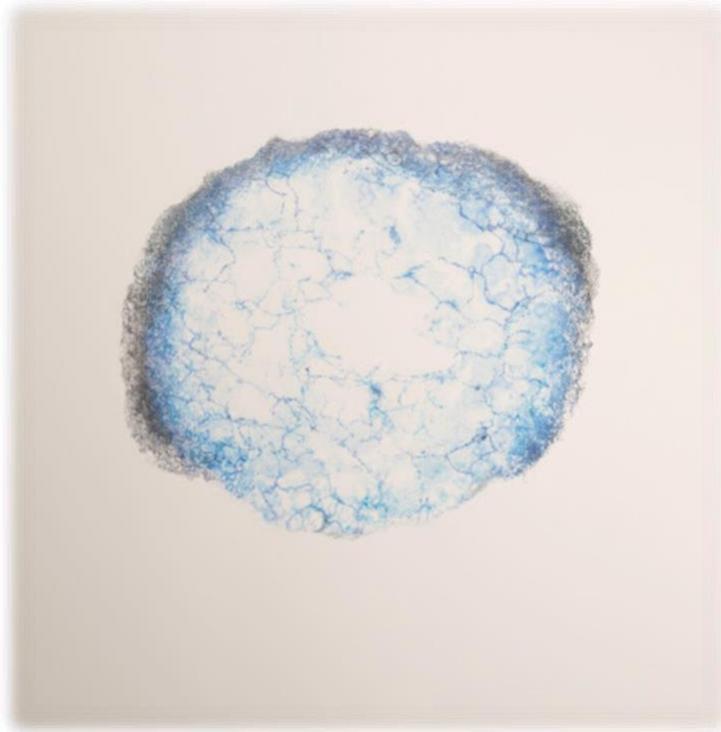
- *know-what* describes the findings of the research, prototype technologies, broader cultural posthuman debates and the original contribution to knowledge for understanding embodied technology and materiality.

*Tentacular worlding*, is a *re-worlding*, an ecology of knowledge and practices, of the human and nonhuman,<sup>57</sup> providing a framework to explore ways of *looking inwardly*. If adopted by the dancer-researcher she experiences herself being within a *re-worlding*, engaged *chiasmically* with the *flesh of the world*, and *tentacularly* engaged with different knowledge sets, without losing her subjectivity nor her human body. Here she finds herself situated within an emergent process, alongside the nonhuman. It is more than Bruno Latour's (2005) *Actor-Network Theory* (ANT)<sup>58</sup> which is a network of relations between "actants" that can be human and nonhuman and is also more than an "assemblage of vibrating matter" (Bennett, 2010, p. 34). Instead, this *re-worlding* is an amorphous moveable *tentacular* ecology likened to the image below (Figure 21) and is fully "immersed in and immanent to a network of nonhuman (animal, vegetable, viral) relations" (Braidotti, 2013, p. 193).

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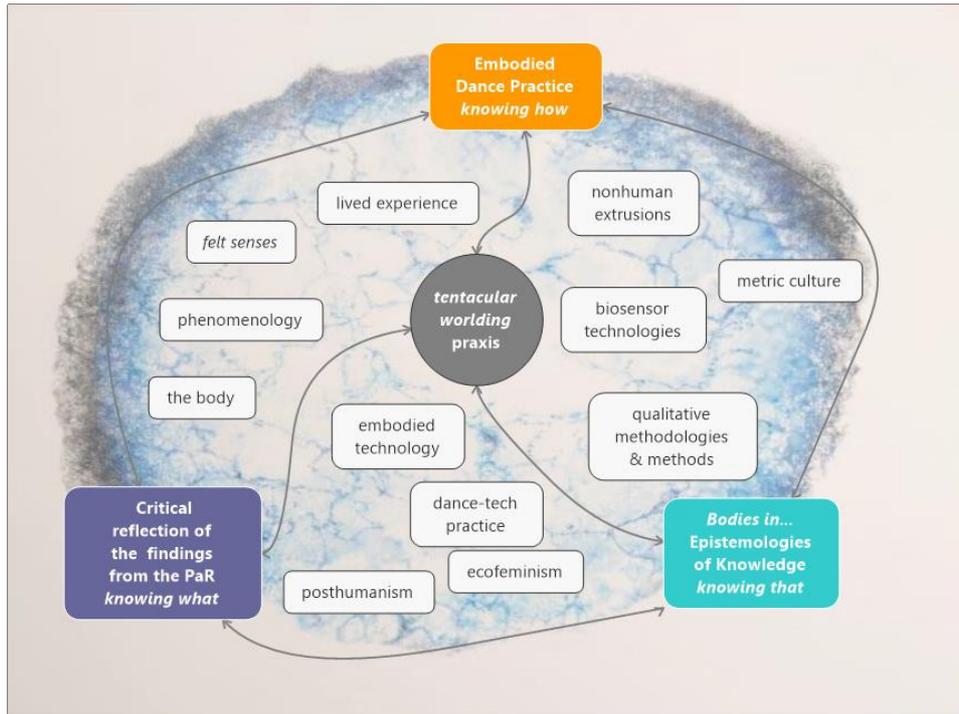
<sup>57</sup> This was found when relations between the HRM and the PSNS were found to relation to *Deep Flow*. This is presented in the portfolio (p. 27-32). The praxis and findings are described in the portfolio (pp. 20-27).

<sup>58</sup> ANT: Actor Network Theory aims to make visible the continuity between humans and nonhumans in the material world and includes the linguistic, social-political, cultural, scientific, and technological. Through co-constitution, all kinds of entities and objects in the world and together with human experience and agency constitute a world (Latour, 2005).



**Figure 21.** Daksha, P. (2017) Signal / Noise: Imaging/Drawing [Drawing]. Available from: <http://lifespace.dundee.ac.uk/exhibition/signal-noise-imaging-drawing> [Accessed 18 August 2020].

This *re-worlding* reflects a *vital posthumanism*, one that values the “zoe-centred embodied subject” (Ibid.), interconnected with relational linkages to the viral, the environmental, eco-others and the technological. *Zoe*, for Braidotti (2013), is the relational capacity to include all non-anthropocentric elements, and ruptures the boundaries between humans, animals, species, and technologies. This infers a *zoe-centric ethics* that values and encourages us to take into consideration a collective of all forms of life, to form new functional and vital assemblages. It is a transversal or non-hierarchical *sympoietic* system of human and nonhuman entities rather than a hierarchical system with a human being taking the lead. By acknowledging the roles of the human and nonhuman in the practice as being equal, it cuts across all domains and knowledge sets that were previously segregated by Anthropocentric thinking.



**Figure 22.** Ginslov, J. (2020) *Tentacular worlding praxis* [Illustration]

*Tentacular worlding* then, is a praxis (Figure 22), a *re-worlding* of the human and non human that may be communicated through personal description, subjective experiences, *liquid knowledge*, artistic practice, imagery, and metaphor. This is informed through multi-dimensional, reflexive methodologies and artistic practices using qualitative methodologies and methods. The following chapter, Chapter 6, describes the methods that are guided by a *tentacular worlding* to explore *looking inwardly*, to be able to communicate and reflect on bodily and subjective experiences within a *tentacular* ecology of the human and nonhuman.

## CHAPTER 6

### THE STUDIES: METHODS AND FINDINGS

This chapter describes the methods, the *know-how*, and the findings, the *know-what* part of this PaR. They are immersed in and driven by the methodology *tentacular wording*. Qualitative and quantitative multimodal data collection methods are used to describe, through a reflective voice, pre-reflective experiences by *looking inwardly* during a method of dance practice. Rather than using predefined abstract concepts or *intentionality* to understand these experiences, the methods follow a qualitative phenomenological approach. This enables the dancer-researcher to go *back to the dance itself*, to describe the *felt-sense* of an Embodied Dance practice, to explore bodily relations between the human and nonhuman and finally to construct new knowledge from a first-person perspective.

To describe these experiences, the findings from two pilot studies and three studies are presented. Each study was comprised of several research events. These uncovered how subjective experience and biosensor technologies responded to methods of dance practice, various environments and how relations between the self, body, world, the technological, the human and nonhuman were discovered. Phenomenological multimodal data collection methods were used to capture these experiences, that resulted in qualitative data such as documentary video, drawings, and verbal description, rich in imagery and metaphor. Quantitative data, or biometric data, was generated using various biosensors during the research events which was interpreted and compared in relation to the felt, visual and verbal descriptions. All these findings were then combined to form a holistic narrative of an otherwise

atomised process. The chapter is divided into two sections, firstly the methods used, and secondly, the three studies are described in detail, as well as their findings and analyses. A portfolio accompanies this thesis. It is a curated collection of all the qualitative, and quantitative findings divulged in this chapter and narrates the development of the main finding *Deep Flow* emphasising specific findings associated with its development. These are signposted in the text as well as in footnotes throughout the chapter leading the reader to significant events in the development of *Deep Flow*. These links show original contributions of knowledge, not only to academia but also to the field of Embodied Dance and *dance-tech*.

**Methods is presented in four sections:**

1. methods of practice to explore the phenomenological, embodied and pre-reflective aspects of Embodied Dance practice;
2. qualitative multimodal data collection methods to explore the specific aims of the study, to describe the *felt-sense* through visual and verbal formats;
3. quantitative biometric measuring methods using biosensor technology to measure physiological responses of the body to the method of practice; and
4. data analytic methods.

**The studies and findings are presented in the following sections:**

1. aims of the study;
2. location of the study;
3. methods of practice;
4. qualitative multimodal data collection methods;
5. quantitative biometric measuring methods;

6. data analytic methods; and
7. the findings: synthesis and conclusions.

## **6.1 Methods**

The methods drew on various qualitative and quantitative methods of practice, data collection and data analytic methods. The application of the different methods was an experimental process as not all the methods were used in all the studies, and as each study had different aims, some methods only developed during an event in a study, becoming more refined over time, such as the method of dance practice. Some methods were dropped and replaced by more suitable ones, whereas others were retained, and further developed in the next study. How this occurred is described in detail in each study.

### **6.1.1 Methods of practice**

A method of Embodied Dance practice developed and emerged during the studies, the *know-how* part of this PaR. This developed from a process of exploration and reflection in the studio using several embodied methods of practice to explore *looking inwardly* and research dance *as experience*. Initially, in the pilot studies, some Somatic Dance methods such as Laban, Ideokinesis, Feldenkrais, Release work and improvisation scores by Andrea Olsen (2014) were used. However, as the *know-how* and *know-that* grew, these Somatic methods were replaced by more phenomenological ones, as they were deemed more appropriate for the aims of the studies. These were explored separately or combined with others. Finally, after refining this *bricolage*, a single method of practice emerged.

From the start, the *Full Drop*<sup>59</sup> (2017) was used in each research event, enabling a *drop into* the body, a subjective and implicit *felt-sense* experience. This internalised process allowed me to slow down, breathe deeply and become more aware of the sensations arising from my subjective embodied experience, reflecting Kozel's (2007, p. 42) phenomenological "methodology-method" of *doing* a phenomenology.<sup>60</sup> *Dropping into the body* (Guðjónsdóttir, 2017) allowed me to experience *knowing* and *being* through my body simultaneously. With this process, I got *closer* to the immediacy of felt and sensed experience and developed self-reflexivity by taking notes after each event.

Merleau-Ponty (1964, p. 159) refers to this strategy as "living in" and experiencing phenomena through artistic practice. Rather than using scientific processes that look on from above, with a single method and objective view, *living in* leads to a better understanding of lived experience within an artistic practice. It is a form of *looking inwardly*. This enables one to "accept, consider, and portray phenomena as they are given to us, fully and sensuously, in order to 'get closer' to them" (Boden and Eatough, 2014, p. 161). The dancer-researcher-practitioner may then focus on the dimensions of lived experience while dancing, a self-reflexive act, allowing the dancer-researcher-practitioner to engage with the rich experiential dimensions of a dance practice.

*Doing* a phenomenology of dance (Kozel, 2017) is not only a methodology but also a method for experiencing and reflecting upon invisible pre-reflective states and the *felt-*

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<sup>59</sup> A full account of this practice is found in Chapter 2.3 *Bodies in... Embodied Dance practice*.

<sup>60</sup> The full methodology-method appears in *Closer: Performance, Technologies, Phenomenology* (Kozel, 2017, pp. 49–53) and in *Lecture: Phenomenology – for the course Practice Based Research in the Arts, Stanford University* (Kozel, 2013, pp. 8–9).

sense. In the style of Merleau-Ponty (1968, p. 122) this *invisibility* is a “characteristic of Being and no disclosure will make us comprehend it.” The goal of *doing* a phenomenology is not to render the *invisible visible*, as we are never “entirely able to grasp or to analyse or to divulge” (Kozel, 2007, p. 42) it, and is extraordinarily difficult to describe and write about. One needs to experience *doing* a phenomenology in dance practice, to get *closer* to this *invisibility*, where one actively takes note of “the constant, minute foldings of one thing onto the other, or of one state onto another, within oneself” (Ibid., p. 207–8).

*Doing* a phenomenology of dance may also be described as *dwelling* in it (Heidegger, 1962, p. 89). For Heidegger, *dwelling* does not literally mean being within a building, but is about sensing what it feels like to be present in a place, a form of knowing a world through *being in it* or experiencing it. Through *dwelling*, one experiences entities in a *worlding* “alongside [other] entities within the world” (Heidegger, 1962, p. 89). Ingold (2000, p. 191) describes this as an immersion of ourselves in the *world* and “through living in it, the landscape becomes a part of us, just as we are a part of it”. If used as a method in dance practice, *dwelling* forces one to remain in a practice for extended periods of time (Kozel, 2007). This requires one to be present, patient, and waiting for the emergence of phenomena on the *horizon of experience*, the pre-reflective, feelings, images, and thoughts. Through mindful iterative practice focusing on the *felt-sense* with one’s entire body, even in stillness, the emergence of embodied phenomena begins to materialise. You begin to *dwell* in phenomena just as much as they *dwell in you*.

*Dwelling* and *doing* a phenomenology develops the notion of *listening* (Nancy, 2007), a form of witnessing embodied experience, that turns one's senses inwardly, *listening* to the resonances and echoes in one's body, rather than using vision to perceive and verify one's lived experience. *Listening*, for Jean-Luc Nancy (2007), is to strain toward a possible meaning on the horizon of what is known and unknown, that which is not immediately accessible. It is a form of *directed attention*, leading to sensing holistically that which is impossible to grasp through concepts and may only be sensed through our bodies "living the situation in its whole context" (Gendlin, 2003, p. 2). Applied to dance practice, it calls one to *listen* to what arises from this sensing and silence (Nancy, 2007, p. 6) and, through this *listening* from deep within, develop a relationship with one's own embodied self.

*Doing* a phenomenology, *dwelling*, and *listening* could be described as *direct experiencing* (Gendlin, 2003) of the *unsaid* and the *felt-sense*. *Direct experiencing* is the messenger of the *unsaid* as it cannot be reduced to language and can only be experienced. Therefore, the longer one *dwells* in and *listens* to *direct experience*, the more one experiences the *unsaid* or "(...)" (Gendlin, 2003, p., 3). *Direct experiencing* is about experiencing of the *mores* of the bodily senses, as one's body-sense expresses and includes "more than you can think by thinking one thing at a time" (ibid.). These methods turn one's focus *inwardly* to *listen* to and pay attention to the *unsaid* and the pre-reflective *mores* of the body. The *mores* are the tacit bodily senses, emotions, moods, and imaginings, before becoming named or identified as a concrete idea or thought.

As these methods developed, I noticed that my movements became slower and more flowing. Consequently, I researched Csikszentmihalyi's (1990; 2004) notion of the psychological state of *flow*. *Flow* for Csikszentmihalyi is an embodied state where the mind and body "just clicks" and flow in a "zone" together, creating optimal performance (Hefferon and Ollis, 2006). Csikszentmihalyi (1990, p. 3) describes *flow* as integrating the self in a state of deep concentration, where "thoughts, intentions, feelings, and all the senses are focused on the same goal" and are in harmony. In the practice, the state of *flow* indicated that I had used the methods sufficiently to slow down my movements and breathing rate. This "changes the conscious states we normally have [and] allows for observing the constant shifts of thought, sensation, or expands the ability to observe characteristics of basic experiencing" (Schiphorst, 2008, p. 9). *Flow* then became a central characteristic of the method of practice, providing me an inner clarity and calm to explore the *mores* of experience without explicit awareness of my corporeality and physical exertion.

As this PaR explored embodied technologies, it also incorporated Heidegger's (1971) notion of *dwelling* within a technological system.<sup>61</sup> This develops a "deep physical understanding of how a system is likely to respond" (Kozel, 2007, p. 77). *Dwelling* in a system of requires becoming absorbed in it for extended periods of time, to become *at home* and familiar with it. This allows for movement vocabularies "to arise from *within* the experience rather than being grafted on *from the outside*" (Kozel, 2007, p. 77) [emphases added]. When applied to *Deep Flow*, the biosensor technology, such as the HRMs, became perceptually *transparent, ready-to-hand, incorporated* and

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<sup>61</sup> Technological system: Kozel (2007) is referring to an interactive system previously described in Chapter 3.4 Ecosystems of performance.

*embodied*. This enhanced my ability of *looking inwardly* to freely explore the *mores* of experience, rather than focusing on visual mediations and technology *outside* my body whilst performing.

I will now turn to how the experiences when *looking inwardly* were made visible using analogue drawings and paintings and made understandable through verbal description, to *get closer* to the rich experiential dimensions of this dance practice.

### **6.1.2 Qualitative multimodal data collection methods**

Certain aspects of Zoë Boden and Virginia Eatough's (2014) multimodal hermeneutic-phenomenological approach, framed by qualitative social science research, was used to collect the experiential aspects of the dance practice. This approach is committed to the "hermeneutic nature of phenomenological research, the embedded and intersubjective nature of human experience 'being-in-the-world', and the primacy of the body" (Boden and Eatough, 2014, p. 161). It is underpinned by three dimensions of sense experience: the *felt-sense*, the aesthetic aspects of language and visual imagery. Through these dimensions it attempts to make the experiential understandable, accessible, and visible. How to communicate and make it understandable is the researcher's task.

Multimodally offers various qualitative methods to interrogate one's own responses reflexively, opening the multiple dimensions of lived experience for exploration, and then combining these as they work "simultaneously across different sensory registers" (Ibid., p. 174). The *felt-sense*, for example, is registered through an embodied consciousness (Boden and Eatough, 2014), that uses multiple bodily senses such as

the verbal, visual, the kinaesthetic, the tactile and the auditory. By using verbal feedback, a participant may give voice to their *felt-sense* (Les Todres, 2007) that may “express something fundamental about their *lifeworld*” (Boden and Eatough, 2014, p. 173) [emphasis added]. Drawing visual images can be used to provide *thick depiction* of these experiences metaphorically “where multiple meanings may be found” (Ibid., p. 163).

When used in dance research, multimodality has the potential to explore the “pre-reflective, bodily, felt experience through various means” before the “reflected upon and languaged dimensions of experience” (Ibid., p. 160). This allows the dancer-practitioner to conduct research from a first-person perspective, to explore *dance as experience*, and enables them to access and interpret pre-reflective experience through their own *felt-sense*, verbal feedback, and visual imagery. It provides alternative means to explore, express and interpret “a participant’s lived experience, especially where language seems inadequate and words are difficult to find” (Boden and Eatough, 2014, p. 163).

## **Visual Imagery**

Drawings used in qualitative social science research provide an additional “manifestation of meaning and significance for the participant” (Boden and Eatough, 2014, p. 168) where “events, experiences, and interactions that precede the drawing all work to produce the understandings that are embedded in the drawing” (Guillemin, 2004, p. 285). Additionally, an image reflects how the creator of the image is bodily and kinaesthetically involved in its creation (Merleau-Ponty, 1964). In the act of drawing, the artist translates the world into images, not only through their mind, but

through their bodies and the media they use. The bodily way an image is made “does not just provide a clue to how the experience is *represented*, but it is also the *expression* of that experience” (Boden and Eatough, 2014, p.174) [emphasis in original] and may reveal more than what the artist is thinking about.

These visual methods demonstrate how images are intertwined with its creator and provide “a ‘way in’ to the phenomenon that is nonlinear, non-linguistic, and directly intertwined with the *felt-sense*” (Boden and Eatough, 2014, p. 163). For a dance practitioner, the drawing of images may be an extension of her *felt-sense* and tacit experiences, as a dancer’s body is their medium of expression and the drawing tools directly linked to their bodily experiences and pre-linguistic modes of communication. Drawings used in this way become a visual record of how a dancer interprets and expresses her lived experience. They have a way of “unconcealing that layer of reality which phenomenology calls the *pre-objective* and which, according to Heidegger, constitutes the horizon of all our modes of *dwelling in the world*” (Ricoeur, 1978, p. 154) [emphasis added].

Two drawing methods were employed: *movement hieroglyphs* by Nancy Stark Smith (2013) and *figuring-figures* by Alex Arteaga (2017) and Nikolaus Gansterer *et al.* (2017).<sup>62</sup> Both methods generate spontaneous visual expressions and gestures in various media to articulate the pre-reflective, the *pre-objective* and the *felt-sense*. The images represent a material part of an experience and act as a metaphorical path to understanding what a method of practice *feels like*.

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<sup>62</sup> Specific and additional images relating to the development of *Deep Flow* were selected and are shown in the portfolio.

*Movement hieroglyphs*<sup>63</sup> developed by Stark Smith (2013) are a form of *writing from the body* to visualise one's internal "body's voices" (Steinman, 1986, p. 16). These are single line drawings or glyphs, symbolic of one's internal sensations and state of presence and are drawn spontaneously without reflection before and or after a movement exploration, using a pen as an extension of one's body. Stark Smith (2013, n.p.) suggests lying on one's back, eyes closed, pen and paper at one's side, breathing gently, becoming aware of the present moment, and then drawing a continuous line across the page, the "energy you feel in your body". Alternatively, she suggests sitting up and drawing "small unit[s] of movement" (ibid.) or *hieroglyphs*. These are drawn by connecting one's body to the pen and allowing "a bit of body energy to move on the page" (ibid.). One then steps back to "read" and reflect on what was drawn, finding out which hieroglyph resonates within one's own body.

*Movement hieroglyphs* were adapted to suit the aims of this PaR study. Immediately after each movement event, I would stand, breathe in and out a few times, *reconnect* to the sensations in my body and, with eyes closed, draw one single line drawing filling an A5 page. This captured the *felt-sense* that I had experienced in the event and took between five to ten seconds to complete.

The practice of *figuring-figures* by Gansterer *et al.* (2017) and Arteaga (2017) were adapted and used to create drawings and paintings, with different media to externalise in colourful visual formats what I had visualised and experienced in my *Lifeworld*.

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<sup>63</sup> Movement hieroglyphs from: Nancy Stark Smith Teaches "Hieroglyphs"- Embodied Activity #1 for Meta-academy(at)bates 2013. [https://www.youtube.com/watch?v=hS1MUpltx\\_M](https://www.youtube.com/watch?v=hS1MUpltx_M)

*Figuring*, according to Gansterer *et al.* (2017), starts in the body by paying attention to the experiential shifts, intensities, or feelings arising from all the senses beneath the register of external visibility. This is “a general impression, registered holistically at the level of body-mind” (Ibid., p. 71) and intermingling of *self-world*. Sensitivity to *figuring* gives rise to *figures*, the point at which *something happening* becomes recognisable or nameable within a wider sense of exploratory, performative action (Ibid.). In this PaR, this was drawn in spontaneous drawings or paintings not controlled by the drawer’s cognitive abilities but through their *felt-sense*. Here the transformation of something recognised through experience was changed into a communicable *figure*, an “analogon” (Arteaga, 2017, p. 260), analogous to the sensorial experience. Communicated on paper as dynamic vitality, *figures* reveal implicit expressions relating to the dancer’s *Lifeworld* that include the phenomenological, kinaesthetic, felt experiences and perceptual shifts in movement, temporality, spatiality, and mood. *Figuring-figures* may be viewed as being symbiotic and reciprocal, like a *Möbius strip* as “*figuring* gives rise to *figures*, whilst they attempt to activate the *figures*, create the conditions for (further) *figuring*” (Gansterer *et al.*, 2017, p. 75) [emphasis in original].

*Figuring-figures* were drawn and painted at the end of each day, giving time for the embodied experiences to *dwell* in my body throughout the day. Selecting different water colours paints, coloured pencils, and brushes, I expressed in vivid imagery and colour, the *mores* I had felt, what resonated and echoed within me and what lingered in my *Lifeworld* long after the experience of the event.

These two analogue drawing methods were used to express my intuitive responses and *felt-sense* experience of an event. They captured both immediacy and memory,

that which was spontaneous and that which left an impression in my body. The first was a blueprint, whereas the second was a metaphor, a poetic rendition of what was remembered, what lingered in my body as a memory. The two combined to provide a means to visually translate how I felt, visualised, and remembered my embodied experiences.

## **Verbal translation**

According to Boden and Eatough (2014), verbal description is another way to report on felt experience.<sup>64</sup> However, finding the right words to describe the *felt-sense* is difficult as they are experienced in the body of the speaker as a resonance or sensation (Merleau-Ponty, 1945) before becoming identified as a thought. In these instances, verbal “analogy, metaphor, and imagery can offer a means to communicate the complexities of *felt-sense* experience outside of literal language” (Schneier, 1989; cited in Boden and Eatough, 2014, p. 163). Verbal translation is therefore needed to describe felt experience into words so that a researcher may better understand and find meaning in them. Boden and Eatough (2014, p. 162) suggest a method of interviewing a subject using a list of questions to “move from the meaning-rich *felt-sense* to the fullest possible verbal account of an experience” (Boden and Eatough, 2014, p. 162), to reach a “bodily informed understanding” (Todres, 2007, p. 2).

Taking this into account, I devised a method of self-interview using a set of open-ended questions. These were derived from Peter Ashworth’s (2006) heuristic analytic method that uses *Fractions of the Lifeworld* to analyse a person’s experience of life.

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<sup>64</sup> These are revealed in the portfolio. Only specific texts were collated from all the studies, to show the development and a deeper understanding of *Deep Flow*.

As lived experience is non-categorisable and non-divisible, this analytic approach is used in social science to analyse and separate the whole and analyse the “interrelated elements of the subject’s *lifeworld*” (Ibid., p. 215). I selected five of the eight *fractions* that I thought relevant to the research aims of the studies:

1. Selfhood: a sense of agency, subjectivity and the feeling of one’s own presence in a dance practice;
2. Embodiment: how does the situation relate to feelings about one’s own body in a practice and situation, including emotions;
3. Temporality: the present meaning of time and duration, related to a performer’s past and future;
4. Spatiality: how the space is experienced, how it affects one and how one reacts to it; and
5. Mood as atmosphere: being in a state of mind, the *feeling* or *tone* of a situation.

The questions were used as triggers, prompts, and guides to access and enable verbal description of the experiences that I felt as whole-body experiences in the method of practice. Splitting the whole-body experience into separate elements such as *selfhood*, *embodiment*, *temporality*, *spatiality*, and *mood as atmosphere* assisted me in giving voice to the *fractions* that I had experienced in each event. Speaking about them reflectively made me more aware of the *mores* (Gendlin, 2003) I had experienced, encouraging me to provide an account of experiences that I may have overlooked.

Two sets of question were generated due to the different aims of the studies. These were verbally answered directly to a documentary camera in the location of the event. This encouraged freedom of expression and occurred immediately after the *movement hieroglyph*. The questions (Table 1) were designed to provide detailed description of how my *Lifeworld* was affected and experienced when performing in various indoor and outdoor locations in study one.

**Table 1: Questions for study one**

1. How was the physical body experienced during the performance?
2. What shapes or forms of the body did I experience?
3. How was the choreography experienced?
4. How was the location experienced during the performance?
5. How was time experienced during the performance?
6. What did you see during the performance?
7. What was the atmosphere and how did that affect your performance?
8. What if any colours, sounds, or smells came to my attention?
9. How did you experience the meditative score (“full drop”, “bones melting”, “connective fascia tissue” and “8 connective points”) in the body?
10. How was the “hyper awareness” state experienced?
11. How did you experience the fusion of the states of mind, body and location?
12. How was the state of flow experienced?
13. What was the state of presence experienced?
14. What if any images came to mind?

15. What if any memories came to mind?
16. What emotions come to mind?
17. What affected levels of concentration during the performance of the dance?
18. How was the experience of this performance different from other performances in other locations?
19. Do I feel different after this experience? What has changed in your body, mind, feelings, sensations?
20. What else do I want to say about this experience?

The questions (Table 2) were designed to provide detailed description of how my *Lifeworld* was affected and experienced when performing a method of dance practice in studies two and three.

**Table 2: Questions for studies two and three**

1. Describe how your body feels now, after the *Deep Flow*<sup>65</sup> session. Do you feel different after this experience? What has changed in my body, mind, feelings, sensations?
2. Describe how your body felt before the *Deep Flow* session.
3. Describe how your body felt during the *Deep Flow* session. Describe the sense of *Deep Flow*.
4. What is going on in the back of your mind right now?

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<sup>65</sup> *Deep Flow* is described in more detail at the end of this chapter.

5. What thoughts, feelings, sensation passed into and through you? What remained?
6. What new materials came up during the experience?
7. How did you find yourself *dwelling* in the experience? How absorbed were you in the experience?
8. If you became *formless*, could you describe what it feels like to be *formless*?
9. How did you find yourself listening to the deeper echoes in your body?
10. Describe if anything felt seemed resonant or potent?
11. Describe any transformations that you experienced during *Deep Flow*.
12. Describe the movement sensations during the session – weight, space, time, flow, gravity.
13. Describe what the air felt like during the session.
14. What associations or metaphors or images came up in your body or feeling and thinking?
15. What emotional tone arose from the experience of *Deep Flow*?
16. What energy or force did you experience during *Deep Flow*?
17. How did you experience the worlding of *Deep Flow* and the tools used in this choreography?
18. Did the wearing of the biosensor affect you in relation to the state of flow? How did you experience the worlding of *Deep Flow* and the tools used in this choreography?
19. How did you experience your HR and HRV during *Deep Flow*?
20. When and how did it start and how did you maintain it?
21. How did *Deep Flow* make you feel?

22. Describe how your breathing patterns and your breathing affected your performance.
23. How was the improvisation experienced?
24. How was time experienced during the performance?
25. How did the visualisations make you feel?
26. What did your skeleton and fascia feel like to you?
27. What was the atmosphere like and how did that affect your performance?
28. What, if any, colours, sounds or smells came to your attention?
29. What, if any, memories came to your attention?
30. What emotions come to your attention?
31. What affected your levels of concentration during the performance of *Deep Flow*?
32. How was the experience of this performance different from previous performances?
33. What else do I want to say about this experience?

### **6.1.3 Quantitative biometric measuring methods**

Wearable biosensors such as accelerometers were used in pilot study one and study one. These use electromyography (EMG),<sup>66</sup> whereas HRMs, using ECG, were used to record cardiac electrical activity in study two and three. The HRMs *extruded* invisible electrical forces from my heart's activity and this biometric data was exported and

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<sup>66</sup> EMG: Electromyography is used for measuring and recording the electrical activity produced by the skeletal muscles when moving, as well as forces of direction and acceleration of the body.

uploaded onto online sites such as Kubios,<sup>67</sup> Polar Flow<sup>68</sup> and EliteHRV.<sup>69</sup> These online sites converted the raw data or *biosignals*,<sup>70</sup> into graphical, readable formats that were saved for *interpretation*, part of the data analytic methods.<sup>71</sup>

The self-interviews were then transcribed verbatim, and the drawings, paintings, biometric data, and documentary videos were collated and kept as part of the data to be later interpreted and analysed. This data is found in the portfolio and archive.

#### 6.1.4 Data analytic methods

Having collected all the qualitative and quantitative multimodal data, the *Fractions of the Lifeworld* and Boden and Eatough's (2014), hermeneutic-phenomenological approach, were used to analyse and interpret all the drawings, transcripts, and biometric data. This consisted of four distinct but intertwined phases: *analysis* of the visual imagery, *analysis* of the transcripts, *interpretation* of the biometric data, and overall *comparative analysis and synthesis*. These are described below.

#### Analysis of visual imagery

As *drawing* is both a noun and a verb (Guillemin, 2004), both the product and the production of the images were considered for analysis. To interpret an image,

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<sup>67</sup> Kubios, is an HRV analysis software system used for a more scientific research approach that works with MatLab, a desktop environment tuned for iterative analysis and design processes with a programming language that expresses matrix and array mathematics directly. From: <https://www.kubios.com/> and <https://www.mathworks.com/products/matlab.html> [Accessed 17.12.2019].

<sup>68</sup> Polar Flow is an online system that analyses HR and HRV data. My online diary for study two and study three exists online on their website. From: <https://flow.polar.com/diary/2019/month/6> [Accessed 17.12.2019].

<sup>69</sup> EliteHRV is an HRV online and mobile phone app analysis software system that connects via Bluetooth to the HRM, to provide live streaming from the HRM while exercising. From: <https://elitehrv.com/> [Accessed 17.12.2019].

<sup>70</sup> Biosignals are any signals in living beings that can be continually measured and monitored and may be both electrical and non-electrical signals.

<sup>71</sup> Specific biometric values and graphs are evidenced in the portfolio (pp. 27-32).

Merleau-Ponty (1964, p. 164) suggests that the researcher must *be-with* the image, “see according to, or with it”. Gillian Rose (1991, p. 142) suggests looking at them to sense “the flux of tension and release, [and] the rhythms of visual forces” resonating through one’s own body. Accordingly, I adopted the notion of *being-with* or *dwelling* in each image for the analysis of the visual imagery to identify the resonances inherent in the images in relation to my memory of the lived experience of the event.

The hermeneutic-phenomenological framework (Table 3) by Boden and Eatough (2014, p. 167), inspired by Rose (2001), was adopted to interpret, and analyse the drawings. This resulted in detailed self-reflexive commentary about “the meanings inherent in each element” (Boden and Eatough, 2014, p. 166), and how they resonated in my body upon reviewing them, as I was the creator of the images.

**Table 3: Framework for the analysis of the drawings (Boden and Eatough, 2014)**

1. Contents: describe the distinct elements of the image?
2. Composition: where are the elements laid out on the page?
3. Balance: how do the elements interplay? Is there symmetry or pattern?  
Equilibrium or disequilibrium?
4. Geometry: what shapes are used and how do they interplay?
5. Materials: which ones are chosen for each element?
6. Texture: what are the textural characteristics of each element?
7. Colour: how are hue (colour), saturation (vividness) and value (lightness/darkness) used?
8. Depth/perspective: how are they created using space and colour?

9. Temporality/dynamism: is there a sense of rhythm or movement? Does the image suggest a still frame, continuity, or duration?
10. Focus: what is the visual focus of the image?
11. Expressive content/empathic reaction: what is the emotional tone of the image? What feelings does the viewer have in response (bodily, emotional, memories, images)?
12. Signs/symbolism: are there any overt symbols or cultural references included?
13. Style: does the image “shout” or is it “quiet”, or something in between? Does the drawing seem to imitate or reflect a trend in dance practice?
14. Text: has any text been included, for example, a title? Where has this been placed? In what way has it been included? What style, font, capitalisation, etc., is used?
15. Distraction/noise: do any elements draw your attention away from the main focus? Is there a sense of confusion or clarity in the image?

Detailed notes were made on all the images using each element of this framework to describe how the images were made, composed and what meanings they conveyed. Notes were then made on the commonalities and differences between each image in a study. There was a constant comparison between the verbal transcriptions and the images, as each one informs the other in hermeneutic dialogue, according to Boden and Eatough (2014). These notes were then set aside for the overall comparative analysis and synthesis.

## **Analysis of verbal translations**

This requires a “dwelling’ with verbal data” (Boden and Eatough, 2014, p. 166) a slow, careful, and iterative process, by taking note of the recurring themes and metaphors in the verbal translation of the event, using the *Fractions of the Lifeworld*. This method acts like a sieve, capturing metaphorical verbal descriptions from the interviews, and to make sense of the raw data.

Firstly, all the transcripts were read thoroughly. The *fractions* were then colour-coded to highlight any metaphors, sentences, or group of words that alluded to *selfhood*, *embodiment*, *temporality*, and *mood as atmosphere*. These were then copied into another document and clustered around each *fraction*. During the initial noting and coding stage, there was a constant back-and-forth between the drawings, verbal accounts, and the biometrics data, as one informed the other in a hermeneutic dialogue. Time was spent exploring the relations between these separate elements using the selected *fractions*. Commonalities and differences between the *fractions* in the events were identified and cross-referenced. Summaries were made in relation to the *fraction*, the event, and the overall aim of the study. Notes were made on all the collected multimodal data, setting out the commonalties and differences, and then set aside for the overall comparative analysis and synthesis.

### **Interpretation of biometric data**

As biometric data *concerns* our embodied being, the extruded biometric data was not treated scientifically but as another strand of description and interpretation feeding into the qualitative analyses. The interpretations provided links between the methods of practice and the verbal translations of the *felt-sense* as “the perception and interpretation of the biometric data feeds back to one’s embodied being” (Van Den

Eede, 2015, p. 151). Through a process of visual hermeneutics, the data was read after each event and interpreted as providing feedback to my embodied state of being. The biosensor not only recorded my *Körper's* physiological material responses to the methods of practice, but also included my *Leib* as I situated myself within the data, through a relational process and self-reflexive praxis. The interpretations were integrated into the final comparative analyses and syntheses.

### **Comparative analysis and synthesis**

A method of comparative analysis was used to draw out the commonalities and differences found in each event and between each study. Each event in a study was reviewed, then only two that displayed marked differences were selected and used for comparative analysis and synthesis, as it is beyond the scope of this thesis to comparatively analyse all the events that made up each of the studies. Notes were made on the two events, and these are presented as a final overall summary of *what-it-was-like* to *look inwardly* and be in that moment, and how it is understood now in relation to the research aims which inform this writing-up process.

These multimodal methods of practice, data collection methods, quantitative biometric measuring methods and data analytic methods provided me with tools to explore *looking inwardly*, to analyse visual imagery, verbal translations, interpret biometric data and comparatively analyse and synthesise the findings that emanated from the studies. The pilot studies and the studies are described, and their findings are discussed below.

## **6. 2 The studies and findings**

Two pilot studies and three studies were conducted from 2017 to 2019. Each study used qualitative and quantitative multimodal data collection methods, previously described, to explore specific aims of each study. Each was made up of several research events performed over several days and followed six stages:

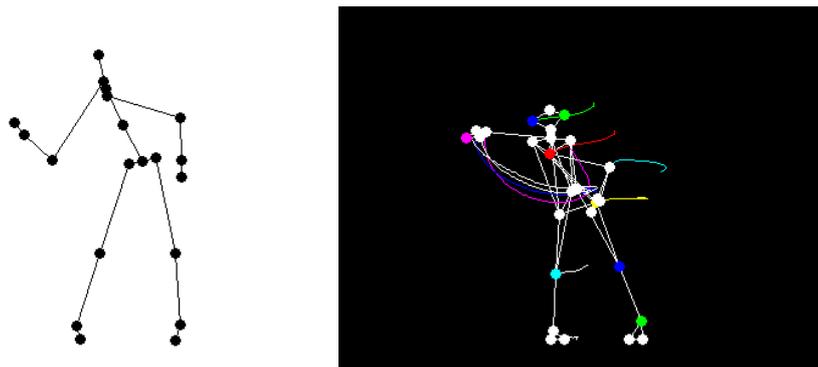
1. Method of practice recorded by documentary video camera;
2. Visual expression: *movement hieroglyph*;
3. Verbal translation: a self-interview recorded by a documentary video camera;
4. Visual expression: *figuring-figures*;
5. Biometric data upload: raw data was uploaded onto online analysis platforms that translated the data into readable and graphical formats; and
6. Interpretation and analysis.

This process enabled me as a dancer-researcher to develop a method of practice, ways of collecting data, noting commonalities and differences between each event, to synthesise and reflect on the collected data from each event and describe how this answered the research questions. Each event illuminated what was missing and what was needing to be explored in the next study. New ideas learned in the *knowing that* part of the PaR impacted on the studies as I introduced new ideas or methods into the methods of practice. The process was conducted in starts and stops; however, there was continuous progress and refinement to the methods of practice as well as to the analysis of the collected data in relation to the research questions. This progress was instigated by understanding and making clear the relations between the collected data, the *felt-sense*, the physiological and the practice of *looking inwardly*. In other words, each research event revealed findings that fed back into the next event, whereas each

study's findings led to the next study. This revealed a simultaneous iterative and linear process, a forward moving helix of events, a *tentacular worlding* of studies and findings. Before describing the three main studies, however, two experimental pilot studies were conducted.

### 6.2.1 Pilot studies

Two pilot studies were conducted June to July 2017 where I explored Somatic Dance methods, biometric measuring, and digital visualising techniques. In pilot study one, I used Somatic methods such as Laban's Eight Effort Actions, Ideokinesis, yoga and *improvisation* dance scores by Olsen (2014). *Movement hieroglyphs*, transcriptions and documentary video captured qualitative data, while the accelerometers *Sensor Kinetics* and *VibSensor*, both iPhone mobile apps, captured quantitative data and images, using EMG. In pilot study two, Motion Capture<sup>72</sup> was explored to create 3D visual animations (Figure 23) of short Somatic movement sequences. All the documentary videos, transcriptions and images are found in the archive.



**Figure 23.** Straiotto, B., (2017) Images from Motion Capture Animation [Still frames].

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<sup>72</sup> Motion capture is the process of recording the movement of objects or people wearing reflective markers on specific body parts. The movement is then captured by specialised optical systems and the resulting skeleton image has animation applied to it.

## Findings

After the pilot studies I realised that I had explored Somatic methods using movement scores imposed from the *outside* rather than originating from within my *Lifeworld* and my *felt-sense*. These Somatic methods also encouraged the creation of line and form that was expressed *outwardly* for an audience's viewership. In addition, in pilot study one, the extruded data failed to deliver anything meaningful in relation to the notion of *looking inwardly*, and in pilot study two Motion Capture produced digital animations that visually represented and illustrated my moving *Körper*. I also realised that my methods of research needed to use a subjective voice to reflect *knowing how* through subjective and embodied experience.<sup>73</sup> With these outcomes, I came to realise that I needed to find other methods of practice and other biosensors to investigate *looking inwardly*. This instigated the aims and rationale for study one that explored dancing in different environments and the effect that these may have on my *Lifeworld* and *felt-sense*.

### 6.2.2 Study one

Study one entitled, *2mins x 10 locations* explored how my *Fractions of Lifeworld* would be affected by dancing for two minutes in ten different locations in Dundee, Scotland, 20 to 28 December 2017. Using the hermeneutic-phenomenological approach in the method of practice, the multimodal data collection, and the data analytic methods, I utilised comparative analyses to draw out the commonalities and differences between two different events with contrasting data to investigate the aims of the study. The

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<sup>73</sup> This is shown in the documentary video from pilot study one in the portfolio (p.5).

study required the further development of a method of practice, the use of a biosensor, an accelerometer, and the selection of ten different locations.

### **Aims of study one**

Study one set out to explore, describe, interpret, and analyse the effects of *affordances* (Gibson, 1986) on the phenomenological aspects of experience such as the *chiasmic* (Merleau-Ponty, 1964) relationship of the *Körper* and *Leib* and its entwinement with the *flesh of the world*. *Affordances*, according to James Jerome Gibson (1986), are experienced by an individual that is situated within an environment filled with physical objects that require complementary sensorimotor actions when encountering them. They present visual possibilities for proprioceptive action that are directly perceived and not mediated by mental representation. However, they may also be “embedded in a more encompassing biological, psychological, and cultural context” (Varela *et al.*, 1991, p. 173), a more relational enactive approach, where there is mutuality between the individual and the environment, involving more than optical perception, as it affects the *Lifeworld* of an individual.

This provided a fertile context for an exploration of lived experience while performing a one-minute choreographed dance and a one-minute *improvisation* in ten different locations. It enabled me to describe more fully what it *felt like* to dance in different locations, how being “caught in the fabric of the world” (Merleau-Ponty, 1964, p. 163) felt like and how my *Lifeworld* was affected and challenged by the differences found in the *affordances* of each location.

### **Location of the study**

Ten locations in Dundee were selected, as this is where I  *dwell* . Through  *dwelling*  in these locations and experiencing their affordances, they have become part of my  *Lifeworld* . The locations were chosen because of their contrasting  *affordances*  such as environment, exposure to the weather, mood, colour, architecture, and use. As I was the dancer performing in the studies, I considered that these  *affordances*  would influence the  *chiasmic*  relationship of my  *Körper*  and  *Leib*  within those environments. Table 4 is a list of the ten locations, with an image (Figures 24–33) of the location and a short description.

**Table 4: Indoor and outdoor locations of Dundee**

Location and description	Images (Ginslov, J. 2017) Locations [Photographs]
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**Figure 24.**

- 1) Under Tay Road Bridge – a noisy damp location on the banks of the River Tay.



**Figure 25.**

- 2) Top of Tay Road Bridge – a noisy and windswept bridge used by cars, cyclists, and pedestrians over the River Tay.



**Figure 26.**

- 3) Chandler's Lane – an historical street previously home to the Harbour Metal Workshops in 1837 and 1850.



**Figure 27.**

- 4) The High Street of Dundee – a busy walking street filled with pedestrians



**Figure 28.**

- 5) The A92 opposite the V&A Design Museum on a busy road linking Dundee to other cities



**Figure 29.**

- 6) My home – a flat in Eden Street, the lounge



**Figure 30.**

- 7) Broughty Ferry Beach – a popular beach



**Figure 31.**

- 8) The Dundee Law – the highest point in Dundee, situated on an extinct volcano with a war memorial at its summit



**Figure 32.**

9) The Vision Building – an empty office space



**Figure 33.**

10) Edengrove Close – the stairwell to a flat



### **Study one pre-trials: development of the method of practice**

Before beginning the study, methods of dance practice were explored in pre-trials 4 to 6 December 2017 in a yoga and dance studio, using the methods of *improvisation*, *doing a phenomenology*, *flow*, and the *Full Drop*. This helped to develop and choreograph a one-minute dance for study one and provided a way to start *looking inwardly*, to explore *dance as experience*.

I began by *doing improvisations* on 4 December 2017, with different objects such as paper and clothing, with eyes closed in silence. Then I explored “just becoming movement” and “shifts of weight *improvisation*” and with this I became softer and

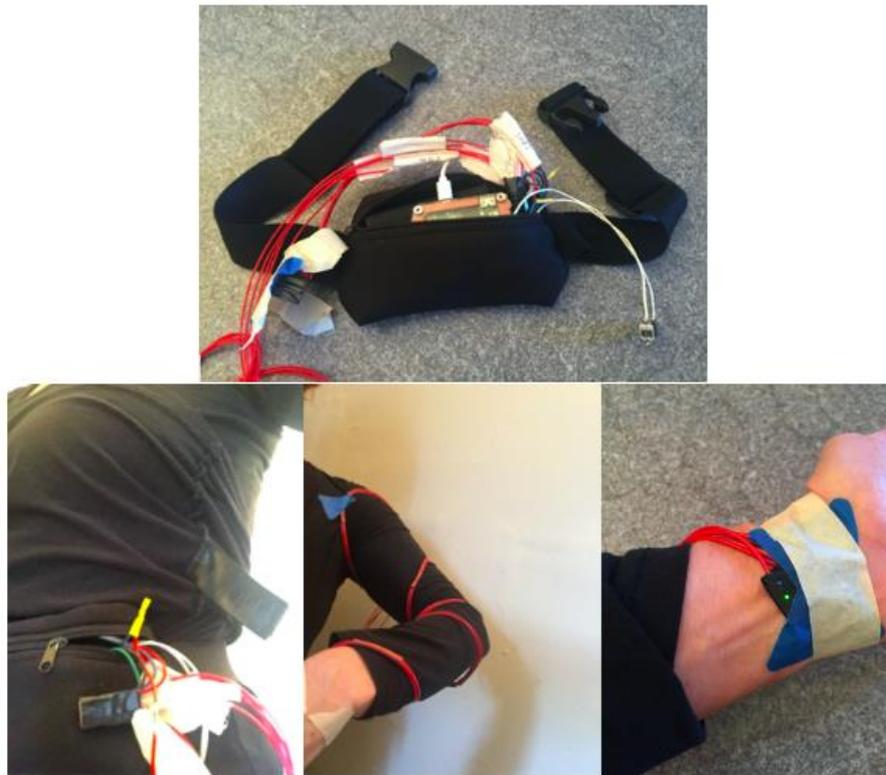
slower. I began to sense the vibrational field between my hands and the room, and by day two, I realised that I should be less kinetic to explore the *felt- sense* in my body. Subsequently my body and movements began feeling more holistic and needed less effort to be performed. On day four, I explored the *Full Drop* on an exercise ball and subsequently experienced a state of *flow*.<sup>74</sup> These starting points for choreography resulted in a one-minute dance sequence that *flowed* in even tempo, states of tension and weight distribution, without pauses, amplifying states of calm and balanced effort. This enabled me to focus on my implicit lived experience that would be challenged by each location's affordances. The method was also used for the one-minute *improvisation* that I would perform after the choreographed dance, in each location.

### **Developing the biosensor technology**

Two 3-axis accelerometers (Figure 34) were made in collaboration with Dr David Martin from the School of Life Sciences, University of Dundee, at The Maker Space, Dundee. These were worn during the method of practice in all ten research events to measure embodied responses to the *affordances* occurring in a location.

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<sup>74</sup> The documentary video and description of this improvisation is found in the portfolio (p.6).



**Figure 34.** Ginslov, J. (2017) Accelerometer in pouch and with one biosensor on left wrist with another attached on L6 vertebra [Photograph].

A wearable GoPro Camera (Figure 35) was attached to my forehead to provide a subjective point of view (POV), and a documentary camera recorded an objective POV of my performances. A mini microphone (Figure 35) recorded my breathing rate to deepen my understanding of my lived experience of the dance. Both POVs and sounds were edited together offering the viewer simultaneous subjective and objective POVs. All these videos are found in the archive.

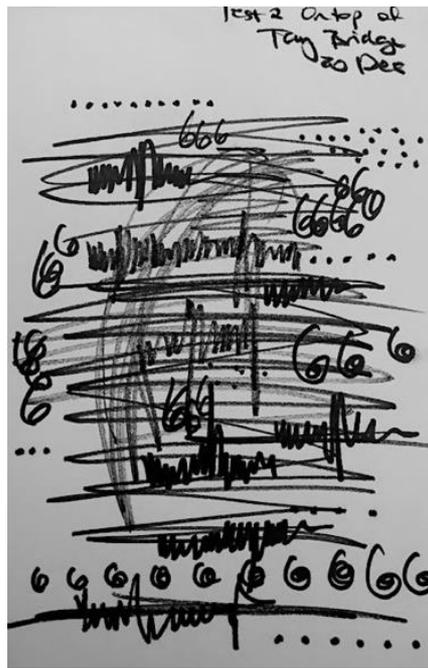


**Figure 35.** Ginslov, J. (2017) Ginslov wearing a GoPro and mini microphone [Photograph].

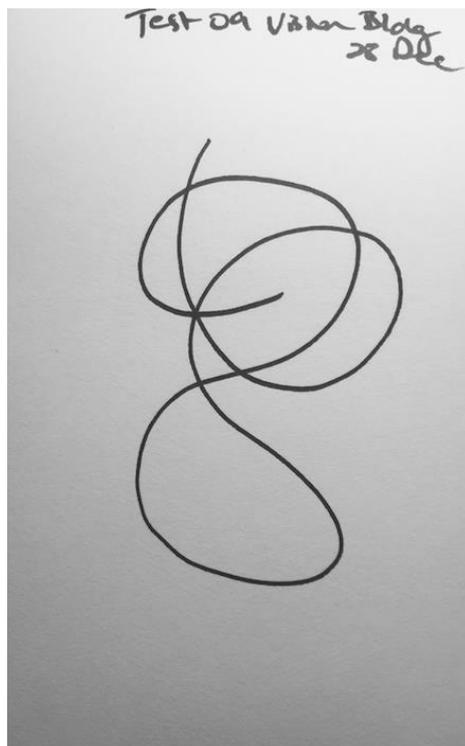
### **Qualitative multimodal data collection methods**

Immediately after the performances, *movement hieroglyphs* (Figures 36 & 37) were drawn as spontaneous responses to the *affordances* in the locations and later *figuring-figures* (Figures 38 & 39) were drawn and then analysed. Some other images are found in the portfolio in addition to the ones in this chapter, as they further develop an understanding of the main finding *Deep Flow*.

### **Movement hieroglyphs**



**Figure 36.** Ginslov, J. (2019) *Movement hieroglyph* study one: Top of Tay Road Bridge [Photograph].



**Figure 37.** Ginslov, J. (2019) *Movement hieroglyph* study one: Vision Building [Photograph]

## ***Figuring-figures***



**Figure 38.** Ginslov, J. (2019) *figuring-figures* study one: Top of Tay Road Bridge [Photograph].



**Figure 39.** Ginslov, J. (2019) *figuring-figures* study one: Vision Building [Photograph].

### **Verbal translation**

The questions (Table 1) were answered directly to the camera immediately after the drawing of the *movement hieroglyph*. This provided rich verbal description of the effects of the *affordances* on my *Lifeworld*, my *Körper* and *Leib* and my relationship with the biosensor technology. The answers gave voice to phenomena that arose from my situated *Lifeworld* and *felt-sense*. These were then transcribed verbatim and set aside for analysis. All these translations are found in the archive.

### **Quantitative biometric measuring methods**

The accelerometer proved to be problematic as there were several technical problems that were not overcome, such as the switch on the device was too small, difficult to use and see in the cold windy weather. It also slipped off as it was not securely attached to my body, and the data files were later found not to be date stamped. This prevented mapping the exported raw data to a research event and the subsequent analysis of the data. All the qualitative data from the Top of Tay Road Bridge and the Vision Building, were gathered for analysis, separately and then comparatively.

### **Data analytic methods: comparative analysis**

The Top of Tay Road Bridge and the Vision Building events were selected for comparative analysis as they presented contrasting *affordances* that affected my *Lifeworld*. Notes were made using Boden and Eatough's (2014) framework (Table 3) to interpret, analyse and compare all the drawings. The data analytic method of comparative analysis was used to draw out the commonalities and differences found in the verbal descriptions of the two events. The *hermeneutic interpretation* of the biometric data was omitted from this analysis as the technical issues with the

accelerometer, described above, could not provide adequate information on an embodiment of technology.

### **Findings: withdrawing/expanding**

Two key contrasting states of *being-in-the-world* or *Dasein* and the *chiasmus* were found running throughout the collated data in the selected locations. On Top of Tay Bridge, *withdrawing* from the world was experienced, whereas in the Vision Building, *expanding* was experienced.

### **Withdrawing/expanding in the visual imagery**

This was echoed in the visual imagery that resonated with the *felt-sense* of withdrawing and expanding in the locations. The *movement hieroglyph* produced on Top of Tay Bridge (Figure 36) revealed chaotic zigzags, crossing lines, waves and spirals spreading out across the page, with a tone of confusion that resonated with my experiences of the cold, wind, noise and rushing traffic. This related to my feeling of wanting to *withdraw* my *Körper* from the world to counter the effects of cold and noise. The *figuring-figure* (Figure 38) reiterates this through stabbing black lines thrusting downwards, reflecting the effects of the *affordances* on my nervous system. Whereas, in the Vision Building, the *movement hieroglyph* (Figure 37) is a simple line drawing, sparsely drawn in the centre of the page, with three interweaving loops, infinitely and calmly looping with each other. The sense of flow is re-iterated in the *figuring-figure* (Figure 39), where the three-dimensional cloud-like image drawn in pencil is smudged, evoking feelings of calm and tenderness, the lived experience and sensation of expansion and well-being in the warm calm location.

## **Withdrawing/expanding in the verbal translations**

Analysing the experiences of *withdrawing/expanding* against the *fraction* of selfhood reveals that on Top of Tay Road Bridge, my sense of *flow* was challenged. I felt like I wanted to *withdraw* from the world as I felt no desire to *interact* with the world but rather a sensation of the *affordances* controlling me, as an experience of “the outside coming and forcing in on me”. The feelings of calm and flow found in the *Full Drop* were substituted by notions of forcing flow, controlling my movements with my mind, where thoughts turned to the timing of the performance rather than the *mores* of the lived experience.

In the Vision Building office, however, I had a feeling of *expanding* into and *entwining* with the world. The *affordances* encouraged *dwelling* and *listening* to the *felt-sense*, where I had a “mind holiday”, floating on the horizon of lived experience and consciousness. My state of embodiment felt like “liquid” as all parts of my body moved effortlessly and harmoniously in relation to each other. My subjectivity was fully immersed in my body and the location and resonated in states of flow.

On the bridge, my *Körper* and *Body Schema* are foregrounded. The *affordances* of the cold and noise emphasised feelings of being scattered and disengaged from the experiences of the location and the sense of flow. The *fractions* of temporality and spatiality are experienced as “making me want to crawl into the centre of my body”, contracting and withdrawing from the world in response to the overwhelming affordances. On the other hand, the office space revealed the experience of time and space expanding, time slowing down, a synergy of flow, lived experience “fusing with

the environment”, my body expanding with the world, producing a calm flowing state of mind with the body.<sup>75</sup>

## Synthesis and conclusions

These findings revealed that the sensations of the *chiasmus*, the *Körper* and *Leib* entwining with the *flesh of the world* were amplified by the adverse or more pleasant affordances. The experience of *withdrawing* on the bridge resonated with the notion of *Dasein*, existentially *being-in-the-world*, and *stimmung*, a mood attuned in relation to that world. My skin, feeling the cold, reinforced my subjective experience of *withdrawal* that impaired a sense of *flow*, giving rise to an *explicit temporal body* with actions of survival as a coping strategy. The experience in the office space, however, was one of *expanding* with the world, the warmth and quiet enhancing states of flow and *dwelling* in my *implicit temporal body*. My skin was no longer a barrier, as it felt porous. My subjectivity *felt like* it was extending outwardly through this porosity *into* the world where I became *formless*, part of, merged with, melted into, and fused with the expanding world. This enhanced the methods of *dwelling* and *listening* to the *mores* of my experience and produced a state of calm, well-being, and *flow*.

After this study, I was more interested in the states of *flow* and how I had experienced this in my body as *expanding* with the world rather than the completion of a set movement sequence pitted against the *affordances* in a world. The experiences of *my mind on a holiday*, my body fusing *with the environment* free from time constraints and sequential thought processes, gave me an overwhelming sense “of well-being and

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<sup>75</sup> Some edited verbal descriptions from study one appears in the portfolio (pp.14-15), reflecting the *felt-sense* of 24 and 28 December, 2017.

calm” (portfolio., p. 127), similar to experiences found in meditation. This made me realise that my HR must have been affected. After reporting these findings in a supervision meeting, Dr John Seeley suggested that an HRM should be used instead of an accelerometer, as it could measure HRV which when used in sports indicates states of fitness, stress, and levels of physical recovery. This would be of better use than an accelerometer measuring physical effort. After researching the connections between HR and meditation techniques, I discovered that HRV is associated with the PSNS that calms the body and is related to the connective tissue and “fascia release” (Guðjónsdóttir, 2017). I then set up a pre-trial before the next study to find relations between HRV and the PSNS using a HRM to help develop a new method of practice.

## **Study two pre-trials: understanding biosensor technologies**

Between 29 March and 5 April 2017, trials were conducted to better understand the embodiment and use of the Polar wristwatch HRM (M430) and chest HRM (H10) in relation to a method of practice (Figure 40). Experiments were also conducted with the Calm App <sup>76</sup> while practicing a breathing-meditation. A *point of departure* (PoD) was established in the method of practice and signalled by a vocal “hum”. This ensured that the biometric data could be mapped to the start of a state of *flow*. The trials also revealed that the Polar wristwatch HRM (M430) could not record HRV, and so this was replaced by a Polar wristwatch HRM (V800) that could. However, I discovered later that I had been using the device incorrectly. This was amended in the next study, study two.

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<sup>76</sup> Calm is an iPhone meditation and relaxation app. It promises to help users sleep better, boost confidence and reduce stress and anxiety with guided meditations, soothing music, and bedtime stories. From: <https://www.calm.com/> [Accessed 17.12.2019].

### **6.2.3 Study two**

Study two was conducted from 6 to 9 June 2019, where the method of practice was further developed, multimodal data was collected, and the data analytic methods were used to analyse the collected data.<sup>77</sup>

#### **Aims of the study**

The aims set out to explore the practice of fascia release as used in the *Full Drop*, states of *flow*, the *felt-sense*, and *formlessness*. It attempted to explore the notions of *flow* and *dwelling* through inner visualisations and movement, using the notion of the *tentacular* interlacing human and nonhuman materials in a *worlding* of lived experience and *embodied* technology. Overall, the study attempted to discover relations between *flow* states, HRV, fascia release, an embodied HRM and the interpretations of verbal, visual and biometric data.

#### **Location of the study**

The study was conducted in my home, a warm and calm space (Figure 40).

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<sup>77</sup> Detailed notes, and verbal translations from study two are shown in the portfolio (pp. 17-20) and a documentary video appears on page 20.



**Figure 40.** Ginslov, J. (2019) Camera and location of study two: Ginslov's Home, Dundee [Photograph].

## **Method of practice**

Two methods of practice were explored: *dwelling* and the *Full Drop*. For a deeper understanding of lived experience, *dwelling* was performed for as long as possible, sometimes with stillness, to encourage deeper *listening* to the *mores* of pre-reflective experience and states of *flow* and *formlessness*. Each event was performed for ten minutes to formalise it as a technique. An eye mask was worn to deepen the states of *dwelling* in the *Full Drop*, enabling a deeper focus on the implicit *felt-sense*, sensing the body in the absence of external visual information.

## **Qualitative and quantitative multimodal data collection methods**

For study two, fifteen data collection phases (Table 5) were used to explore the aims of the study. The Polar Wristwatch HRM (V800) and the chest HRM (h10) were worn to collect HRV measurements. Polar Flow and Kubios were used to analyse the raw data. I also experimented with Elite HRV on an iPhone to livestream my HRV whilst performing. All the collected data is found in the archive.

### **Table 5: Phases for data collection – study two**

- 1) an orthostatic<sup>78</sup> or morning readiness test, to set the HRV baseline for the day
- 2) a fifteen-minute walk in the park to explore a *chiasmic* experience of the location
- 3) phenomenological notes after the walk
- 4) *movement hieroglyph*
- 5) jumping on a trampoline for six minutes with the HRM
- 6) physical exercise for ten minutes with the HRM
- 7) *movement hieroglyph*
- 8) *Full Drop* for ten minutes with the HRM using an eye mask
- 9) *movement hieroglyphic*
- 10) responding to 33 questions to documentary camera
- 11) *Dwelling* for ten minutes with the HRM and eye mask
- 12) *movement hieroglyph*
- 13) hand-written notes
- 14) *Figuring-figures*

### **Verbal translation**

The questions (Table 2) were answered to describe the experiences of *flow* and *dwelling*, fascia release and *formlessness*. The questions were answered directly to the documentary camera in the location immediately after the drawing of the

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<sup>78</sup> An orthostatic test measures heart rate (HR) and heart rate variability (HRV) while lying down and standing for a few minutes. It monitors changes in the function of the autonomic nervous system (ANS). This is affected by several external factors such as mental stress, sleep, latent illness, environmental changes (temperature, altitude), and others. Changes in heart rate and heart rate variability reflect the changes in autonomic regulation of the cardiovascular system. From: [https://support.polar.com/en/support/the\\_what\\_and\\_how\\_of\\_orthostatic\\_test](https://support.polar.com/en/support/the_what_and_how_of_orthostatic_test) [Accessed: 16.12.2019].

*movement hieroglyphs*. These were later transcribed verbatim and are found in the archive.

## **Findings**

A thorough exploration of *dwelling* and the *Full Drop* was unsuccessful as the numerous questions, phases of the data collection and biometric measuring methods proved stressful and overwhelming. These concerns interrupted the exploration of the *Full Drop* as the problems with the biosensors became foregrounded in my lived experience. These frustrations interfered with my focus on the *Full Drop* and consequently after four days, the study was terminated. In addition, Daniel Spikol advised me that I was using the HRM's HRV biometric measuring techniques incorrectly as there was no evidence of HRV in the data feedback. For this reason, the verbal translation and visual imagery were not analysed as they failed to deliver any meaningful results as the method of practice was interrupted by *external* events.

One important finding was however discovered, a new method of practice, what I am referring to hereafter as, *Deep Flow*. This was derived from an amalgamation of all the methods of practice. Its origin can be traced to the study one pre-trials, that was further developed in study two and concretised by study three. *Deep Flow* was born out of exploring states of *flow*, *facia release* and *formlessness* through *dwelling* and these resultant experiences became more evident each day in the study two pre-trials and subsequent studies. This is the main finding of the studies and is described at the end of this chapter. It was explored more fully as a method of practice by study three.

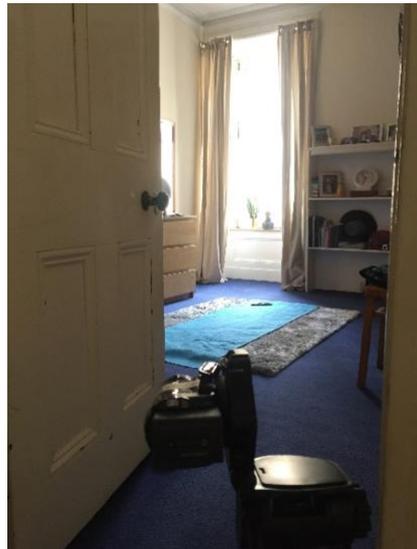
### **6.2.4 Study three**

## Aims of the study

Study three was a series of seven research events from 19 to 25 June 2019 to explore a performative *tentacular worlding* of the *felt-sense*, *Deep Flow*, an embodied HRM, and human and nonhuman materials. The aim of this study was to find relationships between HRV biometric data, *Deep Flow*, visual imagery, and verbal translation, to enable a description of what it feels like to be in a *tentacular worlding* of human and nonhuman materials that can only be sensed within that worlding.

## Location of the study

The location was again in my home, a warm and calm space (Figure 41).



**Figure 41.** Ginslov, J. (2019) Camera and location of study three: Ginslov's Home, Dundee [Photograph].

## Method of practice

Each research event explored a ten-minute session of *Deep Flow* using the Polar Wristwatch HRM (V800) and the Polar chest HRM (H10). They were also used for the

morning readiness and orthostatic tests, that set a daily baseline for HRV. These events were recorded by the documentary video camera (Figure 41) and an eye mask was worn to deepen the states of *dwelling* in *Deep Flow*, enabling me to focus more deeply on the implicit *felt-sense*, in the absence of external visual information.

## **Qualitative multimodal data collection methods**

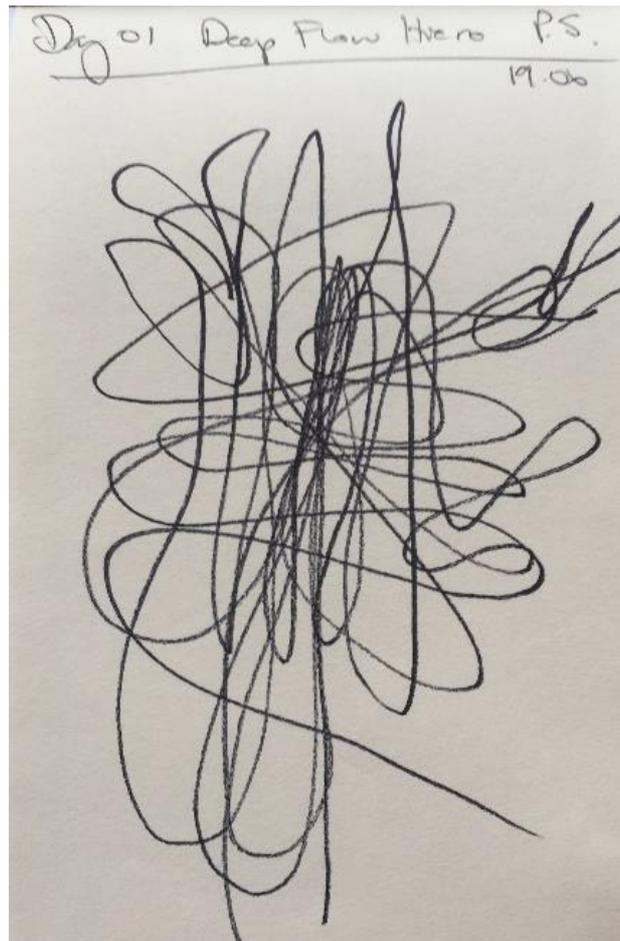
Ten phases (Table 6) were used for the collection of qualitative and quantitative data. These included morning readiness and orthostatic tests, walks in the park and exercises to find a daily average and baseline for my HRV score. Two research events were selected on 19 and 20 June as they revealed striking relations between methods of practice and HRV. In addition to the *movement hieroglyphs* and *figuring-figures* small paintings were also created to augment the description of embodied experiences in *Deep Flow*. Additional images appear in the portfolio (pp. 25-27).

### **Table 6: Phases for data collection – study three**

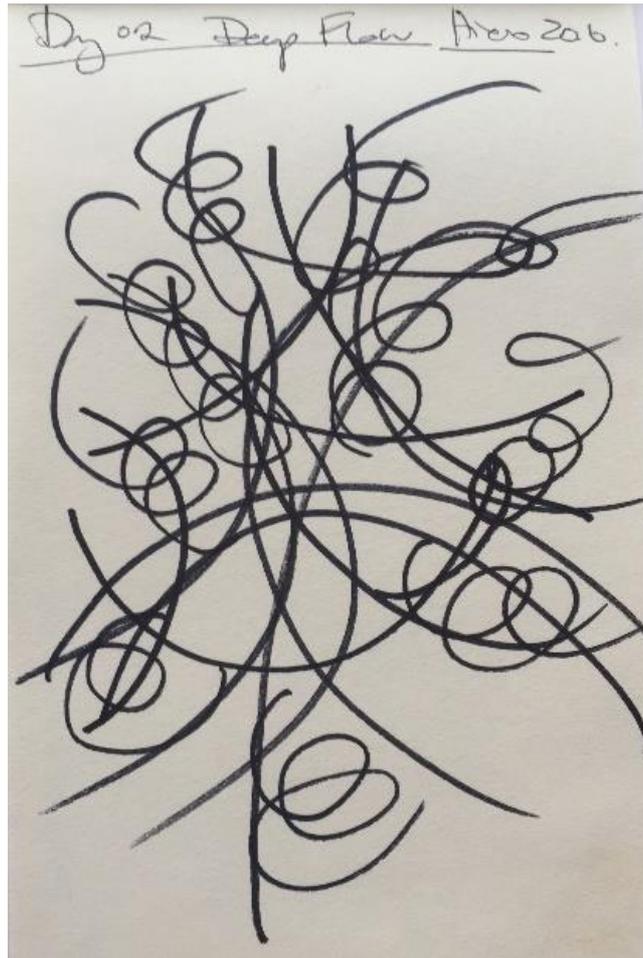
1. Morning readiness score using HRV Elite to set the baseline for HRV
2. Twenty-minute walk in the park without the use of an HRM
3. Orthostatic test with Polar, recording lying down and standing up for a minute
4. Exercises for six minutes recording HRV with Polar HRMs
5. *Deep Flow* for ten minutes recording HRV with Polar HRMs
6. *Movement hieroglyph*
7. Answering a list of questions directly to camera
8. *Figuring-figures*: drawing
9. *Figuring-figures*: painting
10. Uploading and exporting biometric data using Polar Flow, Kubios and Elite HRV

## Movement hieroglyphs

*Movement hieroglyphs* of *Deep Flow* were drawn (Figures 42 & 43) for 19 and 20 June 2019 and selected for analysis.



**Figure 42.** Ginslov, J. (2020) *Movement hieroglyph* study three: 19 June 2019 [Photograph].



**Figure 43.** Ginslov, J. (2020) *Movement hieroglyph* study three: 20 June 2019 [Photograph].

### **Figuring-figures**

Large drawings of *Deep Flow* were created from study three, 19 June 2019 (Figure 44) and Day 2, 20 June 2019 (Figure 45).



**Figure 44.** Ginslov, J. (2020) Large drawing study three, 19 June 2019 [Photograph].



**Figure 45.** Ginslov, J. (2020) Large drawing study three, 20 June 2019 [Photograph].

Small paintings were created to further describe the state of *Deep Flow* in study three, 19 June 2019 (Figure 46) and 20 June 2019 (Figure 47).



**Figure 46.** Ginslov, J. (2020) Small painting study three 19 June 2019 [Photograph].



**Figure 47.** Ginslov, J. (2020) Small painting study three 20 June 2019 [Photograph].

## **Verbal translation**

The questions (Table 2) were answered to describe the experiences of *Deep Flow* directly to the documentary camera in the location immediately after the drawing of the *movement hieroglyphs* and were later transcribed verbatim.

## **Quantitative biometric measuring methods**

Biometric raw data from the Polar HRM (V800) that measured the morning readiness, the orthostatic test and *Deep Flow* was uploaded to Polar Flow, Elite HRV and Kubios, all online HRV analytic systems. HRV scores were highlighted and exported to be interpreted later and integrated into the data analysis. All the qualitative and quantitative data from 19 and 20 June 2019 were gathered for analysis, separately and then comparatively.

## **Data analytic methods: comparative analysis**

This used the methods already described, using Boden and Eatough's (2014) framework (Table 3) for the analysis and interpretation of the drawings. The verbal translations then were analysed, cross referenced, highlighted and thematically grouped. These underwent a comparative analysis and synthesis that describes all the findings into a final overall summary of *what-it-felt-like* to be in *Deep Flow* and how it is understood now, the major finding of the studies.

## **Findings: formless-immersive-fusional**

Three key states of experience emerged from the collated data, *formlessness*, *immersive* and *fusional*. Two events were selected where the feelings of being

*formless* and *immersive* occurred on 19 June, whereas the feeling of being *fusional* occurred on 20 June. Both days reveal higher HRV scores.

### **Formless/immersive/fusional in the visual imagery**

This is echoed in the visual imagery that resonates with the *felt* experiences of feeling *formless*, *immersive*, and *fusional* in *Deep Flow*. The 19 June drawings revealed a *movement hieroglyph* (Figure 42) that is a tapestry of looping dynamic lines, filling the entire page with a sense of heaviness in the centre from which one cannot escape. The *figuring-figure* (Figure 44) is an X-ray-like image of the venous system with brisk, soft green lines flowing from the limbs and a torso reminiscent of the *Vitruvian (Wo)Man*, immersed in *Matrix-like* data. The painting (Figure 46) revealed a dense blue-green three-dimensional vortex of water filling the entire page, *pulling* one into the centre of the page, becoming immersed in a lake of *formless* experience.

The 20 June drawings revealed a *movement hieroglyph* (Figure 43) that is a vibrant image of plant-like semi-circular lines entwined by tendrils, as if springing from the page. The *figuring-figures* (Figure 45) a mixed media drawing and the small painting (Figure 47) both reveal, vibrant lively plant-like entwinements, curling tendril-like around multi-coloured vines.

Overall, the images from 19 June elicit feelings of being *immersed* and *formless* and being drawn into the *worlding*, into the *felt-sense* of *Deep Flow*, whereas for 20 June there is an expression of vibrant, emerging dynamic, symbiotic relations between *things*, where *things* started *feeling like* they were merging with each other.

## Formless-immersive-fusional in the verbal translations

Analysing the experiences of *formless/immersive/fusional* revealed commonalities in terms of the *Fractions of the Lifeworld*. When immersed in *Deep Flow* conscious control of my explicit *Körper* seemed to disappear. Through *listening* and *dwelling*, a shift of consciousness occurred as my cognitive mind slowed down and thoughts turned to images. Images overrode thought processes and words turned to sensed experience. The image of the *Vitruvian (Wo)Man* in my mind whilst in *Deep Flow* provoked the following response: “I’m not trying to move the venous system or the nervous system, [...] I just saw it and then the movement sort of started to take shape or else the image goes away, and I allow the shape to then take over”. It *feels like* the body is moving by itself. Most importantly however, when the arms “start to move by themselves”, from hanging by one’s side to being raised at the side parallel to the ground, *Deep Flow* has commenced. By immersing in and focusing on the whole experience, everything in the body is felt all at once in equal balance with all actions performing relationally. This developed a relaxed state and a trust in being present. Sensations of *floating, expanding, fusing, tentative, surging, swelling, weightlessness and formlessness* emerged where “you’re just floating within this miasma, like a miasmatic pool [...] relational pool that [...] feels like you’re just in this...jelly mass...just there going between all these sensations and feelings and you’re just within that *worlding*.”

The experiences of feeling like an “astronaut” not directed by any intention nor subjectivity, flowing, and melding into the environment was experienced on 19 June. This was again experienced on 20 June, where the relations between *things* were imagined as granadilla tendrils, entwining and fusing movements, images, sensations.

The *worlding* on 19 June is visualised as a “relational pool” and on 20 June as a “relational field” emphasising how one feels immersed in and in relation to human and nonhuman materials. Additional descriptions and translations are found in the portfolio (pp. 21-24).

## **Formless-immersive-fusional biometric interpretation**

The experience of *Deep Flow* revealed relations with the HRV scores when analysed by the Elite HRV and Kubios systems. Generally, the HRV scores increased during stress-free activities and decreased during times of stress. Higher HRV values indicated that my PSNS had produced a calming effect on my body. The results reflected a good average HRV score for people between the ages of 55 and 65, which is 53, with 75% of users falling between 46.3 and 72.0.

The Kubios analysis results (Table 7) revealed measurements of average HR and HRV indicated by the R-R<sup>79</sup> interval rate, that is an indication of the time elapsed between two successive heart beats. The higher the number, the higher the HRV. This is reflected in the Root Mean Square of the Successive Differences (RMSSD)<sup>80</sup> in the results below, a time-domain tool that assesses HRV in milliseconds (ms). The Stress Index is an indicator of stress levels.

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<sup>79</sup> R-R interval rate is an indication of the time elapsed between two successive heart beats or two successive R-waves of the QRS signal on an electrocardiogram.

<sup>80</sup> RMSSD: The RMSSD is the root mean square of successive differences between normal heartbeats. This value is obtained by first calculating each successive time difference between heartbeats in milliseconds. Each of the values is then squared and the result is averaged before the square root of the total is obtained.

The 19 and 20 June data reveal higher scores of HRV and lowered states of stress, whereas on 22 June, a day that is reported in the verbal translation as being stressful, the HRV score is a lot lower, and the Stress Index is a lot higher.

**Table 7: Kubios HRV analysis results study three**

<b>Dates</b>	<b>Stress Indicators</b>	<b>Values</b>
19 June	Mean HR	73
2019	Mean RR	826
	<b>RMSSD/HRV</b>	<b>41.7ms</b>
	Stress Index	6.8
20 June	Mean HR	82
2019	Mean RR	731
	<b>RMSSD/HRV</b>	<b>41.8ms</b>
	Stress Index	6.41
22 June	Mean HR	99
2019	Mean RR	605
	<b>RMSSD/HRV</b>	<b>7.4ms</b>
	Stress Index	28.6

Correspondingly, the Elite HRV analysis results from 19 and 20 June also revealed relatively high scores of HRV: 52 and 51, whereas on 22 June, the score is 31.

The higher scores of HRV confirmed relations between states of *Deep Flow*, lower heart rate, states of calm and flow. For *Deep Flow* to be experienced, higher HRV needs to be present as it affects the PSNS which in turn calms the entire body. The

scores were interpreted as providing feedback about my embodied state of being in *Deep Flow* and interpreted self-reflexively as my state of flow was embedded in the data. This formed a relational loop between *Deep Flow*, my embodied states of being, and HRV. This led to me to conclude that there are relations between *Deep Flow*, *fascia release* and higher scores of HRV. The further development of *Deep Flow* then is the main finding from study three and is discussed in the synthesis and conclusions below. Additional images of the HRV values and results from 24 June appear in the portfolio, to demonstrate further the relations of the human and nonhuman, the *felt sense* and *Deep Flow*, the HRM and HRV (pp.27-32).

### **Formless-immersive-fusional synthesis**

The findings of *formless*, *immersion* and *fusional* were experienced by *looking inwardly* using the *felt-sense*. This was facilitated by the method of practice *Deep Flow* that, that by study three, was a synthesis and refinement of all the methods of practice described in the beginning of this chapter. These experiences emanated from an awareness of being in and experiencing the *felt-sense* fed by the multiple sense modalities situated with the body. The experiences of *withdrawing* and *expanding*, from study one, are also included in this synthesis as they are part of the experience of *Deep Flow*.

### **6.3 Main Finding: *Deep Flow***

*Deep Flow* is a method of dance practice; an embodied, meditative and heightened state of awareness that synchronises states of *flow*, the *felt-sense* and states of presence. It includes the creation of *movement hieroglyphs*, *figuring-figures*, paintings, verbal translations, and the interpretation of HRV biometric data. These are phenomenological methods to understand and illuminate the embodied and subjective

states of being, *liquid knowledge* sets that are created in states of *Deep* as well as the notions of *embodied materiality* and *relational embodiment*.

The embodied method of practice involves *looking inwardly*, *listening*, *dwelling*, and *slowing down*, directing attention to the *horizons of experience*, the emergence of embodied phenomena such as sensations, feelings, internal visualisations, and thoughts begin to materialise. Through this mindful practice, whether in stillness or in slow movements, your whole body suddenly feels connected, lighter, expansive, and effortless, as if gravity no longer exists. Your arms float upwards without conscious control. Moving extremely slowly, using a minimal amount of tension and effort in the body, equalises one's spatiotemporal dimensions of movement. This occurs without the conscious mind guiding the movement, yet your focus is engaged entirely in this one activity.

You are no longer aware of the HRM, as it has become embodied, *incorporated* into your *body schema* and *Leib*. You experience internal visualisations of colour, memories and emotions may surface in your mind's eye; your body sometimes feels like it is melting into the world around you, where you are moving in a thick viscous environment. This fosters a state of calm and flowing relations between subjectivity, the *felt-sense*, the sensorimotor system, the autonomic nervous system (ANS),<sup>81</sup> HRV, PSNS, the fascia, the kinaesthetic, proprioceptive and sensorimotor systems. Attending to every shift of experiencing the physical and phenomenological, the body and mind are experienced as a unified whole. The slow deep breathing stimulates the

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<sup>81</sup> ANS: The autonomic nervous system is an unconscious control system in the body that regulates bodily functions, such as the heart rate, digestion, respiratory rate, pupillary response, urination, and sexual arousal. This system is the primary mechanism in control of the fight-or-flight response

PSNS (Polar, 2020), which releases the fascia, lowers HR, and increases HRV. This in turn reinforces a state of *flow* and calm.

Inspired by the *Full Drop*, *Deep Flow* is however, different to it as it goes deeper. The *Full Drop* is about *doing nothing* and experiencing emotions as *hyperstates* (Guðjónsdóttir, 2017). *Deep Flow* is more concerned with the state of *flow* whilst moving very slowly in a standing position. *Deep Flow* does not seek to investigate the mental, subconscious, and emotional states of a dancer. Nor does it attempt to explore how bodies and reality merge with *matter* (Guðjónsdóttir, 2018). *Deep Flow* is more concerned with a subject *dwelling* in the relational flows of lived and embodied experience. In addition, *Deep Flow* uses biometric measurements of HRV in relation to the method of practice, whereas Guðjónsdóttir never uses any form of biosensor technology.

*Deep Flow*, unlike the *Full Drop*, is also more concerned with increasing HRV (that is measurable) and fascia release that induces profound states of *Deep Flow* and indicates that the rhythm of the heart is highly variable in relation to states of *flow*. This implies that *Deep Flow* has activated the PSNS. This slows down heart and breathing rate and the entire ANS, that leads to an increase of HRV, making you feel relaxed, focused, calm and positive (EliteHRV, 2019; McCraty, 2019). Achieving higher HRV is therefore an essential part of the method. Most importantly during *Deep Flow*, the dancer is not reading or responding to external visual imagery whilst performing. Reading the data occurs after the practice, a self-reflexive practice that informs the

dancer about the embodied state of HRV and its relation to states of *flow*. The biofeedback is reflected upon and informs the next practice session of *Deep Flow*.<sup>82</sup>

The process of finding *Deep Flow* reflects the PaR methodology *tentacular worlding* as it emerged through stops and starts, failures and successes. *Cat's cradling* activated the research to *look inwardly* at the pre-reflective and the *felt-sense* with the entire body and mind focused on bodily experience, that led to feelings of well-being. The biosensor data identified relations between states of *Deep Flow* and higher HRV scores and suggests that the *felt-sense*, the physiological and the biometric are related to and affect each other. Through this *tentacular worlding* of the human and nonhuman the performance and experience of *Deep Flow* is *cat's cradled* into being.

Chapter 7 is a discussion and offers some conclusions about this PaR and *Deep Flow* through the epistemologies of *Bodies in...* phenomenology, post-phenomenology, posthumanism and ecofeminism as a *relational embodiment* and *embodied materiality*.

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<sup>82</sup> The entire method and score for *doing* a practice of *Deep Flow* is found in the portfolio (33-37).

## CHAPTER 7

### DISCUSSIONS AND CONCLUSIONS

This final chapter is a discussion of and reaches some conclusions about the main finding, *Deep Flow* and *tentacular worlding*, that facilitated methods to *look inwardly*, challenging ocularcentric *dance-tech* practice that *looks outwardly*. This chapter is the *know-what* part of the PaR, derived from *cat's cradling*, *know-that* and *know-how* that elicited the findings, the emergent states of *withdrawing*, *expanding*, *formlessness*, *immersion* and *fusion* that were experienced in states of *Deep Flow*.

The discussion starts with a review of the rationale after which the findings from Chapter six are considered in relation to the epistemologies, found in chapters two, three and four that are *Bodies in...* phenomenology, dance practice, performance, and embodied technologies. Some conclusions are reached about *Deep Flow* arising from a *relational embodiment*, bringing about an *embodied materiality*. Reflective and reflexive notes about the PaR journey follows, with a short discussion about potential future research and the development of *Deep Flow* in Sweden and Denmark. The chapter concludes with some final thoughts about *Deep Flow* in a more poetic light.

#### 7.1 The rationale for the studies

The rationale for the studies was to challenge *dance-tech* practices with ocularcentric bias, that project digital media in external environments to which performers respond. These works presented performances using instrumental binary relationships with mediated imagery or sound for an audience's viewership. In response to this an exploration of *dance as experience* rather than the production of an artistic outcome

for an audience was sought. This led to finding experiential and phenomenological methods to explore *looking inwardly*. Using a blindfold, the practitioner eliminated vision that enabled her to focus more on liminal embodied states of experience rather than external visual media and quantification. Furthermore, the rationale was set up to explore how co-constitutions of human and nonhuman technologies and materials, such as an HRM and HRV data may be used to intensify a method of practice from *within*, not *without*. In other words, how to find relations between the human and nonhuman in an ecology of bodily experience, phenomenological methods, and an Embodied Dance practice, *Deep Flow*.

To find out if this rationale could present an original contribution to knowledge, practitioners in the field researching similar performance practices, technologies and ideas were identified and investigated. It was found however, that *dance-tech* performance exploring HRMs and HRV are not paradigmatic and were difficult to trace. Out of the three case studies that were selected, only one *dance-tech* work, *Emovere* (2015), explored the use of HRV to initiate interactive systems and mediations, whereas *Human Sensor* (2016) and *PULse 03* (2014-5) made use of heart and breathing rate only. This remiss substantiated that the rationale for this PaR using HRV and an embodied practice, could provide an argument for *looking inwardly* to deliver an original contribution to knowledge in the field.

After examining the three case studies it was found that they made the *invisible visible* by using biosensor and visualising technologies instrumentally. Through interactive interfaces, the performers and participants responded to things external to their bodies such as urban environments, a *digital-Other* or a biorelational feedback system. These

became activated by the performer's *intentionality*, physiological responses, agency, competition with the self or emotion, and resulted in visual or sonic projections in external media environments. In addition, *one-to-one* mapping techniques produced causal relations between bodies, interactive technologies, representations, and mediations. These findings suggested that an ocularcentric bias through *one-to-one mapping* had occurred, as all three practices explored some form of feedback, mainly reliant on the visual senses. Some of the creators attempted to counteract this phenomenon. This is discussed below.

In case study one, *Human Sensor* (2016), the dancers became sensors, visualising the state of pollution, for audiences to see. It was concluded that the work had more meaning for the audience than the performers, as they saw a representation of the polluted air through visual mediation. In case study two, *PULse 03* (2014-5), goal-oriented practices and interactive software used a participant's HR to signify success or failure rates in a game using a point scoring system. Despite Moore's claim that the work explored subjectivity, agency, and biosensor technology as *bleeding* into each other, it nevertheless resulted in causal relations with technology, as the control of HR enabled the control of external mediated images. The scoring system relied on the visual senses, agency of the participant and the quantification of their physiological responses. This became the main aim of the performances. In case study three, *Emovere* (2015) attempted to avoid this form of causality by using algorithms to randomise predictable responses of the interactive computer software. This was a way to represent human behavioural responses that are more unpredictable than the binary ones found in interactive software systems. However, as the biorelational feedback system seemed to be the main focus of the work, the performers engaged

in exaggerated gestural and effector patterns of emotion to activate this unpredictability. This divested the performer and audience of a deeper understanding of how authentic emotions originate in miniscule changes of HRV in relation to the *Lifeworld* of the performer.

Unquestionably, in all three case studies the embodied experiences of the performers and participants were involved in making the *invisible visible*, as one cannot escape experiencing one's *Lifeworld* nor one's *Körper* and *Leib*. However, the performer's subjective *felt-sense*, or bodily experiences were not primarily focused on before engaging with, activating, or interacting with the interactive software. In addition, postphenomenological relations with HRMs or biosensors were not fully considered in relation to heart rate or HRV, and to what extent these interactions have on one's *Lifeworld*. Rather, *intentionality*, agency, visual and aural perceptions were used to elicit meaning, by *looking outwardly* to facilitate interactions with external mediations. Guided by this, bodies and physiological reactions were used instrumentally to manifest digital representations in external environments, that occurred through technological processes of quantification, gamification, compression, and *one-to-one mapping* techniques. Processes such as these created approximations of bodily experiences via representational imagery and reinforced Cartesian dualisms of *inner* and *outer*, *subject* and *object*, *self* and *other*, forming a closed causal loop. These dualisms overlooked the vast storehouse of lived bodily experiences that lies in the heart of every performer, indeed everyone.

Overall, the case studies revealed that the methods of practice, biosensor technologies and interactive designs failed to adequately explore the invisible *felt-*

sense, the tacit, subjective experiences and the *Lifeworld* of the performers. Nor did the performers explore this within themselves first, as presumably this was not the aim of the projects. The performers seemed to have not fully explored experiential states of embodiment, how the *Körper* and *Leib* are *chiasmically* engaged with the world and technology and how a method of practice using biosensor technology and HRV may investigate this entwinement more thoroughly.

This PaR therefore set out to explore alternative phenomenological methods and methodologies to overcome these issues, to challenge ocularcentric practice and to research the inner *felt-sense* in relation to HRV, by eliminating visibility. Through these considerations the rationale became clear; how to discover relations between dance, biosensor technology, lived experience and embodied materials of the human and non-humankind, by *looking inwardly*.

## **7.2 Bodies of knowledge in the findings**

This section turns to a discussion of the studies and the findings namely, *withdrawing*, *expanding*, *formlessness*, *immersion*, and *fusion* in relation to the aims of each study. It also discusses how the *bodies of knowledge*, found in philosophy, Embodied Dance practice, Performance Technology and Embodied Technology, support the findings. These findings were used to create a novel method of dance practice and to create new knowledge in the field. This is discussed below.

### **7.2.1 A segue before study one**

Before beginning study one, a few *improvisations* and meditations took place in a dance studio to find a method of practice that would lead to a one-minute choreographed dance sequence. *Improvisations* were conducted whilst I sat on a gym

ball, with eyes closed, using deep diaphragmatic breathing. No biosensors were used in these initial experiments. The methods of practice focused on *dwelling, listening, formlessness* and *flow*. Becoming more mindful of these practices and *improvisations* the movements of my body and thought processes slowed down considerably. The gym ball provided a sensation of floating and released extraneous tension in my body. As soon as this occurred, my body felt softer, lighter and the states of mindfulness and embodiment were amplified, as no significant thought processes superseded my lived experience of the *improvisation*. The most significant findings of this *improvisation* were the sensations of *flow* and the calm in my *Lifeworld*.<sup>83</sup>

### **7.2.2 *Withdrawing and expanding in study one***

Study one asked how accelerometer technology could be used in dance practice to understand the lived experience of *affordances* of different environments and how they affect one's *Lifeworld*. The findings, *withdrawing* and *expanding*, were analysed through the notion of *embodiment*, and the *chiasmic* relations of *Körper* and *Leib* responding to ways of *being-in-a-world*.

The two selected locations and their *affordances*, the Top of Tay Road Bridge, and the office in the Vision Building, affected my *Körper, Body Schema* and *Leib* differently. They intensified how one experiences the *chiasmus* differently, based on the context of the experience, and its *affordances* that involves being in touch with the *flesh of the world*, with subjectivity being interwoven in this *fleshiness*.

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<sup>83</sup> This is described in the transcriptions found in the portfolio (p. 6).

On the Top of Tay Road Bridge, my *Körper* and *Body Schema* were foregrounded and became more explicit; the *affordances* of the cold, traffic and noise emphasised my corporeality and sensorimotor functions. Sensations of *flow* diminished and were replaced by feelings of being scattered and disengaged from the experiences of the location. Physiologically and emotionally, there was a *withdrawal* from the context or *affordances* of the cold and noise, forcing a literal contraction of my body. As a result of this contraction and *withdrawal*, the spatiotemporal dimensions of my performance were altered and performed faster than the requisite one minute.

My subjective embodied experience or *Leib* was also experienced as *withdrawing*, attempting to avoid of the challenging affordances. The noise and cold affected my nervous system to such an extent that they affected my mood and emotion. My lived experience became so attuned to the damp, cold and noise, that the emotions of irritability and impatience arose. This amplified bodily experiences of what was happening inside and outside my body, a binary positioning of being a subject *in-the-world* yet feeling separate from the world. The perception of my *Körper* became amplified, as if an object, a disembodied material entity in the world trying to overcome the *affordances* confronting my *Body Schema*, proprioceptive and sensorimotor systems. This was communicated through my CNS, and my bodily senses, most particularly the sense of touch, that reinforced my subjective experiences of my *Körper withdrawing*. Through this my *Körper*, my subjective perception and experience of it, become more explicit, as if my *Leib* was withdrawing with my *Körper*.

However quite the opposite occurred in the Vision Building. Here the experience of *expanding* through *Körper* and *Leib* occurred with the feeling of being immersed in a

warm calm space. These *affordances* enhanced states of *flow* and *dwelling* in my lived experience of the dance that entwined *chiasmically* with the environment. My skin no longer felt cold nor a barrier to fight the cold. Rather it felt porous, and my subjectivity *felt like* I was extending outwardly through this porosity, *into* the world becoming part of it, entwining with it. This enhanced the methods of *dwelling* and *listening* to the *mores* of experience. A state of calm, well-being and *flow* therefore increased.

My *Leib*, was experienced through my entire body that moved effortlessly, with my subjective experience fully immersed within this harmonious state of *flow*. My body, my perceptive subjective experience and the location also seemed to exist in states of *flow*. This dynamic emergent state was experienced as a *self-world*, expanding *simultaneously*, not just the *self* and body expanding into the world, but of *self-world* expanding together. With this experience, time and space slowed down, a synergistic *flow* of time and lived was experienced as *fusing with the environment* and *expanding* with the world.

*Withdrawing* and *expanding* are consequently descriptive approximations of what this *flow* felt like, in different environments and their *affordances*. These words can merely approximate what it felt like to be immersed in *chiasmic* and reversible relationships with the *flesh* of the world. They can never be fully disclosed, how this feels, as one is always sliding across the objective and subjective positions, through multiple *felt-sense* experiences. This makes one constantly shift across states of perception and embodiment that enfold within oneself, across others and the world.

These experiences were perceived as *my mind being on a holiday*, my body fusing *with the environment* free from time constraints and linear thought processes. This gave me an overwhelming sense of *well-being and calm*, a focused state of mind with a feeling of euphoria, previously experienced in the *Full Drop* meditation. These findings made me think that my HR may have been affected. When Seeley, suggested that I use a HRM instead of an accelerometer, to measure HRV, I began to explore how HRV may be linked to the findings of *withdrawing* and *expanding*. An HRM was then adopted in the method of quantitative data collection, replacing the accelerometer, to measure HRV in relation to states of calm and *flow* in study two.

### **7.2.3 Dwelling and formlessness in study two**

Study two used an HRM to discover if, when embodied, it could expand the lived experience of a meditative Embodied Dance practice and the notion of *looking inwardly*. The aims were to explore the methods of *dwelling*, the *Full Drop* and *fascia release*. This resulted in the Embodied Dance practice *Deep Flow*, that attempted find *tentacular* relations between the methods of practice and the HRV data that was extruded by the HRM. It was also an attempt to explore how HRM's fulfil all four of Ihde's (2015) human-technology relations.

Study two, however, failed to deliver any HRV data as the HRM (Polar M430) could not read HRV, the online apps constantly disconnected, and I failed to use the HRV function on the replacement HRM (Polar V800) correctly. This instilled a lack of confidence in the method of biometric measuring. From a postphenomenological perspective, Ihde's four human-technology relations failed to materialise due to the above problems. In other words, the HRM was not fully *incorporated* and *embodied*

and they did not become *perceptually transparent*. The *hermeneutic relations* involving the reading and interpretation of biometric data were not performed as the HRM was measuring HR and not HRV. *Alterity relations* did not develop as incorrect equipment was used and could not provide the feedback to affect my *Lifeworld*, and finally *background relations* with the technological were never formed, as the online site, Polar Flow, using Bluetooth, Wi-Fi, and the iPhone, continually disconnected. The failure of these technological relations instead highlighted my *Body Schema* and *Körper* and not my possible embodied relations with them. Instead of the HRM becoming, *perceptually transparent*, *embodied* and *incorporated* into my *Lifeworld*, it became foregrounded. This significantly hindered my focus on *Deep Flow* and the *incorporation* of technology into the PaR praxis. The accompanying frustration that I experienced, affected my stress levels, my *Lifeworld*, interfered with my investigation of *dwelling* in the methods of *Deep Flow* to such an extent, that I eventually removed the HRM. In addition, the many stages of the research method induced stress. It became evident that the many data collection methods needed to be simplified so that nothing external to the practice of *Deep Flow* could interfere with the state of *flow* as it requires a mental and emotional state of quietude and deep inner *listening*. These developments made me realise that the four relations with the HRM and the correct quantitative data collection methods were crucial to the development of a state of *Deep Flow*.

Paradoxically, with the abandonment of the HRM in this study and the many data collection methods, the state of *formlessness* in the practice developed and allowed me to focus more deeply on the phenomenological aspects of *Deep Flow*. This was an emergent transitional process that developed slowly and was achieved by using

internal visualisations of *melting the bones*, *listening* to the *felt-sense*, slowing down and using *fascia release* found in the *Full Drop*. The *latter* was explored as a whole-body experience amplified by the experiences of feeling *formless*. When this occurred, states of tension were released that in turn induced the feeling of *flow* between the bodily and psychophysical systems. This was experientially and internally visualised throughout my entire body, fed by the *multiple sense modalities* situated within my body. *Formlessness* was felt as a sensory experience of being immersed in the world, within a flux of diverse materials that are in a continual emergent state of mixing, distilling, coagulating, dispersing, evaporating, and precipitating, undergoing continual regeneration and transformation (Ingold, 2011). This reflects Merleau-Ponty's *gestalt theory*, and the *chiasmus* reflecting *body-self-world* experiences and states of awareness that are transitional (Arteaga, 2017). In addition, *formlessness* was understood as *Body Image* overriding the senses of the *Body Schema*, where the proprioceptive and sensorimotor systems became perceptually transparent or *implicit* (Gallagher, 2005). Here the *Body Image* overrode the sensorimotor and physiological sensations provided by the *Body Schema* that dancers are otherwise highly aware of.

The state of *formlessness*, without the HRM, also enabled me to focus on my fascia or the *tissue of connectivity* that is woven throughout one's entire body. This is connected to the ANS that controls states of tension in the fascia, affects muscular tension, blood circulation, hormonal balance, stress, emotions, thought processes as well as the human behaviour of a person (Bois, 2020). Fascia also connects to the vagus nerve and regulates the PSNS. When stimulated by calm lived experiences the PSNS slows the heart and breathing rate, that triggers the rest and digest system (McCraty, 2016; Seymour, 2017; Seladi-Schulman, 2018; Polar, 2020). Consequently,

when the fascia is released, the practitioner experiences a state of *Deep Flow*, HR slows and HRV increases. In other words, as states of tension in the body are diminished and HR is slowed down by the practice of *Deep Flow*, the PSNS increases HRV. This physiological effect is felt as being *formless* and stimulates feelings of well-being.

Viewed phenomenologically, *formlessness* may be understood as being derived from states of *Deep Flow* with relations to fascia release and higher HRV. When this occurs, one can focus on, visualise and listen to the phenomena of lived experience, the *felt-sense* and the *mores* of feeling *formless*. The state of *formlessness* achieved through these experimental methods of *Deep Flow* in study two was carried over into the aims of study three and developed further.

#### **7.2.4 Formlessness, immersion, and fusion in study three**

The phenomenological findings of study three were the *felt* and *sensory experiences* of being *formlessness*, *immersion*, and *fusion*. These are the final experiential components found through *Deep Flow* and *dwelling* within an ecology or *tentacular worlding* of the human and non-human. The aims of study three asked how Embodied Dance using a HRM may assist in finding relations between HRV, the *felt-sense*, lived experience and human and nonhuman materials. The findings, *formlessness*, *immersion*, and *fusion* are an extension of the findings *withdrawing* and *expanding* found in study one. All these experiences relate to the practice of *Deep Flow*. They may be interpreted using the notion of the *chiasmus*, the entangling and entwining of *body-self-technology-materials-world*, a notion that is less reliant on anatomical and

proprioceptive accounts of perception but more on post phenomenological and ecofeminist posthuman ones.

In study three the findings showed that my body felt inseparable from the world. There were feelings of my body intermingling, sensing, and touching the world, and where internal visualisations occurred that I had not seen nor experienced before. This made me feel like I was caught up in the world and the world was caught up in me. Here my body and lived experience of the *tentacular worlding* merged as a place of mutual, overlapping, and reversible exchange, fed by the multiple sense modalities situated in my body. In *Deep Flow*, my body, the *things* sensed, and internally visualised became interchangeable as the boundaries between the inner visual experiences and the haptic began to break down. This however made me question my subjectivity.

Using Ihde's postphenomenological perspective, I found that my subjectivity was realised in the *inter-relational* and *self-reflexive* relations that I had with the technological and embodied aspects of the practice. In these relations I never felt that I lost a sense of my own subjectivity. My subjectivity was realised through my relations with my practice and the HRM. This confirmed Ihde's *I-technology-world* definition. In addition, when in and after *Deep Flow*, I found that I had fulfilled all four of Ihde's human-technology relations: the HRM in *Deep Flow* became *embodied*, the data was *hermeneutically interpreted*, it was a *quasi-other* as it reflected data back at me that concerned my embodied state of being and it performed *background relations* during my performance of *Deep Flow*, as it was not explicitly experienced.

These *inter-relations* with the HRM demonstrated that my body, subjectivity, and technology were entwined in a *self-reflexive* practice and had the ability to transform and shape my experiences of *Deep Flow*. Through this I came to realise, that all human and nonhuman objects, human and nonhuman materials, the self, and technology are in *mutual relation* to each other, rather than separate entities. Additionally, the reading and interpretation of biometric data reported on my HRV also transformed and shaped my further sessions of *Deep Flow*.

The data, read and interpreted reflexively after a session of *Deep Flow*, made me understand the relations between my HRV scores, PSNS, fascia, states of *flow*, meditation and breathing. Most importantly the higher HRV scores made me realise that the higher the score the better my state of flow state or if lower, that I needed to work harder on the methods of practice. The reading and interpretation of HRV data then became an essential element of the *Deep Flow* method as it informed me about my HRV and PSNS responding to the methods of practice. One could argue that feelings of well-being and calm should be enough to inform the practitioner that a state of *Deep Flow* state has been reached. However, as HRV is impossible to detect using one's own bodily senses, the practitioner needs a HRM to inform them that rates of HRV were elevated through the practice. The reading of this data therefore instils a sense of trust in the methods of practice, *Deep Flow*.

From a postphenomenological perspective, the embodied and perceptually transparent HRM in *Deep Flow* afforded me ways of experiencing *polymorphic* ways of seeing myself in different data formats, such as data, graphical images, or texts. This gave me an ability *read* rather than *see* myself through *second sight imaging*

techniques. This reading is interpreted and embodied after *Deep Flow* challenging ways of knowing through ocularcentrism. One is not seeing and reacting to data in real-time whilst performing, as in the case studies, rather, one reads and interprets oneself as being situated and reflected within the data after a session of *Deep Flow*. This shifts *monomorphic* real-time visual representation and mediation that uses mapping techniques between the dancer and an interactive computer system, to *reading* the self in data or nonhuman materials. The reading of this biofeedback is a *self-reflexive* practice informing the practitioner about the embodied state of *flow* and its relation to HRV. This is reflected upon by the practitioner and informs the next practice session of *Deep Flow*. Consequently, relations with a HRM and *second sight imaging* provides ways of reading the *invisible* aspects of the body, such as HRV, in relation to *Deep Flow*, without reverting to real-time external projected visual imagery, feedback or representation. This supports the practice of *looking inwardly* on the *felt-sense* without the need to *look outwardly*, to validate human experience.

The states of being *formless*, *immersion* and *fusion* in *Deep Flow*, also reflect a post-anthropocentric, ecofeminism, as relationships with HRMs technologies shape new forms of subjectivity (Braidotti, 2013). These relationships have reached higher degrees of intimacy as a HRM intrudes our CNS and extrudes very fine measurements of HRV that are personal. Intrusions replace external visual modes of representation with modes of simulation that are sensorial as well as neuronal (Braidotti, 2013). This realises relational powers between subjects and materials that are no longer cast in a dualistic frame as they share bonds with the human and nonhuman merging with “one’s technologically mediated planetary environment” (Ibid., 92).

### **7.3 *Deep Flow*: a relational embodiment**

This section describes *Deep Flow* as embodying interconnections and embodied relations between the deeper recesses of the body, the pre-reflective and the technological through the methods of Embodied Dance practice, *movement hieroglyphs*, verbal translations, drawings, or paintings and HRV data. All these entities and interactions are embodied, co-equal, complementary and *cat's cradled* into being to become relational, co-dependent and co-constituted. They are viewed as being set by or within a "perspective of relationism" (Overton, 2008, p. 1). *Deep Flow* may then be considered as reflecting a *relational embodiment*, an embodiment of the human and nonhuman in which "natures, cultures, subjects and objects do not pre-exist their intertwined worldings" (Haraway 2016, p. 13) and relations. *Relational embodiment* in *Deep Flow*, is a synthesis of the biological, the phenomenological, then subjective, the imagined, the drawn, the languaged, and the technological, are relational entities that together constitute a whole. The biological, meaning HRV and the CNS, are included in this view they are always dynamically active within our *Lifeworld*, environments, practices, and technologies. In this sense, a *relational embodiment* is not a singular entity but may be defined as a relational, dynamic process which is *chiasmically* enfolded with the *flesh of the world* and the technologies we use in our *Lifeworld* and *worlding* of the human and nonhuman.

A *relational embodiment* in *Deep Flow* is also dependent on *relational thinking* (Ingold, 2000) where the mind and body exist in relation to each other, situated within the cultural, the anthropological, and environmental world in which they exist. Here the body, mind and world are not separate but exist through active and relational engagements with each other. *Relational thinking* thereby transforms and collapses Cartesian and Rationalist traditions that used mind-body, subject-object, inside-

outside binaries to define human existence and experience. Rather, *relational thinking* redefines those binaries relations through *embodied interactions* between self, world, and technologies. This is reflected in *Deep Flow* where the relations between *Körper*, states of being in *flow*, HRV, the PSNS and feelings of well-being are forged.

*Deep Flow* thereby unveils a *relational embodiment* that creates a synthesis of the physical and phenomenological, the subjective and the technological, the human and nonhuman, that flow and entangle with each other in a relational ontological way of being and knowing. This could be viewed as experiencing *porosity*, where the blurring of boundaries between these entities occur to such an extent that it becomes impossible to define any clear distinctions between things and events (Blackman 2008). *Deep Flow* may then be thought of as *embodied relations* of the technological, the biometric, the experiential, the biological, the corporeal, the subjective and the *worlding* in which it is experienced.

#### **7.4 Deep Flow: an embodied materiality**

This section describes how interactions with human and nonhuman materials in *Deep Flow* generate an *embodied materiality*. The definition of *materiality* used here, is defined as being the quality of the experience of different materials. These are qualified as being human or nonhuman, tangible, or intangible, visible or invisible, such as biosensors or dance practice, HRV or data, drawings, or visualisations. Encounters with these variable materials in *Deep Flow* occur through *embodied interactions* and leave remarkable effects on the practitioner's embodied states of being. These are described below.

Using MET, *embodied materiality*, may be described as emerging through a *dance of agency* (Aydin *et al.*, 2018), a hybrid of human and nonhuman materials, practices, and engagements, that is performed without the need for mental representation or *intentionality*. In this *dance of agency*, the artist and materials interact with each other, and through co-creation create an *embodied materiality*. One form of *embodied materiality* is dance studio practice (Mills, 2009) or the *know-how* of the dance practitioner, that shapes her creation of a dance practice. The *know-how* of *Deep Flow* is intangible, but also includes the more tangible aspects of the practice such as a HRM, the drawings and tools used. Another form of *embodied materiality* is illustrated by the potter working with her hands, clay, and wheel, where her body, agentic actions, and clay merge. Her experience of agency is formed in her engagement with the tangible materials. It is also found in the actions of HCI designers who work intuitively with materials that are digital (or intangible) and analogue (or tangible) materials. Here, these materials “talk back to their hands and thoughts” (Kozel, 2017, p. 109) that shape their design processes. Finally *embodied materiality* is witnessed in our increasingly technological and bio-mediated world, where technologies such as HRMs, Wi-Fi, wearables and the *IOT* are becoming more invisible, ubiquitous, and intangible that Aydin *et al.* (2018) call ATE’s. In all these examples a *dance of agency* between differing materials and practices generates *embodied materiality*, a *tentacular* practice that *cat’s cradles* tangible and intangible materials, thought, action and embodied practice, that are embodied and experienced at differing levels of intensity and resonance in the body.

Other material engagements in *Deep Flow* occur when *embodied interactions* with HRMS, drawings or paintings occur through touching, viewing, and interpreting them. Upon viewing an image, the materiality of a drawing or painting is extended beyond its physical matter when the work's material existence is embodied by the practitioner. This material embodiment provokes sensations such as smoothness, or discordancy in the body. Upon viewing a painting or a *movement hieroglyph* for example, one may experience the quality of the drawn materials, the textures or colours as being bodily expressions of the practitioner that affected their *Lifeworld* whilst in *Deep Flow*. This form of *embodied materiality* realises a transformation of visual materials, from the visible to invisible, that leave traces of resonance in the body.

On the other hand, when using an HRM in *Deep Flow* the tangible materiality of the HRM is also extended beyond its physical matter when it is embodied by the practitioner. This relationship occurs through the sense of touch. During the early stages of this PaR when exploring the method of practice and upon realising that the devices were not working, the HRM remained as a material and tangible object. They had not become embodied into the *Body Schema* and *Leib* and because of this had not become, *perceptually* transparent. They remained explicit in the practitioner's awareness as they were literally felt through the sense of touch as being attached to the body. However, once they were embodied in the practice of *Deep Flow*, the HRMs became *perceptually* transparent. The practitioner was no longer aware of feeling them attached to the skin and the body, as they had become embodied into the practitioner's *Body Schema* and lived experience of *Deep Flow*.

*Embodied materiality* is also discernible as imagined states of being and experience. These are manifested by implicit sense modalities and perceptions *tentacularly*

crossing over in the embodied mind. These are felt in the body and appear in the imagination, as intangible materials with which she works yet become tangible when she draws them in *movement hieroglyphs*, and *drawings*. *Embodied materiality* then, emerges through the practice of *Deep Flow* as the practitioner embodies human and nonhuman materials through embodied interactions that transforms materials presented to the practitioner in *Deep Flow*.

*Embodied materiality* also occurs through the invisible action of *extrusions*, the reading and interpretation of HRV data. For example, HRV is a material or physiological response to *Deep Flow*, yet the *extruding* actions of the device as well as the ECG, Wi-Fi and Bluetooth technologies are perceptually transparent, and invisible to the naked eye. However, once a session of *Deep Flow* has been completed, the HRM becomes *tangible* again as the practitioner becomes aware of it through the senses of touch and sight. An opposite transformation occurs when the biometric data is printed out on a piece of A4 paper. When interpreted by the practitioner, the data becomes embodied and immaterial or intangible again. When this occurs, the embodied self and data become co-constituted as a form of materiality within the practitioner.

These forms of embodying differing materials, practices and technologies does not mean losing the presence of the human body nor subjectivity. In *Deep Flow* the body is not disintegrating, dissolving into matter or the digital, as one's subjectivity is always present. Rather *embodied materiality* occurs in a *sympoietic* system that brings together, the body, subjectivity, *flow*, *felt-sense* experiences, HRV, the PSNS, fascia, and *embodied interactions* with the HRM. This results in the experiences of *withdrawing*, *expanding*, *formlessness*, *immersion*, and *fusion* that exist in states of relational and "transitional awareness" (Arteaga, 2017, p. 260). *Embodied materiality*

therefore emerges through *embodied interactions* with tangible and intangible objects, materials and technologies, states of embodiment and the *tentacular worlding* in which it is practised. One could then define *Deep Flow* as an *embodied materiality* occurring through *embodied* and *material interactions*, that are tangible and intangible, visible and invisible, human and nonhuman.

In conclusion, *embodied materiality* provides a deeper understanding of *Deep Flow* as being a phenomenological and aesthetic practice rather than an artistic one. It is framed within a *tentacular worlding* of human and nonhuman materials that are only experienced by the practitioner and not performed for audience's viewership. This challenges current ocularcentric *dance-tech* practice mediating and visualising invisible events in the body *outwardly*. *Deep Flow* rather, chooses to *look inwardly*, to experience *embodied materialities* of the human and nonhuman as a means to get closer to the *felt-sense*, and bodily experiences as a form of *knowing* from the body.

## **7.5 A few reflections on the research process**

This is an account of the PaR process, the praxis, *tentacular worlding*, that used reflective and reflexive methods to better understand the embodied research process *from the inside* (Alvesson and Sköldberg, 2009). Reflective practice is where the researcher reflects on what they have learnt and what it means to them. It is about observing, noting what occurred and not being critical. Reflexivity, however, is about becoming more critical, where the researcher considers the implications of what they have learnt in the wider context or disciplines within which they have researched. The practice of reflexivity brings together theory and critical reflection, noting why the researcher responded in a certain way, what caused those responses and how that shaped the outcome (Alvesson and Sköldberg 2009). This also includes the

researcher's interpretation all the knowledge sets that they have learned from *within* a research practice. This section therefore starts with the subjective voice reflecting on the studies and moves to a reflexive analysis of the PaR, as it telescopes outwardly to critically map the systems of knowledge used, how they relate to each other in a wider context and how this shaped the main finding and contribution to knowledge, *Deep Flow*.

Overall, the thesis notes reflectively and reflexively, what it felt like to conduct research *looking inwardly*, dissolving the notion of knowledge being created *outside* the subject, which is implausible, as the research began from a phenomenological perspective, where subjective experience is found in relation to the state of *Deep Flow*. Knowledge created by *Deep Flow* thereby collapsed binary notions of knowledge *out there* and *in here*. Rather, the two co-exist and feed into each other, supporting the overall research aims of this research, *looking inwardly*.

Reflectively, the PaR methodology, methods of practice, multi-modal data collection methods and data analysis methods in each study were experienced differently. The process of finding the method of dance practice, *Deep Flow*, was a frustrating, exhausting yet exhilarating nonlinear process, with some stops and starts, failures and successes. For example, in the pilot studies, I very quickly realised the methods of Somatic Dance practice, drawings and quantitative methods produced visualisations and data were not reflective of embodied and subjective experience. During that stage, I serendipitously encountered an Embodied Dance practice, the *Full Drop*. After this encounter, I inculcated it into my methods of practice and research as it not only transformed my understanding of Somatic Dance practice, but also my ways of *being in the world*. The *Full Drop* experience was so powerful and impactful that I decided to

develop my own interpretation of it and explore it using other embodied and phenomenological methods. *Dropping into the body* (Guðjónsdóttir, 2017) in the *Full Drop* shifted my research from exploring Somatic Dance kinaesthetically to exploring *states of being*, mindfulness, meditation and states of *flow* in movement. These provide invisible yet sensorial and subjective states of *being*, states that Embodied Dance practice explores.

This led to study one where I used multi-modal methods and an accelerometer to measure the impact of *affordances* qualitatively and quantitatively on my physical and lived experience of a location that would be reflected in the velocity, speed, and direction of my moving body. Despite the accelerometer proving impracticable and the biometric measurements unusable, I continued to develop the method of practice. This deepened my experiences of being in *flow* and led to the use of a HRM, which is better equipped to measure biological responses in relation to a phenomenological method of practice. In study two, I decided to concentrate on my Embodied Dance practice, *knowing how* and *knowing that*, as the many data collection methods and incorrect use of the HRM proved stressful, overwhelming, and affected my state of *flow*. Ironically, by not using technology, this led me to develop the method of practice, *Deep Flow*. By study three the practice of *Deep Flow* was formalised, and the methods of data collection methods improved.

Conversely, throughout the studies the data analytic phases proved challenging as I had never analysed a dance practice using data analytic methods before. By study three however, through perseverance and determination, I assumed an objective position as researcher, that enabled me to analyse, compare and synthesise the

findings from *Deep Flow*. Overall, the methods of practice, data collection and analytic phases produced *Deep Flow*, a novel practice in the field and an original contribution to the field of knowledge that entwines the disciplines of Embodied Dance, phenomenology, and *dance-tech* practice.

Reflexively, the creation of the conceptual framework and praxis, *tentacular worlding*, emerged choreographically. Having choreographed many dance works in the past, the process of *tentacular worlding* reflected how I gathered a trope of concepts, epistemologies, and practices within a relational framework. Some concepts remained as they related to each other, whereas some were discarded. Through this relational ontological framework, I created a praxis, *tentacular worlding*, to *look inwardly* at dance practice *as experience*. This produced relations between different knowledge sets, creating liquid knowledge between the disciplines of dance, the social sciences and philosophy. Furthermore, the practice of *Deep Flow* may be considered as metaphorically opening the “black boxes” (Latour, 2005) of biomedical technology to not only quantify the body, but also to explore experiential aspects of lived experience. In this way *Deep Flow* crosses the divide between the medical and scientific, the biomedical and artistic and by doing so uses the HRM *variationally* (Ihde, 2010). In this way self-tracking practices that result in the *Quantified Self* found in Metric Culture are challenged (Ajana, 2018). Instead of revering the quantification of *self*, *Deep Flow* uses biometrics to reinforce phenomenological states of *flow* that induce states of well-being and instils a return to embodied experience and a trust of the *felt-sense*. *Deep Flow* therefore alters a dancer’s perception of themselves while using biosensor technology and to improve their sense of well-being. The practice of *Deep Flow* may also be extended to a wider academic and artistic community, enabling them to

understand and explore relations of self, technology and the world as well as their embodied *relations* with the human and non-human.

The development of *Deep Flow* and future research projects to extend this PaR study, are being sought in Sweden and Denmark. The *Conspiracy Archives* collaboration with Kozel, Guðjónsdóttir, and Lim, has transformed into *Bodily Interfaces* to explore bodies interfacing with Screendance and AI-AR technology. The collaboration starts in Malmö, August 2021 and ends with a presentation in Berlin February 2022. I shall be collaborating further with Dr Daniel Spikol from the University of Copenhagen to further explore *Deep Flow*. This may be researched further with Henrik Kaare Nielsen from Aarhus University, working in the field of aesthetics and phenomenology. The possibility of a Postdoctoral position is also being investigated. I would like to explore *Deep Flow* with the work of Höök, from the KTH Royal Institute of Technology in Stockholm, who uses Somaesthetics<sup>84</sup> and the Feldenkrais Technique for the design of HCI. In June 2022, I am presenting *Deep Flow* for the 15<sup>th</sup> Nordic Forum for Dance Research Conference, in Copenhagen. Alongside this I intend holding *Deep Flow* workshops for dancers in Scandinavia. This will provide networking opportunities with Scandinavian *dance-tech* practitioners and researchers.

## **7.6 Some final thoughts about *Deep Flow***

*Deep Flow* challenged ocularcentrism in *dance-tech* practice, performed in an age that is obsessed and trapped in its “own present spectacle”, “narcissistic parochialism”

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<sup>84</sup> Somaesthetics is an interdisciplinary field of inquiry aimed at promoting and integrating theoretical, empirical and practical disciplines related to the Feldenkrais Technique, bodily perception, experience, performance and aesthetic appreciation.

(Zylinska, 2017, p. 17) through the *Digital Other*. The practice of *Deep Flow* re-addresses these issues by *looking inwardly*, to invoke the more earthy organic aspects of a performer's *Lifeworld*, encouraging the practitioner to extend themselves into the wider environmental world. This shifts discourses of *body-mind-visual practice* to interrelationships of *body-mind-environment* as *body-mind-world* are inextricably linked (Fraleigh, 2018). Overall, this could provide a radical rethinking of the dominance of ocularcentrism found in Western performance practice.

The Case studies showed that they were more concerned with making the *invisible visible* by privileging *intentionality* and *visuality*. *Deep Flow*, on the other hand, privileges the *felt-sense* and eliminates *visuality* by exploring sensing and moving as inseparable experiences (Sheets-Johnstone, 1966) without the use of sight. This collapses dualistic and binary relationships of the visible and invisible, inner and outer, subjective and objective, and creates *states of being* and interiority that are primary and *felt*. In *Deep Flow* the practitioner explores these experiences through the implicit *felt-sense*, as she is unable to distinguish between what is seen and not seen. The practice envelops binary systems through the actions of the *tentacular worlding*, that *cat's cradles* relations between human and nonhuman materials, forging *embodied interactions* between them.

*Deep Flow* within a *tentacular worlding* may be seen to invoke a *Chthulucenic turn*, one that acknowledges and encourages felt bodily experience to rise within the praxis. This *turn* embraces Haraway's (2016) ecofeminist posthumanism to challenge the prevailing legacy left by the Anthropocene and Capitalocene, chiefly Metric Culture, that exploits human biodata for financial gain. It counters the QS, a self that is driven

and obsessed with self-quantification and objectification in the *Digital-other*. Rather than the *Chthulucenic turn*, acknowledges the more organic earthy life processes within and the world around us. Becoming aware of these entities is fundamentally important to us as human beings, as we are relationally engaged in relentless *tentacular* processes of “becoming with” a world in which “natures, cultures, subjects and objects do not pre-exist their intertwined *worldings*” (Haraway’s, 2016, p. 13). A return to the *felt-sense* through a *sympoietic* embodied practice such as *Deep Flow*, may be a way to reconnect to and trust the *mores* of lived and bodily experiences, our *Chthonic* selves and *tentacular* connections with the nonhuman, something that quantification, representation and objectification cannot capture.

*Deep Flow* reflects a new form of subjectivity that is situated in a *tentacular worlding*, an ecology of the human and nonhuman, that is interconnected with relational linkages, to the viral, the environmental, eco-others and the technological. This forms a transversal or non-hierarchical *sympoietic* system of human and nonhuman entities rather than a hierarchical system with a human taking the lead. Instead, in *Deep Flow* one becomes a relational subject, one that operates across differences but is also internally differentiated (Braidotti, 2013). This view therefore sees *mutual* and *embodied interactions* between humans and materials as being co-constituted in their relations with each other, not driven by ocularcentrism or *one-to-one* mapping systems.

*Deep Flow* then, is a praxis enabling one to *look inwardly* to get in touch with *states of being* and felt experience. It reflects a form of *poiesis*, illuminating and foregrounding subjective experiences of embodied dance, technology, and relations with human and

non-human. It is a *gestalt* that is part phenomenological, part posthuman, part ecofeminist brought into being by *tentacular* actions that *cat's cradles* an ecology of being, thinking and *doing* with technology. This creates relations between *liquid knowledge* sets, biosensor technology and subjective lived experience. Whereas the *movement hieroglyphs*, *figuring-figures*, paintings, and verbal descriptions, part of *doing a Deep Flow*, are phenomenological processes that are needed to understand and illuminate this *liquid knowledge*, embodied states of being, *embodied materiality* and *relational embodiment*.

In an ethico-political sense, this reorientates a performer's visual mastery over things as being the purveyor of unequivocal *truths*. By relinquishing ocularcentrism, the performer needs to trust of their *felt-sense*, and *Lifeworld* experience that are perceptually experienced using multiple senses that occur without clear definition. This may lead the practitioner to a better understanding of themselves not only in their practice, but also in their connection to the world and the relations they have with the nonhuman that de-emphasises human exceptionalism.

Psycho-physically and poetically, *Deep Flow* releases the fascia and in so doing releases hidden voices, implicit experiences and the *Lifeworld* of the practitioner that are tied up or linked to the fascia via the CNS. When the fascia releases and HRV increases, poetic imagery starts to emerge in the mind of the practitioner. Hidden memories, feelings, and sensations start to cross over our earthy bodily sensations. After a while the sensorimotor and kinaesthetic feelings dissipate, and one experiences a *worlding* entirely made up of sensations and imagery. One enters one's own liminal world, that has been withheld possibly by focusing too much on *looking outwardly* and the stress of living in an Anthropocentric world. However, the more one

breathes deeply and slowly that calms the heart that releases the fascia, the longer one remains in this metaphoric imaginary world, the deeper you fall into *Deep Flow*. The experience is a fine and light, without loss of emotion. This is not an unconscious zombie-like state but one where your sense of experiencing is keenly being observed by the *self*. You always know that you are doing an exercise and that the session of *Deep Flow* is temporary and will end. A return to the 'real' world is inevitable, but the return is filled with more knowledge about the inner self and bodily experience. Since it is such a pleasurable and enriching experience the desire to go deeper is always on the horizon.

In conclusion, *Deep Flow* is an Embodied Dance practice that uses *tentacular* multimodal phenomenological methods and a HRM to construct knowledge from a first-person perspective. It finds ways to explore bodily relations between the human and nonhuman, the heart and the *felt sense* within an embodied *worlding*. Through the *felt sense* the practice discovers how humans find new ways of experiencing their interiority in relation to their practice, biosensor technology and the world, embracing the human and non-human. *Deep Flow* above all is an intimate and heart felt experience.

## REFERENCES

- Ajana, B. (ed.) (2018) *Metric Culture: Ontologies of Self-Tracking Practices*. United Kingdom: Emerald Publishing Limited.
- Alvesson, M. and Sköldböck, K. and (2009) *Reflexive Methodology: New Vistas for Qualitative Research* (2<sup>nd</sup> ed.). London: Sage Publications Ltd.
- Arteaga, A. (2017) Researching aesthetically the roots of aesthetics: an enquiry into figure and figuring in: Gansterer, N., Cocker, E. and Greil, M. (eds.) *Choreo-graphic figures: deviations from the line*, First ed. Berlin/Boston: deGruyter Publishers, pp. 255-263.
- Ashworth, P. D. (2006) Seeing oneself as a carer in the activity of caring: Attending to the lifeworld of a person with alzheimer's disease, *International Journal of Qualitative Studies on Health and Well-Being*, 1 (1), pp. 212-225. DOI: 10.1080/17482620600967786.
- Aydin, C., Gonzalez Woge, M. and Verbeek, P. (2018) Technological environmentality: Conceptualizing technology as a mediating milieu, *Philos. Technol*, 32, pp. 321-338. DOI: <https://doi.org/10.1007/s13347-018-0309-3>.
- Baker, C. C. and Sicchio, K. (2017) *Intersecting art and technology in practice: Techne/Technique/Technology*. First ed. New York: Routledge.
- Batson, G. (2009) *Somatic Studies and Dance*. International Association for Dance Medicine and Science.
- Bennett, J. (2010) *Vibrant Matter: a political ecology of things*. Durham and London: Duke University Press.
- Besmer, K. M. (2015) What Robotic Re-embodiment Reveals about Virtual Re-embodiment.: A note on the Extension Thesis, in: Rosenberger, R. and Verbeek, P. (eds.) *Postphenomenological Investigations: Essays on Human-Technology Relations*, Maryland: Lexington Books, pp. 55-72.
- Birringer, J. (1999) Contemporary performance/technology, *Theatre Journal - Project Muse*, 51 (4), pp. 361-381. DOI: 10.1353/tj.1999.0079.
- Birringer, J. (2008) *Performance, Technology & Science*. First ed. New York, New York: PAJ Publications.
- Blackman, L. (2008) *The Body. The Key Concepts*. First ed. New York: Berg. Oxford International Publishers Ltd.
- Bloch, S. (2006) *The Alba of Emotions – Managing emotions through breathing*. Chile: Editiones Ultramarinos PSE.
- Boden, Z. and Eatough, V. (2014) Understanding more fully: A multimodal hermeneutic-phenomenological approach, *Qualitative Research in Psychology*, 11 (2), pp. 160-177. DOI: <http://dx.doi.org/10.1080/14780887.2013.853854>.

- Bois, D. (2020) *Fasciatherapy is an individual-oriented form of physiotherapy*. Available from: <https://www.fascia.be/en/fasciatherapy/history> [Accessed Oct 28, 2020].
- Bolt, B. (2008) *Performative paradigm for the creative arts? working papers in art and design*, 5. Available from: [http://www.herts.ac.uk/data/assets/pdf\\_file/0015/12417/WPIAAD\\_vol5\\_bolt.pdf](http://www.herts.ac.uk/data/assets/pdf_file/0015/12417/WPIAAD_vol5_bolt.pdf) [Accessed 15 June 2017].
- Braidotti, R. (2013) *The posthuman*. First ed. Cambridge: Polity.
- Broadhurst, S., (2012a) Digital Practices: New Writings of the Body in, *Sensualities/Textualities and Technologies: Writings of the Body in 21st Century Performance*. 2<sup>nd</sup> ed. United Kingdom and USA: Palgrave Macmillan.
- Broadhurst, S. (2012b) Merleau-Ponty and Neuroaesthetics: Two approaches to performance and technology, *Digital Creativity*, 23:3-4, pp. 225-238. DOI: <https://doi.org/10.1080/14626268.2012.709941>
- Broadhurst, S. and Machon, J. (eds.) (2012) *Sensualities/Textualities and Technologies: Writings of the Body in 21st Century Performance*. 2<sup>nd</sup> ed. United Kingdom and USA: Palgrave Macmillan.
- Broadhurst, S. and Price, S. (eds.) (2017) *Digital Bodies: Creativity and Technology in the Arts and Humanities*. London: Palgrave Macmillan Limited.
- Cartwright, L. (1995) *Screening the Body: Tracing Medicine's Visual Culture*. Minneapolis: University of Minnesota Press.
- Colebrook, C. (2014) *Death of the Posthuman*. London: Available from: <http://www.doabooks.org/doab?func=fulltext&rid=16374> [Accessed 20 January 2020].
- Cox, G. and Lund, J. (2016) *The Contemporary Condition: Introductory thoughts on contemporaneity and contemporary art*. Online: Available from: <https://www.sternberg-press.com/product/the-contemporary-condition-introductory-thoughts-on-contemporaneity-and-contemporary-art/> [Accessed 28 January 2020].
- Csikszentmihalyi, M. (2004) *Flow, the secret to happiness*. California: Available from: [https://www.ted.com/talks/mihaly\\_csikszentmihalyi\\_flow\\_the\\_secret\\_to\\_happiness?utm\\_campaign=tedsread&utm\\_medium=referral&utm\\_source=tedcomshare](https://www.ted.com/talks/mihaly_csikszentmihalyi_flow_the_secret_to_happiness?utm_campaign=tedsread&utm_medium=referral&utm_source=tedcomshare) [Accessed 28 January 2020].
- Csikszentmihalyi, M. (1990) *Flow: The Psychology of Optimal Experience*. London: HarperCollins Publishers Ltd.
- Deleuze, G. and Guattari, F. (1987) *A Thousand Plateaus Capitalism and Schizophrenia*. Ninth ed. United Kingdom: Bloomsbury Academic.
- Dempster, B. (2000) Sympoietic and autopoietic systems: A new distinction for self-organizing systems. in: *International Society for Systems Studies Annual Conference*, Toronto, July, 2000. Toronto: ISSS.

- Dourish, P. (2001) *Where the Action Is: The Foundations of Embodied Interaction*. Cambridge, MA: MIT Press.
- Eddy, M. (2009) A brief history of somatic practices and dance: Historical development of the field of somatic education and its relationship to dance, *Journal of Dance and Somatic Practices*, 1 (1), pp. 5-27. <https://doi.org/10.1386/jdsp.1.1.5.1>.
- Elite HRV (2019) Online platform. Available from: <https://elitehrv.com/> and the Learning Academy <https://elitehrv.com/academy> [Accessed 16 December 2019].
- Engberg, M., Kozel, S. and Larsen, H., Svarrer (2018) Visual materiality: Crafting a new viscosity in *Design Research Society*, 4 (15), pp. 1762-1774. DOI: 10.21606/dma.2017.534.
- Flusser, V. (1983) *Towards a philosophy of photography*. London: Reaktion Books.
- Fraleigh, S. (2018) *Back to the Dance Itself: Phenomenologies of the body in performance*. Chicago: University of Illinois Press.
- Gallagher, S. (2005) *How the body shapes the mind*. Oxford: Oxford University Press.
- Gansterer, N., Cocker, E. and Greil, M. (eds.) (2017) *Choreo-graphic figures: deviations from the line*. First ed. Berlin/Boston: deGruyter Publishers.
- Gendlin, E. (2003) Beyond postmodernism: From concepts through experiencing in: Frie, R. (ed.) *Understanding Experience: Psychotherapy and Postmodernism*, London: Routledge, pp. 100-115. Available from: [http://www.focusing.org/gendlin/docs/gol\\_2164.html](http://www.focusing.org/gendlin/docs/gol_2164.html) [Accessed 1 April 2017].
- Gibson, J. J. (1986) *The ecological approach to visual perception*. New York, NY: Psychology Press Taylor and Francis Group.
- Gibson, J. J. (2014) The senses considered as perceptual systems, by J. J. Gibson in *Journal of the British Society for Phenomenology*, 2:2, pp. 104-105. Available from: <https://doi.org/10.1080/00071773.1971.11006191>
- Ginslov, J. (2004) Emotional Intelligence and the Actor, June 19, Available from: [http://www.jginslov.com/uploads/2/1/9/5/21959466/jginslov\\_emotional\\_intelligence\\_and\\_the\\_actor\\_2004.pdf](http://www.jginslov.com/uploads/2/1/9/5/21959466/jginslov_emotional_intelligence_and_the_actor_2004.pdf). [Accessed 2 November 2020].
- Ginslov, J. (2009) *The Concrete and the Digital: Emotional and Kinaesthetic Amplification of the Authentic and Digitalised Body in Screendance*. M.Sc. diss., Duncan of Jordanstone College of Art & Design, University of Dundee.
- Gray, C. and Malins, J. (2004) *Visualizing Research: A Guide to the Research Process in Art and Design*. United Kingdom: Routledge.
- Grosz, E. (1994) *Volatile Bodies: Toward a Corporeal Feminism*. Indianapolis: Indiana UP.
- Guðjónsdóttir, M. S., (2019) in Kozel, S., Guðjónsdóttir, M. S., Ginslov, J. and Lim, K. (2019) *Conspiracy Archives a process archive of an archival process*. Available from: <https://nivel.teak.fi/adie/conspiracy-archives/> [Accessed 28 January 2020].

- Guðjónsdóttir, S. M., (2017) *The Full Drop Meditation Session Voice Recording*. Unpublished.
- Guillemin, M. (2004) Understanding illness: Using drawings as a research method, *Qualitative Health Research*, 14 (2), pp. 272-289. DOI: <https://doi.org/10.1177/1049732303260445>
- Hanna, T. (1993) *The Body of Life: Creating new pathways for Sensory Awareness and Fluid Movement*. Third ed. Vermont: Healing Arts Press.
- Hanna, T. (1986) What is Somatics? in, *Somatics: Magazine-Journal of the Bodily Arts and Sciences*, 5 (4). Available from: <https://somatics.org/library/htl-wis1>. [Accessed 1 April 2017].
- Haraway, D. (1985) *A Cyborg Manifesto: Science, Technology and Socialist-Feminism in the Late Twentieth Century* Minnesota: University of Minnesota Press.
- Haraway, D. (2016) *Staying with the Trouble: Making Kin in the Chthulucene*. Durham and London: Duke University Press.
- Hefferon, K. M. and Ollis, S. (2006) 'Just clicks': An interpretive phenomenological analysis of professional dancers' experience of flow, *Null*, 7 (2), pp. 141-159. DOI: <https://doi.org/10.1080/14647890601029527>
- Heidegger, M. (1962) *Being and Time*. First English Edition ed. Oxford: Blackwell Publishing.
- Heidegger, M. (1977) *The Question Concerning Technology and Other Essays*. New York and London: Garland Publishing Inc.
- Höök, K. (2018) *Designing with the Body Somaesthetic Interaction Design*. First ed. Cambridge, MA: MIT.
- Höök, K. (2019) Designing with the body interview with Kristina Höök on somaesthetics and design, *Journal of Somaesthetics*, 4 (2), pp. 79-95. DOI: <https://doi.org/https://somaesthetics.aau.dk/index.php/JOS/article/view/2880/2505>.
- Husserl, E. (1970) *Logical Investigations: Vol 1*. First ed. London and New York: Routledge.
- Husserl, E. (1989) *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy. Second Book: Studies in the Phenomenology of Constitution*. Fifth ed. Netherlands: Kluwer Academic Publishers.
- Ihde, D. (1993) *Postphenomenology: Essays in the Postmodern Context*. Evanston: Northwestern UP.
- Ihde, D. (2002) *Bodies in technology*. Minneapolis; London: University of Minnesota Press.
- Ihde, D. (2009) *Postphenomenology and Technoscience: The Peking University Lectures*. First ed. New York: Suny Press.
- Ihde, D. (2010) *Embodied Technics*. United Kingdom and USA: Automatic Press.

- Ingold, T. (2000) *The Perception of the Environment: Essays on livelihood, dwelling and skill*. First ed. London and New York: Taylor & Francis Group.
- Ingold, T. (2012) *Being Alive - Essays on movement, knowledge and description*. London and New York: Routledge Taylor and Francis Group.
- Jaimovich, J. and Morand, F. (2019) Shaping the biology of emotion: Emovere, an interactive performance, *International Journal of Performance Arts and Digital Media*, 15 (1), pp. 35-52. DOI: <https://doi.org/10.1080/14794713.2018.1563354>
- Kozel, S. (2007) *Closer: Performance, Technologies, Phenomenology*. First ed. Cambridge, Mass.: MIT Press.
- Kozel, S. (2010) The Virtual and the Physical: A Phenomenological Approach to Performance Research, in: Biggs, M. and Karlsson, H. (eds.) *The Routledge Companion to Research in the Arts*, First ed. London and New York: Routledge, pp. 204-222.
- Kozel, S. (2013a) *Lecture: Phenomenology – for the course Practice Based Research in the Arts, Stanford University*. Available from: <http://medea.mah.se/2013/12/susan-kozel-phenomenology-practice-based-research-arts/> [Accessed 15 March 2018].
- Kozel, S. (2013b) Somatic materialism or "is it possible to do a phenomenology of affect?", *Site*, 33, pp. 153-167. Available from: <http://muep.mau.se/handle/2043/23376> [Accessed 15 March 2018].
- Kozel, S. (2017) *Re-Embodiment: new strategies for teaching Embodied Interaction*. Denmark: Cumulus International Association of Universities and Colleges of Art, Design and Media.
- Kozel, S., Guðjónsdóttir, M. S., Ginslov, J. and Lim, K. (2019) *Conspiracy Archives a process archive of an archival process*. Available from: <https://nivel.teak.fi/adie/conspiracy-archives/> [Accessed 28 January 2020].
- Kristensen, D., Brogård and Prigge, C. (2018) Human/Technology Associations in Self-Tracking Practices, in: Ajana, B. (ed.) *Self-Tracking Empirical and Philosophical Investigations*, London: Palgrave Macmillan, pp. 43-59.
- Latour, B. (1999) *Pandora's Hope: Essays on the Reality of Science*. Cambridge, Massachusetts: Harvard University Press.
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*. New York: Oxford University Press.
- Lupton, D. (2016) *You are Your Data: Self-Tracking Practices and Concepts of Data*. New York: Springer.
- Lupton, D. and Smith, G. J. D. (2018) 'A Much Better Person': The Agential Capacities of Self-tracking Practices, in: Ajana, B. (ed.) *Metric Culture: Ontologies of Self-Tracking Practices*, United Kingdom: Emerald Publishing Limited, pp. 57-76.
- Manning, E. (2009) *Relationscapes*. First ed. Cambridge, Mass.: MIT Press.
- Manning, E. (2016) *The minor gesture*. Durham: Duke University Press.

- Marcevska, E. (2010) Technologies of change: Body coded in motion, *eSharp Special Issue: Communicating Change: Representing Self and Community in a Technological World*, pp. 157-179. Available from: [http://www.gla.ac.uk/media/media\\_141054\\_en.pdf](http://www.gla.ac.uk/media/media_141054_en.pdf) [Accessed: 28 January 2020]
- McCraty, R. (2016) Science of the Heart, Volume 2 Exploring the Role of the Heart in Human Performance: An Overview of Research Conducted by the HeartMath Institute. Available from: <https://search.datacite.org/works/10.13140/rg.2.1.3873.5128> [Accessed 28 January 2020].
- McGregor, W. (2020) *Choreographic Language Agent*. Available from: <https://waynemcgregor.com/research/choreographic-language-agent> [Accessed 28 January 2020].
- Merleau-Ponty, M. (1945) *Phenomenology of Perception*. English edition first published 1962 ed. London and New York: Taylor and Francis e-Library, 2005.
- Merleau-Ponty, M. (1964a) Eye and Mind, in: Eye and Mind, in: *The Primacy of Perception*, Evanston: Northwest University Press, pp. 121-149.
- Merleau-Ponty, M. (1964b) *The Primacy of Perception*. Evanston: Northwestern University Press.
- Merleau-Ponty, M. (1968) *The Visible and Invisible*. Evanston: Northwest University Press.
- Midgelow, V. L. (2018) Improvisation as Paradigm for Phenomenologies, in: Fraleigh, S. (ed.) *Back to the Dance Itself: phenomenologies of the body in performance*, Chicago: University of Illinois Press, pp. 59-77.
- Mills, C. M. (2009) *Materiality as the Basis for the Aesthetic Experience in Contemporary Art*. MA Thesis, University of Montana. <https://scholarworks.umt.edu/etd/1289> [Accessed 23 February 2020].
- Miriam-Webster Dictionary (2020) Available from: <http://www.merriam-webster.com/dictionary/reational> [Accessed 3 February 2020].
- Misi, M. and Pimental, L. (2016) The Virtual Body is Real! Phenomenological and Postphenomenological Perspectives in Mediadance, in: Rosenberg, D. (ed.) *The Oxford Handbook of Screendance Studies*, New York: Oxford University Press, pp. 557-572.
- Molga, K. (2016) *The Human Sensor*. Available from: <http://www.keytoalef.com/kasianet/index.php/the-human-sensor-2/> [Accessed 28 January 2020].
- Moore, L. (2015a) *PULse 03: HDVD Human Digital Video Device*. Available from: <https://lornam77.wixsite.com/lornamooreartist/single-post/2015/01/28/PULse-03-HDVD-Human-Digital-Video-Device> [Accessed 28 January 2020].
- Moore, L. (2015b) Be[ing] You: In[bodi]mental a Real-Time Body Swapping Video Performance, in: Harrison, D. (ed.) *Handbook of Research on Digital Media and Creative Technologies*, USA: IGI Global, pp. 18-32.

Moore, L. (2017) *The Bleeding Self in Digital Performance Practice: A Phenomenology of Self through the Making Process*, in: Baker, C. C. and Sicchio, K. (eds.) *Intersecting Art and Technology in Practice: Techne/Technique/Technology*, New York and United Kingdom: Routledge, pp. 31-41.

Moore, J. (2020) *Heart Rate Variability (HRV): A Deeper Metric*. Available from: <https://elitehrv.com/what-is-heart-rate-variability> [Accessed 28 January 2020].

Naccarato, T. J. and MacCallum, J. (2016) From representation to relationality: Bodies, biosensors and mediated environments, *Journal of Dance & Somatic Practices*, 8 (1), pp. 57-72. [https://doi.org/10.1386/jdsp.8.1.57\\_1](https://doi.org/10.1386/jdsp.8.1.57_1)

Nancy, J., Luc (2007) *Listening*. New York: Fordham University Press.

Nelson, R. (2013) *Practice as Research in the Arts: Principles, Protocols, Pedagogies, Resistances*. United Kingdom: Palgrave Macmillan.

Olsen, A. and Mc Hose, C. (2014) *The Place of Dance*. Middletown: Wesleyan University Press.

Overton, W. F. (2008) Embodiment from a Relational Perspective, in: Overton, W., F, Muller, U. and Newman, J., L. (eds.) *Developmental Perspectives on Embodiment and Consciousness*, New York: Taylor & Francis Group, pp. 1-18. DOI: 10.4324/9780203809778-5.

Polar (2019) Online platform. Available from: <https://www.polar.com/uk-en> [Accessed 15 December 2019].

Polar (2020) Heart Rate Variability and Orthostatic Test Sept 28. Available from: <https://www.polar.com/blog/heart-rate-variability-and-orthostatic-test-lets-talk-polar/> [Accessed 20 January 2020].

Ricoeur, P. (2013) The metaphorical process as cognition, imagination, and feeling, *Chicago Journals: Critical Inquiry*, 5 (1), pp. 143-159. Available from: <http://www.jstor.org/page/info/about/policies/terms.jsp> [Accessed 28 January 2020].

Rose, G., (1991) 'Abstract art and emotion: expressive form and the sense of wholeness', *Journal of the American Psychoanalytic Association*, vol. 39, pp. 131–56.

Rose, G. (2001) *Visual Methodologies: An Introduction to the Interpretation of Visual Materials*. First ed. London: Sage Publications Ltd.

Rosenberg, R. (ed.) (2016) *The Oxford Handbook of Screendance Studies*. New York: Oxford University Press.

Rosenberger, R. and Verbeek, Peter P. C. C (2015) *Postphenomenological Investigations: Essays on Human-Technology Relations*. Maryland: Lexington Books.

Salazar Sutil, N. and Popat, S. (2015) *Digital Movement: Essays in Motion Technology and Performance*. United Kingdom: Palgrave Macmillan.

- Salter, C. (2010) *Entangled: Technology and the Transformation of Performance*. Cambridge, Mass.: MIT Press.
- Schiller, G. (2003) *The Kinesfield: A Study of Movement-Based Interactive and Choreographic Art* (PhD Thesis). University of Plymouth.
- Schiller, G. (2005) Body-screenographies, jumping back to leap forward, 5 (1). DOI: <http://doi.org/10.16995/bst.186>.
- Schiphorst, T. (2008) *The Varieties of Use Experience: Bridging embodied methodologies from somatics and performance to human computer interaction Thesis* (PhD Thesis) UK: University of Plymouth.
- Seladi-Schulman, J. (2018) *Vagus Nerve Overview*. Available from: <https://www.healthline.com/human-body-maps/vagus-nerve> [Accessed 24 April 2019].
- Seymour, T. (2017) *Everything you need to know about the vagus nerve*. Available from <https://www.medicalnewstoday.com/articles/318128.php> [Accessed 24 April 2019].
- Sheets-Johnstone, M. (1966) *The phenomenology of Dance* (50<sup>th</sup> ed.) Philadelphia Pennsylvania: Temple University Press.
- Smith, J. A., Larkin, M. H. and Flowers, P. (2009) *Interpretative Phenomenological Analysis: theory, method and research*. London; Los Angeles: Sage.
- Stark Smith, N., *Teaches "Hieroglyphs"- Embodied Activity #1 for Meta-academy(at)bates* (2013) [https://youtu.be/hS1MUpltx\\_M](https://youtu.be/hS1MUpltx_M) Video Directed by Marlon Barrios Solano. Bates Dance Festival 2013: Creative Commons Attribution licence.
- Steinman, L. (1986) *The Knowing Body: Elements of Contemporary Performance and Dance*. Boston: Shambhala Publications Inc.
- Todres, L. (2007) *Embodied Enquiry: Phenomenological Touchstones for Research, Psychotherapy and Spirituality*. UK: Palgrave Macmillan
- Van Den Eede, Y. (2015) Tracing the Tracker in, Rosenberger, R. and Verbeek, P. (eds.) *Postphenomenological Investigations: Essays on Human-Technology Relations*, London: Lexington Books, pp. 143-158.
- Varela, F. J., Rosch, E. and Thompson, E. (1991) *The embodied mind*. Cambridge, Massachusetts: The MIT Press.
- Varela, F., J and Shear, J. (eds.) (1999) *The View from Within: First person approaches to the study of consciousness*. UK: Imprint Academic.
- Wehrle, M. (2019) Being a body and having a body. The twofold temporality of embodied intentionality, *Phenomenology and the Cognitive Sciences*, 19 (July 2020), pp. 499–521. DOI: <https://doi.org/10.1007/s11097-019-09610-z>.
- Wildman, W., J (2006) *An Introduction to Relational Ontology*. Available from: [http://people.bu.edu/wwildman/media/docs/Wildman\\_2009\\_Relational\\_Ontology.pdf](http://people.bu.edu/wwildman/media/docs/Wildman_2009_Relational_Ontology.pdf) [Accessed 28 January 2020].

Zylinska, J. (2017) *Nonhuman Photography*. Cambridge: Mass.: MIT Press