

***Coenesthesia: An Aesthetic of Healing
Through Hybrid Reality Art***

by

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Abstract

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Coenesthesia: An Aesthetic of Healing Through Hybrid Reality Art

by Wendy Whaley

The affordances of new forms of interactive art including virtual reality (VR) and mixed reality (MR) have implications for health, opening new perspectives on embodiment. The title of this thesis project – Coenesthesia – is a term for the feeling of embodiment that arises from the sensorial processing of multiple stimuli from various bodily organs. This thesis incorporates the idea of the art object as amenable object and techniques from cognitive neuroscience studies. It explores proprioception and synaesthesia, surreality, and the precognition of autonomic affect. These ideas are applied to the question of how to form revitalizing affects. How can hybrid media art advance exploration and affective engagement with one's embodied interiority? A coenesthetic aesthetic - a multi-modal, multi-sensorial aesthetic that combines biofeedback with surreality - is proposed as a strategy to form revitalizing affects. Coenesthesia, the hybrid media installation, is an example of the coenesthetic aesthetic in practice.

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Dedicated to my three muses

TJ, Ty, and Marc.

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1. Introduction

“Artistic activity, for its part, strives to achieve modest connections, open up (one or two) obstructed passages, and connect levels of reality kept apart from one another.”
(Bourriaud, 1998)

The recent proliferation of consumer biometrics opens up potentials for artists and healthcare. Inspired by the feelings of powerlessness and disconnection during personal experiences in healthcare, I sought to create ways of empowering people to feel a connection with their internal physiological and psychological being.

For thousands of years, meditation has contributed to a positive sense of self amongst those who practice it. At the core of meditation is awareness of breath, an enhanced interoception¹. My project is informed by the role of breath in meditation and art creation.

In 1995 Char Davies used breath-based navigation in virtual reality (VR) to create an embodied world that was experienced as meditative and uplifting. (McRobert, 2007). In her artwork *Osmose*, Davies used a vest as a wearable controller for participants that translated breath and tilt data to allow scuba diving inspired navigation in an abstract world of translucent branching imagery.

In 1998 Botvinick and Cohen established the ‘the rubber arm illusion’². This experiment demonstrates how sight, touch and proprioception³ can combine to create a convincing feeling of body ownership, one of the foundations of self-consciousness. Inspired by this experiment, I examine other research in the field of cognitive science that uses virtual reality as a tool to

¹ the awareness of one’s internal workings

² An experiment in which a participant sits at a table with one arm hidden behind a screen. In the position where their arm would comfortably be, a rubber arm is substituted. Through synchronous stroking of the rubber arm and the real arm of the participant, the participant gains ownership over the rubber arm, believing it is their own arm when it is threatened with pain.

³ The sense of body position elaborated on throughout the text.

explore body ownership. Through a research creation approach, I enlist techniques similar to those used in cognitive neuro-prosthetics research to form an enhanced connection between a VR immersant, their internal organs and their internal self-image. My research expands on neuro-prosthetics studies (Botvinick and Cohen, 1995), by taking the idea of ownership over an external body part to that of internal body parts. In *Coenesthesia*, my hybrid reality installation, I incorporate interoception and touch synchronisation paired with visual and auditory synchronisation (Botvinick and Cohen, 1995). Through the mixture and contrast of different sensory experiences in virtual and sculptural reality, I generate affective conditions for seeing, hearing and interacting with one's heart, and sharing this interaction with a companion or caregiver. This affective environment is enhanced and paired with content derived through explorations in of affect using surreal synesthetic content. This is situated in the paper in terms of the aesthetics of the senses and the roles of synaesthesia, analogy, and affect.

This thesis explores the questions: how can a revitalizing affective feedback loop be formed between an art recipient and their physiological and psychological being? How can this be extended to include the connection between the art recipient or patient and their companion or caregiver? How can the new affordances of virtual and hybrid environments impact on one's embodied experience?

I start by exploring the systems at work between play, connection and intimacy, applying Jeanne Randolph's reworking of DW Winnicott's theory of transitional objects (typically the first stuffy a child has) to art objects (including virtual objects) as amenable objects. I explore embodiment, proprioception and body ownership, through both art that engages embodiment and the field of cognitive neuroscience, from cognitive neuro-prosthetics to synaesthesia and surrealist dream systems. As affect is key to all of these studies, I explore revitalizing affect as a therapeutic approach.

Using an interdisciplinary approach at the intersection of art, technology and cognitive science I worked with virtual and tangible objects to create an immersive interactive experience, intended to form a feedback loop of affect with the participants. The sense of touch features prominently as do the visual and auditory experiences. The materials I use include wearable tech, faux fur, virtual reality, biometrics, and projection.

I was plunged into field research unexpectedly when my husband suffered a heart attack in the summer of 2017. Anyone who has spent a length of time in the hospital as either patient or with a patient will know how powerless this situation and environment can make one feel. I envision this work as a prototype that could potentially be developed using VR within hospital environments as a possible escape for patients into the creative space of their mind where they can connect with their insides and their companion. Also, other participants could positively engage with patients and caregivers in mixed or virtual reality artworks. In an effort to apply the research to therapeutic potentials, I apply Relational Aesthetics (Bouriaud, 1998) to consider the immersant⁴ as patient and the other participants as companions, or healthcare providers.

The work is transposed to a hospital setting, a private room off of a high traffic area at a hospital, and also potentially in a future networked experience between compact bedside VR that could engage positive intension from around the world. Most people want to recover and want each other to recover; drawing out this positive intension is a key piece of the experience.

The work explores possible techniques for empowering people to have an enhanced coenesthesia,⁵ potentially allowing them greater control over their mental internal images, and empowering companions and caregivers to connect and playfully participate in the patient experience while affording them an escape from the sterile hospital environment into a more

⁴ The immersant is the player who is biometrically connected and experiencing the VR.

⁵ coenesthesia is the "potential and perception of one's whole sensorial being" (Sobchack, 2000)

intimate space. By acting out each role in the installation, participants become the patient, when they are in the VR, and companion or caregiver, when interacting from the swing pod or from on line.

In the gallery installation, participants have an opportunity to perform different roles. In the role of patient, the participant is linked directly to a biofeedback device that attunes their heartbeat to that of heart-like objects in the VR environment. In the role of the caregiver, a participant can engage with the virtual environment from their seat in a meditation pod, using a trackball. In the role of observers, others in the exhibition space can watch, encourage and explore through touch, sound, vision and even the smell of fresh oranges. The thesis exhibition explores the social aspects of revitalizing affect through empathetic role-playing and experiences of vulnerability and intimacy in the gallery.

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2. Literature Review

2.1 Art, Touch, Play

Investigating connections between people and objects, in this section I map correspondences between art, touch, object-relations and play, through the lenses of artists and psychologists who have investigated the field of psychology and attachment.

DW Winnicott described transitional objects as objects that exist in a liminal space between “me and not me”. Touch and play are key components of this classification.

Winnicott had observed that, “maximally intense experiences are in the potential space... between me-extension and the not-me.” Winnicott would see the creation of artworks, in this context, like play, where subjectivity and objectivity overlap, not as regression to the toddler’s level, but instead as an adaptive relationship with the mysterious world (Randolph, 1991)

When Winnicott speaks of objectivity and subjectivity, he speaks in terms of “me and not me” object-relations. Winnicott’s theory of the *transitional object* references the first object of childhood affection, usually a soft, cuddly, stuffed animal with sensory allure, often imbued with sentience. Jeanne Randolph adapts this notion of the *transitional object* into that of an art object as *amenable object*. She conceptualizes the artwork as an amenable object by reshaping Winnicott’s theory to the aims of art criticism, allowing “a way to interact with the artwork as an intentional revelation of the artist’s version of experience, intentionality that need be neither explicit nor disguised.” (Randolph, 1991)

The psychoanalytic work of D.W. Winnicott, particularly as expressed in his book *Playing and Reality*, raises the possibility that in art it is the ambiguity between the objective and subjective that gives artworks a unique psychological validity.” The material aspects of this transaction between the user and the form. What the user or viewer brings to that experience where the conditions of virtual world immerse the user. (Randolph, 1991)

Playing and Reality was Winnicott's deathbed manifesto about how play develops and how it can be used clinically to improve people's health and why play matters. His biographer, Brett Kahr notes that he was a man who "truly embodied play" and would ride his bike downhill, with his feet on the handlebars. (Kahr, 2016) "Whatever is already known becomes a wonder when it is re-used in a subjective way." (Randolph, 1991)

Coenesthesia, the hybrid reality installation, strives to create a revitalizing affect by incorporating physical and virtual visceral elements that can be interacted with through play. Faux fur covers the wheels of unicycles both in the gallery space and the virtual space. The immersant (the person experiencing the VR, through the HTC headset), has the experience of wandering in a space filled with mammoth, furry internal organs (as transitional objects) that beat in sync with their own heart and objects that could be considered amenable that incorporate the immersant's breath into their motion.

2.2 Coenesthesia Synaesthesia

"The reflexivity of sense is not the relation of myself to my senses but rather is endemic to sensory and perceptual life, distributed and diffused throughout my perceptual resonance with the world." (Sobchack, 2000)

I look at two related mechanisms of experiential sensory processing and the role they play in art and affect. Sobchack defines coenaesthesia as "the potential and perception of one's whole sensorial being" (Sobchack, 2010). Synaesthesia is generally considered the cross-wiring of sensory input that happens in specific individuals whose brains cross-wire information, but all people experience this to some extent. For example, certain music inspires an uncontrollable trigger to move for most, and since movement is tied directly to one's sense of proprioception, this is a cross-wiring of the senses. Smell and taste directly overlap, but so do sight and taste for

most as the sight of an ice cold beer triggers a thirsty response. Recent studies show that synaesthesia can be learned and there are instances where synaesthesia can be created in individuals who perhaps don't typically experience it or who want to expand their existing sensibilities. (Hutson, 2017) (Twilley, 2017)

Similar to the subconscious content of surrealist art works that defy the laws of physics and pair unexpected forms, synesthesia stimulates signals from one sensory input to an unexpected sensory experience thus altering one's perception of reality. In this mixed reality artwork, I leverage the power of synaesthesia as a mechanism of sensorial analogy, considering how analogy works on a subconscious level⁸ (Hofstadter, 2009), I speculate that it operates beyond just words and visuals. By incorporating a variety of sensory potentials *Coenesthesia* allows for an enhanced perception of one's sensorial being.

Janet Cardiff and George Bures Miller

Janet Cardiff and George Bures Miller engage binaural sound in immersive installations that sometimes resemble theatrical sets. I look to this work to identify its affective qualities. Initially I was inspired by their early works: *ToTouch*, by Cardiff (section 2.1) and *Imbalance.6 (Jump)* by Miller.



FIGURE 1 *To Touch*, JANET CARDIFF 1993

To Touch, was on display at the Power Plant gallery in January of 1994. I walked into a quiet room, at the centre of which sat a large wood table. It looked well-worn and substantial; it looked touchable. Having spent much of youth exploring galleries in Europe I was conditioned not to touch, but with no one else around and the title of the piece seducing me, I reached out to explore the surface with my hands. Each spot on the table corresponded with a speaker around the room and a different sound - sexy, scary, tender, peaceful. I formed a bond with that table, an intimate relationship. The sense of sound and touch become one and my body became inseparable from the piece.



FIGURE 2 *IMBALANCE 6*, GEORGE BURES MILLER 1998

The proprioceptive aesthetic is a term coined by Scott C Richmond in his book *Cinema's Bodily Illusions; Flying, Floating, and Hallucinating*. He describes proprioceptive aesthetics as a self-referencing system of body, world and technics: "Proprioceptive aesthetics entails the sense of aesthetics in which it names how we resonate with the world and attune ourselves to it." (Richmond, 2017) Proprioceptive aesthetics can serve as a lens for interpreting artworks as well as cinema. For example, Bures Miller's *Imbalance 6*, synchronises a video clip of a man's feet jumping with the hydraulic robotic jumping motion of a cathode ray television set. This piece stimulates an affective response, inspiring the viewer to jump.

Meret Oppenheim

FIGURE 3 FUR-COVERED CUP, SAUCER, AND SPOON MERET OPPENHEIM 1936

Just looking at surrealist artist Meret Oppenheim's fur-covered cup, saucer, and spoon (Oppenheim, 1936) creates an unpleasant sensation of fur on my tongue, triggering my gag reflex and a sense of nausea. Mismatching texture and familiar form is a strategy used often by the surrealists to shock and generate embodied sensation and affective response. This strategy can also be used in virtual environments to generate more visceral rather than retinal responses to virtual objects.-Sensory inputs combine to trigger a coenesthetic response in the viewers. As explored by Winnicott, adapted by Randolph and created by Cardiff, Miller and Oppenheim, artworks that engage, sight, touch, sound, proprioception and synaesthesia can stimulate potent affective responses.

2.3 Kinaesthetics and Healing Touch

Emma Westecott, Assistant Professor in the Faculty of Design at OCADU writes of “experiential modality – tactility, proprioception and internal kinaesthesia – all senses proper to the body” and focuses on the “visceral experience of gameplay”. Gameplay in this case being relevant as a mixed reality that includes both real world and virtual experiences. Westecott writes about the feedback loop between player and game being “tightly coupled” and argues that player response is precognitive and physically felt. “It is only by being embodied human beings that we are able to connect the divergent worlds of the tactile and the visual.” (Westecott) This aligns with affect as being precognitive and also applies directly to the feeling that when I touch something in VR I physically feel it. When immersed in digital media artist Hector Centeno’s virtual meditative experience, *Sitting Under an Overpass* (Centeno, 2015), I see my hands in the VR world touch the cubes, they feel feather-light, but I physically feel them. The surface of my hand tingles with the sensation. My brain fills in the gaps perhaps through, as Westecott suggests, a combination of me seeing what I believe to be my hands (because they are in sync with my hands), touching a sound-responsive cube, combined with “anticipation and expectation” of the feeling of that cube.

Healing touch has been documented as far back as cave paintings in Pyrenees, and has been used by “medicine men, shamans, and healers of cultures in Africa, Asia, Oceania, and the Americas” (Wuthnow, 1997).

Touch is a basic human need without which people die. Mothers by instinct hold and stroke their babies; researchers, as early as 1915 in a study of sensory-deprived orphans, determined the value of such holding. More recently, social scientists have determined that old people who have lost a spouse often die within a few months and that people

who live alone do not live as long as people who live together. The healing power of touch is part of the gift of our humanity (Wuthnow, 1997, p2)

In *Coenesthesia*, the healing touch is applied through kinaesthetics. Virtual reality opens up a realm of potentials for alleviating isolation; as well as acting as a connective mechanism, the kinaesthetics of touch give the players and participants purpose, empowering them with vitality.

2.4 The Proprioceptive Aesthetic in Virtual Reality

In *Cinema's Bodily Illusions*, Scott C Richmond defines proprioception as "the name for the set of perceptual processes whereby we orient ourselves with the world." His central thesis in this book is "that proprioceptive aesthetics lies at the heart of the cinema as an aesthetic medium and as a technical system". Richmond includes virtual reality and installation art in his description of the proprioceptive aesthetic. He looks at Marcel Duchamp's *Anémic Cinéma*, (Duchamp, 1926) for its dizzying qualities and references Mark B. N. Hansen who writes, "What we call "cinema" encompasses all time-based media that operate within the temporal thresholds of human perception, including deployments of digital technology to transpose analogue media like film into installation environments." (Richmond, 2017). Richmond viscerally explores bodies, film screens, and media technology, finding resonance between ordinary perception and cinematic perception. He sees the relation of one's body to the movement on screen as key for engaging the proprioceptive aesthetic. The scenes he references feature dynamic movement; in relation to this movement, physical reactions are generated, such as needing to adjust position or feeling like you are moving through space and need to grab your armrests.

Barbara Montero writes of proprioception as an aesthetic sense. She writes that vision and hearing are commonly considered aesthetic senses but that smell, touch and taste are not. Perhaps they are not commonly considered aesthetic senses, but certainly all senses are aesthetic senses. As I find a Rembrandt aesthetically beautiful and intense, so too do I find the feel of ultra-soft fur, the taste of a lime margarita, the smell of salt water on ocean air. Also, although perhaps more personalized, synaesthesia has an aesthetic of its own. The previous example of Oppenheim's fur-covered cup, saucer and spoon certainly generates a unique and synesthetic aesthetic response.

I draw from cinema studies and my 20 year history in stereo film and visual effects (VFX) to consider the intersections between cinema and VR focusing on the proprioceptive aesthetic. To explore proprioceptive aesthetics in relation to virtual reality, I look at the differences and similarities between cinema and virtual reality. The relation of one's body to the movement on screen in cinema differs from the relation of one's body to movement in a head mounted display (HMD), by virtue of the active feedback created through the immersant's movements and what they see in relation to those movements. Cinema has gained the perspective and occlusion afforded by the new wave of stereoscopic films, and both mediums can set one's position in space.

"Returning to cinematic kinesthesia, we must hold fast to the insight that in ordinary perception these sources of information are consonant and redundant. Our perceptual resonance with the world involves the mutual reinforcement of such resonance across multiple sources of information. *This is not the case in the cinema*. In fact, this is never the case in the cinema. The cinema ruptures, suspends, transforms, disorders – it modulates – the covariance of sources of perceptual information. The perceptual modulation of the cinema is a matter of its control over these sources of information, in time, *and their degree of covariance*. The cinema modulates our ongoing perceptual resonance with the world." (Richmond, 2017)

Looking at modulation and control over sources of information over time that is core to cinema, does something similar exist in VR? Certainly VR can be created in all of the same ways

as cinema, just cinema that is viewed through a HMD. The full potential of VR comes from combining the affordances of each medium. In VR a choice needs to be made by the artist between reinforcing the perceptual resonance of the world, and controlling the specific ways the viewer/immersion experiences the world over time. The affordances of VR combine real-world movement and cinema. VR at its best lies somewhere between reality and cinema. What VR gains in feedback it sacrifices in control, and selectively choosing the moments for each is a powerful affordance.

Aspects of control and modulation over the duration of the VR experience are orchestrated by the creator. As a filmmaker selects musical cues to align with specific moments, so too can a VR artist. In narrative VR experiences and games, there is a stronger element of control than is often found in exploratory, environment-based, experiential VR. By giving up much of the direct control over the frame by frame montage, the VR artist gains greater feedback from the world itself, which enhances the proprioceptive experience.

VR is similar to POV in stereo cinema (as a technical cinematographic system), but with autonomic feedback. Only a shot like *Arrival of a Train at La Ciotat* (The Lumière Brothers, 1895) in which the camera is locked off from the angle of the train station platform, positioning the viewer's body as if they are waiting for the train causes a synchronous autonomic reaction to the physical reality they are in. The difference between the camera in cinema and the head mounted display in VR, is that in VR, the immersion is actively engaging their motor signals and has corresponding feedback to those signals. They are the camera, there no longer is a camera, only eyes to the world before them. This system repositions their body into a new world free of the screen, the cinema chair, forcing them to think about where they want to move to, a full body teleportation. "When you move the body you know the relation between intention and action. The impulse to move and the movement are seen to be connected. If you don't have

that, the body is not viable” (Bohm, 2008) this contributes to VR’s proprioceptive features and aspects.

Richmond explains the locution proprioceptive aesthetics:

the term proprioceptive is not merely some qualification of a previously understood aesthetics, a modular adjective specifying a region of aesthetics. Rather, proprioceptive aesthetics entails the sense of aesthetics in which it names how we resonate with the world and attune ourselves to it. “(Richmond, 2017)

I interpret this as that we resonate with film and attune ourselves to it through affect. The relationship, the connection, the invisible strings eliciting a physical response. VR tends to engage affect through direct primal responses, including all of the sensory systems discussed thus far. In *the Blu: an underwater VR experience* (WEVR, 2016), as the 80-foot blue whale swims past, and you feel dwarfed by its size and majesty. In Claire Brunet’s VR piece *Trans: duRéal auVirtuel* (Brunet, 2016), there is a kind of a creep up resonance that is like being swamped by a massive wave the moment that you realize the small bronze pieces are the heads you were just inside of. Scale seems to be a common factor in feeling the resonance in VR, perhaps because when seeing the scale in VR it directly resonates with our reality by virtue of the camera being in the direct position of our eyes.

2.5 Surreality and the Precognition of Autonomic Affect

I look for the liminal space where consciousness and precognitive affects meet and overlap. Autonomic function is usually not present in conscious awareness; these processes, signals and affects are pre-cognitive and typically present as gut feelings, an instinct, in the signal sent from the brain to tell a foot to move, or the electrical signal beating one’s heart. When conscious, one tends to tune out the majority of one’s autonomic operations. However, shifts in affective

intensity can bring these into conscious awareness. My research creation seeks to generate situations in which one may tune into them, synchronising and balancing consciousness with autonomic processes, attenuating signals, gaining symbiotic control between the conscious and autonomic. Pre-conscious activity is subconscious⁶, it happens before you are consciously aware of it.

The subconscious is the state in which dreams are formed. Dreaming was of great interest to the Surrealist movement. Critic and Poet Andre Breton, author of the Surrealist Manifesto, asked "Can't the dream also be used in solving the fundamental questions of life?" The Surrealist Manifesto states "I believe in the future resolution of these two states, dream and reality, which are seemingly so contradictory, into a kind of absolute reality, a surreality, if one may so speak." (Breton, 1924) With Coenesthesia, although my methods are not exclusively surrealist, in that they do not conform to Breton's paradoxically strict definition of Surrealism⁷, I am after this surreality. Breton, referencing Freud's work writes:

On the basis of these discoveries a current of opinion is finally forming by means of which the human explorer will be able to carry his investigation much further, authorized as he will henceforth be not to confine himself solely to the most summary realities. The imagination is perhaps on the point of reasserting itself, of reclaiming its rights. If the depths of our mind contain within it strange forces capable of augmenting those on the surface, or of waging a victorious battle against them, there is every reason to seize them -- first to seize them, then, if need be, to submit them to the control of our reason. The analysts themselves have everything to gain by it. (Breton,1924)

In reference to the unconscious mind, Michael Craig Miller, M.D.writes:

⁶ Freud used the terms subconscious and unconscious interchangeably early on in his career, later unconscious won out for him and most academics scholars. I prefer subconscious because it suggests a level closer to consciousness just under the surface.

⁷ Surrealism, n. Psychic automatism in it's pure state, by which one proposes to express -- verbally, by means of the written word, or in any other manner p the actual functioning of thought. Dictated by the thought, in the absence of any control exercised by reason, exempt from any aesthetic or moral concern.

These mental processes are so interesting to us, perhaps because we know that much is at stake. So much that moves us happens outside our awareness and outside our control—we believe (and maybe it's true) that greater awareness will lead to greater self-control or greater well-being. And maybe that's why, when the French novelist Marcel Proust wrote about a character biting a cookie and being flooded with memories, we too are moved. It is a reminder that there is so much to know that we don't know, and it seems like such a lucky accident when we discover what was hiding within us all the time. (Miller, 2010)

Affect is precognitive and so to become consciously aware of affect involves catching your

unconscious thoughts in action. *Coenesthesia* is, in part, an experiment to explore this idea. I speculate that seeing and hearing one's autonomic processes will allow greater potential for control over them and for forming an empathic connection with them. In *Coenesthesia*, the immersant sees and hears the real-time representation of their internal organs in the virtual reality world, this allows them a measure of control over the contents actions.

The type of precognition involved in affect, is the type that involves seeing a trajectory and extrapolating it into the future. This future is something that drives you to want to interfere with it in some way. These instances happen either due to the trajectory expected through knowing the laws of physics or through analogy. Virtual Reality is a great tool for altering the laws of physics, and for using analogies to draw out affect.

Douglas Hofstadter theorized that analogy is at the core of cognition. Hofstadter argues that the "sequential process of thinking is driven at all times by unconscious analogy-making carried out simultaneously at various levels of abstraction." Central to this is what he describes as the mind's capacity to categorize mental representations by their "essences" and to make connections between them. (Hofstadter, 2006) Analogy is touched on throughout *Coenesthesia*, the use of the unicycle is based on analogy, the use of the ball motif is an analogy for scale, that from the smallest to the largest components of our physical existence there are spheres. The universe texture on the intestines is an analogy for the universe of creatures living within the gut and drawing on the power of the

universe to heal. In the Uncover/Recover conference at the Art Gallery of Ontario, the First Nations art students who had been reconnecting with ancestral objects at the Royal Ontario Museum, describe their experience with the museum through visceral analogies, one student feeling as though she “had been on fire” and another saying that they “felt as though they were being stabbed by a million knives”. Char Davies uses the analogy of life through forest imagery. Meret Oppenheim’s piece creates a sense of uncomfortable frisson from the analogy created when our mind puts together the feeling of fur with our tongue. In *Coenesthesia*, the environment includes a body of water 200 feet below the brain; it is meant to evoke a feeling resembling one I had on a cliff in Spain. Dreams speak through analogy; the driving force for the selection of the content in the virtual environment is this network of analogies.

2.6 Toward an Aesthetic of Healing

Ordinary Affects “work not through ‘meanings’ per se, but rather in the way that they pick up density and texture as they move through bodies, dreams, dramas, and social worldings of all kinds. Their significance lies in the intensities they build and in what thoughts and feelings they make possible. The question they beg is not what they might mean in an order of representations, or whether they are good or bad in an overarching scheme of things, but where they might go and what potential modes of knowing, relating, and attending to things are already somehow present in them in a state of potentiality and resonance.” (Kathleen Stewart, 2007)

This section comprises several subsections delving into the elements that make up an aesthetic of healing: an affective resonance between the sympathetic and parasympathetic nervous system created through intensity of experience, a feeling of embodiment created through a mix of synchronous, harmonic and dissonant sensory input, and a relational aesthetic.

These combine to allow for a mental correlation between surreal reality and reality, a surreality.

I will call this aesthetic the *Coenesthetic Aesthetic*.

2.6.1 Affect as Therapy

Intensity “is narratively delocalized, spreading over the generalized body surface like a lateral backwash from the function-meaning interloops that travel the vertical path between head and heart.” (Brian Massumi, 2002)

My interest lies in the underlying mechanisms that allow a person to affect their own body. I am inspired by coenesthesia, and the implication of experiments that alter one’s mental body image, (the rubber arm illusion and the mirror illusion). I hope by advancing this research, to come to an understanding of the mechanisms at work, perhaps addressing more effective and affective treatment. By way of phenomenology, embodiment, anticipation and expectation, I explore affect as a mechanism for therapy.

In the chapter *Autonomy and Affect of Parables for the Virtual*, Brian Massumi discusses autonomic nervous system and affect, giving the galvanic skin response as indicator of affect. He writes: “Intensity is embodied in purely autonomic reactions most directly manifested in the skin—at the surface of the body, at its interface with things.” Along with the stomach, skin⁸ has recently been touted as the body’s other brain, and is the largest organ in the human body. We are designed for interaction.

Kathleen Stewart describes her objective in the book *Ordinary Affects* as one of trying “to provoke attention to the forces that come into view as habit or shock, resonance or impact.” She describes ordinary affects as “the stuff that seemingly intimate lives are made of... Rooted not in fixed conditions of possibility but in the actual lines of potential that a something coming together calls to mind and sets in motion, they can be seen as both the pressure points of events

⁸ https://www.youtube.com/watch?v=Rat1n34l_wl

or the banalities suffered and trajectories that forces might take if they were to go unchecked.”

The potentials she speaks of here bring to mind *Pendulums* (Wannerstedt, 2017)⁹. This is a series of animations of what look like shiny metal balls or weights continuously looping in scenarios that loosely simulate reality and look so precise that the slightest force would break the loop. They create a tension due to our embodied knowledge that if real, would break down through real world physics, but because it is only a looping image, it is infinite and never breaks down. The disparity between the potential we see for the system to break down and its seemingly magical ability to be infinite, engages affect with a similar feeling to that of your team scoring a goal. It’s something you hope for but the moment it happens you feel elated. The role of our sense of physics in this scenario is reinforced by Stewart’s description of ordinary affects, as “habitable and animate”. We live in a world of gravity and dynamics based on physics. This affect breaks down the assumption of impending doom with continued success. Each time the system continues to run smoothly we believe in it a little more. Like the mirror experiment for amputees, in which positioning a mirror to reflect the existing arm of the amputee, standing in for the missing limb, alleviates the pain from phantom limb syndrome. The longer one engages with it, the more it alters their perception of reality. In the following quote Stewart describes a more complex and intimate example of affect:

“Alphonso Lingis noted that jump of affect in his description of touring a mine at the Arctic Circle: “The young miner who showed me the mine put out every cigarette he smoked on his hand, which was covered in scar tissue. Then I saw the other young miners all had the backs of their hands covered with scar tissue.... When my eye fell on them it flinched, seeing the burning cigarette being crushed and sensing the pain ... The eye does not read the meaning in sign; it jumps from the mark to the pain and the burning cigarette, and then jumps to the fraternity signalled by the burning cigarettes,”(Lingis, 1993)

Even though the affect is partly pain, the scars become symbols of a shared identity, an affective bond between miners. The miner’s scars are a key to forming a connection, a shared history.

⁹ <http://www.andreaswannerstedt.se/pendulums>

“Ordinary affects highlight the question of the intimate impacts of forces in circulation.” (Stewart, 2007). *Coenesthesia* works to create a shared bond through the relational roles the participants are cast in, and through the sharing of virtual space.

As *Ordinary Affects* highlights the everyday occurrences and environments that increase or diminish our vital force, the 1980 study called Rat Park, although perhaps a too simplistic view of the opioid crisis, provides solid evidence of the impact affect can have on behaviour. In this study,, Beyerstein, Hadaway and Coombs, examined the effects of addictive behaviour on rats in different living environments, one group in jail-like cells and the other in a community environment with lots of structures and toys to play with. They force-fed morphine to some of the young rats while they were developing in two different environments, then moved the rats to ‘rat park’ where they could compare the effects on the rats. Rats that lived in community from early on stopped the addictive behaviour as soon as the option became available to them. The rats that were isolated in early development, showed a heightened addictive behaviour over those that lived in community in early development; over time in the community, they lessened their addictive behaviour. Those that remained in isolation remained addicted. There are obvious issues with the study. Rats are not directly comparable to people and we live in a world where there is no end in sight for atrocities such as war, corruption, poverty, starvation, assault, just to name a few. “The point that Rat Park is used to underscore is true. Environment often plays a role in a person developing an addiction” (MacBride, 2017). This study shows the importance of social connection in healing, while supporting the aesthetics of an environment that allows one to play and sensually engage, as a key element to wellness.

2.6.2 A Clue to Aesthetics that Access the Potential of Affect

I share a personal experience in which affect worked as a life-saving mechanism, that perhaps could be a clue in how to access revitalizing affect to optimize our autonomic nervous system.

In 2004, I was hiking in the mountains on the west coast of Mallorca with my partner at the time, Richard. We had read in the *Time Out* guide that this was a fantastic, eight-hour hike with breath-taking views, but had only read about half way through the article before rushing off up the mountain. At about four hours in, half an hour past a remote monastery that only had about 4 visible occupants, we came to a spot where the way was only visible through a few dim-coloured markings sprayed onto the rock wall. Ahead was only an inch-wide ledge to shimmy along, with no clear end in sight and a drop straight down several hundred feet to the rocky ocean below. A breath taking view all right. I idiotically set out along the wall clinging to the ledge to find the next marking with Richard close behind me. Several feet out along the rock wall I realized that I could not see any other markings and really could not see any feasible way of continuing. I said to Richard, “we have to turn around, there is no other way without climbing gear.” At this, he panicked. He froze in place and would not move. At this moment I realized that if I didn’t talk him backward out of this situation, we would both plummet to our deaths. Somehow in this realization, time slowed to a crawl, my own fear was drawn out by an overwhelming sense of calm, and in a soft comforting voice, I relayed directions as to where he should put each limb, one by one, guiding him backward out of the situation I had gotten us into, until we were both safe, back on the top of the mountain. When we finally made it back to the Jeep, we read the rest of the article in which the next two sentences said, “in 1998 two hikers fell to their deaths from this point”. This story’s most obvious lesson is to always read the

whole article, which I now try to strictly adhere to, especially if it involves hiking. The reason I mention this story though is due to the role affect played in this situation. This experience inspired the way height is depicted in the virtual environment in the installation, and how vertigo is leveraged for affect. I felt my impending doom and my autonomic nervous system kicked in, symbiosis of the sympathetic (fight or flight) and parasympathetic (rest and relax) nervous systems. Perhaps accessing the moment when time slows down, is a key to positively affecting one's reality. Analysis of this event reveals that the vertiginous perspective combined with a complete sense that I was the only one who could claim control in the situation allowed for a physiological and psychological transformation within my being. The combination of fear and control were key. Recently Bonnie Devine, Anishinabek installation artist, performance artist, sculptor, curator, and writer from Serpent River First Nation, recounted the experience of riding the lounge in Montreal, "when you were on your way, it cleared away the cobwebs".

2.6.3 The Role of Fear in Healing

It has been found that the Placebo Effect is more powerful when the experience incorporates being poked with a needle. Most people fear or at least physically cringe at the thought of a needle penetrating their body, and this very act makes the effect more pronounced. I suspect that it is only a very specific type of fear that works in this way and therefore, in my work, I narrow the implementation of this to a simple fear of death and of physical pain that most humans share. The site of organs and viscera is associated with fear, abjection and even horror in cinematic representation. The sounds of viscera, especially when ill or malfunctioning, can provoke affective sensations of tension, evidenced in galvanic skin response and adrenaline production, leading to distortion in the sense of time, where time seems to stretch or slow down.

Coenesthesia references some of these fearful responses, while at the same time and paradoxically including soothing affective dimensions by way of the sound design (smooth, flowing, dissolving) and surface texture (furry, soft, responsive).

2.6.4 Embodiment

“In short, my body is not only an object among all other objects, a nexus of sensible qualities among other, but an object which is sensitive to all the rest, which reverberates to all sounds, vibrates to all colours, and provides words with their primordial significance through the way in which it receives them.” (Merleau-Ponty, 1945)

In the 90’s Char Davis created a Virtual Reality system that engaged with the immersant’s proprioception. By employing the immersant’s own live breath and body tilt data as a means of simulating the physical sensation of scuba diving, she was able to fully teleport the immersant into her worlds. By combining the already proprioceptive immersive experience of VR with the addition of breath control and feedback she created a fully embodied experience.

In *Char Davies’ Immersive Virtual Art*, Laurie McRoberts theorizes that “immersive virtual art such as Davies’, is fated to act positively and catalytically on the human psyche, to bring us face to face with an experience of space/time that we intuitively know but had no way of consciously accessing prior to VR”. (McRoberts, 2007) She argues that:

Immersive virtual art such as Davies’ acts as a facilitating medium that allows us to appreciate something more than our mathematically conditioned, four-dimensional experience of space and time and takes us deep into our DNA and an innate sense of an archaic/eternal space/time. (McRoberts, 2007)

Immersive virtual art allows us to appreciate something more than our conditioned experience of relativistic space and time, because our embodied knowledge of space and time provide a foundation for forming meaning and connection with the experience of altered realities.

McRoberts asks the question “Can such work produce biochemical by-products in the brain that affect consciousness?” To which this book supports the subjective answer yes.

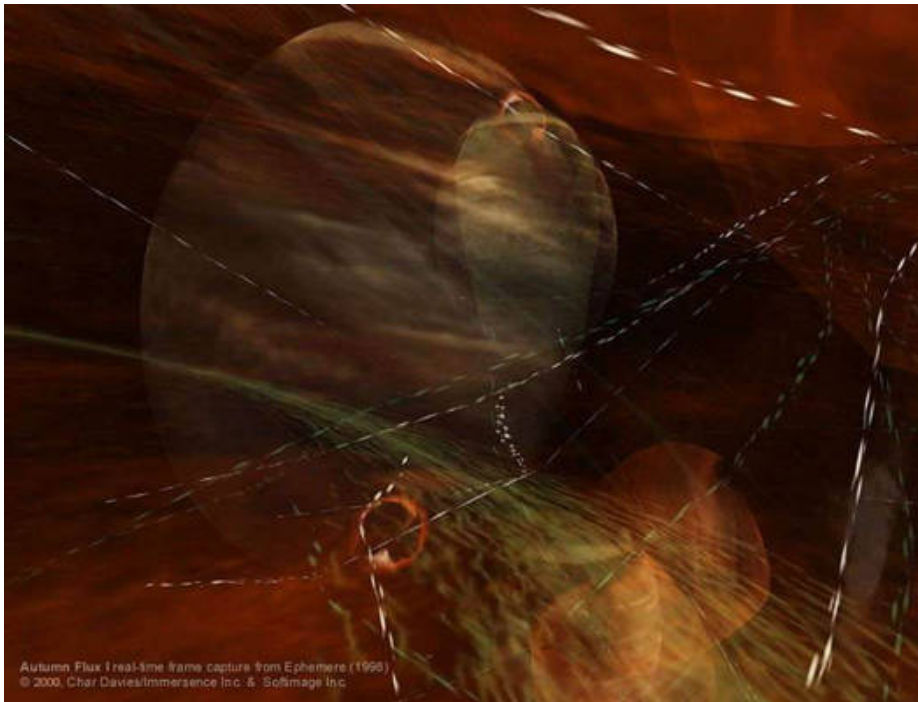


FIGURE 4 CHAR DAVIES. *AUTUMN FLUX*, EPHÉMÈRE (1998). DIGITAL STILL TAKEN IN REAL-TIME THROUGH HMD (HEAD-MOUNTED DISPLAY) DURING LIVE PERFORMANCE OF THE IMMERSIVE VIRTUAL ENVIRONMENT EPHÉMÈRE.

2.6.5 Relational Aesthetics Empowering Participation in Wellness

In this section I investigate the theory of relational aesthetics, and how it can be applied to works that empower participation in wellness. Relational Aesthetics is a term coined by Nicolas Bourriaud, in 1996. He defined this relational aesthetics as “a set of artistic practices which take as their theoretical and practical point of departure the whole of human relations and their social context.” My point of departure is the social context of human inter-personal relations and human-organ relations in the medical system.

Bouriaud “saw artists as facilitators rather than makers and regarded art as information exchanged between the artist and the viewers. The artist, in this sense, gives audiences access to power and the means to change the world.” (Tate) In *Coenesthesia*, I attempt to give audiences access to the power and means to engage with their physiological and psychological being by casting them as characters within an alternative healthcare scenario. I use the VR environment as an access point to the internal workings of the immersant who is cast as the ‘patient’ and the immersive environment as an access point for the participant that is cast as the ‘companion/caregiver’. By embodying these roles, the ‘patient’ is able to access their connection to their internal organs and the positive vibes from their ‘companion’, and the ‘companion’ is able to experience their positive vibes having a positive effect on the ‘patient’. *Coenesthesia* has the purpose of facilitating the connection to one’s internal being.

2.6.6 Mapping Correspondences from Examples that use Affect to

Successfully Aid Healing

In this section I look at research creation projects that address healing - either mental or physical illness or both. I map correspondences between affect and the creative elements of these processes.

2.6.6.1 Lac La Croix First Nation Ponies

Métis scholar Dr. Angela Snowshoe in her paper *Eyiniw mistatimwak: The role of Lac La Croix Indigenous Pony for First Nations youth mental wellness*, explores the shared histories of the indigenous ponies with that of their First Nations community, envisioning a system for

Indigenous Horse-Based Healing that adapts *Equine-Assisted Learning (EAL)* and, *Equine-Assisted Therapy (EAT)*¹⁰ to the *Four Blankets of Indigenous Horse-based Healing*.

Her method considers both horse and human patients, and takes into account the horse's experience as much as the human experience, while honouring, rebuilding and strengthening Indigenous tradition. This is what *Coenesthesia* is trying to accomplish with the 'patient' and the 'caregiver' or 'companion', each is treated in a way that connects and compliments the others treatment.

The four blankets of Snowshoe's approach are: Spirit World; Land and Natural World; Family, Community and Nation; Horse-Human. When talking of the spirit world, Snowshoe speaks of the importance of dreams and visions, and of the lack of division between the dream world and what non-Indigenous people call the real world.

Snowshoe's work speaks to connection and exploration of dreams and dream-like states. The emphasis on nature and dreams find synchronicity in with surrealist explorations of dream states. "The sweat lodge ceremony, the naming ceremony, fasting and vision quests, and dreams involving the horse are ways in which an Indigenous person can closely connect with the spirit world and learn from what they experience and discover." (Snowshoe, 2016) With these intense affective ceremonies and experiences as inspiration, perhaps we can find new ways to approach technology. In specific situations, such as hospital environments, where patients have little opportunity to connect with nature and community, I feel that technology has gotten to a place where it could inspire and facilitate internal visions and insights, rather than distract or separate us from them.

¹⁰ are experiential interventions in which *horses* are incorporated, in a therapeutic capacity, to ameliorate mental illness.

2.6.6.2 Pathfinding

Pathfinding is collaborative art project that included Judith Doyle, Robin Len, Emad Dabiri, and Kang-Il Kim which took place at Baycrest Hospital with neuropsychologist Dr. Brian Richards. The project was developed in the context of Memory Link, a program for developing assistive technologies and training for people with Acquired Brain Injury (ABI).¹¹

In this collaboration, the artists worked together using Adobe After Effects to create works in an “error free” environment. Robin Len, who had suffered a Traumatic Brain Injury, had previously been an industry leading Animator and Title Designer. In this project Robin was assisted in using Adobe After Effects to create moving images for the piece, and this process helped his brain to heal. His previous familiarity with the software supported his ability to restore his creative process through collaboration, and as a side benefit, to function with more agency in his everyday life. The truly remarkable thing about this is that it not only rebuilt his ability to use the software, but it also had a marked effect on his day to day quality of life and ability to function better in the world. (Citation - <https://www2.ocadu.ca/feature/pathfinding-installation-explores-memory-loss>)

This project presents another situation in which a shared history is a key element to the mix. Both participants with ABI had prior experience with After Effects. Through error free

¹¹ Pathfinding portrays the perceptual experiences of memory loss in images combining natural branching phenomenon and scans of neuro-pathways. The collaboration continued for more than a year, Pathfinding was installed at Baycrest Health Sciences in a high-traffic, publicly accessible space. Composited imagery played on an array of vintage TVs, each with its own soundtrack or "voice".

Robin and Kang have difficulty storing and retrieving new memories (anterograde amnesia) resulting from ABI. All four of us have worked as filmmakers/compositors and we drew from this experience, enlisting embodied memory through artistic collaboration. (Doyle,2013)

learning and creative collaboration, the ABI participants made composited imagery and non-linear abstract visuals, without the stress of being confronted with errors. *Coenesthesia* also, has no wrong way to create or experience it. The immersant can explore the space and organs in any way or order that inspires them. That Robin and Kang were given agency, set in motion to create anything with the software, played a role in contributing to their affective experience. They had an open-ended mission to create which requires engaging in movement and thought, two things that are similarly integral to *Coenesthesia*, in the roles the participants are given to play out.

This system is partly mirrored in the approach taken by this thesis. My husband Marc is Patient 0 of this experiment in revitalizing affect. He has participated at every stage of the process, from reading papers to working as tech support and being my test subject for user interaction feedback. Although this project cannot claim all of the success in his medical improvement - there has been much progress in terms of the medical support he is receiving now compared to the start of the project - I am convinced that his partial recovery in at least the mental health realm, is due in part to participating in this work.

2.6.6.3 Virtual Meditative Walk

Dianne Gromala, Canada Research Chair and a Professor in the Simon Fraser University School of Interactive Arts and Technology, works with virtual reality to help alleviate chronic pain, from which she herself suffers. Virtual Meditative Walk (VMW) is an extension of the Meditation Chamber, where a self-regulated treadmill is added to a VR environment and biofeedback technology. Instead of sitting, users of the Virtual Meditative walk learn how to meditate while they walk through virtual landscapes, which are displayed stereoscopically and binaurally. Simultaneously, real-time feedback of users' physiological states alters these visuals and sound. This work is ongoing and is being studied as a way to train people who suffer from

Chronic Pain to gain control over their pain. This piece is a collaboration with the Transforming Pain Research Group of which Diane Gromala is the founding director.



This VR experience has a transforming affect on the patient. Gromala tests her work through qualitative questionnaires to quantify success.

This work supports my thesis with its implementation of meditative elements combined with proprioception paired with synchronous physical movement and virtual reality.

FIGURE 5. A CHRONIC PAIN PATIENT DOES WALKING MEDITATION IN SIMON FRASER'S PAIN STUDIES LAB. (PAIN STUDIES LAB AT SIMON FRASER UNIVESRITY)

2.6.6.4 Osmose

Char Davies' meditative ephemeral virtual world that was experienced through interactive breath based navigation had reportedly therapeutic effects on those who were immersed in it. *Osmose*, taps in to the natural bond that most humans have with nature. It uses technology to evoke an organic ephemeral space of forests. For most, this engages a shared history, a phenomenal, sensual knowledge of the forest, instantly connecting to the piece. The sensual memories it evokes tap into that synesthetic cross-wiring linking smell, taste, touch and vision and sound. Some of the participants exited this piece having felt as though they had an experience of having died, yet it was uplifting, like they were reborn.

Intimacy and connection are enabled by recognition. Transformation happens when sounds and images are reorganised into unexpected forms and trajectories; recognition, intimacy and connection are key. In Char Davies doctoral thesis, she writes:

I cannot emphasize enough however, that such potential for transformation exists only to the extent that a virtual environment is designed to be different, that it is designed to be *unlike* the world of our usual perceptions. When designed in ways that reflect our habitual assumptions of a Cartesian opposition of subject and object and related manipulating and controlling behaviour, such environments (regardless of Innovative content) forego their transformative potential and by default, reinforce the status quo. (Davies,2005)

Reproducing physical reality creates a habituation that can lull us into complacency, but there is a sweet spot of incorporating some representational images and sound. Davies avoids the inclusion of any solid virtual objects, her forms hint at forest scenes, cells and floating ethereal figures. By using some familiar objects in unfamiliar ways, she taps into the language of the subconscious and captures intrigue. By accessing those sounds and representations that have meaning to us, she subverts Cartesian norms and affects transformation.

This work is evidence alongside its user testimonials for the convincing feeling of embodiment paired with natural meditative elements leading to emotional affective reactions. It also supports the use of biofeedback as an important element to the mix.

2.6.6.5 Uncover/Recover

Serpent River First Nations artist and scholar Bonnie Devine is creating a revolution in museology with a first of its kind collaboration between the Indigenous Visual Culture Program (INVC) at OCADU and the ROM in which 9 students were allowed in-to the ROM collections of Indigenous artefacts with the mission of selecting one item to document, and envision it in a present day incarnation and a future incarnation. The artists were to produce artworks that will be hosted on the ROM website for the next couple of years. This project included a conference

panel with indigenous scholars and museum curators where students presented their projects allowing for cross pollination of ideas and directions.

During the conference, the artefacts were referred to as “belongings” and “ancestors”, not objects. They were imbued with anthropomorphic qualities. In the discussion Mohawk illustrator and art student, Kaia'tanoron Dumoulin Bush said “when I touched it, I felt energy travel up my arm”. For her the act of touching the pipe she had chosen to work with formed a connection of healing. There was a general feeling that this process promoted healing through enabling the students to hold the object and reconnect with their past. Being in the museum brought feelings of frustration and anger at the colonialism that separated them from these belongings. Karalyn Reuben urban Cree-Ojibwa, German-British, printmaker, said that “it felt like a million knives stabbing in-to me as I entered” but in time, through this openness of the institution, a healing began allowing for an ability to feel a little more comfortable in the space. Megan Feheley, a multidisciplinary artist of Ililiw (Moose Cree), Irish and Dutch descent, said that when they left, it felt as though they “had just been on fire”. The students produced projects including virtual elements, and the process of reconnecting with their “ancestors” and writing the future was revitalizing.

The inspired use of analogies of affect truly illustrate the relationship between these concepts. The work creates a sense of empowerment through connection and purpose.

Correspondences for a Framework of Restorative Affect

The examples in this section establish what is meant in this project by the term ‘restorative affect’. Each of these artists/researchers develops and promotes revitalizing

and healing affective experiences for their collaborative participants. Snowshoe engages empathy, shared history and the re-forging of human-animal friendships and paths while acknowledging the importance of the dream world as being equally real to what we consider the real world. Doyle promotes *error free* participation in collaborative studio-based artistic creativity. Gromalla designs meditative walks in virtual environments that alter fog through brain wave data. Davies translates her love of the forest and scuba diving into an embodied experience that connects the subject to nature as translated through a digital medium with proprioceptive controls. Devine connects students with ancestral objects that share their history and give them agency to create their own future. Each of these artists engages subjects both cognitively and through their bodies, engaging a revitalizing affective response through connection, a sense of agency and empowerment through creative collaboration.

To summarize, grounded in the literature review, a revitalizing affect creates a sense of connection or even intimacy in the face of precarity and vulnerability. A revitalizing affect can mobilize a sense of agency and empowerment. Agency requires a motivation, and motivation is often induced through some level of fear or desire to make a change. Connection and intimacy can be formed through shared experience and collaboration, and empowerment can be a result of feeling that as though you can make a difference, even if only temporarily and elusively. An error-free environment is also necessary for empowerment and motivation, because when there is no order of right and wrong, there is true freedom.

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3. Theoretical Framework

3.1 Creating a Sense of Body Ownership Over Virtual Body

Parts.

Here I do not write in socio-economic terms of ownership. Ownership in this context comes from the language used in neuro-prosthetics research, to establish things that are included as being part of the makeup of one's physical body.

Whereas amenable objects are the realm of the 'me and not me extension' somewhere between subjective and objective, so too are prosthetic limbs. I look to the field of cognitive neuro- prosthetics to establish techniques for creating a sense of body ownership over virtual representations of body parts. This field builds, "models of self-consciousness in order to project them onto artificial limbs, avatars and robots." (Blanke, 2012)

Hugh Herr, a renowned neuro-prosthetics researcher who revolutionized prosthetic limbs after losing his own legs in a climbing incident at the age of 17 says "Technology has the power to heal, to rehabilitate and to even extend human experience and capability" (Hugh Herr, 2015)

In 1998 Botvinick and Cohen established the 'the rubber arm illusion'. This is an experiment where one arm of the participant is hidden from view and a rubber arm is positioned where the participant's real arm would typically be. The experimenter then simultaneously brushes both the real arm of the participant and the rubber arm for length of time. This synchronization creates a sense of body ownership in the participant for the rubber arm and

when it is threatened with pain, they jump to protect it. This experiment shows how sight, touch and proprioception combine to create a convincing feeling of body ownership, one of the foundations of self-consciousness (Nature, vol 391, p 756). In 2007, Frank H Durgin et al, expanded on the rubber arm experiment¹². They replaced the brush with a laser and discuss the results in terms of multisensory integration¹³. Vision, Touch and Synchronisation are all key elements.

Based on the rubber arm illusion In 2007, Frank H Durgin et al, expanded the experiment¹⁴. They replaced the brush with a laser and discuss the results in terms of multisensory integration¹⁵. Vision, Touch and Synchronisation are all key elements.

¹² Two experiments involving a total of 220 subjects are reported. The experiments document that “stroking” a false hand with the bright beam of light from a laser pointer can produce tactile and thermal sensations when the hand can be seen as one’s own. Overall, 66% of subjects reported somatic sensations from the light. Felt hand location was recalibrated toward the location of the false hand for those subjects who felt the light. Moreover, the proprioceptive recalibration from the laser experience was comparable to that produced by actual coordinated brushing of the false hand and of the unseen real hand after 2 min of stimulation. The illusion may be experienced on one’s real hand as well. (Durgin, 2002)

¹³ We interpret this touch-from-light illusion in terms of a multisensory-integration theory wherein perceptual signals of high certainty from one sense modality can produce perceptual consequences that influence the experience of a second modality (De Gelder & Bertelson, 2003; Driver & Spence, 2000; Ernst & Banks, 2002; Gibson, 1966; McGurk & MacDonald, 1976; Shimojo & Shams, 2001). For example, an insect crawling on the skin would not normally produce tactile sensations if the mechanical disturbances to the skin are below sensory threshold. Once the insect is seen, however, a vivid experience of tactile sensations could arise from the combination of the visual localization evidence with sensory noise from the tactile sensors (see Durgin, 2002). In the present case, sensory integration depends on the ease with which a rubber hand can be incorporated into the body schema or body image (Head et al., 1920; Schilder, 1938).

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Experiments established the mirror therapy method (Ramachandran, 1994), to relieve pain in phantom limbs. Using a mirror to recreate a mental image of the missing limb was found to alleviate pain in the phantom limb and over time to remap the mental image of that limb in the brain of the amputee, having a lasting effect on the pain relief. With the limb missing, confusion develops in the signals sent between the limb and the brain, forming in some patients a mental image of a cramped up, clenched hand. When a mirror is used to substitute an image of the opposite arm, there is instant pain relief when they see the hand stretched and relaxed. The mental image of the limb is key to the experience of it.

Heautoscopy is a phenomenon where patients have a sensation of being reduplicated and to exist at two or even more locations. It has been found that self-identification with two virtual bodies was stronger during synchronous stroking (Heydrich, 2013). This proposes that having more than one set of organs in the virtual space I have created encourages the immersant to identify with more variations of organ representation.

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In *Coenesthesia* I create a synchronous link between the immersant's real organs and the virtual representations of the body organs and virtual objects through synchronous biometric data.

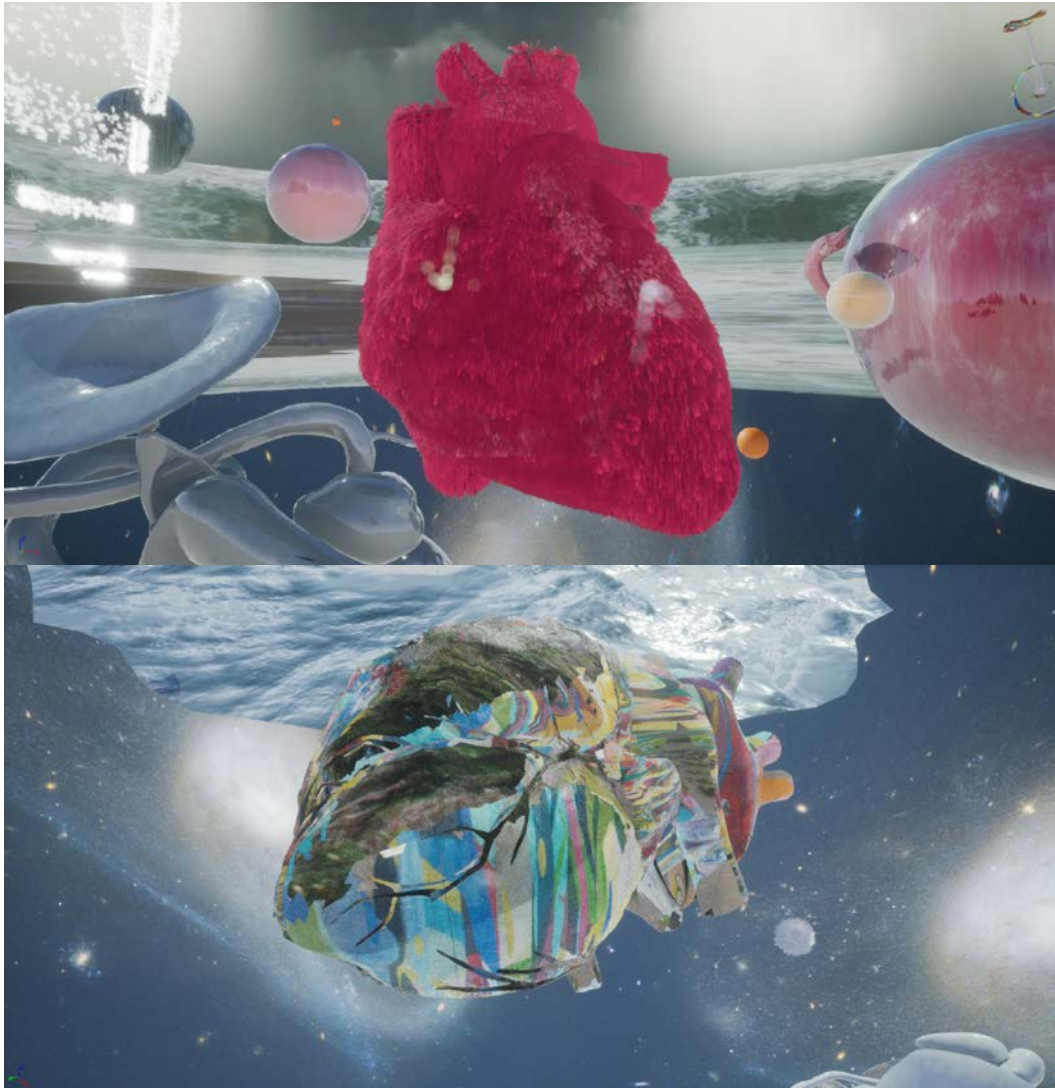


FIGURE 6,7 TOP: FURRY HEART, FROM COENESTHESIA 2018, BOTTOM: GRAFFITI HEART, FROM COENESTHESIA

2018

To make effective use of the sound component in the project was influenced by the findings of Noel et al, in which they consider acoustic stimuli, in the mix of synchronous stroking

during the rubber arm illusion. They write, “the distance at which acoustic stimuli are presented may alter the balance between self- and non-self, biases.” (Noel et al, 2017).

Light when employed in sync with a physical sensation can contribute to a sense of body ownership and of heautoscopy. Actively engaging motor neurons and the position of acoustic stimuli are also of key importance to the mix.

3.2 Surrealist Dream States

Lucid dreaming, and the hypnogogic state occur in the liminal zone between conscious and subconscious mental activity. I look at these in relation to this thesis to find resonance.

When working in the Unreal game engine, I felt like I had teleported into that world. I wandered around and played with things in the scene view¹⁷ and then popped out to blueprint windows¹⁸ to tweak things. This experience feels like a slower, more technical version of lucid dreaming. I controlled the experience I had by altering the world and its physics behind the scenes.

Lucid Dreaming

Steven LaBerge distinguishes two contrasting perspectives from which we experience our dreams and other states of consciousness: actor and observer. (LaBerge, 1985). He describes dreams and waking life as being an actor perspective and lucid dreams as being both actor and observer, because in the lucid dream you are both participating in and “witnessing” the dream (Gackenbach, 1991).

The actor perspective is how we ordinarily experience our dreams (and waking life)—as an actively involved participant within the dream (or waking) scene. In contrast, when we take

the observer perspective, we are reflective, not identified, and “beyond” or “meta” to the scene. As actors, we experience ourselves as being contained in the dream scene; as observers, we experience ourselves as containing the dream “I am in the dream” versus “the dream is in me” (or, equivalently, “in my mind”). Lucid dreaming involves a balance between detachment and participation in which both actor and observer perspectives are present (LaBerge, 1985). In the typical nonlucid dream, we are identified with the actor perspective. In “witnessing,” whether of dreaming or nondreaming sleep, identification is with the detached observer (Gackenbach, 1991).

In a dream state, one is an actor. In a waking or a lucid dream state, one becomes a participant, with agency over actions. VR may afford conditions that are closer than cinema’s to how we experience lucid dreams, in that it is a participant perspective, but it is also an observer perspective through the immersant’s knowledge that they are in a world other than their tangible one. VR has the added potential of built-in interactions that allow the immersant to manipulate their virtual reality in ways similar to what is experienced in lucid dreaming.

When one realizes that they are actually dreaming and have control over the way that dream plays out, their subconscious experiences may align with conscious awareness. This can be a form of playful mental exercise in a realm where one has access to the code of one’s own mind. If one can plan for episodes of lucid dreaming the potential is there for tweaking thought patterns. My personal favourite mode of dreaming is one that walks the line between -a complete dream state and a lucid dream state, where the moments of conscious awareness of the ability to change things only happens intermittently when most needed.

Accessing the synchronicity of our lived world with the virtual world as a means of accessing the overlap zone of conscious and subconscious mental activity is similar to dreams,

our dreams incorporate elements of realism with distortions and reorganizing of that realism.

See Appendix A for a few dream explorations.

“Whatever is already known becomes a wonder when it is re-used in a subjective way.”

(Randolph, 1991)

The mental processing that carries events from lived experience into the internal space of self, the space of analogy, where our memories become a language of our subconscious mind is important not only toward content creation to incorporate into the immersant’s language of the subconscious but also to find trigger points to bring them mentally back to the internal space of memory of the experience when they are out in the real world. For this reason, I add local graffiti as textures to the imagery of my piece in order to trigger the experience of it from the outside every-day world.

The Hypnogogic State

The hypnogogic state occurs, at the moment between waking and sleep. Capturing the moment at which one jumps from the dream to waking state is of interest to many thinkers, including the Surrealist artists, as a brief moment when the subconscious communicates with the conscious through the language of stored images. I have spent much of the two years of this thesis accessing the hypnogogic state to find answers. Einstein is noted for having used a system to capture this state. He would sit in his chair with a spoon in his hand and a metal plate below. When the spoon dropped he would obtain the brief but luminary, hypnogogic state.

André Breton’s quest for a “Surreality” encouraged explorations in dream states.

Apparently Salvador Dali had a similar system to Einstein’s spoon system, Dali though used keys instead of spoons with the metal plate:

The most characteristic slumber, the one most appropriate to the exercise of the art of painting...is the slumber which I call 'the slumber with a key,' ... you must resolve the problem of 'sleeping without sleeping,' which is the essence of the dialectics of the dream, since it is a repose which walks in equilibrium on the taut and invisible wire which separates sleeping from waking." (Salvador Dali, 1992)

These methods for achieving a hypnogogic state were first developed by monks and today Tibetan Monks are often found sleeping while standing to access the state.

"This kind of mental play uses both unconscious and conscious thinking: scanning various stimuli and information, perceiving patterns and clear or hidden similarities between things or ideas, and playing with their interconnections, relationships, and links," notes researcher Victoria Stevens, who explored the neuroscience of creativity in *To Think Without Thinking*. Stevens notes that the link between problem solver and creative thinker is essential. "Combinatory play provides a fertile field for neuro-aesthetic investigation into the direct link between play, imagination, creativity, and empathy". (Stevens, 2014)

Much of the writing for this thesis has come from hypnogogic moments, and many insights in this document could be considered hypnogogic. For a few examples and for my experiments with hypnosis, see Appendix A. The swing pod from the installation section of *Coenesthesia* can double as a system for achieving a hypnogogic state. The cosy duvet covering on the swing itself can work with the swinging motion to lull one into this state when not operating the trackball.

Perhaps precisely because the hypnogogic state is one where the dreamer positions themselves in slightly precarious physical position, the connection between the physical and dream world is more tightly linked. I speculate that when ill, a person is more likely to experience a hypnogogic state due to the physical ailment acting similarly to the precarious physical position of the dreamer. One of the most interesting aspects of dreams that we have when our body has an urgent physical need is that the physical need manifests in a dream. The

need to breath manifested as suffocating in the dream I had while having trouble breathing from a sinus infection. When my children wet the bed they were dreaming of peeing or waterfalls. This is an example of how our body communicates with the subconscious through analogy in dreams.



FIGURE 8 THE INSTALLATION OF *COENESTHESIA* WENDY WHALEY 2018

3.3 Working in a Feedback Loop

The research system informs itself, as I move between dream state, virtual and physical creation, and literary review. Each morning I wake abruptly around 5am with some new piece I need to add to either the writing, the physical or virtual world. Guided dream states work subconsciously to steer the project. Binaural beats help focus thoughts and somehow revitalize the exhaustion from the previous day. I zone in to the virtual when I can and find myself drifting in to hypnogogic states that produce figurative images that contain an essence, like furry unicycles. The technical difficulties tend to pull me out of the zone and days are sacrificed to

sifting through instructional Youtube videos, most of which do not quite answer the questions. I have the good fortune of spending moments with digital media artist, interactivity designer and creative software developer Hector Centeno every few weeks in which he helps trouble-shoot my issues. Hector programmed the flying mechanics I envisioned into the leap motion controller interface for the Unreal Engine, and coded the link between the sensors, the Arduino-Lilypad circuit board and Unreal Engine.

My background in visual effects has proven helpful in the creation of the virtual environment. The 3D modelling for the virtual world was done in Maya (Autodesk, 2017) and the animated textures were created as detailed composites in Nuke (The Foundry, 2013). I have had to teach myself Epic Unreal Game Engine which has proven more difficult than anticipated; I spend between 30 and 50 hours per week on this alone.

For the mediation pod, I created the design in Maya and sent the plans to my father and brother who constructed the metal frame. After getting the pod to my studio, a member of my cohort Michael Simon donated some parachute cord to my project and so I learned macramé from a Youtube video to create the swing. It brought to mind the Winnicott piece about the patient who connected things with string and thought of connecting everything in the space with string. In the maker lab, Reza cut a wooden base from a cardboard pattern I made to establish the seat shape, and I inserted it for stability. The cushioning was made from old duvet bits I had in the studio and the cover went through a few iterations but in the end is made of a king duvet cover with faux fur accents. The duvet cover adds to the dream theme and the faux fur to the accentuated sense of touch. Having this in my studio lends itself to swinging breaks, thinking and swinging. These swing breaks help gain perspective considering how much of my time was absorbed in front of a computer.

The furry materials come from King Textiles on Spadina and my time in the back room communing with the faux fur was filled with revitalizing affect.

For the wearable chest strap I experimented with various types of straps, from knapsack connectors to baby carriers, in an effort to create something that would be easily adjustable to various body types. I ended up Frankenstiening together a thing that is part baby carrier, part strap from sport heart-rate sensor, covered in faux fur for tactile input. The biometrics are contained in the front of the strap and the wire feeds out the back into the rest of the wires from the HMD. All of the wires for both the HMD and wearable component feed up into a suspended dog leash that keeps the immersant from tripping over them.

Initial computer generated velvety fur explorations began within Maya, which produced great results but required long render times that are not possible in a real time renderer. I had to limit my fur requirements and form the most part sacrifice realistic fur for interactive textures. I was able to get relatively decent fur on a smaller heart that is closer to the scale of a human heart but it requires a top computer system to play it without dropping the frame rate beyond what is acceptable. If frame rates drop below 24 frames per second immersant's are prone to motion sickness. This would not be acceptable considering the intended application of this piece.



FIGURE 9 MAYA FUR TEST 4HR RENDER, WENDY WHALEY, 2018



FIGURE 10,11 REAL TIME FUR IN *COENESTHESIA*, 2018

I was having difficulty with the Arduino code and so as to keep my time with Centeno efficient, I decided to lean on my friend Rob Cruickshank, master coder of all things electronic art related and board member of Inter/Access Media Arts Centre. The electronics for this section were programmed into an Arduino-Lillypad for wearability. Cruickshank helped with the

programming to get clean code that could be fed into the Unreal system for both the heart rate and stretch sensors.

In the studio, depending on my mood, I played either purring sounds, waves or binaural beats through decent speakers aimed at my head accordingly. I tried various frequencies and established that I like 528 HZ best. This was incorporated into the sound track along with the waves and purring sounds. I have the good fortune of knowing award winning sound designer, artist, Tom Third as a friend and so communicated with him about the sound and put together a list a descriptions of things like “the sound of interpersonal connections” to which he sent me a sound library to work with. The purring sounds are from E-Z-Purr Virtual Cat, which another of my awesome cohort, Morgan Sea directed me to when I sought purring sounds for the *Negativity Vacuum*. The space sounds are from NASA. Having worked in the visual effects industry, one of the first great insights is that NASA has a vast library of royalty-free images, footage and sounds. The lung and heart sounds are from a CD that was in a box with a stethoscope that our upstairs neighbour threw out. The hypnotic voice recordings I wrote and recorded myself.

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4. Research Creation

My methodology is an Interdisciplinary approach to art practice at the intersection of art, technology and cognitive research. I work through a self-referencing feedback loop of experiential techniques, literary review and physical and virtual explorations. I use a combination of literary review and experiential techniques both to conceptualize and draw inspiration from affects I hope to engage. In this section I unpack inspiration for the project, some initial explorations leading up to *Coenesthesia*, the cognitive neuro-prosthetics research that I tap for techniques of creating body ownership over non-body objects, and some explorations - both literary and experiential - in surrealist dream states and hypnosis.

4.1 Contextual Background

4.1.1 An Exploration of the Dynamics of Happiness

“A journey of a thousand miles, begins with one step” Lao Tzu



FIGURE 12 *NEGATIVITY VACUUM*, 2017, A FUNCTIONING VACUUM ENCASED IN STUFFING, FELT, AND NYLONS.

I created an artwork called Negativity Vacuum, designed to suck out negative energy. Next, I decided to come at the problem of negativity removal from another direction, by finding the dynamics of happiness. I began field observations by logging various internet gifs and short clips that caused me to feel affect as pure happiness. My definition of this feeling is some amount of heightened physical sensation that can be likened to a positive form of frisson. Various themes came to the surface such as seeing cute fluffy animals doing fun silly things. Less often, people doing fun silly things like jumping and rolling on an oversized ball, or riding unicycles well. Water, fluid dynamics, and things like the making of bubble gum, with thick strips of pink gooey substance being squished and pulled, all generated positive affect.

<http://www.andreaswannerstedt.se/oddly-satisfying-vol2>

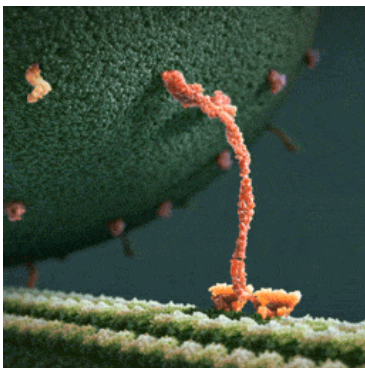


FIGURE 13 DREW BERRY, OUR SECRET UNIVERSE: THE HIDDEN LIFE OF THE CELL (2012)

I found myself most attached to a gif that I traced back to its origin, the Harvard documentary *Our Secret Universe: The Inner Life of a Cell*, which stirred existential debate over the concept of intelligent design in our genetic code. The gif itself seamlessly loops a representation of a kinesin protein carrying what might be a dopamine molecule along a micro tubule to and from plasma membranes in the brain. The anthropomorphized protein brings thoughts of Albert Camus's *The*

Myth of Sisyphus (Camus, 1942), by way of Sisyphus' acceptance of futility of the expectation that the journey to know and attain happiness will ever end and so happiness must be found in the journey itself. Now looking back at this image, I see a representation of one of the mechanisms of affect. One of the processes at work behind the scenes, as a positive affect is engaged. Field observations can be found in the appendix.

This exploration led to the creation of *The Dynamics Of Happiness* kinetic sculpture. In order to incorporate the dynamic motions, I worked with faux fur for the surface of the ball and the slippers and balloons for the structure of the body. The balloons were at first filled with air but in an effort to make the piece more sustainable I stuffed them all with pillow stuffing. The balloons are strung together with thin rope and the large ball holds it's structure with a central internal yoga ball. The piece went through a few iterations, from the initial development of the treadmill and monitor to the later kinetic sculpture which incorporated a mechanized walking system for the slippers. I used motors and wood to create a system that would walk with a nice forward flip to the foot movement, enhancing the dynamics of the fur. The whole piece is tied in to the feet so that there is an overall body movement transmitting all the way through to the ball and its furry outer layer.

Version 1: The first iteration was meant as a performance and was a way for me to truly embody happiness. I created a wearable outfit made of strings of balloons that wrapped around my legs and torso, fuzzy slippers I wore on my feet and a large fuzzy ball that I held up and carried around as I walked. I had intended walking on flat escalators at the airport but decided to rethink and move on to the next iteration.

Version 2: The user puts on the oversized fluffy slippers and walks on the treadmill while holding the ball and watching the inspiring Kinesin protein. I set it up for a casual test run -with

whomever was in the vicinity (about 20 people), and the piece unanimously enhanced feelings of happiness.

A link to version 2 in motion: <https://vimeo.com/208924459>

Version 3: A kinetic installation in which the representation of the anthropomorphic Kinesin protein continuously walks. The arrangement and dynamics of the materials had the conversationally confirmed result of making myself and others experience happiness.

A link to version 3 in motion: <https://vimeo.com/212680830>



FIGURE 14 *DYNAMICS OF HAPPINESS*, 2017, WIDE AND CLOSE UP

Reflecting on this exploration, I feel that the final iteration, although it is very well liked and pretty much universally made people happy to look at, lost much of the embodiment that was felt in the interactive second iteration. Both the negativity vacuum that acts a bit like an amenable object and the second iteration of the dynamics of happiness had interaction; this became an important aspect for forming an affective connection.

4.1.2 Unplanned Field Research



FIGURE 15 JULY-AUGUST 2018, MARC UNCONSCIOUS SEVERAL DAYS AFTER HEART ATTACK

In the summer of 2017, I was living out of a hospital for about a month. While there, I truly experienced how frustrating life can be; around half of the nurses made me feel as though I was in the way and they would rather I just leave. I suppose since my husband was unconscious for most of the time they felt I didn't need to be there. But each shift change is a new nurse and not all of them read the 300 pages of documentation that came with him including paperwork telling them of his fractured spine and osteoporosis. There was a roughness to initial interactions with him, as if they hadn't read that they should be careful, and when I told them of his conditions, I would occasionally get a nurse who from that moment on, had it in for me. Who was I to interfere with how they do the job they were trained to do? He was kept unconscious, in five-point restraints for about a week, and when they finally decided to extubate him, as he began

gaining consciousness, he pulled a Houdini, and extubated himself. For anyone who doesn't know what that means, he yanked the inflated breathing tube out of his lungs himself while still in restraints. After some discussion on whether or not to re-intubate him they finally decided to just let him be, since, aside from coughing up a lot of blood, he was breathing fine on his own. When Marc woke up, at first he had no idea who I was, it took about 24 hours for him to remember. This only brushes the surface of rough interactions at the hospital but that are beyond the scope of this paper, I only wanted to give a hint to the experience of being the patient's companion.

4.3 *Coenesthesia*: The Thesis Creation and Exhibition



FIGURE 16 *COENESTHESIA*, 2018, INSTALLATION, MEDIATION POD SWING, FURRY SPHERES, VR, PROJECTION,

UNICYCLE



Figure 17,18 *Coenesthesia*, 2018, opening May 24, 2018

A row of chairs greets each participant as they enter the room. Here they can line up to take a turn as 'patient' in the VR world. At the front of the line stands a mattress next to a furry plinth with VR headset ready for the next participant. Here the participant removes their shoes and I help affix a furry biometric chest strap to the participant. I show them where to attach the self-adhesive medical heart rate sensor probes and have them stand on the mattress. The furriness of the chest strap is meant to heighten the mental recreation of the sensation of touch, the squishy foam mattress is to enhance the sense of malleability of the space the participant stands on.



FIGURE 19,20,21 *COENESTHESIA*, BIOMETRIC WEARABLE IN ACTION, 2018, FROM LEFT TO RIGHT: DAVE MCKELLAR FLYING, MARC WHALEY PROTOTYPE MODELLING, JEAN TRIVET FLYING.

When they are connected, I then describe how to fly in the world: “reach your arms out in front, palms apart, fingers spread apart, make sure to have a gap between the hands. This will make you travel fast and if you want to slow down just turn your palms to face the ground. This world allows you to communicate with your internal organs. This can be a personal experience or if you want to connect more deeply with a caregiver or companion we can invite them to interact with

you in the world". At this point my assistant starts the VR and the experience of exploring the world of biometrically connected virtual organs begins.



FIGURE 22,23 TAMARA STONE ENJOYING FLYING AROUND IN *COENESTHESIA*, 2018

A typical exploration of the virtual space progresses as follows. The participant starts inside a brain that is separated in a sort of exploded view, so as to be able to see all of the parts. Sounds of ocean waves and purring fill the space. The participant sees what appears to be their own hands, in sync with their actual hands, through the use of a Leap Motion device. The hands appear solid at the finger-tips and then disperse into particles toward the wrists, toward the body. This is meant to hint at the immersant's body being opened up to a space in between the physical particles that constitute matter, to a space where affect resides. The participant looks at their hands and notices that it as if when they move them, they pass through the texture of space-time and leave a trail of glowing particles behind. These particles affect the objects that they interact with painting light onto them. The participant looks down to see a pad of what looks like a body of water about 200 feet below the downward tilting brain they are perched on. The pieces of the brain are watery and slowly close in toward each other, forming a complete water brain. As the participant notices the brain closing in, they usually look around behind them,

see the large beating heart in the distance and quickly learn to fly. The journey to the heart takes at least a full minute, sometimes longer depending on the participant's proficiency with flying. The time helps with the feeling of distance and of scale and creates a sense of anticipation. The heart the participant flies to first is very large, about 40 feet high. The heart is beating in sync with their own heart, they can fly directly inside the heart and experience the valves opening and closing in sync with their own. Here, either through suggestion or through the synchronization of sensation or a combination of both, most participants feel as though they are inside their own heart. This first heart is kind of pink and watery.

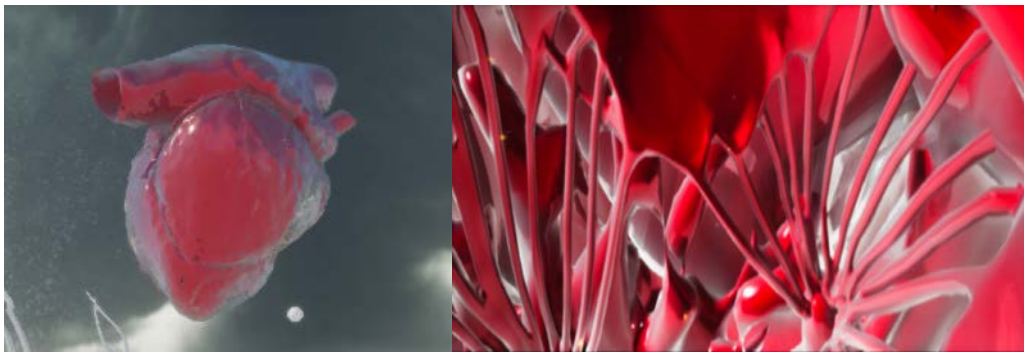


FIGURE 24,25 OUTSIDE AND INSIDE OF THE 40FT HEART IN *COENESTHESIA*, 2018

Once done with this heart, the participant looks around the world. The overall space consists of a ring of kaleidoscopic ocean waves in the distance with a stormy sky above and beyond the ring of waves an opening clear through to outer space, stars, nebula. At the core of this outer setting is a brightly lit gathering of internal organs, appearing as if a beam of light is focused on them as though there is this oasis of light inside the chaos. Hearts exist with various -textures, from watery to velvety, to furry. Intestines textured with stars and galaxies, translucent lungs, random veins draw details in the space, cochlea warble with sound waves as do sex organs and watery spheres.

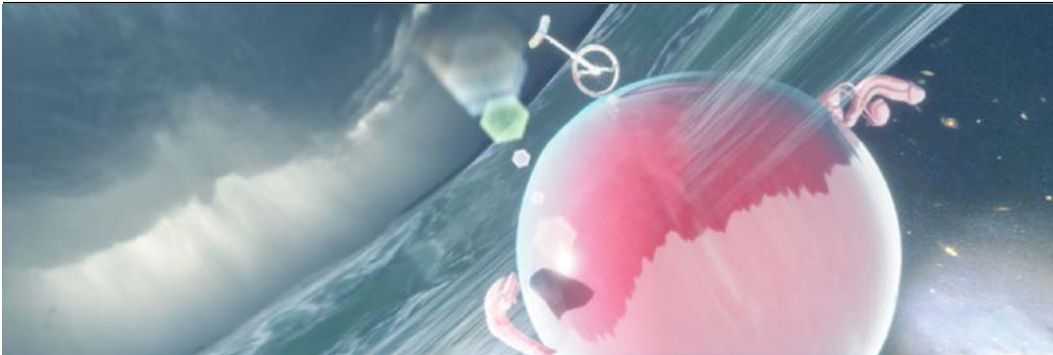


FIGURE 26 SEX ORGANS A UNICYCLE AND SPHERE IN *COENESTHESIA*, 2018

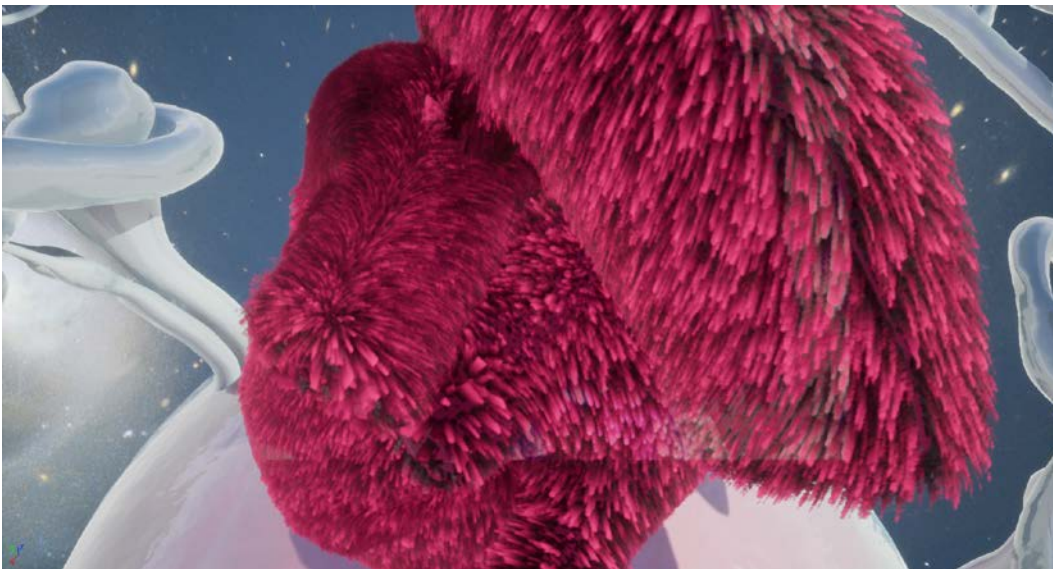


FIGURE 27 FURRY HEART INSIDE *COENESTHESIA*, 2018

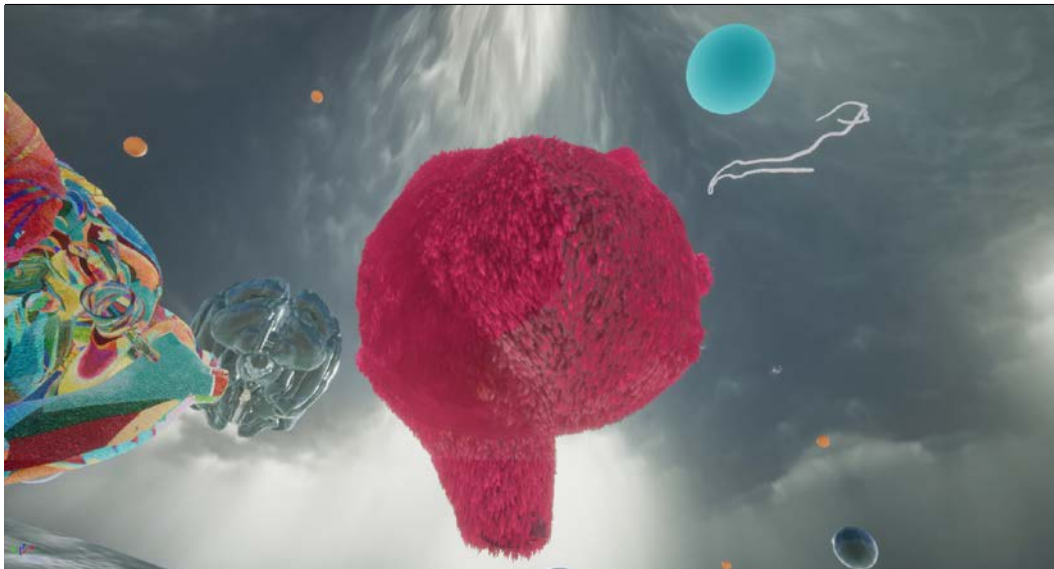


FIGURE 28 FURRY HEART INSIDE *COENESTHESIA*, 2018



FIGURE 29 GRAFFITI HEART INSIDE *COENESTHESIA*, 2018



FIGURE 30 GRAFFITI HEART INSIDE *COENESTHESIA*, 2018

Unicycles cycle forward with a bit of the immersant's breath mixed in to personalize them and incorporate them into the body image.



FIGURE 31 UNICYCLES INSIDE *COENESTHESIA*, 2018

There are various sizes and copies of organs within the space of various sizes and configurations. These variations of form and texture allow for variation in interaction and affect. Oranges are

scattered through the world that tie into the sense of smell that spills over from the physical gallery space in which sits a table full of partially peeled oranges. After looking around the participant usually next flies into the colourful velvety graffiti heart which also beats in sync with their own heart, allowing for a sensation of heautoscopy. They touch the heart, leaving trails of glowing lit surface where they touch. Next they move on to the very furry heart which also glows when touched. Then the participant travels through the sphere that has two cochleae that warble and emit glowing particles. When they enter this sphere a comical fart mix sounds and persists until they exit the sphere. This turned out to be quite fun for most, but created shock or anxiety in a few people who seemed to think that an actual person in the room was farting. Next they most often gravitate toward the unicycles and try to control them with their breath while becoming mesmerized by the waves beyond. This is a description of a typical journey through the world, but it is open to being experienced in any order as it is all sort of an active playground of interactive pieces connected to the participant.



FIGURE 32 WIDE SHOTS INSIDE *COENESTHESIA*, 2018 GRAFFITI HEART WITH WAVES AND STORMY SKY BEHIND.



FIGURE 33 WIDE SHOTS INSIDE COENESTHESIA, 2018 FISH TOWEL, BEACH, KALEIDOSCOPIC WAVES, STORMY SKY, SPHERES, BRAIN, LUNGS AND INTESTINES IN DISTANCE.



FIGURE 34 WIDE SHOTS INSIDE COENESTHESIA, 2018



FIGURE 35 WIDE SHOTS INSIDE *COENESTHESIA*, 2018

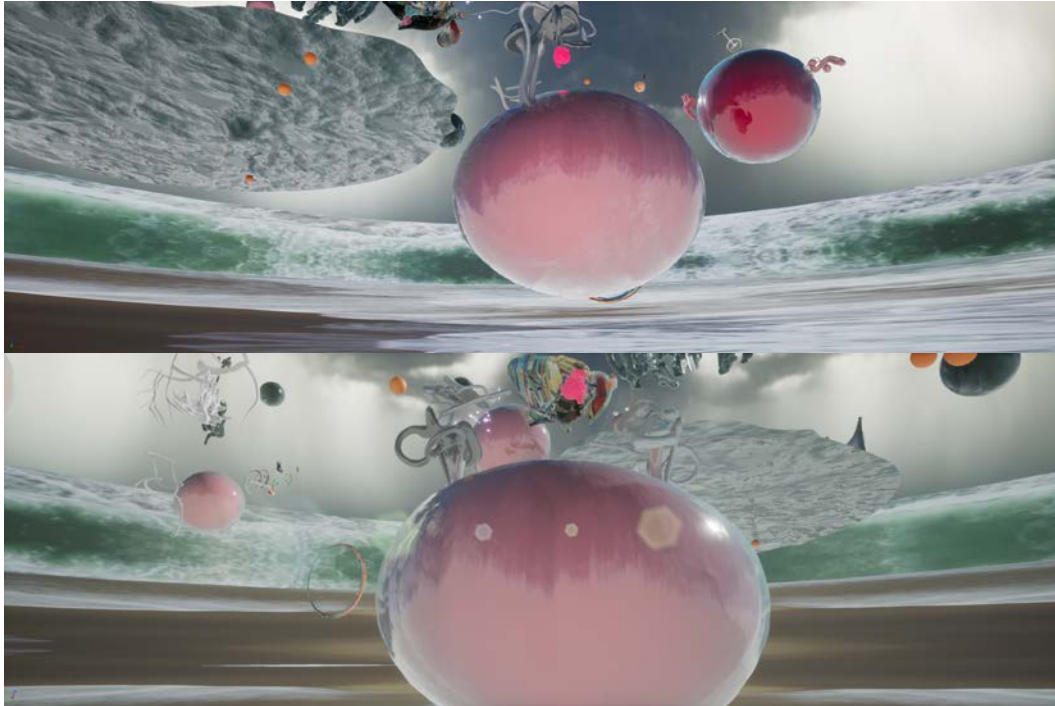


FIGURE 36, 37 WIDE SHOTS INSIDE *COENESTHESIA*, 2018

While waiting for a turn at being the 'patient' or immersant in the VR experience, the participant takes in the room. The space is filled with the sounds from the experience that is currently being played out, which usually consists mostly of ocean waves and purring, occasionally interjected with beating hearts, a fart mix or sounds from NASA. There is a large pod swing suspended in a metal pyramidal framework on wheels. This is where the companion or caregiver participant sits. The assistant directs the participant to get comfortable in the swing and then hands them the track ball and instructs them on its use. "this ball enables you to spread positive healing light particles throughout the virtual world that is currently being explored by the 'patient', the ball determines the direction and the outer ring determines the height in the world, this screen is your virtual perspective and the other screen is that of the 'patient', you can find each other and interact." There are two large projection screens that show the current virtual world, one from the 'patient' perspective and one from the 'companion' or 'caregiver' perspective. Also in the room are furry balls continuing the sphere motif into a tactile space, the furry automata feet, the squishy balloon body of the molecule from dynamics of happiness, the table filled with oranges a couple of which have heart sensor pads attached, a telephone positioned as if an orange is taking a call, and a suspended furry unicycle.



FIGURE 38 INSTALLATION *COENESTHESIA*, 2018. UNICYCLE, PROJECTIONS, TABLE, ORANGES, SPHERES AND BODY OF *DYNAMICS OF HAPPINESS*.



FIGURE 39,40,41,42 *COENESTHESIA*, 2018. TY WHALEY IN VR AND BIOMETRIC CHEST STRAP. UNICYCLE. ORANGE

WITH BIOMETRIC SYMBOLICALLY ATTACHED.



FIGURE 43,44 INSTALLATION *COENESTHESIA*, 2018. LEFT TO RIGHT: BOB JEFFERY PLAYING THE 'COMPANION' ROLE,
ROB CRUICKSHANK PLAYING THE 'COMPANION' ROLE.

One of the primary functions of the installation is to engage multimodal responses and social interactions that VR cannot approximate. For example, the smell of oranges which are strewn about the virtual world are used to establish an overlap between the virtual world and the real world that suggests that perhaps we have more control over reality than we may think. The time spent in the virtual world where one has control over the physics and agency of the objects when connected to the real world can perhaps lead to sense of empowerment within the real world which in turn could lead to increased optimism.

Other participants in the space engage by watching, hearing, smelling the action, perhaps feeling a sense of anticipation at getting a turn as a key actor. Outside of the main gallery space is a more brightly lit foyer where prints of frame-grabs from the virtual world and text from this thesis document are displayed. This space can be explored before or after the main installation and is meant to portray key details of the virtual environment. This can inform the journey, be a reminder of the journey, or reveal parts of the environment that the viewer did not travel to.

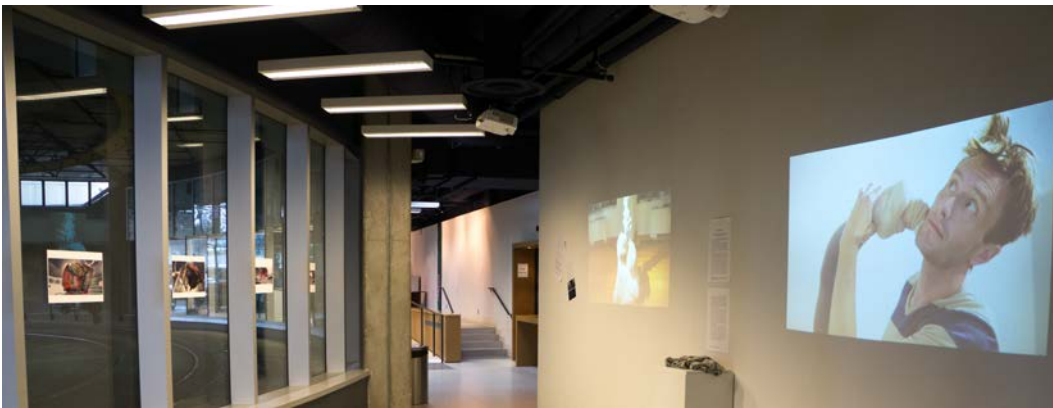


FIGURE 45 FOYER *COENESTHESIA*, 2018. PROJECTION LOOPS OF *DYNAMICS OF HAPPINESS* AND *NEGATIVITY VACUUM*, THESIS DOCUMENT AND PRINTS FROM VR WORLD



FIGURE 46,47 FOYER *COENESTHESIA*, 2018. PRINTS FROM VR WORLD

4.4 Inducing Restorative Affect

A revitalizing affect creates a feeling of connection or even intimacy, motivates agency and stimulates empowerment. Situations that cause fear or shock, such as the 200 foot drop at the beginning, contrasts with what you know – that in reality, you are standing on a mattress. The fart mix bubble explores the comical and embarrassing affects. There were mixed reviews of each of these situations, but most liked them because stimulated a strong reaction in the participant. I also worked with specific textures and interactions to create connections and stimulate potential synesthetic reactions. The system as a whole is meant to stimulate empowerment; the indexical cross referencing between objects in the physical installation and in the virtual world are intended to blur the distinction between real and virtual as a metaphor for the liminal overlapping space between conscious and subconscious activity.

Coenesthesia creates connections through interactive play between participants and through amenable heautosopic connections with virtual objects. Performance and suggestion play a role, by influencing participants to think of the watery light particles as positive energy, potentially heightening their intension and motivation to connect while empowering them with purpose and agency. Considering connection and Intimacy I look to Kaelan Doyle-Myerscough, theorist from Comparative Media Studies at MIT. Doyle-Myerscough considered intimate affects in a recent livestream, where she declares “video games have a unique capacity to generate intimate affects” (Doyle- Myerscough, 2018); this aligns with my choice of working with game development software. She goes on to say “Playing with and working through intimate affects is a way that we can learn to contend with vulnerability to stay with the trouble of precarity to try and find the kind of indeterminacy that affords new possibilities in uncertain times.” (Doyle- Myerscough, 2018) The restorative affect is crucial within situations of precarity, uncertainty and

indeterminacy, for example in the setting of a hospital. In *Coenesthesia* The participant is assumed to begin the experience in a somewhat depressed state of vitality; they are then shocked, frightened into motion which triggers a heightened awareness to sensations of all kinds. Based on conversations with participants, the enhanced sensations work to help form connections and the realization that they can fly gives a sense of relief and control. The realization that they can directly affect the environment they are in through internal biological processes and touch is generally experienced as an embodied sense of empowerment the project aspires to achieve.

Looking at intimacy within Coenesthesia, participants are given the option to experience the piece alone or with another participant depending on their level of comfort incorporating another into their feedback loop. When experienced as a two participant system, both participants can see a representation of each other in the space and so have the ability, if they so choose, to overlap and occupy the same space, a virtual hug. They could also choose to go hang out together inside the beating heart or perhaps just roam alone in a combined experience. Participants can also switch roles, it just takes unplugging one participant and plugging in the other. As a lone participant in the VR the 'patient' by seeing their own hands can see the interactions they engage in play out and the objects they interact with respond both visually and acoustically, creating connection through reciprocal communication.

Other elements had to be omitted from this version due to computer system constraints¹⁶

There were soft socks and realistic interactive blobby water. The socks were interactive and floating about the space. They could be placed in a portal to the real world, and when a sock in the virtual world was placed into a portal, it would be shot into the gallery space, through a large tube as a real physical sock. This was meant to symbolise our ability to manipulate space time suggesting that the socks that go missing in the dryer are slipping through a wormhole and perhaps we can access some form of space/time/wormhole manipulation within our own bodies. The watery blobs were to accentuate the same idea, sort of a nod to the idea that intension can change the structure of water. (Emoto,1999)

The Biometric Wearable

In an effort to allow the immersant quick mental access to the sensation of fur, I created the bio-sensing vest out of a variety of faux furs. The vest has an easily expandable strap to account for various different sized of participants and contains the electronics for the biometrics within the soft furry chest plate. In an effort to maintain a hint of the medical purpose of the piece, I stuck with the 3 probed medical heart rate sensors that use the disposable sticky pads that are used in hospitals. This also made for more accurate readings than wearable sensors used for sport purposes. The breath data comes from the built in stretch sensor which is made from a resistive fabric that stretches across the wearers chest. It structurally blends in with the rest of the piece seamlessly.

¹⁶ the requirement of a top end machine with NVidia graphics card for use with Flex plugins. and no access to this for the exhibition.

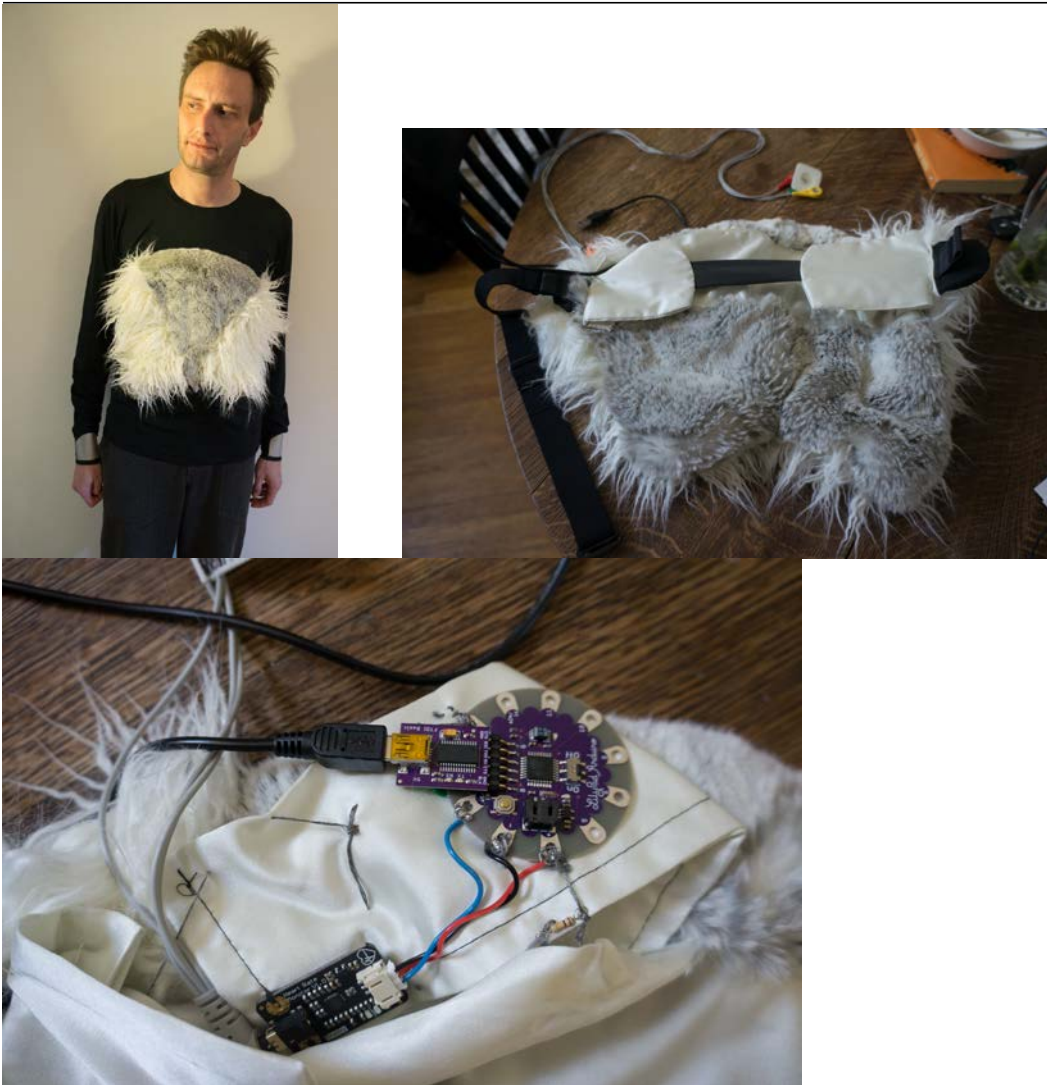


FIGURE 48,49,50 THE BIOMETRIC WEARABLE FOR THE IMMERSANT OR 'PATIENT' *COENESTHESIA*, 2018. CLOCKWISE FROM TOP LEFT: MODELLED BY MARC WHALEY, THE INSIDE OF THE STRAP, THE ELECTRONICS THAT ARE HOUSED INSIDE THE CHEST STRAP.

The Take Away

A subtle take away is the memory trigger implanted through the use of local graffiti as texture maps. There is a possibility that upon walking past one of these works it might trigger a memory of the immersive experience.

it is the anti-logical, re-arranging aspect of primary process that gives the amenable object the potential to extend perceptual capacities, to skip precedent for the sake of more intense or extensive perception or to envision other potential realities.... Within the amenable object there is the intrinsic meaning that a change in perception can initiate a future reality. (Randolph, 2007)

4.5 Challenges

The learning curve for Epic Unreal Game Engine was tremendous. This is a program that would take years to truly master and so having to accomplish this in a few months really was limiting in terms of how far I could take it. With more time and expertise it could expand to the intricately integrated hybrid reality I envision.

Rather than simply projecting on two screens on walls, I would prefer the meditation pod position to be tracked in space and for the projections to be on the ceiling. This would allow for the position of the pod to line up in the space with the projections so that it appears that they are directly emanating from the top of the pod, synchronous with the VR environment. This is something I wanted to do this time around but with all of the other technical hurdles was unable to implement in the time frame. The projections should blend seamlessly with the environment so that the room itself is situated in the perspective of the VR viewpoint.

The meditation pod/swing was initially meant to be a pod with a closable opening to climb in and a built in kaleidoscope to enhance the view out the top. A member of my cohort found this claustrophobic and so the decision was made to leave it open like a swing. The swing is comfortable and seems to work best for this iteration of the project. I would though like to have a few variations of the meditation pod so that there are options with how to engage with the experience.

Finding a computer system powerful enough to run the complex project I created was difficult. I had to simplify beyond the look I was going for. I lowered the polygon count on objects which makes them less organic and I minimized the overall number of objects in the scene, I also limited the number of animated textures, physics and particle systems in order to optimize the scene enough for it not drop below 44 fps. When the system drops below that, people get motion sick and so the project has the opposite result to what is intended.

5. Potential Futures

Potential futures for this type of system include the possibility of incorporating a version into hospitals for patient use and or incorporating a more portable version of this system that taps into the heart rate data that patients are already connected to and transmits it to a phone based VR headset that they can wear without leaving their hospital bed. The system could be connected to a central internet hub where people around the world could send positive energy by logging in and interacting.

In terms of content there is potential for indexing analogies, both visual and sensorial, and graphing their potential for revitalizing affect. This could help in establishing the variants needed to cover a diverse group of participants, and perhaps creating suggested routes through the world that cater to different reactions to the content.

Incorporating tools within the virtual environment for content creation so that patients, caregivers and companions have the ability to add their own creations to the world if they want to would be a great way to encourage empowerment.

Future projects could include live input and output (potential wind or wave data) -to sublime locations such as Cox Bay in Tofino, B.C. Canada. This would connect participants to the sublime, a common trigger for affective response. I would also like to incorporate generative objects that grow through interaction. This would give participants more agency and enable purposeful play amongst participants.

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6. Conclusions: The Coenesthetic Aesthetic

The *Coenesthetic Aesthetic*, is conceived as a multi-modal, multi-sensorial aesthetic that combines biofeedback, and surreality with an aim at forming a revitalizing affect.

Social engagement in mixed reality art affords an opportunity to establish new forms of connection. The surreal opens up a space for error-free creative exploration and socializing. Merging research in cognitive neuro-prosthetics, affect, virtual reality and biometrics enables potential for new forms of self-image, where artists and participants creatively tap into mental representations of ourselves as well as opening up a zone for surprising interactions to be formed with each other. Simple biofeedback systems when combined with virtual reality can have a meaningful impact on our sense of our embodied self and connection.

As a system for engaging revitalizing affect, hybrid reality installations have a great deal of potential and this is where the focus on innovation should be. We need to push these tools in ways that expand and enhance our existence.

I speculate that a system of this sort would be useful in a hospital environment not only for its potential as an adjunct healing tool empowering patients to bond with their insides but also for its potential to empower companions and care-givers to participate in treatment by enhancing their connection with the patient.

This contributes to the growing body of research finding that virtual reality is an effective tool for supplementing treatment in some medical conditions.

Technology has reached a place where virtual reality and biometrics are becoming more accessible to a larger audience. It is time to use these technologies in creative ways to tap in to

the affects that can enhance our realms of experience and our understandings of them. There are huge healthcare potentials in pairing interactive immersive art and VR with synesthetic affective content.

Mindfulness requires an almost precognitive ability to sense and register affects just before they take hold, giving the participant the ability to steer their direction and manifestation. Future research will seek complex forms of connection between the physical and material elements in media installation, including elements in augmented reality. For example, instead of oranges and unicycles mirroring each other in both virtual and physical spaces, new correspondences in site-specific installations may emerge, providing parks, waiting spaces, schools, galleries and remote communities with zones of meaningful contact and connection, for the creation and experience of mixed reality installation.

The technology is still financially out of reach for the average artist and so systems need to be in place to facilitate artists' access to the tools and technical support needed to create these works. The level of difficulty requires a collaborative approach and interdisciplinary methodology with small production teams to create works, including artists, technicians and community participants. Co-operative approaches to making will be key to realizing the potential of mixed reality for revitalizing affect.

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FIGURE 51 POSTER FOR THE EXHIBITION OF *COENESTHESIA*, WENDY WHALEY 2018

Appendix A Rambling Written Explorations

Explorations in Hypnosis

In November I went to visit my friend and mentor Norm White. He was my electronic art professor at OCA in the 90s, and is one of Canada's most fantastic pioneering electronics artists. He lives in the Kneckell Mill in Durham Ontario. Actually, he lives in half of the Mill and the other half is occupied by Geoffrey Shea, Ilse and Joschi, all important Canadian Artists/Curators/Directors and wonderful people. White has continued the OCA tradition of hosting a large camp-out for artists and art students on his property each summer, and this has made it easy to keep in touch with him and numerous other OCADU and now Ryerson students and artists. In this visit in November, we discussed the topic of the subconscious. White recounted stories from his childhood when he had taken to hypnotising his brother. He had found a novelty book on hypnosis at his local variety store, sold amongst the candy, with one of those cool old retro pictures of guy with rays emanating from his eyes. The technique it taught was to have the subject to be hypnotised lay flat on a comfortable surface with their feet pointing up and so that they can see their whole body, then about 3 feet from their feet place a candle on a table such that they can see the flickering candle past their body. Dim the rest of the lights and talk in a monotone voice, guiding them to relax their entire body while watching he candle flicker. Then when you think they are completely relaxed, tell them to fold their hands together, palms touching, fingers entwined. Then tell them that they may find it hard to pull their hands apart when you about to ask them to in a minute, like they are glued together with crazy glue. Now ask them to try to pull their hands apart. If they come apart then mind control was not

achieved, but if they stick, they are now open to hypnotic suggestion. At this point plant the suggestion. Hypnosis, it should be noted is a tool that should not be used lightly, a level of mind control can be attained if only for a brief time and so would be best to agree beforehand with the participant a set of rules for the hypnotic suggestion, so that personal freedoms are not infringed upon.

Upon our return to Toronto we decided to try this on Marc (my husband), who lives with intractable chronic pain from multiple spinal fractures.

I tried hypnotising myself with body scan hypnosis found on youtube. The first one I tried made me feel rested and relaxed. The second one I tried was past life regression. What I took from this experience is that the media we consume has almost as much space in the vocabulary of the subconscious as our actual lived experience. My own lived memories took up the entire space of the experience where I was regressing back through this life but when I was directed back to explore other lives, I would piece together scenes from films I had seen, set in historic times. I took on the role of characters and was completely in control of making up the stories as if I was lucid dreaming but actually with less freedom to distort spatial constraints.

I am continuing this study to determine the effectiveness and implementation of post hypnotic suggestion. Inspired by the body scan hypnosis and dream mechanics, *Coesthesia* incorporates recordings of myself speaking in a relative monotone, relaying guided experiential sensing and eating, hypnotic meditations. One is of eating an orange, there are piles of oranges on an old wooden table in the gallery space with scent and objects to eat.

Dream Studies

It is the day that I am to upload this paper to the repository. Currently have a sinus infection and am having trouble breathing. Last night I had a detailed dream that we were living on an alien planet in a really nice house. There were aliens living on the planet that would sneak in and look around and we were unsure of them and thought of sneaking in to their place but only made it so far as to walk just past the edge of what was considered our yard which was more of a lake, where there was a sort of puddle in a kind of highway underpass that seemed to connect to the lake on the other side I jump in to water and swim to check it out, it seems that it might connect but I cannot swim far enough before I run out of breath so I turn around to swim out from where I got in but there is some invisible force stopping me from going back that way. I feel like I am suffocating and wake up. My left sinus is completely clogged and I am having trouble breathing. I am not quite sure how to analyse this dream at the moment my head is about to explode.

A dream from October:

Last night I dreamt that me Marc and the boys visited Derek Robinson (previous OCAD professor who taught Chaos Theory) who had been living in the jungle. We had brought our rather large hockey bag fully of cloths. I noticed that there were cute little yellow and white snakes everywhere, they started darting away, some toward the open bag. Out of concern not to end up with a bunch of cute snakes in our luggage I stomped to scare them away from it, not noticing that a larger one was quite close atop the bag and looking at me. The stomp triggered it to jump toward my face, and I woke up. (my journal, Oct. 2017)

“From a Jungian perspective, snake dreams offer people the dangerous possibility of connecting with the wisdom of the collective unconscious and drawing strength from its archetypal

energies.” (<http://kellybulkeley.org/snakes-dreams-jungs-red-book/>) . Apparently tribes¹⁷ who’s shamanic traditions involve Ayahuasca say that Mother Ayahuasca is a female serpent.

I recount some of my personal Lucid Dream experiences in order to look at the systems that make a Lucid Dream unique. These specific dream is relevant to the flying mechanism used in Char Davies piece *Osmose*.

I used to have an ability to dream lucidly. I would often find myself running and taking flight in a sparsely forested grassy field. I remember feeling a mix of fear and exhilaration. I would wobble at first trying to figure out the system. When I had worked out that I needed to lean forward and breath in to move up I would find myself near the top of a tree. While there I would grab a branch to anchor myself but my legs would still float up unless I tried to pull them back into my body. I would let go and fly up a bit higher at which point there would always be this mass of horizontal power lines at various heights. I would carefully navigate between them, moving and bending. I would love to know if I had been moving correspondingly in my sleep. I eventually reached the end of the wires and there would be nothing but blue skies above. When the dream was lucid, I could change the number of power lines or add a nearby tree if I felt that I needed one. In other dreams, I would sometimes have the ability to actively make changes to the environment to aid my goals. Bending the ground up or down, making it liquid, altering gravity or magnetism if I needed to reach something.

The commonality of these dreams with VR lay both in a sense of the embodiment, through the connection between having the thought to move and playing it out - reinforcing the feeling that the dream body is the real body - and actively being able to alter the objects and environment by thinking about it and it playing out (Bohm, 2008,318).

¹⁷ Ayahuasca shamanism, as practiced among indigenous peoples like the Urarina of the Peruvian Amazon

Those dreams happened in my early 20's, somewhere around the time when I had seen Char Davies present a talk on her work at Inter/Access Media Arts Centre. It was only a talk with some video footage of *Osmose* with some testimonials from people who had experienced it and so I did not have the full experience of her VR world. Somehow though, this flying in my dreams really was what I imagined the navigation of her world to be. As I do not have an eidetic memory, I cannot say for sure that I had the dreams after or potentially before this talk but it would make the most sense that they happened after having seeing her talk. Another element of the dreams included annoying power cords that I had to navigate around, but after a bit of fear, I did so with relative ease. I think this element is representative of my workplace at the time. I had been at my first visual effect (VFX) industry job, where there were many different VFX supervisors and many power struggles; navigating these felt, very much, the way navigating the power lines felt.

Field Observations for Dynamics of Happiness

The piece came to light after it was spread around Reddit and Facebook a couple of years ago. It came with a headline that read "A Microtubule Carrying Happiness to Your Brain", and in the small blurb underneath said that it was a microtubule carrying dopamine to receptors in the brain. I have kept this gif on my desktop to access at a moment's notice to help flood my brain with happiness whenever I need it. I have been trying to pinpoint the elements within this moving image that make me feel as though happiness is flooding my brain. Perhaps it was just the suggestion from the headline, and I do think that has played a part, but there are also visual clues. When the image is still and not moving, it has no affect. The definition of what is actually happening in the scene that contains this clip is that 'micro tubules provide tracks for membrane

bound vesicles to travel, to and from, the plasma membrane', not the same as was suggested with the gif. The footage in the documentary also has no effect on me, and so I have looked at the differences in the documentary footage to the perfectly looping gif that I found on the internet. The footage in the documentary is lit very neutrally, just a minimal diffuse ambient overall, whereas the footage in the gif has a bright light source creating shadows that accentuate the movement. The gif contains more particle detail in the surface of the ball that the microtubule is carrying, the waves of interacting particle dynamics cause me frisson. The other notable gesture that causes frisson is the motion of the microtubule. The anthropomorphic shape that it has mimics that of a person carrying the ball with fuzzy slippers on its feet. The feet appear to have this wonderful clicking into place each time they take a step. The looping animation of the entire clip is seamless; I could watch it until my eyes get tired.

An Equation for Forming a Positive Feedback Loop

My adaptation of Einstein's $E=MC^2$

$$E \stackrel{\infty}{=} MC^2$$

E Positive Energy

M Mass of Illness = Immersant: the person who is considered the patient, the person who is wearing the VR headset, experiencing the VR world and tied in biometrically to it.

C Light = Connection = Intension = Participants in the immersive environment (the people in the room experiencing the projections, pushing and or meditating in the meditation pod.)The meaning of this equation is that if a patient becomes an immersant and is multiplied by light

imbued with positive intension (which light inherently is) than this creates a feedback loop of positive energy