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THE VARIETIES OF USER EXPERIENCE

BRIDGING EMBODIED METHODOLOGIES FROM SOMATICS AND PERFORMANCE TO HUMAN COMPUTER INTERACTION

by

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A thesis submitted to the University of Plymouth
in partial fulfillment for the degree of

DOCTOR OF PHILOSOPHY

Center for Advanced Inquiry in the Integrative Arts (CAiiA)
School of Computing
Faculty of Technology

September 2009

Dedication

to my mother
Helena Johanna Smeets Schiphorst
your memory lifts my gaze
and fills my heart

Thecla Henrietta Helena Maria Schiphorst

THE VARIETIES OF USER EXPERIENCE: BRIDGING EMBODIED METHODOLOGIES FROM SOMATICS AND PERFORMANCE TO HUMAN COMPUTER INTERACTION

Abstract Embodied Interaction continues to gain significance within the field of Human Computer Interaction (HCI). Its growing recognition and value is evidenced in part by a remarkable increase in systems design and publication focusing on various aspects of Embodiment. The enduring need to interact through experience has spawned a variety of interdisciplinary bridging strategies in the hope of gaining deeper understanding of human experience. Along with phenomenology, cognitive science, psychology and the arts, recent interdisciplinary contributions to HCI include the knowledge-rich domains of Somatics and Performance that carry long-standing traditions of embodied practice. The common ground between HCI and the fields of Somatics and Performance is based on the need to understand and model human experience. Yet, Somatics and Performance differ from normative HCI in their epistemological frameworks of embodiment. This is particularly evident in their histories of knowledge construction and representation. The contributions of Somatics and Performance to the history of embodiment are not yet fully understood within HCI. Differing epistemologies and their resulting approaches to experience identify an under-theorized area of research and an opportunity to develop a richer knowledge and practice base. This is examined by comparing theories and practices of embodied experience between HCI and Somatics (Performance) and analyzing influences, values and assumptions underlying epistemological frameworks. The analysis results in a set of design strategies based in embodied practices within Somatics and Performance. The subsequent application of these strategies is examined through a series of interactive art installations that employ embodied interaction as a central expression of technology. Case Studies provide evidence in the form of rigorously documented design processes that illustrate these strategies. This research exemplifies 'Research *through* Art' applied in the context of experience design for tangible, wearable and social interaction.

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Acknowledgements

I would like express gratitude and the deepest respect to Roy Ascott and the University of Plymouth for their generosity and undying support of my research and their grace during my times of challenge. Also, to my colleagues and friends in the Center for Advanced Inquiry in the Integrative Arts and the Planetary Collegium for challenging me to greater precision and greater humility. This tremendous opportunity has developed my skills as a researcher and an artist. Your wit and your warmth have buoyed me upward. I would also like to thank my external examiners Roberta Mock and Peter Wright for your incisive feedback and thoughtful critique. It has greatly increased the quality of my work.

I would like to thank my colleagues in the School for Interactive Arts and Technology at Simon Fraser University for their dedication to excellence and for their commitment to new horizons in pedagogy and in research. I have gained wisdom in my association with you and continue to learn through you.

I offer heartfelt thanks to my collaborators in the 'whisper research group': Susan Kozel, Sang Mah, Norman Jaffe, Robb Lovell, Gretchen Elsner, Jan Erkuu, Kristina Andersen, Pablo Mochcovsky, Diana Burgoyne, Calvin Chow, Mark Brady, Camille Baker, Adam Marston, Alex Mateesco, and also for my collaborators at V2_Lab in Rotterdam: Anne Nigten, Stock, Simon de Bakker, Michel van Dartel, Michiel KauwATjoe, Frank Nack, Siuli Ko Pullan, Rui Guerra, Bonana van Mil and the partners of the Passepartout project: Lora Aroyo, Angel Perez Rosillio, Heilke Schut. Thank you all for helping me to make the world more beautiful.

I would like to thank the Canada Council for the Arts, the Daniel Langlois Foundation, the British Columbia Arts Council, V2_Lab in Rotterdam, Shinkansen Future Physical, Passepartout ITEA, CANARIE INC, Heritage Canada, BC Advanced Systems Institute, Nokia, New Media Innovation Centre, Simon Fraser University, Canada Foundation for Innovation (CFI) and the British Columbia Knowledge Development Fund (BCKDF) for your valuable resources and recognition. This research could not have come to fruition without your generous support.

And thank you to my family and friends: To Norm. To my brothers and sisters. To Patricia Novotny for your self. To Malcolm: my dear husband, and to Nathan: my dear son. I am grateful for your love.

AUTHOR'S DECLARATION

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award without prior agreement of the Graduate Committee.

This research was supported with the aid of the Daniel Langlois Foundation, the Canada Council for the Arts, the British Columbia Arts Council, V2_Lab in Rotterdam, Shinkansen Future Physical, Passepartout ITEA, CANARIE INC, Heritage Canada, BC Advanced Systems Institute, Nokia, New Media Innovation Centre in Vancouver, Canada, Simon Fraser University, Canada Foundation for Innovation (CFI) and the British Columbia Knowledge Development Fund (BCKDF).

Relevant seminars, conferences and art exhibitions were regularly attended at which work was presented, papers were published and interactive art was exhibited. Artworks and publication credits are included below.

Artworks Credits

My artwork and artistic practice is highly collaborative and interdisciplinary. A list of detailed contributions and credits to the art-works referenced within this thesis are described below. The artworks whisper, exhale and soft(n) are referenced specifically as case studies in Chapters 5, 6 and 7 of this thesis. The artworks Felt Histories and Bodymaps are used as historical examples of my artistic exploration of the sense of touch in Chapter 7. As an artist, I am indebted to notable collaborators such as Susan Kozel, Kristina Andersen, the whisper[s] research group, V2_Lab, and of course the pre-eminent Merce Cunningham.

(soft^n), interactive public art installation, 2005 – 2007

Artist and Creative Concept: Thecla Schiphorst
Artistic Director: Thecla Schiphorst
Original Tactile Interaction Design: Thecla Schiphorst
Supported by V2_ Institute for the Unstable Media
Premiere at the Dutch Electronic Arts Festival *DEAF07: interact or die*, Rotterdam, April 10-29 2007.
Project Dates: September 2005 to April 2007
V2_Lab Manager: Anne Nigten
Project Manager: Siuli Ko Pullan, V2_Lab
Hardware Engineering: Stock, Simon De Bakker, V2_Lab
Software Design: Rui Guerra, Michiel KauwATjoe, V2_Lab
Original Software Design for Tactile Gesture Recognition: Norman Jaffe, Robb Lovell, SFU whispers research group <http://whisper.iat.sfu.ca>
Physical Object Co-Design, Construction: Bonana van Mil
Sound Design: Mark Brady
Passepartout Partners: Frank Nack, CWI, Amsterdam; Lora Aroya, TU/E, Eindhoven University of Technology
Funded by: Passepartout Project EU Dutch Consortium in conjunction with Philips Inc, TU/E, CWI, and V2_Institute for the Unstable Media
Photo Credits: Rui Guerra, Simon De Bakker

exhale: breath between bodies, interactive wearable public art exhibition.

Artistic Director: Thecla Schiphorst
Funding: Canarie, Heritage Canada, SFU, Nokia
Project Dates: 2003 – 2005
In collaboration with *the whisper[s] research group*:
<http://whisper,iat.sfu.ca>
Artistic Director, Concept, Systems Design: Thecla Schiphorst
Performance and Dramaturgical Design: Susan Kozel
Project Manager: Sang Mah
Software Engineering: Rob Lovell, Norm Jaffe
Hardware Engineering: Jan Erkuu, Calvin Chow
Fashion Design and Construction: Gretchen Elsner
Sound Design: Mark Brady
Production and Video: Camille Baker
Production Assistants: Alex Mateesco, Malahat Husseini
Web Design: Adam Marston

whisper: wearable body architectures, interactive wearable public art exhibition.

Artistic Director: Thecla Schiphorst
Artistic + Funding Collaboration: Thecla Schiphorst, Susan Kozel
Funding: Daniel Langlois Fondation for the Arts, Canada Council for the Arts, BC Arts Council, V2_Lab, Future Physical
Project Dates: 2001 – 2003
Artistic Concept, Systems Design: Thecla Schiphorst
Artistic Concept, Dramaturgy: Susan Kozel
Interaction Designer: Kristina Andersen
Project Manager: Sang Mah
Software Design + Engineering: Rob Lovell, Norm Jaffe, Andruid Kerne, Stock V2_Lab
Mathematical Visualization: Julie Tolmie
Hardware Engineering: Stock, V2 _Lab; Jan Erkuu, Calvin Chow, whisper[s] research group
Garment Design: Thecla Schiphorst, Kristina Andersen
Garment Construction: Kristina Andersen, Maryan Schiphorst
Production and Video: Camille Baker

Felt Histories, Interactive Computer Video Art Installation, 1998-2000

Artist, Concept, and Video Director: Thecla Schiphorst
Funding: Canada Council for the Arts, BC Arts Council
Project Dates: 1998 – 2000
Artistic Concept, Systems Design: Thecla Schiphorst
Software: Ken Gregory, Grant Gregson, Norm Jaffe
Sound Design: Ken Gregory
Hardware Engineering: Carlos Vela-Martinez
Sensor Wall Design: Ken Gregory, Carlos Vela_Martinez
Sensor Wall Construction: Carlos Vela-Martinez
Video Director + Editing: Thecla Schiphorst
Woman in Door: Helena Schiphorst
Production Assistant: Bernadette MacGregor
Documentation Video Editing: Lorna Boschmann

Bodymaps: artifacts of Touch, Interactive Video Art Installation, 1995-1997

Artist, Concept and Video Director: Thecla Schiphorst
Funding: Canada Council for the Arts, BC Arts Council
Project Dates: 1995 – 1997
Artistic Concept, Systems Design: Thecla Schiphorst
Software: Ken Gregory, Norm Jaffe, Grant Gregson,
Sound Design: Ken Gregory
Hardware Engineering: Infusion Systems
Table Design: Hanif Jan Mohammed
Table Construction: Ewan McNeil
Video Director and Video Editing: Thecla Schiphorst
Video Performers: Thecla Schiphorst, Nathan Evans
Production Assistant: Bernadette MacGregor
Documentation Video Editing: Lorna Boschmann

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exhale: breath between bodies, interactive public art exhibition. National Academy of Sciences, *Speculative Data and the Creative Imaginary: shared visions between art and technology*, Washington D.C., June 4^{th} – August 24^{th} 2007. Curated by Pamela Jennings. Artist: Thecla Schiphorst in collaboration with *The whisper[s] Research Group.* Group Exhibition including Sheldon Brown, Christa Sommerer and Laurant Mignonneau, Nell Breyer and Jonathan Bachrach, Ernest Edmonds, George Legrady, Thecla Schiphorst. <http://www7.nationalacademies.org/arts/Speculative_Data_and_the_Creative_Imaginary.html>

(soft^n) survival strategies for interaction, interactive public art installation, commissioned by V2_ Institute for the Unstable Media, for Dutch Electronic Arts Festival *DEAF07: interact or die*, Rotterdam, The Netherlands, April 10^{th}-29^{th} 2007. Group Exhibition, Artist: Thecla Schiphorst. DEAF07 Exhibition: <http://www.deaf07.nl/index.php?option=com_program&act=project&Itemid=17> soft(n)

Bodymaps: artifacts of Touch, interactive art installation. Media Art Exhibition: *Can We Fall in Love with a Machine?* Curated by Murray Horne and Claudia Hart; Wood Street Galleries, Pittsburgh, Pennsylvania, January 2006 – April 2006. Group Show: <www.woodstreetgalleries.org/>. Artist: Thecla Schiphorst.

exhale: breath between bodies, interactive public art exhibition. Digifest Exhibition and Symposium, *Digifest: mods*, Toronto, Harbourfront Centre and Ontario Science Centre, May 9^{th} – 15^{th} 2006. Artist: Thecla Schiphorst in collaboration with *The whisper[s] Research Group.* <http://www.ontariosciencecentre.ca/calendar/default.asp?eventid=486>

move.me smart objects + exhale: breath between bodies, interactive public art installation and demonstration. *Fleshing Out* Exhibition, Symposium + Workshop, V2_Lab, Rotterdam, The Netherlands, November 9^{th} – 10^{th} 2006. Artist and Principle Director for *exhale*: Thecla Schiphorst in collaboration with *The whisper[s] Research Group*. Artist and Principle Director for *move.me*: Thecla Schiphorst in collaboration with V2_Lab. <http://www.virtueelplatform.nl/article-3553-en.html> and <http://www.virtueelplatform.nl/artefact-3047-en.html>

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<between bodies>, interactive wearable public art presentation and exhibition, *New Forms Festival, Technography,* Vancouver, Roundhouse Centre, Oct 15-22 2004, Artist and Principle Director: Thecla Schiphorst in collaboration with Susan Kozel and *The whisper[s] Research Group*. Group Exhibition. <http://www.newformsfestival.com/nff04/>

<between bodies>, interactive wearable public art presentation and exhibition, *Ciberarts Festival*, Bilboa, Spain, Apr 20-30th 2004, exhibited as part of *The Evident Traces projects* curated by Christiane Paul (Whitney Museum). Artist and Principle Director: Thecla Schiphorst in collaboration with Susan Kozel and *The whisper[s] Research Group*. Group exhibition. Festival: <http://www.ciberartfestival.net/instala_en.htm> About Exhibitions: <http://www.realtimearts.net/article/62/7506>

whisper: wearable body architectures, interactive wearable public art presentation and exhibition, *e-culture fair*, Paradiso Theatre, Amsterdam, The Netherlands, Oct 23-25 2003, Artist and Principle Director: Thecla Schiphorst in collaboration with Susan Kozel and *The whisper[s] Research Group*. Group exhibition. <http://www.e-culturefair.nl/site/index_en.html> > projects > mymode

whisper: wearable body architectures, interactive wearable public art presentation and exhibition, *Respond Festival*, produced by *Future Physical*, Cambridge UK, April 2 – 6th 2003, curated by Ghislainne Boddington, Shinkansen and Lizzie Muller. Artist and Principle Director: Thecla Schiphorst in collaboration with Susan Kozel and *The whisper[s] Research Group*. Group Exhibition.

Respond Event: <http://www.futurephysical.org/pages/content/resp_env/nex.html>

Exhibition: <http://www.futurephysical.org/pages/programme/commissions.html> >co-productions >whisper

whisper: wearable body architectures, interactive wearable public art presentation and exhibition, Dutch Electronic Arts Festival, *DEAF03: Data Knitting*, Rotterdamse Schouwburg Theatre, Rotterdam, The Netherlands, Feb 23 – March 07 2003. Artist and Principle Director: Thecla Schiphorst in collaboration with Susan Kozel and *The whisper[s] Research Group*. Group exhibition. <http://www.deaf.v2.nl/03/>

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Felt Histories, Interactive Computer Video Art Installation, Media Art Exhibition at Gaerlock Gardens, *Oakville Galleries*, Oakville Ontario, February - April 2000, curated by Su Ditta, Artist: Thecla Schiphorst. Solo Exhibition. Oakville Gallery Website: <http://www.oakvillegalleries.com>

Felt Histories, Interactive Computer Video Art Installation, Media Art Exhibition: 7th *New York Digital Salon*, SVA, School of Visual Arts, New York City, January 2000. Artist: Thecla Schiphorst. Group Exhibition. New York Digital Salon: <http://www.nydigitalsalon.org/> 7th New York Digital Salon Installations: <http://www.nydigitalsalon.org/07/installationFrames.html>

Exhibition Catalogues

Schiphorst, T., *exhale: breath between bodies*, National Academy of Sciences, in exhibition Catalogue of the *Speculative Data and the Creative Imaginary: shared visions between art and technology,* Curated by Pamela Jennings, July 2007.

Schiphorst, T., *exhale: (breath between bodies),* in ACM Siggraph 2005 Emerging Technologies SIGGRAPH '05, July 2005, Article No. 6.

Schiphorst, T., *exhale: breath between bodies*, ACM SIGGRAPH 2005, in Juried Artists: Electronic Art and Animation Catalog, SIGGRAPH '05, pp. 62-63.

Performances

exhale: breath between bodies: Canada House Pavilion, Winter Olympics, Torino, Italy, Feb 18th 2006. Developed and choreographed 8 dancers for an interactive performance of *exhale: breath between bodies* to exemplify networked wearable technologies and design innovation, presented during New Media B.C. exposition.

exhale: breath between bodies: FutureFashion, Pisa, Italy, May 20th, 2006. Choreographed, Rehearsed and Developed choreography with 6 dancers for an interactive performance of *exhale: breath between bodies.* This performance was developed in the context of new interactive fashion that is integrating technology, communication and expressivity through smart textiles, soft circuits and urban design. <http://www.cutecircuit.com/now/futurefashion-catalog/>

exhale: breath between bodies: Light Lantern Festival, September 17th, 2005, Shadbolt Centre for the Arts, Public Dreams Productions <http://www.city.burnaby.bc.ca/cityhall/departments/departments_parks/prksrc_fclts/prksrc_fclts_shdblt.html>

exhale: breath between bodies: Cyber-Fashion Show Wired Woman, Vancouver October 2005, "What Wired Woman Wear", interactive fashion event <http://www.wiredwoman.com/>

exhale: breath between bodies: Cyber-Fashion Show Siggraph August 2005, as part exhibition and festival in the context of ACM Siggraph <http://psymbiote.org/cyfash/2005/>

<*between bodies*> Cyber-Fashion Show Siggraph August 2004, as part exhibition and festival in the context of ACM Siggraph http://www.siggraph.org/s2004/conference/studio/fashion.php?pageID=conference

Presentations Panels Reviewed

Ascott, R., Cos, D., Dolinsky, M., Gromala, D., Novak, M., Rogala, M., Schiphorst, T., Slattery, D., Vesna, V., "Artist Round Tables", ACM SIGGRAPH 2004 Art Gallery, SIGGRAPH '04, August '04, pp. 131-134.

Jeremijenko, N., Schiphorst, T., Mateus, M., Straus, W., Wright, W., Kerne, A., Siggraph Panel, "Extending interface practice: an ecosystem approach", ACM Siggraph 2002 abstracts, pp. 90-92.

New Bodies, New Realities, Live Chat Room, Dance Umbrella 2000,October 2000, live webcast event with Thecla Schiphorst, Merce Cunningham, Paul Kaiser, Shelley Eshkar, Wayne McGregor; moderated by Ghislainne Boddington.

Presentations Invited

Keynote	ECSCW European Computer Supported Co-operative Work, Vienna, Sept 9-11, 2009.
Workshop	*Wearable Computing for Art and Performance*: a workshop in Laban Computer Movement Analysis and Intermedia Performance, University of Illinois at Urbana Champaign, September 3-6 2009
Lecture	Krannart Centre for the Arts, Invited Lecture Series, University of Illinois at Urbana Champaign, April 2009
Presentation	HASTAC Conference, April 2009, University of Illinois Champaign
Presentation	SXSW, South by South-West, March 2009
Keynote	Creativity and Cognition, 2007, Washington DC, July 12-15, 2007.
Presentation	Dutch Electronic Arts Festival DEAF07, Rotterdam, April 2007.
Workshop	Dutch Electronic Arts Festival DEAF07, Rotterdam, April 2007.
Keynote	NTA National Textiles Association, February 2007, South Carolina.
Presentation	Dancing Around Technology, V2_Lab Open Process Workshops, Feb 2007.
Lecture	Smart Fabrics Europe Conference, December 12-15, 2006, Edinburgh.
Presentation	Fleshing Out, V2_, November 22-23 2006, Rotterdam, Amsterdam.
Presentation	ITEA Passepartout Technical Demonstrations, Paris Oct 11-14, 2006.
Lecture	Smart Fabrics Conference, Intertech, March 2006, Miami.
Lecture	Digifest 2006, May 10-15, 2006, Toronto, Ontario Science Centre.
Presentation	Smart Fabrics Europe, Invited Lecture and Presentation, Dec 2006.
Presentation	Nokia University Research Collaborations workshop; presentation: move.me project, December 15, 2005, Nokia Vancouver.
Presentation	Digital Cultures Workshop and Lab, University of Trent at Nottingham, conference presenter, November 27 – December 4, 2005.
Presentation	Banff, Bodies In Motion Seminar, June 24–27, 2005, research presentation, whisper[s] project.
Presentation	ASU Flexible Fabrics Research Presentation, ASU, June 2005.
Presentation	Canada Japan Culture New Media Days, New Media Exchange, Nagoya Expo, June 4-8, 2005, Japan Canada, Invited to represent Canada New Media Research, sponsored by Heritage Canada.
Presentation	Consciousness Reframed Conference, Beijing, China, Nov 22-28, 2004.
Panel	New Forms Festival, October 14-16, 2004.
Lecture	Venice Biennelle, Dance and Technology Festival, June 2004.
Workshop	"Cross Dressing and Border Crossings", SigCHI 2004 Vienna, Austria, Workshop, CHI Workshop, ACM CHI 2004, April 2004, Vienna.
Lecture	Banff wireless workshop, Lecture, Banff New Media Institute, "A case history of the whisper project", November 14–16, 2003.
Panel	e-culture fair, Amsterdam, Wearable Technologies, sensory tools and performance, October 23, 2003, with Thecla Schiphorst (whisper), Joey Ryan, Institute of Sonology, STEIM, Jussi Angelsleve, Media Lab Europe.
Lecture	RISQ2003-Canarie ANW2003, Networks for People: Accessibility > Performance > Results > Conference Montreal, "whisper: networking wearable community architectures", October 20-23, 2003.
Panel	Merce Cunningham, The Four Discoveries, Presenter, Panelist, "Merce Cunningham's process with LifeForms, computer dance technology" BAM, Brooklyn Academy of Music, New York, October 18, 2003.
Lecture	V2 – Waag Symposium, "whisper: wearable body architectures", Den Haag, The Netherlands, September 4–6, 2003.

Presentation	NewForms Festival, July 30, 2003, Conference Roundtable, “whisper: wearable body architectures”.
Presentation	Consciousness Reframed, Newport, University of Wales, “Wearing our<selves>”, July 4-6, 2003.
Presentation	Nomadic Arts and Technology Conference, “BodyState: building our technologies through attention modeling”, Zurich April 15-17, 2003.
Presentation	Venice Biennale, Conference on Dance and Technology, “Movement architectures: the dancing body within the machine”, May 8-10, 2003.
Presentation	Future Physical, Presentation, Respond Festival and Conference, Cambridge, UK, April 1-5, 2003.
Panel	DEAF festival, Data Knitting, Women and Technology, March 7, 2003.
Keynote	Wear Me! Conference and Festival, Norfolk, England, produced by Future Physical, December 5, 2002.
Presentation	Bridges II, The Banff New Media Institute, October 4–6, 2002, Collaboration and Our Bodies.
Artist Talk	BEAP, The Biennale of Electronic Arts, Perth University, August 6, 2002.
Presentation	Consciousness Reframed 2002: John Curtin Gallery, Curtin University of Technology, Perth, Western Australia, August 2-4, 2002.
Panel	Siggraph 2002, Extending Interface Practice an ecosystem approach.
Panel	Theatre, Gender and Beyond, London, UK, SmartLab, July 7-8, 2002.
Presentation	V2-Lab, Seminar, V2- anarchiving conf, Pulp Fashion, July 5, 2002.
Presentation	Intimate Technologies, Banff Summit, April 25-28, 2002.
Workshop	Workshop on Physiological Computing, CHI2002, Minneapolis.
Panel	The Uncanny, Experiments in Cyborg Culture: reading the Cyborg, artist’s panel, Vancouver Art Gallery, February 2002.
Presentation	The Art of Software, Sonic Arts festival, Amsterdam, December 2001.
Presentation	9-11-N2N Networks to Nanosystems: Art, Science and Technology in Times of Crisis, UCLA, UC Santa Cruz, November 2001.
Artist Talk	Foundation Lecture Emily Carr Institute of Art and Design, August 2001.
Presentation	Extreme Computing, Conference, Barcelona, July 2001.
Presentation	e-naissance | new configurations Conference, Turino, Italy April 2001.
Presentation	Bridges Symposium, UCI, conference May 2001.
Presentation	ISEA, Paris, December 2000.

Reviews

HorizonZero: Digital Arts and Culture in Canada, Issue 04: TOUCH, November 2002, “Artifacts of Touch: Thecla Schiphorst re-choreographs the relationship between technology and the public body”, by Jeanne Randolph; <http://www.horizonzero.ca/textsite/touch.php?is=4&file=10&tlang=0>

HorizonZero: Digital Arts and Culture in Canada, Issue 04: TOUCH, November 2002, “Bodymaps, Thecla Schiphorst”, by Eric Raymond; <http://www.horizonzero.ca/textsite/touch.php?is=4&file=9&tlang=0>

Word Count of Main Body of Thesis: 76,353

Signed

Date September 2009

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The Varieties of User Experience

"Our fields of experience have no more definite boundaries than our fields of view. Both are fringed forever by a more that continuously develops, and that continuously supercedes them as life proceeds."
William James[1]

"Quality [of experience] is concrete and existential, and hence varies with individuals since it is impregnated with their uniqueness." *John Dewey*[2]

"When writing or reading . . . like this, we face the problem that we cannot learn what we do not already know. Writings are not representations or explanations of the world, they are intended to trigger some awareness by the reader toward his or her own experiences." *Susan Bødker*[3]

1.1 Introduction

The work presented here is radically interdisciplinary[4], situating itself between knowledge traditions that are historically rooted in divergent terrains and climates of knowing. These roots originate in human computer interaction (which has traditionally grown out of usability engineering and computer science), and in somatics and performance (focusing on body-based disciplines that have flourished largely outside of academia and that originate from the shared history of modern dance and somatic practice). Powerful and accelerating shifts in technology, culture and society are asking, even demanding, new mechanisms for 'realizing' the world, its inhabitants and their relations. It is within this climate of necessity and change that such seemingly disparate traditions can work together in a shared concern for understanding human experience.

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[1] James, W. (2003). *Essays in Radical Empiricism*, London: Dover Publications, p. 37.

[2] Dewey, J. (1934). The Varied Substance of the Arts, in *Art As Experience*, Carbondale, Illinois: Southern Illinois University Press, p. 223.

[3] Bødker, S. (1990). *Through the Interface: A Human Activity Approach to User Interface Design,* Hillsdale, New Jersey: Lawrence Erlbaum Associates, p. 3.

[4] Wright, Blythe & McCarthy (2006) refer to *radical interdisciplinary dialogue* in their argument for extending design perspectives within HCI, see Wright, P., Blythe, M., & McCarthy, J. (2006), User Experience and the Idea of Design in HCI, *Lecture Notes in Computer Science*, *3941*, Springer Verlag, p. 1-14; also Davis (2003); and Mateus & Sengers (2003) use the phrase *radical interdisciplinarity* to express the need to integrate technical and humanistic research to design for experience and narrative.

This common ground, this shared concern for experience, is a starting point that seeds a comparison of the varied and differentiated epistemologies of practice that thrive between human computer interaction (HCI) and the fields of somatics[5] and performance. Body-based practices are the specific focus of the epistemological history shared between somatics and modern dance performance, fields that intersect and align through a common genealogy of practice. This inquiry forms the basis of *Research through Art*[6], practice-based research that is exemplified by applying somatic awareness of bodily experience to HCI in order to expand the practical application of embodied theory within technology design. Artistic outcomes and technological examples concentrate on networked, tangible and wearable technologies, offering a theoretical framework originating in practice. The intention is to support the efficacy of experience and embodiment practices, while contributing to knowledge that responds to an increasingly technological world.

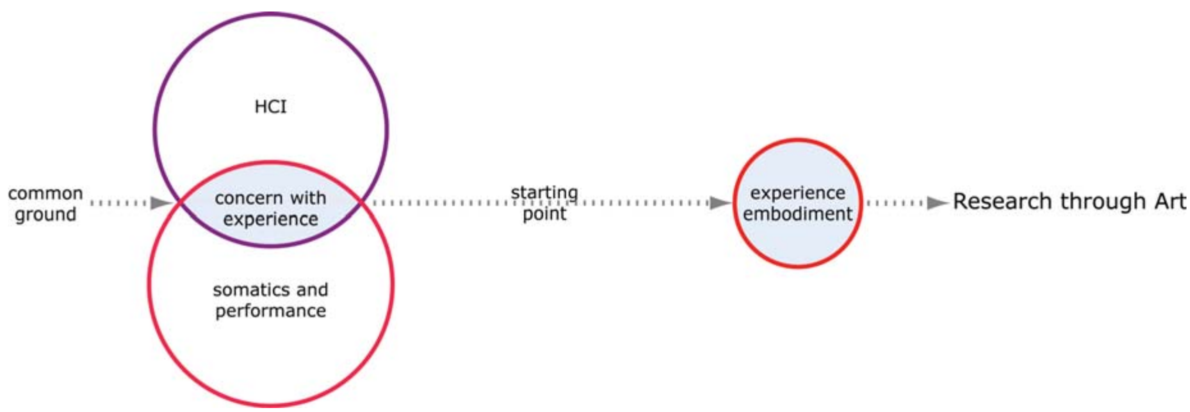

Figure 1. The common ground of 'concern with experience' seeds the basis of Research through Art

[5] Somatics is a term applied to a field of practice and research developed during the late nineteenth and twentieth century in Europe and America. Following over a century of development and practice from pioneers of bodywork and body awareness, the field was named Somatics by American philosopher Thomas Hanna, and *Somatotherapie* by French physicians and educators. Hanna founded the American journal *Somatics* in 1976, subtitled *The Magazine-Journal of the Bodily Arts and Sciences*, and French psychiatrist Richard Meyer, the French journal *Somatotherapie* in 1989, to review theoretical and practical work in the field. Hanna's definition is "the field which studies the soma: namely, the body as perceived from within by first-person perception" in Hanna, T. (1986). What is Somatics?, *Somatics Journal of the Bodily Arts and Sciences, 5*(4), Spring/Summer 1986, p. 4.

[6] Christopher Frayling's 1993 paper 'Research in Art and Design' is cited frequently in support of practice-based research, and most recently within HCI in John Zimmerman, Jodi Forlizzi and Shelley Evanson's CHI'07 paper exploring integration of design in research and practice (Zimmerman 2007). They suggest that this approach enables designers to contribute to HCI based on their strengths in addressing under-constrained problems, and which stresses design artifacts as outcomes that can transform the world from its current state to a preferred state, see: Frayling, C. (1993). Research in Art and Design. *Royal College of Art Research Papers, 1*(1), p. 1-5, and Zimmerman, J., Forlizzi, J., Evenson, S. (2007). Research through design as a method for interaction design research in HCI, *CHI '07: Proc SIGCHI Conf.* New York: ACM, p. 493-502.

1.2 Conceptual Framework

This work bridges embodied methodologies from somatics and performance to human computer interaction. I explore human experience and its inseparability from the material processes of technology. While the intended audience is HCI, this work will also be of interest to researchers that apply body-based somatic awareness practices to interdisciplinary methods in the sciences, social sciences and humanities: those interested in radical interdisciplinary dialogue. This research is aligned with others working within HCI and computation including Dourish (2001), McCarthy and Wright (2004) and Agre (1997). In Agre's introduction to *Computation and Human Experience*[7] he emphasizes the integral connection between computational processes and their unmitigated connection with the world at large:

> I wish to investigate this confluence of technology and human experience. The philosophical underside of technology has been deeply bound up with larger cultural movements, yet technical practitioners have generally understood themselves as responding to discrete instrumental "problems" and producing technologies that have "effects" upon the world.... I would like to contribute to a *critical technical practice* in which rigorous reflection upon technical ideas and practices becomes an integral part of day-to-day technical work itself.[8]

Although Agre's account of *critical technical practice* is focused on technological systems, technical practice itself can be represented within a wide variety of domains. With this wider view of technical practice in mind, Agre's statement can be applied equally to HCI as it can to the body-based practices within somatics and performance. Each defines, utilizes and refines a set of technical knowledge, applying this to practice that produces "effects" upon the world. In the case of human computer interaction, technical knowledge is embedded in computational systems and their representations, which include usability and user experience. In the case of somatics and performance,

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[7] Philip Agre takes the stance that people are intimately connected with the world around them and that the epistemological isolation that Descartes took for granted is untenable. Further explicating the views of Heidegger and Merleau-Ponty, he asserts this stance *technologically*, defining a *critical technical practice*. See Agre, P.E. (1997). *Computation and Human Experience*, Cambridge, UK: Cambridge University Press.

[8] Ibid, p. xi.

technical knowledge is embedded in embodied systems and their representations: technical body-based practices where one of the primary goals is reproducibility (i.e. repeatability) of *body-state* in the context of day-to-day actions[9].

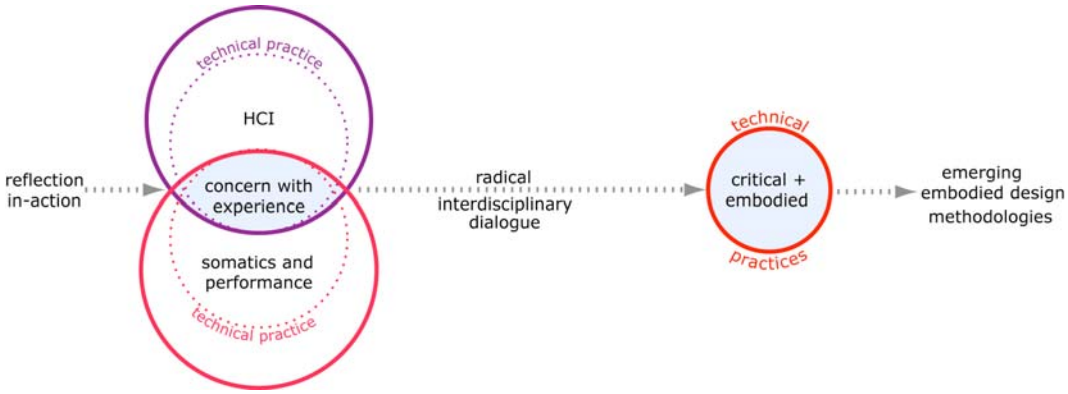

Figure 2. Critical *Embodied* Technical Practices support emerging embodied methodologies

In each case technical practice is inseparable from experience, so that 'modeling embodied techniques' is equally as experiential as 'modeling computational systems'. It is not the intention of this work to create binarisms, but rather to unfold distinctions that clarify values and contributions to interdisciplinary methods. While we have not yet established substantive theory associated with the specific technical nature of embodied practice within HCI literature, the application of body-based technical practice in somatics and performance can provide core disciplinary expertise and further evidence for integrating body practices into the design of technology.

Technical processes express rigour, specificity, and knowledge: explicit as well as tacit. Agre speaks of *critical technical practice.* My work contributes *embodied processes* to critical technical practice where reflection-in-action[10] can invite a dialogue between the

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[9] For example, Glen Hartelius makes an argument for a state-based access to knowledge which enables replicable inquiry in what he refers to as Somatic Phenomenology, see: Hartelius, G. (2007). Quantitative Somatic Phenomenology: Toward an Epistemology of Subjective Experience, *Journal of Consciousness Studies*, *14*(12), p. 24–56.

[10] Donald Schön discusses the epistemology of practice with his notion of 'reflection-in-action' which places technical problem solving within a broader context of reflective inquiry, and illustrates how reflection-in-action can be rigorous in its own right, linking the art of practice in uncertainty and uniqueness to the scientist's art of research. Schön, D.A. (1983). *The Reflective Practitioner: How Professionals Think In Action*. Basic Books, p. 69. His discussion of reflection-in-action describes techniques of 'thinking on your

differing *forms* of technical practice in computation and embodiment. I work to foster creativity by integrating these divergent epistemologies of practice. This approach uses a radical interdisciplinary dialogue,[11] in which the varieties of user experience can be expressed in the context of interaction.

To achieve this end, I explore the varied epistemological value centres within HCI, and the body-based knowledge within somatics and performance, focusing particularly on notions of technical rigor in action. This is an epistemological *reframing* of the nature of user experience within HCI and between HCI and somatics; its exploration is one of the primary goals of this research.

1.3 Conceptual Framework – An Approach to Embodied Interaction

In the midst of this terrain, embodied interaction continues to gain significance within the field of human computer interaction. Its growing recognition and value is evidenced in part by a notable increase in publication and systems design focusing on various aspects of experience and embodied interaction [see Table 1], including special journal issues exploring such topics as the emerging role of performance in human computer interaction (MacCaulay et al, 2006). The enduring need to interact through experience has spawned a variety of interdisciplinary bridging strategies in the hope of gaining a deeper understanding of human experience (Davis 2003), (McCarthy & Wright 2004), (Moen 2005). Along with phenomenology (Dourish 2001), cognitive science (Hurtienne & Israel 2007), psychology and the arts (Höök, Sengers, & Andersson 2003), recent interdisciplinary contributions to HCI include the knowledge-rich domains of somatics and performance traditions such as contemporary dance and physical theatre that carry long-standing traditions of embodied practice.

feet' in which attributes of 'corrective measures in action' based on awareness coupled with ability to redirect cognitive-motor functioning are identical to Somatic learning frameworks. This discussion illustrates that somatics has a potential to increase the adoption of reflection-in-action if applied in technical practices.

[11] See also footnote 4 in this chapter. The term 'radical interdisciplinary dialogue' can also be linked to William James' 'Radical Empiricism', in his conception of a 'pluralistic universe' perceptual experience unfolds revealing and necessitating multiple simultaneous truths, in which 'reality is created temporally day by day'.

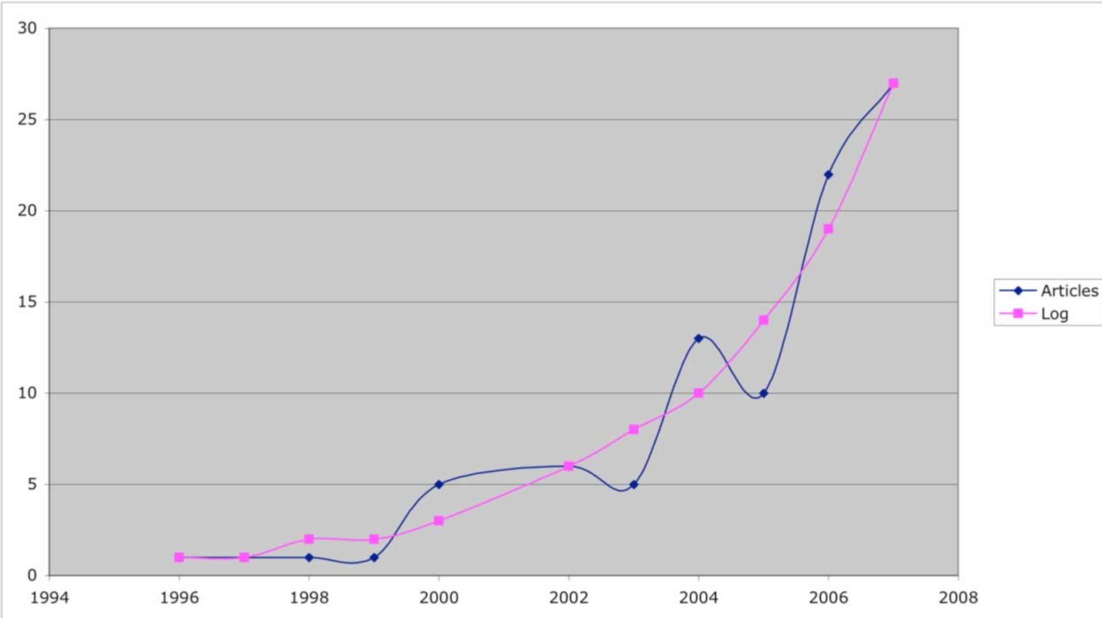

Table 1. Evidence of growth in HCI publications with keywords 'experience' and 'embodiment' [12]

We have identified that the common ground between HCI, and the body-based practices within the fields of somatics and performance is found in the need to understand and model human experience, and that somatics and performance differ from normative HCI in their epistemological frameworks of embodiment. This is particularly evident in their histories of knowledge construction and representation with regard to the body as a site of experience. The contributions of body-based practices within somatics and performance to the larger history of embodiment is not yet fully articulated or understood within HCI. The differing epistemologies and their resulting approaches to experience, along with an unexplored terrain in the HCI literature, identify an under-theorized area of research and opportunities to develop richer knowledge that can be applied to the design of technology.

[12] The method used to obtain this data was based on a keyword search of the ACM Guide to Computing Literature for {embodiment, embodied, embodied interaction, experience, user experience, experience design}, extracted in November 2007. Abstracts and keywords were skimmed to filter and avoid inclusion of material that was not in the area of interest. The resulting chart illustrates growth in number publications and the logarithmic function of that growth.

Figure 3 below, outlines the proposed research exposition and progression as presented in this thesis.

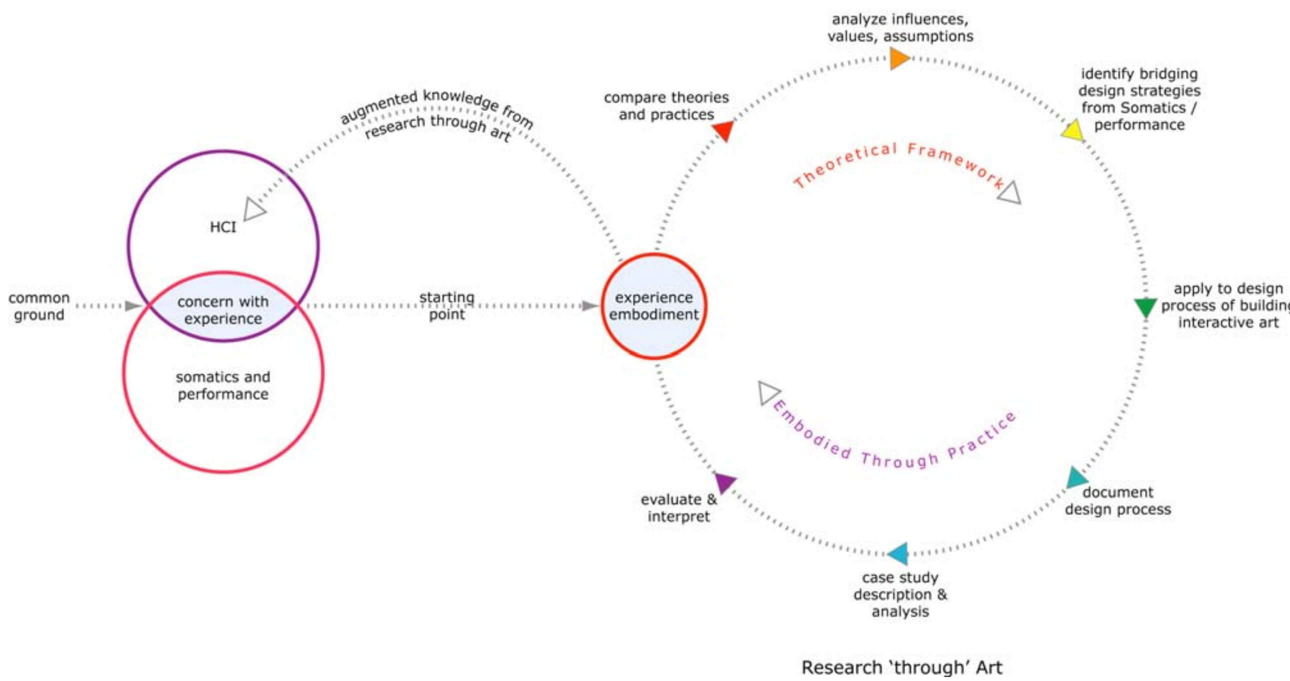

Figure 3. Conceptual Framework: Outline of Thesis Structure as Supported by Research through Art

Figure 3 illustrates a research through art cycle that begins with a shared concern for experience. This seeds a comparison of the epistemologies of practice between HCI, and body-based practices within the fields of somatics and performance. Comparing theories and practices of experience through the lens of 'reflection-in-action' allows us to focus on the transmission and representation of knowledge. By tracing the historical influences, values and assumptions underlying these two epistemological frameworks, and analyzing both fields within the larger context of society and culture, we can articulate resonances, similarities and differences. Comparing epistemologies of practice that distinguish HCI from the body-based practices within somatics and modern dance performance, is accomplished by tracing histories from mid-nineteenth century developments in the transmission and codification of bodily experience. This comparison fosters a historical perspective that can, in turn, bring appreciation and greater contextual understanding to the specific attributes of bodily knowledge, while supporting a radical interdisciplinary dialogue between HCI and body-based somatic awareness practices. As an integral aspect of *Research through Art*, the analysis results in a theoretical framework and a set of design strategies that can be applied to the development of technologies and human experience through Interactive Art. These design strategies focus on bridging embodied practices within somatics and performance to human computer interaction. In order to bring a reflective and critical stance to this process, the subsequent application of these design strategies is exemplified through a series of case studies using interactive art that employs embodied interaction as a central expression of technology. These case studies provide evidence in the form of rigorously documented design processes that illustrate the multi-faceted techniques applied within embodied design, while simultaneously grounding the development of the theoretical framework. Evaluation is based on interpretations of the assumptions, methods and outcomes: the 'self-evidence' that results from analysis of these case studies. Outcomes are equally balanced between the theoretical framework and the artworks that enact the framework. This example of Research through Art is applied in the context of experience-design for tangible, wearable and social interaction.

1.4 Conceptual Framework – Positioning Artistic Practice

My artistic practice applies somatic awareness of experience to human computer interaction, focusing on the design of networked, wearable and tangible technologies that are exhibited as interactive art installations. The practice is born out of, and synthesizes three disciplinary approaches to 'making' that come together through formal training: contemporary dance performance, somatic body-based experiential awareness techniques, and computer systems analysis and design. This practice-based research intersects art and design modalities, as it intersects body and technology modalities. The artistic, experiential and technological outcomes can be described as atypical uses of both body-based practices and digital technologies.

Somatics and contemporary dance share a genealogy of practice, yet they also differ in their approaches to practice. While both apply body-based techniques that educate somato-sensory awareness within the body, their goals are distinctly focused. Somatics is ameliorative, focusing on the education of the sensory motor system to effect greater awareness of movement; its educational and therapeutic goals result in increased agency of the *everyday* body's ability to transform itself through its own self-cultivation, self-action and self-knowledge in the situation of daily felt-life. Contemporary dance applies similar and even identical techniques of body-awareness, however the goal is to educate the *expert* technical body, both the instrument and the material of performativity. In contemporary dance, somatics education is applied to the body's expertise, virtuosity and agency in performance, where the goal is artistic and aesthetic; the dancer's skill enables an extended range of expressivity, repeatability, and proficiency in enacting technical bodily skill.

The emergence of the proposed research approach to 'radical interdisciplinary methods' is coloured by life-experience and extensive formal training across disciplinary boundaries of body and technology. My artistic practice has fueled a curiosity in bridging knowledge that has been internalized through decades of experience, but that remains unaccounted-for in an explanatory capacity within HCI, and between HCI and body-based practices. In choreographic practice, 'making' is inscribed directly through bodily knowledge: the bodily experience of the dancer and choreographer. In somatic practice, 'making' is akin to first-person body awareness and to self-reflexive action. While exploring how somatic awareness techniques can be applied to human computer interaction, the process of designing and implementing technologies *through* the body requires articulation, exemplification and validation in order to be incorporated into the HCI literature in a legible and generalizable form that can support the design of technology as experience. The research presented here focuses on the articulation of more explicit body-based approaches, somatic techniques and the integration of a somatic historical context within HCI. The 'somatic turn' invites a rethinking of the process of making technology, one that includes design for the experience of the self.

1.5 Conceptual Framework – Background and Prior Work

My interest in this research is founded in deep working knowledge and experience from the fields of somatics and performance. A life-long training in contemporary dance, choreography and somatics practice include expert knowledge in a range of movement creation, movement analysis, physical and structural techniques (Laban Effort / Shape, Feldenkrais and Alexander Methods, Pilates and Ashtanga Yoga), Applied Kinesiology (Body-Talk, Touch for Health, Hypertonix, Psychosomatic Energetics and One-Brain modalities) and contemporary dance technique and choreography (Cunningham, Limon, and Graham technique, Contact Improvisation and Butoh). These practices share a focus on ameliorative processes that operate on the somato-sensory body, and that enable the use of one's own experience as a tool of change. My professional training coupled with over 12 years experience in computing, computer programming, systems analysis and computing education prior to completing my Masters Degree, has enabled me to conceptualize and design within the field of human computer interaction. The research presented in this thesis advances my life-long interest in bridging the epistemologies of practice from body-based awareness techniques within somatics and contemporary dance performance in ways that can be legibly and coherently applied to human computer interaction. As a Media Artist who has exhibited internationally for over 15 years, my research has emerged from intersecting foundational knowledge of computing and body-based practices, and results in working technology prototypes: art installations that are exhibited, tested and validated within the context of an international interactive art community. I adopt Christopher Frayling's[13] usage of the term research through art to position these research strategies.

My artistic practice explores embodied interaction through movement, touch and body-state. The artwork is highly experiential, material, and aesthetic. My interdisciplinary background in performance (primarily contemporary dance), somatics and computing has framed the approach I apply to my artistic practice.

1.5.1. Movement. In 1993 I received an Interdisciplinary Master's Degree (M.A.) from Simon Fraser University between the School of Computer Science and the Dance Program within the School for Contemporary Arts. This degree was undertaken through "Special Arrangements", a degree designation for exceptional students working outside or between existing disciplines[14]. The research explored the relationship between dance and technology, and resulted in the design of a computer application called Life Forms, a 3D choreographic design tool. My contribution within the development team was user interface design; translating the choreographers' mental model (creative and kinesthetic methods) to a computational framework. This research combined creative and technical capacity, from design, through to implementation. In 1989, as a direct outcome of LifeForms' presence and early recognition within the global dance community, I began to work with the internationally acclaimed choreographer Merce Cunningham, supporting his creation of choreography with the computer. Cunningham's embrace of the LifeForms choreographic software radically changed the face of dance and technology.

[13] Christopher Frayling's paper on 'Research in Art and Design' (Frayling 1993) adapted Richard Read's celebrated 1940's distinction between teaching to art and teaching through art and applied it to the evolving research culture of postgraduate art courses. Frayling's contribution has shaped further discussions of art as research – where the methods and conventions and debates of research became embodied in the artifact itself.

[14] Extracted from <http://www.sfu.ca/gradstudents/prospective/specialarr.html>, Nov 15, 2007, "Exceptionally able students may pursue graduate studies outside or between existing graduate programs by enrolling under Special Arrangements".

I continue to work with movement as material. Movement is integral to expression within dance and to learning within somatics. An example is *immerce,* an interface to an archival database application exploring multiple navigation modes based on Cunningham's choreographic methods. Navigation modes included Linear, Associative and Random, and a Memory Map that traced the user's navigation through the dataspace. This work won three IDMA (International Digital Media Awards) and was exhibited in Canada and abroad.

1.5.2. Touch. The sense of touch has been a theme in my artwork since 1995 and in my somatics training since 1984. My historical exploration of tactile interaction spans a fifteen year period and is illustrated through a range of expressiveness and application. Touch and tactile interfaces are used as an exploration of *active touch*[15] in experience, in particular, experience that 'attends' to our inner state. Touch is sometimes called "the first sense"; it is associated with intimacy and empathy. Touch is also an important sense in the field of somatics, and remains influential in my research trajectory.

Bodymaps: artifacts of touch and Felt Histories (two interactive art installations that used touch, 1995-1999) were exhibited internationally at Ars Electronica, Paris Cultural Centre, Screens Festival, Interaction 97 in Japan, and many others. As a result of this work, I was awarded the prestigious PetroCanada award in 1998, a biennial award granted by the Canada Council for the Arts to a Canadian artist for innovation and contribution to New Technologies design and research.

My conception of 'A Semantics of Caress' began in 1984 with my study of Laban Effort Shape Analysis, where I successfully applied Laban's Effort Qualities to the expressive

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[15] *Active touch* is defined in Gibson, J.J. (1966). *The Senses Considered as Perceptual Systems,* Westport, Connecticut: Greenwood Press, p. 99. Gibson identifies that touch can be simultaneously Objective and Subjective "the same stimulating event has two possible poles of experience, one objective and the other subjective. There are many possible meanings of the term *sensation* but this is one: the detection of the impression made on a perceiver while he is primarily engaged in detecting the world".

movement of 3D human figure animation. Through observations made during the exhibitions of Bodymaps and Felt Histories, I began to conceive of a tactile semantics that could be applied to a computational model. This work has evolved iteratively through a series of input devices and participant observation. Its most recent implementation exists in *soft(n),* where 10 networked soft objects communicate with one another and the interactive participants through qualities of touch (2007). This development is one of the applications of somatics described in the final case study of the thesis.

1.5.3. Body-State. The three case studies presented within this thesis focus on my most recent artworks with wearable and mobile technologies. These works explore participants' first-person interaction with their own *body-state* and the sharing of their state with other networked participants in the installation. Many physical techniques in somatics and performance access our experience of body-state, and one of the primary interaction techniques is paying attention to qualities of first-person experience. I explore body-state through physiological data such as breath and heart rate. This input data is shared between participants through touch and movement, while sound and visual output patterns represent and communicate the collective group state. My goal is to cultivate self-observation so that body-state can be observed and shared with others in a networked environment. In these artworks this is explored in an open and playful social environment. During the course of this research, I have designed and implemented four original wearable/mobile art installations that have been exhibited in a series of international art venues including: the Dutch Electronic Arts Festival (DEAF03) in Rotterdam, the Future Physical Respond festival in Cambridge, England, the e-culture fair in Amsterdam, Ciber@rts festival in Bilbao (2004), Spain, Siggraph05 Emerging Technologies and Art Gallery, the Dutch Electronic Arts Festival (DEAF07) in Rotterdam and Picnic'07 in Amsterdam.

My personal observations of the internal validity of technical knowledge within somatics, coupled with a personal history of exploring how these techniques can be applied to the design of experience for computational systems has led me to this research. My interest in human experience and the somatics model of self-cultivation, together with my respect for the far-reaching impact of technology "transforming the world from its current state to a preferred state"[16] is the point of departure for a reframing of the epistemologies of practice in these fields. This aligns my approach with Schön's appreciation of research-in-practice where "the contributions that I [Schön] have found most helpful are from people for whom research functions not as a distraction from practice but as a development of it."[17] In his discussion of research-in-practice, Schön states:

> When someone reflects-in-action, he becomes a researcher in the practice context. He is not dependent on the categories of established theory and technique, but constructs a new theory of the unique case...He does not separate thinking from doing… because his experimenting is a kind of action, implementation is built into his inquiry. Thus reflection-in-action can proceed, even in situations of uncertainty or uniqueness, because it is not bound by the dichotomies of Technical Rationality.[18]

1.6 Research Strategy - Methodology

My research strategy is based on an overarching process of research through art that has explanatory value within the HCI community in the context of design for embodied interaction. As a result of creating a series of interactive art works over a period of seven years: whisper [2001-2003], exhale [2004-2005] and *soft(n)* [2006-2007], each resulting in rich descriptive data sets, a multiple case-study research strategy was

[16] Zimmerman, J., Forlizzi, J., & Evenson, S. (2007). Research through design as a method for interaction design research in HCI, *CHI '07: Proceedings of the SIGCHI conference on Human factors in computing systems*, New York: ACM, p. 493.
[17] Schön, D.A. (1983), op. cit. p. ix.
[18] Ibid p. 69. Donald Schön counterpoints reflection-in-action with Technical Rationality in which problem solving is emphasized over problem setting and where the ends are agreed upon before the solution is implemented. Technical rationality is a successful strategy when ends are fixed and clear, and that problem-solving methods are known prior to their implementation, but less successful in situations where ends are ill-defined or "wicked", see also: Buchanan, R. (1996). Wicked Problems in design thinking. In Buchanan, R., & Margolin, V. (eds.), *The Idea of Design*, Cambridge, Massachusetts: MIT Press, p. 3-20.

selected in order to analyze and build upon this data. This comparative case study approach enables a rich variety of somatic body-based techniques to be explored, documented and assessed during the design period in which these art-works were created. Multiple cases allowed for the development of cumulative knowledge, for testing the replication of results and for the development of a rich theoretical framework.

1.6.1. Research through Art

Research through Art enables a discovery-led and speculative design process to unfold through an inquiry that is leading the development of the artwork. This is the over-arching frame of the research. Because the HCI literature offers no insights into how we can apply somatic awareness techniques or similar embodied theory to design and implementation of new technology, and because I frame my research within artistic activity, I utilize a *Research through Art* approach with the goal of gaining insights into the application of somatic practice to the design of technology that can be shared in an HCI context. My intention is to extrapolate common features and values that can be extended to a design framework that can lend insight to the broader HCI community, and that can enable somatic body-based practices to be a *resource* for technology design within HCI.

1.6.2. Comparative Case Studies as Research Strategy

I selected three case studies, each tracing the process of making an interactive-art work. Each of these art-works was selected for two primary reasons: they were created during the process of defining and refining the research laid out in this thesis, and as a result, their process was rigorously and explicitly documented and reflected-in-action. This iterative reflection-through-practice resulted in an approach to gathering and enacting knowledge. The case studies are cumulative and inter-connected, yet each case study's analysis highlights a particular aspect of an artistic design process where somatic body-based knowledge is applied to a technological design process. Each case study describes, illuminates and documents design process, materials, experience and artifacts that resulted directly from the exploration and implementation of somatic awareness techniques and strategies, often articulated through discovery-led speculative design approaches. These design processes utilized a synthesis of technological, material, aesthetic and experiential processes that resulted in the interactive artwork.

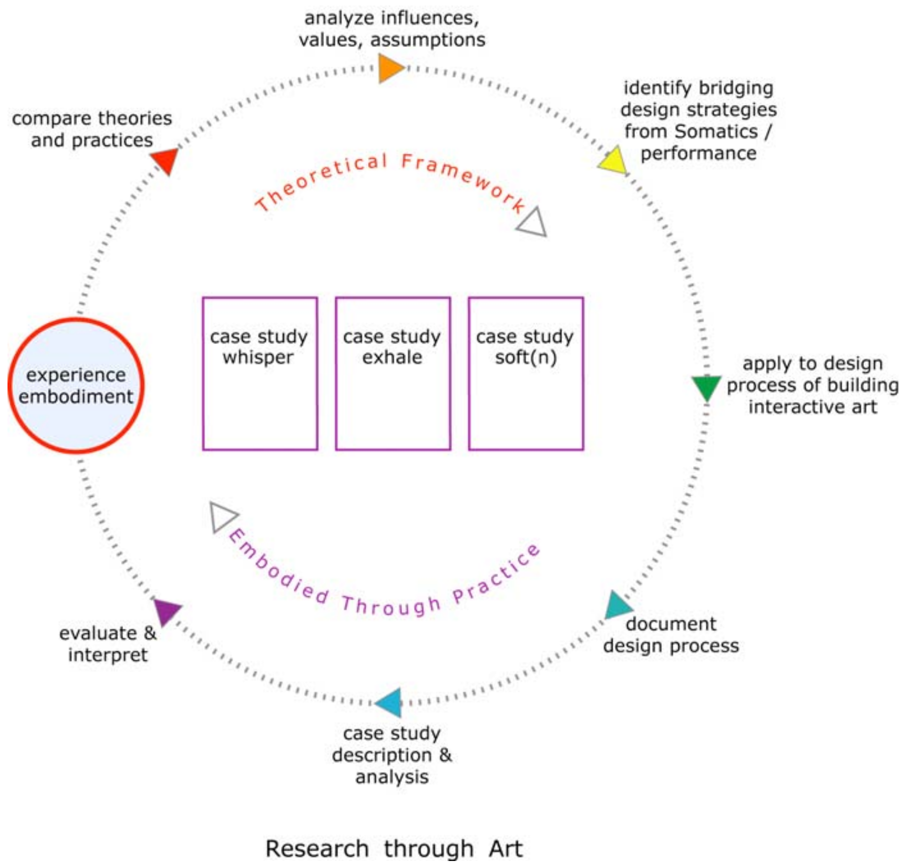

Figure 4. Research Strategy: Comparative Case Study Analysis within Research through Art Cycle

1.6.3. Personal Experience Combined with Empirical Data

In Robert K. Yin's[19] comprehensive presentation and analysis of case study research, he suggests that the combination of personal experience with extensive empirical data enables multiple sources of evidence to be integrated into a coherent theoretical framework, optimizing case study design. The art-works whisper, exhale and *soft(n)*

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[19] Yin, R.K. (2003). *Case Study Research: Design and Methods,* Thousand Oaks, CA: Sage Publications, p. 98.

combine personal experience within a seven-year research through art process. Personal experience based on expert knowledge determined the conceptual framework and research questions that seeded the research. Documentation of data in the form of design process, materials, experience and artifacts collected during this time frame represent extensive empirical data. These multiple sources of evidence enable triangulation and analysis of case study data, enhancing validity through the development of cumulative knowledge and testing replication of experiential results.

1.6.4. Case Study as Appropriate Strategy

Yin[20] also describes specific attributes of *scope* and *data collection and data analysis* that are suited to the case study as a research strategy. When the *scope* of research investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident[21], a case study provides a highly appropriate research strategy. This thesis investigates the contemporary *phenomenon* of the application of somatic body-based practices within its real-life *context* of technology design within HCI. As previously articulated, HCI offers little guidance as how to apply somatic awareness techniques or similar embodied theory to design and making of new technology. By positioning the phenomenon of body-based somatics practice within the context of HCI and design for technology, the case study can allow "you [to] deliberately … research contextual conditions."[22]

Yin continues by illustrating that the contextual condition (in this case the exploration of somatic practice within HCI) also defines a set of *data collection and data analysis strategies*. The case study inquiry relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and it benefits from the prior development of theoretical propositions to guide data collection and analysis.

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20 Ibid. p. 12.
21 Ibid. p. 13.
22 Ibid.

Figure 4 illustrates the interconnection of the theoretical framework with its articulation throughout the case study design, and its use as a frame for testing propositional evidence that results from the application of somatic awareness techniques through the design of the art-works themselves.

1.6.5. First-Person Somatic Phenomenology

The 'somatic turn' invites a rethinking of the process of making technology, one that includes design for the experience of the self. Including self-experience and self-awareness *into* technological design brings an ethical dimension to the assessment of technological systems in HCI. Within the data collected throughout the case study research, first-person methods are forefronted in their centrality to somatics and body-based epistemologies of practice, and in their effect upon articulating design processes for technology [See Figure 5].

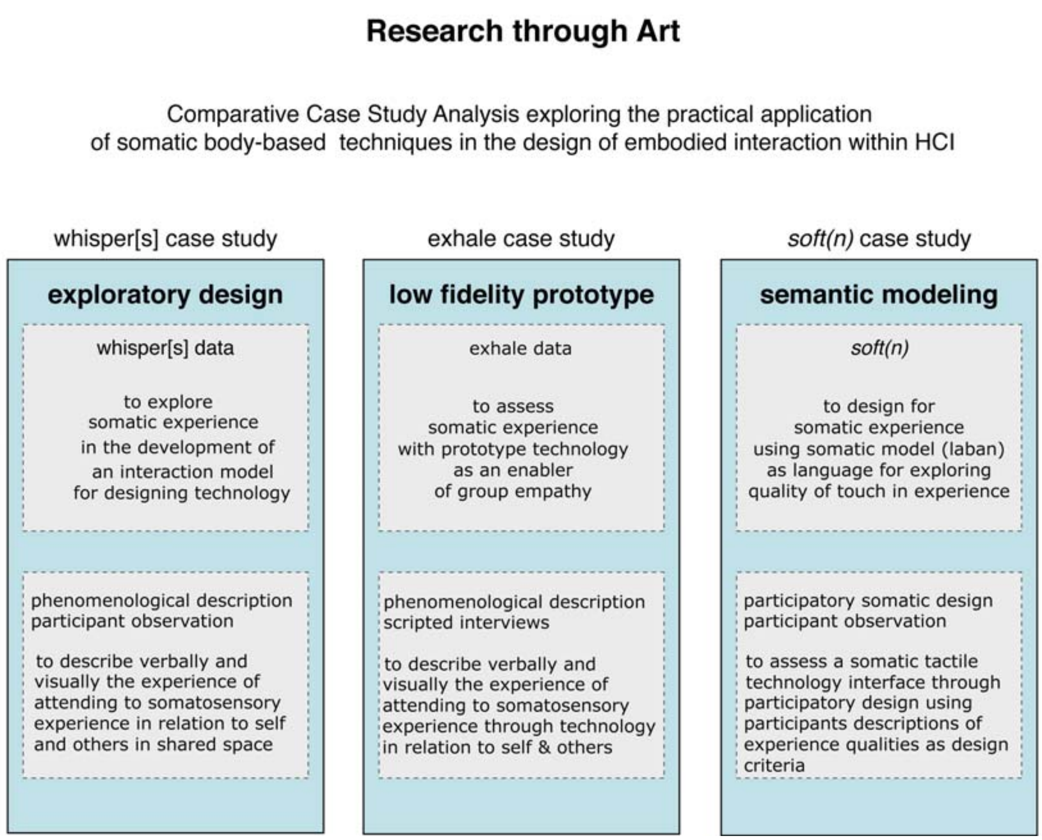

Figure 5. Case Study Evidence highlights accessing and interpreting first-person experience

First-Person methodologies have a rich history in somatics and contemporary dance practice. Practitioners and scholars such as Elizabeth Behnke[23] and Sondra Fraleigh[24] have written extensively about bringing direct experience of the moving body into scholarship, and into technical practice: the body of knowledge that represents the moving self. Fraleigh's approach places first-person experience on a continuum with second and third person approaches to interpreting experience, and is aligned with the phenomenological methods of data collection, such as phenomenological description and hermeneutic interpretation that has been utilized within the case-study design.

> I wanted to weave the intuitive voice of the dancer into a descriptive aesthetics, slipping from first-person voice to analytical third-person theory, as phenomenology does.[25]

Just as Fraleigh is concerned that the future of dance research not be dictated solely by objective distance and quantification, this research works to articulate how the intersection of first-person methods and phenomenological approaches to somatic experience can be integrated *as practice* within technology design. While first-person practices in somatics and dance performance are based in self-cultivation and self-agency, they act upon the self in order to ameliorate, to improve our *technical skills* of accessing experience. The application of first-person methods within this research can be differentiated by its context. Its goal is to articulate first-person methods *through* the design of technology, so that the ameliorative process is at once individual, cultural and systemic: it becomes simultaneously inter-subjective and a form of social self-inquiry. Awareness of one's own organism leads to recognition of the commonality of all human organisms.[26] Attention is an ecological process. The proposition is that as the self is cultivated, an ethical relationship can emerge between self-awareness and technologies created from the application of attention to our experience.

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[23] Behnke, E.A. (2008). Interkinaesthetic Affectivity: A Phenomenological Approach. *Continental Philosophy Review,* 41(2). p. 143-161.
[24] Fraleigh, S.H. (2000). Consciousness Matters, *Dance Research Journal, 32*(1), Summer 2000, p. 54-62.
[25] Ibid. p. 54.
[26] Trigant Burrow, a psychoanalyst coined the term *cotention* to identify shared attention to experience, also called social self-inquiry, in Burrow, T. (1999). *The Social Basis of Consciousness*, London: Routledge.

1.6.6. Research Questions

This research is focused on the varieties of user-experience from the pragmatic to the exquisite, and articulates this focus by bridging embodied methodologies from somatics and performance to human computer interaction. The propositions, exploration and evidence gathered has followed from an inquiry based on the following research questions:

- How can body-based somatic practices be described, articulated in practice, and applied in an HCI context, in order to expand the practical application of embodied theory and its application to technology design?
- How can body-based somatic practices be used as a design resource within an HCI context?
- How can the ameliorative properties of first-person methods of somatics and contemporary dance performance enhance a reflective space for ethical valuation through a dialogic radical interdisciplinary approach to technology design within HCI?
- How can body-based somatic practices support an epistemological *reframing* of the nature of user experience within HCI and between HCI and somatics?

1.7 Chapters Outline

Figure 4 Illustrates the Chapter organization of the Thesis. Underlying the Thesis structure is the cycle from inception to realization to evaluation and interpretation. This is illustrated in the diagram as a ‘Theoretical Framework’ that is ‘Embodied through Practice’. It is equally accurate to say that the enactment of the Artistic Practice is the foundation of the formalization and embodiment of the Theoretical Framework. The cycle as a whole is a balanced representation of reflection-in-action and research-through-art.

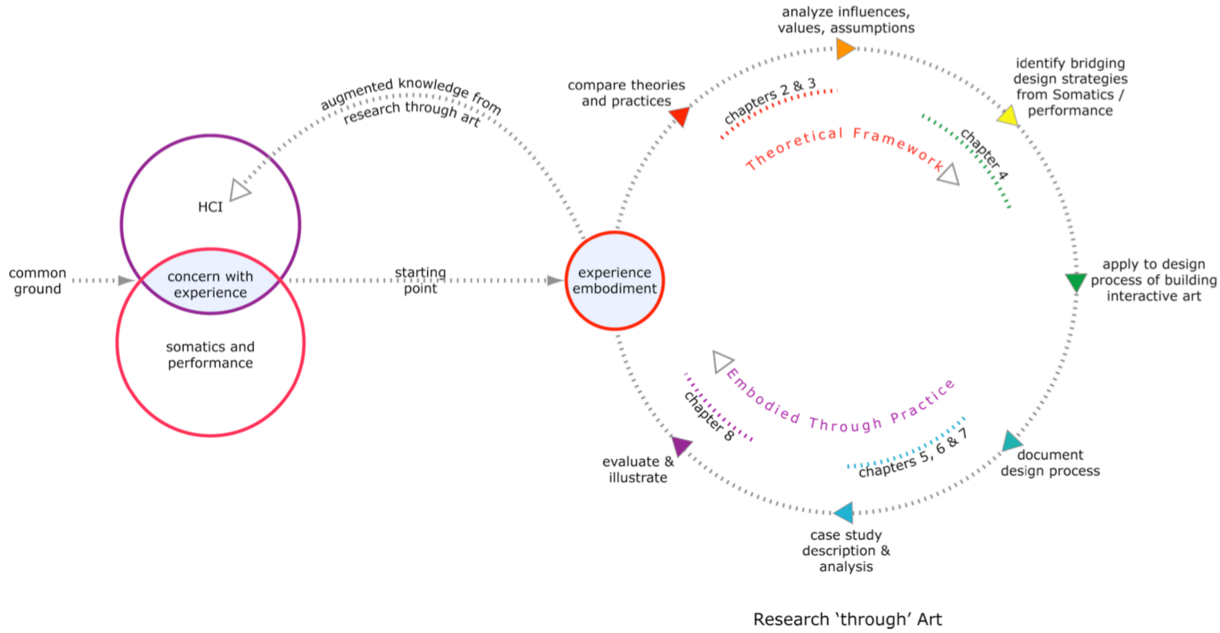

Figure 6. Conceptual Framework: Mapping the Chapters to the Thesis Research Structure

Chapter 2 *Somatics and Performance* explores the histories, influences and philosophical underpinnings of experience from within the perspective of body-based disciplines, and together with Chaper 3 outline the theoretical framework for the case studies. This chapter characterizes the technical practice of first-person methodologies, describes attitudes and values of experience from the perspective of body-based disciplines, illustrates the intertwining of somatics and contemporary dance performance practices, and lays a groundwork for the use of these technical practices in the field of human computer interaction.

Chapter 3 *User Experience within HCI* surveys research in user experience and outlines historical influences of human computer interaction in relation to the emerging recognition of embodied cognition within a broad range of cultural movements including contemporary science, humanities, the arts and the experience-centered histories of somatics. It identifies common historical influences that have shaped human computer interaction and the body-based somatic traditions, while emphasizing the richness of interdisciplinary exploration within HCI, and drawing a perspective that can enable knowledge sharing between HCI and somatics.

Chapter 4 *Bridging Methodologies* presents an overview of the three case studies presented in the thesis. It discusses the comparative units of analysis utilized to gather data and construct evidence within each case study. It introduces and reviews the multiple approaches to somatic practice and knowledge. Each case study describes a specific aspect of the design of an interactive technological artwork [*whisper*, *exhale* and *soft(n)*]; and each artwork applies and highlights a particular set of technical practices from body-based somatics and contemporary dance performance practice to its technology design.

Chapter 5 *From the Inside Out,* the first case study, describes the experience design process of *whisper*, an interactive wearable art installation premiered at the Dutch Electronic Arts Festival in February 2004. The title *From the Inside Out* refers to the experiential processes explored in a series of five developmental workshops resulting in the interaction design model implemented in *whisper*.

Chapter 6 *Designing with Breath,* the second case study, explores the relevance and importance of breath as a somatic indicator of state. It describes the experiential design processes used in *exhale*, an interactive wearable art installation prototyped at Siggraph 2005 Emerging Technologies. The design inquiry focused on *how* networked wearable technology could mediate group empathy through shared breath; particularly how interaction, sharing and exchange could become 'legible' to the participants.

Chapter 7 *The Somaesthetics of Touch,* the final case study, describes the historical development of a '*Semantics of Caress*', a somatic representation of movement quality based on Laban Effort / Shape Analysis. This case study traces the concept from its inception to the development of an input heuristics for tactile recognition. The most recent implementation was integrated in the interactive art installation *soft(n)*, a ‘family’ of 10 networked soft objects that respond to qualities of touch drawn from interactivity with installation participants.

Chapter 8 *Self Evidence: a Non-Alienated View,* analyzes the multiple sources of evidence gathered as case study data from the theoretical framework laid out in Chapters 2 and 3. This chapter analyzes, evaluates and critically reflects on the three case studies, focusing on what the case studies as a whole have contributed to the thesis objectives. It explores the nature of collaboration, and the extent to which the designer can act as a facilitator. It also discusses the role that somatic sensibilities can play in shaping a facilitation role. Evidence collected and documented in the website, DVD, Appendices and in-bound articles are referred to.

Chapter 9 *Toward A Richer Model of Experience* summarizes the theoretical framework and evaluates its validity in practice through interpretations of radical interdisciplinary dialogue. It reviews the application of somatic design strategies for technology, and reframes epistemologies of practice within HCI. It reflects and articulates the contribution to HCI, summarizes the relationship between theory and practice through the case studies, methodology and theory, and outlines future responsibilities for research in the area of somatics and embodied interaction. This chapter recommends the inclusion and even embrace of a set of somatic techniques that can be applied to the design of experience, inviting further exploration through reflection-in-practice. It posits attention as an ecological process, and suggests that an ethical relationship can emerge between self-awareness and technologies created from the application of attention to our experience.

2

Embodiment in Somatics and Performance

"We are the material, our bodies and minds the medium of our exploration. The research is experiential as is the material."
Bonnie Bainbridge Cohen[1]

"Embodied practice and event is a recurring point of reference within performance studies."
Kirshenblatt-Gimblett[2]

"... it relates to the principle of the immediacy of experience... any technique or philosophy ultimately comes back to the axiom: know thyself."
Bonnie Bainbridge Cohen[3]

2.1 Introduction

This chapter explores embodiment within the field of somatics, tracing the historical influences and development of its epistemologies of practice. Body-based practices are the specific focus of the epistemological history shared between somatics and modern dance performance, fields that intersect and align through a common genealogy of practice[4]. Somatics offers an account of experience enacted through first-person methodologies incorporating technical expertise and reflection-in-action that has the attributes of being rigorous in its own right[5]. Its frameworks are rooted in its historical ties with modern dance performance and movement practices, and can be traced to philosophical underpinnings within contemporary phenomenology[6] and pragmatism[7]

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[1] Cohen, B.B. (1993). *Sensing, Feeling and Action: The Experiential Anatomy of Body-Mind Centering*, Northhampton, Massachusetts: Contact Editions, p. 1.

[2] 1999, adapted by Kirshenblatt-Gimblett from "Performance Studies", a report written for the Rockefeller Foundation, as quoted in Schechner, R., (2002). *Performance Studies,* London: Routledge, p. 3.

[3] Cohen, B.B. (1993), op. cit., p. 11.

[4] In this chapter, the term 'somatics' refers to the shared epistemological history of practice articulated within body-based practices, and is intended to include the movement arts, particularly contemporary dance and its ancestry from modern dance. This history is elucidated more fully, later within this Chapter.

[5] Schön, D.A. (1983), op. cit., p. 69.

[6] For example Elizabeth Behnke is a somatics practitioner who founded the Study Project in the Phenomenology of the Body in 1987, focuses on first-person Husserlian phenomenological practice. See <http://www.newschool.edu/GF/phil/husserl/Future/Part%20One/Behnke.html> (retrieved November 17, 2007).

and to ancient concepts of the 'self' that date back to Hellenistic[8] traditions and eastern philosophic thought[9]. Within somatics, technical practice is centered in first-person *technical enactments of experience*. These are self-reflexive techniques structured to transform one's experience of the *self in the world*. Somatic first-person body-based techniques form part of a larger history of practices of subjectivity and self-cultivation. First-person techniques engage what Michel Foucault termed *Technologies of the Self.*[10]

This chapter characterizes the technical practice of first-person methodologies as articulated in body-based disciplines. It outlines their instrumentality in approaches to reflection-in-action: technical problem solving within a broader context of reflective embodied inquiry. It analyzes traditional academic concerns of validation, seeking to illustrate an approach to incorporating first-person practices in a larger design context that can be applied within the design of computer technologies. Finally, it describes attitudes and values associated with experience from the perspective of body-based disciplines, and illustrates the historical intertwining of modern dance performance and

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[7] The American philosopher John Dewey studied with F.M. Alexander, one of the father's of somatic training. Dewey's approach to pragmatism and experience has recently entered the literature of user experience within HCI (see McCarthy & Wright, 2004). Dewey met F.M. Alexander in New York in 1916 and subsequently trained and worked with him for over twenty years. Dewey's philosophy of learning, education and experience was strongly influenced by Dewey's work and practice with Alexander. Dewey credits his work with Alexander in the development of a number of his philosophical frameworks of experience and education, particularly as they relate to habituated stances that refer to self-agency and ethics.

[8] This refers to an analysis of Foucault's "care of the self" in his late work, *The Hermeneutics of the Subject: Lectures at the Collège De France 1981-1982*. Foucault's textual analysis of ancient history of Hellenistic thought suggests that the Delphic prescription "know yourself" can be understood as being formulated in subordination to the precept of "the care of the self' from the point of view of a history of practices of subjectivity (first-person practices); that to know the self one must "attend to the self" Foucault suggests this as an "event in thought" where *knowledge* in a philosophical sense is subordinated to subjective physical practices that transform the self. He distinguishes this position from 'Knowledge' as it was transfigured in "the Cartesian moment", which he states functioned historically in two ways: re-qualifying the importance of "knowing the self" while "discrediting the practice of 'the care of the self'." The Hellenistic form of activating the knowledge of the self through the practices of the 'care of the self' has many resonances with the form of contemporary somatic epistemologies of practice. See: Foucault, M. (2004). *The Hermeneutics of the Subject: Lectures at the Collège De France 1981-1982,* F. Gros (ed). New York: Palgrave Macmillan.

[9] In Eastern Philosophy, the concept of self-cultivation is seen as a practice toward the goal of unifying mind and body. This is achieved through a set of rigorous technical first-person practices based on the somatic self, awareness (or attention) and cultivated within a somaesthetics of experience, see Yasuo, Y. (1987). *The Body: Toward an Eastern Mind-Body Theory,* SUNY Press. The notion of self-cultivation is resonant with technical practices of somatics.

[10] Foucault refers to technologies of the self as a set of processes that operate on the self to effect change or transform the self in order to attain a certain state. See Foucault, M., (1988). Technologies of the Self, in *Technologies of the Self, A Seminar with Michel Foucault*, University of Massachusetts Press, p. 18-19.

somatic practices, laying the groundwork for the use of these technical practices of embodiment within the field of human computer interaction.

I argue that first-person methodologies in somatics and body-based performance are technical practices utilizing reflection-in-action that can contribute in an integral way to design for user experience in new technology.

> The study of reflection-in-action is critically important. The dilemma of rigor or relevance may be dissolved if we can develop an epistemology of practice which places technical problem solving within a broader context of reflective inquiry, shows how reflection-in-action may be rigorous in its own right, and links the art of practice in uncertainty and uniqueness to the scientist's art of research. We may thereby increase the legitimacy of reflection-in-action and encourage its broader, deeper and more rigorous use.[11]

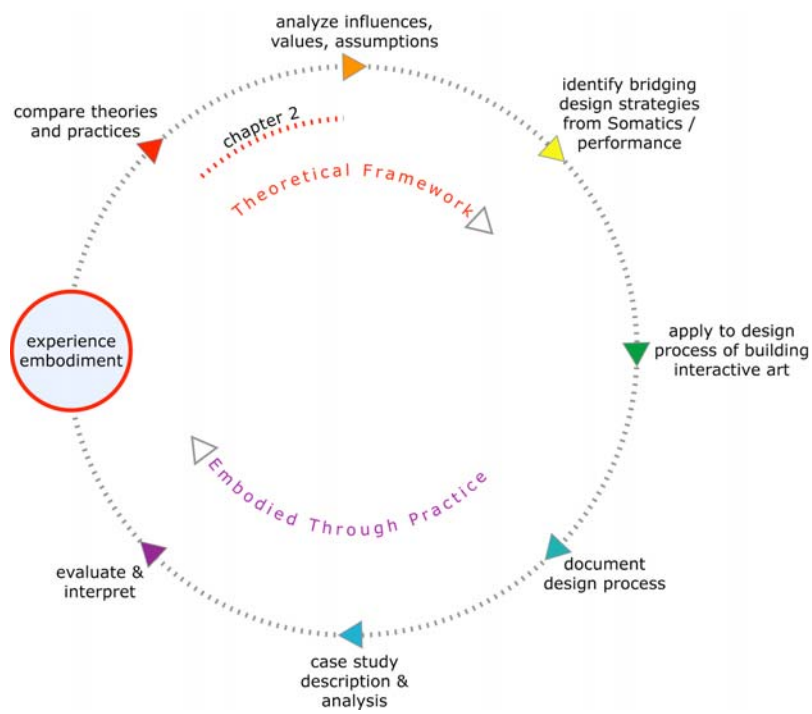

Figure 7. Chapter 2 Compares theories and practices of experience and embodiment within somatics and performance analyzing its influences and values in a historical context

[11] Schön, D.A. (1983), op. cit.

I invite the reader to explore the *experience* of research through the reading of this text and to imagine that the art of practice in uncertainty and uniqueness can develop the *researcher as an instrument* through the disciplined inquiry of the research itself.

2.2 What is Somatics?

Somatics is a term applied to a field of body-based practice and research developed largely outside of mainstream academia during the late nineteenth and twentieth centuries in Europe and America. Its western roots can be traced back to Delsarte[12] while its contemporary practice is richly influenced by eastern philosophy and body practices. In 1976 Thomas Hanna, a practitioner and philosopher, named the field *Somatics*, identifying a collection of embodied disciplines that share an approach to first-person practice focusing on *sensory awareness*: the ability to act on perceived stimuli. Naming the field also marked the foundation of the American *Journal of Somatics* and it was followed by its French equivalent, *Somatotherapie.* Somatics was christened almost a century after its emergence in Europe in the mid 1900's with the Delsarte Method of movement integration. The body-based practices of somatics have a long and interconnected history with modern dance. Their concurrent and intertwined emergence was born from the same historical source: the Delsarte Method was the precursor to both modern dance and the emerging body practices that became somatics. Contemporary somatics includes practices such as *Alexander Technique*, Feldenkrais' *Awareness Through Movement* and Rudolph Laban's *Effort-Shape Analysis*. Many somatics techniques are intended to be used '*by the self on the self*' in order to refine knowledge and precision through use of the human body in action. While

[12] Francois Delsarte (1811-1871) created a system of integrating movement, speech and gesture in the mid nineteenth century in order to enhance physical expression of emotions in connection with speech and thought. This practice was radical for its time as is emerged from the Victorian era of the court dance, and was also a part of the larger Belle Époque that liberated Europe. Delsarte himself an actor and operatic singer had a significant influence of modern dance and related fields including the fledgling development of somatics.

contemporary somatics maintains its historical goal as an ameliorative form that educates attentional skills of the *every-day* body by facilitating self-awareness, contemporary dance applies somatic techniques with the goal of educating a *virtuosic* technical body, where the dancer's skill is applied to the *body as finely tuned instrument* for performance, what Victor Turner refers to as "the liberated and disciplined body"[13]. Somatics and contemporary dance share a historical epistemology of practice. In this section I characterize the technical practice of first-person methodologies within somatics, outline the historical growth of two differing yet parallel epistemologies of practice with regard to the knowledge of the body, and illustrate how these differing epistemologies of practice can find a common ground in the 'turn to experience' within HCI. The growth of publications exploring embodiment within the field of human computer interaction is evidence of the need to refine instrumental knowledge of the human body in action, particularly when that action is implicated in or applied to the use of technology [see Table 1 Chapter 1].

2.2.1 Characterizing First-Person Methodologies

First-person methodologies can be characterized as embodied technical practice that is both self-reflexive and self-enacted. They *attend* to the self in order to *act* upon the self. First-person methodologies are an example of what Schön refers to as reflection-in-action, and what Foucault refers to as Technologies of the Self. As reflection-in-action, first-person methodologies involve technical problem solving within the broader context of 'reflective embodied inquiry'. As Technologies of the Self, first-person methodologies constitute part of a larger history of practices of subjectivity and self-cultivation that include ancient western and eastern cultural forms. This section outlines characteristics shared by first-person methodologies and illustrates how first-person practices play a role in defining the areas of intersection between somatics and

[13] Turner, V., (1986). Dewey, Dilthey, and Drama: An Essay in the Anthropology of Experience, *The Anthropology of Experience,* Chicago: University of Illinois Press, p 43.

other contemporary disciplines such as performance, philosophy, physiology, psychology and eastern medicine. While first-person methodologies are central to somatics and body-based performance such as modern dance, they also contribute to the technical practices and tacit knowing: the ‘know-how’ of many other disciplines. Section 2.4 gives examples of the values and instrumentality of first-person practice.

2.2.1.1 Common Characteristics of First-Person Methodologies

First-person methodologies share a set of common characteristics. Their goal is ameliorative: to *learn* through the *experience* of the self. They are technical practices that use a set of definable, rigorous, physical techniques that can be learned. When enacted, they produce recognizable and repeatable body-states. First-person techniques are self-reflexive and self-enacted. While third-person methodologies use observation to gain knowledge about the world, first-person methodologies use observation to gain knowledge about the self. Based in self-observation, they use the direction of attention or awareness to re-educate perception. Intention, intuition and movement play important roles in their attentional processes. Other disciplines that use first-person methods refer to them in a number of ways. Within phenomenology these techniques are referred to as *epoché*, reduction-suspension or phenomenological reduction, and engage techniques such as phenomenological description[14] to access and record these states. Within psychology first-person techniques are known as introspection or reflection, focusing[15] and cotention[16]. Within the contemplative

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[14] Following from the earlier writings of Maxine Sheets-Johnson, Sondra Fraleigh, a dance scholar, somatics practitioner and contemporary dance choreographer, introduced the first-person method of phenomenological description into contemporary dance scholarship, opening a discourse for first-person experience of the dancer and choreographer to be acknowledged, valued and interpreted as formal knowledge within the field. Fraleigh’s contribution included examples of phenomenological description in the context of choreography and dance education. See Sheets, M. (1967). *The Phenomenology of Dance,* Madison: The University of Wisconsin Press, pp. 10-31 (as cited in Nadel & Miller, 1978), and Fraleigh, S.H. (1991). III. A Vulnerable Glance: Seeing Dance through Phenomenology, *Dance Research Journal, 23*(1), 1991, 11-16.

[15] Eugene Gendlin developed first-person attention processes which he called Focusing ‘the experiential method’. Focusing is a mode of inward bodily attention that cultivates self-managed attentional skills and expertise. See: Gendlin, E.T. (1996). *Focusing-Oriented Psychotherapy: A Manual of the Experiential Method,* New York: The Guildford Press. Mark Johnson cites Gendlin’s contribution to embodiment practices, attributing his blending of formal-structural with felt-qualitative as an approach to *revaluing* the bodily

traditions they are referred to as mindfulness[17]. A central characteristic of first-person techniques is the simple act of paying attention to the self. The common goal is learning: re-educating perception to increase discernment and freedom of choice for action. First-person methodologies access and construct knowledge in the body.

> Our body moves as our mind moves. The qualities of any movement are a manifestation of how mind is expressing through the body at that moment. Changes in movement qualities indicate that the mind has shifted focus in the body. Conversely, when we direct the mind or attention to different areas of the body and initiate movement from those areas, we change the quality of our movement. So we find that movement can be a way to observe the expression of mind through the body, and it can also be a way to affect changes in the body-mind relationship. [18]

Section 2.4 gives examples of the values underlying the instrumentality of the common characteristics of first-person methodologies introduced here, including: access to body-state, self-observation, sensory-motor perception, attention, intentionally directed action, and state-dependant access to knowledge.

2.2.1.2 First-Person Methodologies Intersect Somatics With Shared Disciplines

While first-person methodologies are central to somatics and performance, they also contribute to the epistemologies of practice of a number of other contemporary disciplines. First-person methodologies are the common ground for shared knowledge across the multi-disciplinary boundaries of somatics and performance, psychology, cognitive science, physiology, eastern philosophy and medicine, and western philosophy, particularly phenomenology and pragmatism.

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experience of language and meaning, see: Johnson, M. (2007). *The Meaning of the Body: Aesthetics of Human Understanding,* Chicago: The University of Chicago Press, p. 79-85.

[16] The psychoanalyst Trigant Burrow highlighted what he called the 'ecosomatic' function of first-person attention in its importance to connecting us is a sustaining way with our environment. His term for *cotention* identifies shared attention to experience, while distention defines a loss of ability to 'attend to' ourselves in relation to the world around us. See: Burrow, T. (1999), op. cit.

[17] For a discussion of similarities among first-person methodologies particularly with regard to method and validation see Varela, F.J., & Shear, J. (1999). First Person Methodologies: Why, What, How? *Journal of Consciousness Studies, 6*(2-3), p. 7.

[18] Cohen, B.B. (1993), op. cit., p. 1.

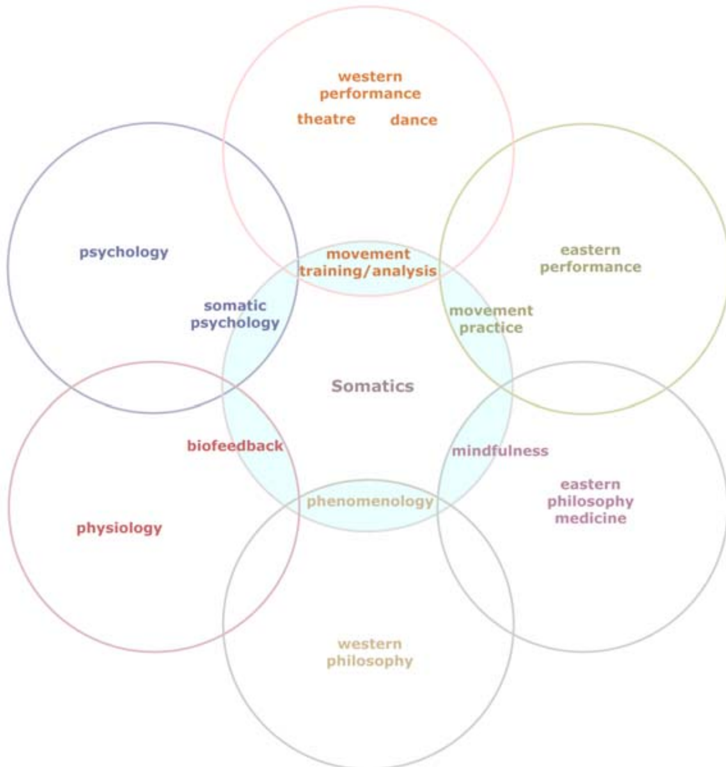

Figure 8. First-Person Methodologies are the Intersection between Shared Disciplines

Figure 8 illustrates how first-person methodologies form the intersecting areas shared between somatics and other contemporary disciplines. First-person methodologies hold an integral position in knowledge construction, particularly where the body or self is the site of research. In the disciplines illustrated first-person methods are often partnered with second- and third-person methodologies. In *The View From Within: First-person Approaches to the Study of Consciousness,* Varela and Shear explore the efficacy of first-person practice and acknowledge the expanded understanding that can be gained by blending first-, second- and third-person methodologies. They describe the need for creating a continuum of practice where first-person methodologies are neither isolated in nor excluded from research:

> It would be futile to stay with first-person descriptions in isolation. We need to harmonize them by building the appropriate *links* with third-person studies. We seek methodologies that can provide an open link to empirically based description… This often implies an intermediate position, a second-person position.[19]

The following examples investigate the way we understand *knowing* in the world and explore first-person approaches that can expand our *quality* of knowing the world through ourselves.[20] The examples are far from exhaustive, yet they illustrate the breadth and applicability of first-person methodologies in their capability to explore personal, social and political forms of knowing.

First-person methodologies have direct transferability beyond knowledge of the self because they access and train acuity in multiple aspects of cognition including observation, discernment, synthesis, critical distance, focus and clarity. Valerie Janesick in *Stretching Exercises for Qualitative Researchers* suggests that observing the self increases a researchers skill, capability and mastery of the practice of observation of other phenomenon in the world. She argues that since empirical research relies on 'direct experience and observation', the qualitative researcher herself is the *instrument* used in observational research, and that this instrument requires development, practice and refinement.

> In qualitative work, the fact that the researcher is the research instrument requires that the senses be fine-tuned. Hence, the idea of practice, on a daily basis, sharpens the instrument.[21]

First-person approaches engender concepts that value attention to the senses, the importance of practice and the self as an instrument of perception. These are echoed in the skills developed within the body-based practices of somatics.

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[19] Varela, F.J., & Shear, J. (1999), op. cit., p. 2.

[20] Neuman, Y. (2003). *Processes and Boundaries of the Mind: Extending the Limit Line*, New York: Kluwer Academic, p. 3.

[21] Janesick, V.J. (2004). *Stretching Exercises for Qualitative Researchers,* Thousand Oaks, California: Sage Publications, p. 3.

Mathew Miles and Michael Huberman resonate with Janesick's stance in their discussion of what they call 'recurring' features of qualitative research, elements that persist, reappearing time and time again in the process of building research design:

> The researcher attempts to capture data on the perceptions of local actions "from the inside" through a process of deep attentiveness, of empathic understanding *(Verstehen*) and of suspending or "bracketing" preconceptions.[22]

Miles and Huberman highlight the need for an inner process that enables greater refinement, subtlety and accuracy in data collection. First-person accounts of experience access attention as a precursor and foundation for accessing and 'capturing' data in the world. It is the first-person framework that develops and deepens abilities of attending, enables empathy through inter-subjectivity and, at its best, is able to suspend preconceptions through techniques of self-observation and reflexivity that support a critical discernment.

Just as first-person approaches can contribute to third-person methodologies, the converse is also true. Third-person methodologies can provide constructs that can be applied to self-observational techniques and phenomenological description. One such example is anthropology's influence on performance studies through Victor Turner's articulation of the use of ethnographic methods in their cultural and performative contexts. Ethnography studies human social phenomena and meaning created in the context of cultural values. While ethnography uses participant observation to bridge the *intersubjective* experience of the cultural 'other' with the researcher-as-observer, autoethnography turns the observation back toward the self, in a reflexive account of one's own experiences situated within culture. In Victor Turner's edited collection *Anthropology as Experience* he recounts the potency and transcendental nature of the aesthetic qualities of theatrical experience. He notes that somatically based techniques

[22] Miles, M.B. & Huberman, A.M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook,* Thousand Oaks, CA: Sage, p. 6.

used in ritual are *designed* to shift the neurobiological state of the entire soma toward a shared group experience of gestalt, timelessness and transcendence[23]. Turner's approach to anthropological fieldwork influenced and formulated approaches within performance studies[24] that borrowed from anthropology's methods in order to create a 'field-work of the self':

> Fieldwork as in "participant observation" is a much-prized method adapted from anthropology... Participant observation is about learning about cultures other than that of the fieldworker. In anthropology for the most part the home culture is "Western" and the "other" non-Western. *But in performance studies the* <u>other</u> *may be an aspect of one's own behaviour*... [italics mine] In an active way, one performs fieldwork [on the self]. Taking this critical distance from the self invites revision, the recognition that even knowledge itself is not fixed, but subject to a "rehearsal process" of testing and revising.[25]

This describes the concept of constructing first-person methodologies by *appropriating* third-person observational techniques that focus outwardly to the world, turning them inwardly toward the self. In this example, self-observation techniques are enacted to create a discerning and critical self-reflective distance. This notion of re-visioning the self through critical self-observation in order to revise knowledge is an example of the first-person practice of autoethnography, brought to performance studies through anthropology. Its self-reflexive approach to self-observation is also an example of reflection-in-action as described by Schön.

Observation plays a critical role in all research and inquiry and is central to first-, second- and third-person methodologies. It follows that knowledge can be gained by

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[23] Turner, V. (1986), op. cit.

[24] Performance Studies as a whole accounts for many different registers and epistemologies of practice outside of body-based approaches, including other frameworks such as those of spectatorship and reception theory, which do not emphasize physical theatre, movement-arts or enacted performance. The example given here focuses on those aspects of Performance studies that utilize first-person methods in a somatic educational form, those techniques that re-form the somatic self. See Schechner, R. (2002). *Performance Studies,* London, UK: Routledge.

[25] Victor Turner and Richard Schechner met in 1977 prior to Clifford Geertz's Trilling Lecture in New York; their meeting began a productive and creative interdisciplinary partnership. They remained colleagues, collaborators and friends until Turner's death in 1983. The intersection between anthropology and performance studies has had an historical effect on the development of both fields. See Schechner, R. (1985). Forward by Victor Turner, *Between Theater and Anthropology,* Philadelphia: University of Pennsylvania Press.

sharing observational strategies and techniques, and that the skills of observation lie within the observer herself.

From the intersections of philosophy, psychology and Buddhist mindfulness practices, Natalie Depraz, Francisco Varela and Pierre Vermersch explore first-person observational techniques in *On Becoming Aware: a Pragmatics of Experiencing*[26]. They describe the concrete activity of self-observation: how we examine what we live through, and how we *become aware* of our own mental life. Acknowledging that the range of our experiences is immense but that our inherent ability to observe ourselves is habitually ignored or left atrophied, they illustrate that exploring human experience amounts to developing and *cultivating* this basic ability through *specific training.*

Their work is rigorous and precise: describing methods for stepping back from our day-to-day perception of experience (suspension), techniques for moving attentional focus from the world to ourselves (redirection), the process of recognizing qualities of attention (letting-go), intuition as gesture and as process, the nature of intuitive evidence, criteria of appreciation and completion, and comparing similarities of expression and validation. By applying Husserlian phenomenology to practices of observation and attention, Depraz, Varela and Vermersch outline a method of exploring our experience that is consonant with somatics and body-based performance.

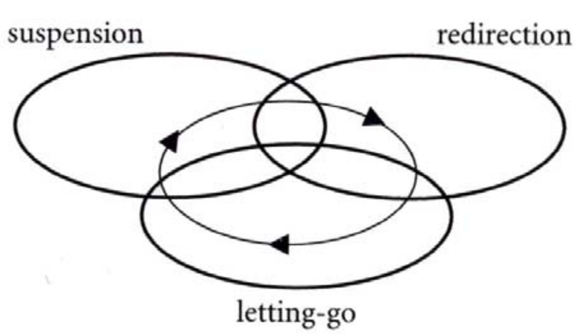

Figure 9. The process of *Becoming Aware* (from Depraz, Varela and Vermersch)

[26] Depraz, N., Varela, F.J., & Vermersch, P. (2003). *On Becoming Aware: a Pragmatics of Experiencing (Advances in Consciousness Research, 43)*, Amsterdam: John Benjamin Publishing.

Through examples taken from empirical research, meditation, psychoanalysis, teaching, writing and interviewing, *On Becoming Aware* illustrates the breadth and applicability of first-person methodologies in their capacity to explore personal and social forms of knowing, giving an account of validation that places first-, second- and third-person methodologies along a continuum where the three positions are not differentiated by the content they address, but *by the manner that they are inserted in a social network.* By favoring a *continuum* of methodological positions along a social network, the need for oppositional positions between public and private, or objective and subjective, can dissolve. This model allows for the sharing of knowledge and insight through observational strategies and techniques, supporting *radical interdisciplinary dialogues*.

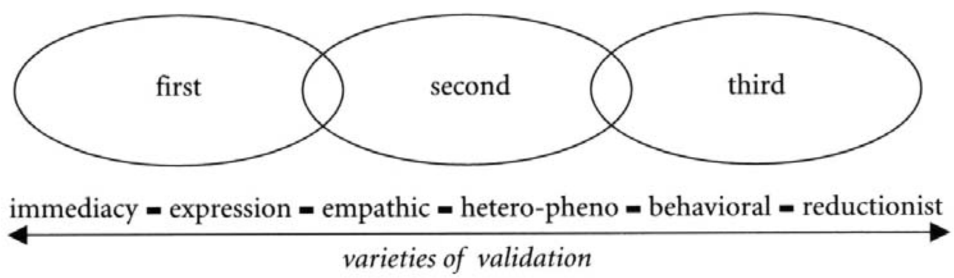

Figure 10. Validation Methods along the Continuum of a Social Network (Depraz, Varela, Vermersch)

This section has described ways in which first-person methodologies contribute to the epistemologies of practice of many contemporary disciplines. First-person methodologies have direct transferability beyond knowledge of the self, and just as first-person approaches can contribute to third-person methodologies, the converse is also true. Observation plays a critical role in all research, so that exchanging observational methods along a social continuum has the potential to enrich research methods and the knowledge they create.

2.2.2 The Politics of the Self in an Ethics of Radical Interdisciplinarity

Accessing experience as a political 'tool of knowledge' also forms an integral part of our histories of subjectivity and in Foucault's terminology, our technologies of the self. Like Foucault, the authors Depraz, Varela and Vermersch, draw attention to the ancient lineage of self-observational practices linking them with Greek Antiquity. Foucault traces subjective practices including self-observation to the ancient Hellenistic concept of the 'care of the self' illustrating how first-person practices such as 'attending to the self' were utilized as a foundation of knowledge. In Greek Antiquity, the Delphic oracle *know thyself* was understood as a form of knowledge born from self-cultivation, self-observation and somatic practice in which the body was held 'accountable' for knowledge construction. This differs from our contemporary rationalist epistemological reading of the directive *know thyself,* which has shifted toward an objective third-person knowledge 'about' the self, which Foucault links to the *Cartesian moment:* the historic Cartesian split between body and mind[27]. While both these forms of knowledge offer tremendous value and resources for acting in the world, my own research proposition applies these differing epistemological frameworks in a complementary and ethical radical interdisciplinary framework: one in which technology design can be born through self-knowledge, enabling a form of 'citizenship' of technological inquiry. This refers to the Hellenistic notion that mastery of knowledge gained through 'attending to the self' enabled one to enter public life as a mature citizen: one could *care for the city* only when one understood the techniques and subtleties of care for the self[28]. Depraz, Varela and Vermersch also link the attentional practice of *epoché* or suspension with the Greek ethical attitude of the Stoics in which the freedom of the wise man constituted the ability and the techniques to suspend

[27] Foucault, M. (2004), op. cit., p. 17-18.
[28] Ibid.

judgment until he had gained an ‘absolutely certain knowledge’[29]. In this case, the act of self-cultivation, the observation of inner processes transform and ameliorate the act of discernment, developing observational acuity resulting in greater objectivity *through* the subjective relationship with the self. This is a crucial example, since it illustrates the ability of a subjective position to increase a form of clarity, resulting in greater objectivity (a rationalist term that has been valorized to refer to truth-value).

The threshold between self-knowledge and the role of the self as a citizen in public life locates body-based somatic techniques (technologies of self-change) within the issues of disciplinary power structures. Our ability to effect change within our self is a precursor to our ability to effect change within our context. This corporeal transformative relationship between our self and our disciplinary, social and institutional role[s] is a vital political link in our ability to alter our world and our technologies *through* our self.

The necessary connection between self-knowledge and ethical action in the world is echoed in the pragmatist view of John Dewey, the political view of Michel Foucault, the social-activist view of Augusto Boal and the somatic-philosophical view of Thomas Hanna, Sondra Fraleigh, Bonnie Bainbridge-Cohen, Elsa Gindler, Trigant Burrow and Richard Shusterman (in addition to countless somatic practitioners). These positions share the view that repetitive or habitual action limits human agency. These limitations are evidenced by habitual thought, feeling and physical bodily postures, combining to create a narrowing of the human faculty of perception, reducing access to knowledge of the surrounding environment and the world. Thomas Hanna, the somatics-educator, refers to this as “sensory-motor amnesia”[30], a bodily state that reduces our ability to act and respond with agency in the world.

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[29] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 25.

[30] Hanna refers to sensory-motor amnesia as a habituated state of forgetfulness, a memory-loss situated in our central nervous system affecting the image of who we are, what we can experience and what we are

Augusto Boal, the Brazilian theatre director and cultural activist founded the Theatre of the Oppressed, a theatrical form originally used to effect social change by enabling the impetus for change to come from within the *spect-actors*, who acted simultaneously as participants and audience members. He evolved the performative practices commonly associated with the Theatre of the Oppressed for the purpose of ameliorating social conflict, creating harmony within society[31]. These forums enabled habitual and often unseen social and political situations to 'come to light', highlighting the underlying or embedded emotion and thought. Within this political and ethical stance Augusto Boal and Michel Foucault can be compared in their political strategies and goals of social transformation. Both Boal and Foucault enact their goals by constructing skills (of thinking and acting) that support self-agency and self-knowledge. While the example below compares habituated feeling with habituated thinking, the goals are ethically similar. Augusto Boal's early theatrical exercises outlined in *Games For Actors and Non-Actors* was concerned with de-habituating the performers loss of ability to express a greater *range* of feeling:

> Our first principle at that time was that emotion … should be given free rein to shape the final form of the actor's interpretation of a role. But how can emotions 'freely' manifest themselves … if that very instrument (the body) is mechanized, automated in its muscle structures and insensible to 90 per cent of its possibilities? … How does this mechanization of the actor's body come about? By repetition. The senses have an enormous capacity for registering, selecting and then hierarchising sensations.[32]

This can be compared with Foucault's notion of the habituation of thought. Foucault focuses on the history of thought and how our thinking patterns are created through social constructs, ideologies and institutions. His primary goal was to analyze these formal social structures "related to specific techniques that human beings use to understand themselves"[33]:

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able to act upon, Hanna, T. (1980). *Somatics: Reawakening The Mind's Control of Movement, Flexibility, and Health.* Addison-Wesley Publishing, p. xiii.

[31] Boal, A. (1995). *The Rainbow of Desire: The Boal Method of Theatre and Therapy*, London: Routledge.

[32] Boal, A. (1992). *Games For Actors and Non-Actors*, London, UK: Routledge, p. 40.

[33] Foucault, M. (1988c), op. cit., p. 18.

> My field is the history of thought. Man is a thinking being. The way he thinks is related to society, politics, economics, and history and is also related to very general and universal categories … The political and social processes by which Western European societies were put in order are not very apparent, have been forgotten, or have become habitual. They are a part of our familiar landscape, and we don't perceive them anymore.[34]

Just as Boal and Foucault identify the form of habit as a precursor to limiting agency and knowledge, they suggest the *practices* of self-ameliorative process, which lie in the somatic form of bodily retraining, or what Foucault refers to as technologies of the self. Augusto Boal suggests exercises of 'de-mechanization':

> Like all human beings, the actor acts and reacts according to mechanisms. For this reason, we must start with 'de-mechanisation', the re-tuning (or de-tuning) of the actor … He must relearn to perceive emotions and sensations he has lost the habit of recognizing.[35]

Michel Foucault notes his goal of creating greater discernment with regard to the habits of thought that he claims are created by historical social forms that have become habitual and therefore unconscious.

> It is one of my targets to show people that a lot of things that are a part of their landscape—that people think are universal—are the result of some very precise historical changes.
>
> All my analyses are against the idea of universal necessities in human existence. They show the arbitrariness of institutions and show which space of freedom we can still enjoy and how many changes can still be made.[36]

My proposition is that the ethical attitude of the attentional practice of *epoché* can be used to apply Boal's notion of de-mechanization and Foucault's notion of the technologies of the self to the design and development of our digital technologies of production. By positioning the concept of an ethical citizenship born of a 'care of the self' within the landscape of technology design in the world, we can work to improve the *quality* of knowing that underlies our technology design and use.

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[34] Ibid, p. 10.
[35] Boal, A. (1992), op. cit., p. 41.
[36] Foucault, M. (1988c), op. cit., p. 11.

2.2.3 Two Parallel Epistemologies of Practice

Having characterized the technical practices of first-person methodologies and positioned them within an ethics of radical interdisciplinarity, I would like to return to the historical development of the parallel yet differentiated epistemologies of practice that represent somatics and human computer interaction. First-person methodologies of body-based disciplines began to develop as a *secular* practice with the emergence of Delsarte's (1811-1871) movement system in the mid-nineteenth century. In her book *Heilkraft durch Bewegung,* (translated as: Healing Through Movement), Hede Kallmeyer, one of the early forerunners of the discipline, attributes Delsarte's originating work with inciting "the dawn of body consciousness"[37]. Her reference identifies a historical moment when the subjective experience of the body could be reclaimed in what would become a growing secular development of 'body-based disciplines'. Delsarte developed his movement system during the mid-nineteenth century Victorian Era, which saw the influence of the Greek revival and its effects upon architecture and the movement arts. Togas and loose robes were worn regularly in Delsarte's classes, freeing the body from the heavier constrictive clothing of the day, and later influencing dance arts during the Belle Époque that established Isadora Duncan and her infamous attire. Hede Kallmeyer's statement addresses a historical juncture in western European culture when the body's *own experience* was re-appropriated or reclaimed to a wholly 'secular self'. This marked a growing understanding of the body as less singularly defined by the religious mores that had dominated Europe. In this re-appropriation, the body was freed to become not only its own first-person subject, but also an object of third-person empirical study.[38] Each of

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[37] As quoted by Ilse Middendorf in The Perceptible Breath: A Breathing Science, in Johnson, D.H. (ed.) (1995). *Bone, Breath and Gesture: Practices of Embodiment,* Berkeley: North Atlantic Books, p. 76.

[38] Delsarte was a contemporary of Étienne-Jules Marey and Eadweard Muybridge, both involved in studying human movement. Marey was a French scientist and chronotographer who studied heartbeats, respiration, muscles (myography), and movement of the body. To aid his studies he developed many instruments for precise measurements. Muybridge was an English-born photographer, known primarily for his early use of multiple cameras to capture human and animal motion, and his zoopraxiscope, a device for projecting motion pictures that pre-dated the celluloid filmstrip that is still used today. Both Marey and Muybridge worked to understand the body in movement and have been connected with the development of Cinema.

these trajectories represent a direction in which the body began to be ‘loosened’ from the grips of Victorianism and are identified by a set of parallel histories. First, the history of constructing knowledge through the first-person subject (the domain that defines body-based disciplines and includes somatics) and second, the history of constructing knowledge through third-person scientific data that describes the body in action (the domain of medicine and the sciences, including HCI). Each of these trajectories refined their own parallel epistemologies of practice from the nineteenth century to contemporary frameworks. These trajectories branched and traversed over time, inciting various intersections that included phenomenology, psychology and, more recently, embodied cognition and neurophysiology. The main differentiation between these two parallel paths remains ‘the mechanism by which experience is claimed’: one from *within the subject* and the other from the externalized frame of an *empirical body*. In this junction lies a key historical moment where the relationship of knowledge to observation and experience results in the differentiation of epistemologies of practice. Over time, these epistemologies developed differing language, methods, values, assumptions and approaches to validity. The trajectory based in first-person experience used methods centered in self-observation: valuing knowledge enacted through experience. The trajectory based in empirical methods used third-person observation utilizing scientific methods: traditions where knowledge was claimed outside the subject, in which the body became an object of knowledge rather than the subject of experience. These parallel and differentiated practices have viewpoints that define complementary yet differing epistemologies of practice, which even today remain central to the fields they encompass.

2.2.4 The Turn to Experience within Human Computer Interaction

At this present juncture in history, contemporary research in human computer interaction is re-directing its inquiry toward designing for lived experience, asking what

Delsarte on the one hand and Marey and Muybridge on the other exemplify these two parallel and differentiated trajectories and approaches to human movement and experience.

it would be like to put *felt-life*[39] at the centre of HCI without marginalizing the cognitive aspects of interaction with technology. In *Technology as Experience*[40], John McCarthy and Peter Wright introduced the term *felt-life* into HCI, drawing on the philosophical pragmatism of John Dewey and Mikhail Bakhtin. McCarthy and Wright define *felt-life*:

> … life as lived, sensed and experienced [focusing] attention on the sensual and emotional [while] throwing light on the cognitive and intellectual aspect's of people's interactions with technology.[41]

McCarthy and Wright argue for the importance of sensory engagement, the value of emotional life as goal-setting and evaluative, and the irreducible relationship between a person and their use of technology. They propose the inclusion of subjective, personal values to be sought, documented and incorporated within the empirical research of user experience, and they advocate redressing the balance between our inner life and external behaviour in relation to technology. Their argument and valuation resonates deeply with my own positioning of somatics practice as an example of an ameliorative, ethical and relational design resource within HCI. Somatics and body-based practices focus their expertise precisely on techniques of self-awareness, subjectivity and agency created through an ethical-aesthetic relationship to our bodies and our selves. The exploration of felt-life within HCI holds a nascent and yet-to-be fulfilled place within the design of technology and there is a continued need for such a discourse to develop and flourish within HCI. McCarthy and Wright state:

> An account of self as the narrative centre of experience is insufficient. It is too cognitive an approach to self, underplaying as it does the often-inexpressible feelings that constitute our awareness of our self or our subjectivity. This is an area [within HCI] … which none have yet engaged in a fully satisfying manner. A radical approach to the mediation of our subjectivity by technology requires us to linger in the gap between inner life and external behaviour, where our subjectivity or sense of self is created, and *we have not yet done that in reflecting on our practices with technology*.[42] [italics mine].

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[39] McCarthy, J., & Wright, P. (2005). Putting 'felt-life' at the centre of human-computer interaction (HCI), *Cognition, Technology & Work,* 7(4), p. 262-271.
[40] McCarthy, J., & Wright, P. (2004). *Technology as Experience,* Cambridge, Massachusetts: MIT Press.
[41] Ibid, p. 262.
[42] Ibid, p. 267.

Within HCI, the turn to experience is sketching felt-life as first-person, self-reflexive and personal, and acknowledging that

> … although [felt-life] does not lend itself to a natural sciences approach, it is possible to use it to enquire into practical reasoning in a systematic and critical way,[43]

This approach to felt-life echoes the research goals of this thesis. By bridging methodologies from somatics and the body-based disciplines of modern dance performance, we can demonstrate their instrumentality in supporting the growing discourse of felt-life within HCI.

> From a felt-life perspective, it is in the moment when experience is being expressed … that feeling and expression create each other … [that] human subjectivity or self-awareness is created. Putting felt-life at the centre is an attempt to press into these gaps in order to focus our discussions of people and technology on the moments of potentiality in which human subjectivity is created.[44]

From the field of somatics, Thomas Hanna's perspective corresponds with that of McCarthy and Wright addressing the need for the subjective somatic viewpoint that can augment knowledge from the perspective of inner-life and outer behaviour. Hanna states that:

> the somatic viewpoint complements and completes the scientific view of the human being, making it possible to have a science that recognizes the whole human: the self-aware and self-responsible side as well as the externally observable bodily side.[45]

There is an intentional movement from within both HCI and somatics, to create a dialogue for greater complementarity: a movement toward bridging these differing epistemologies. Echoing McCarthy and Wright's propositional framing for lived experience within HCI, I turn this approach toward somatics by suggesting that 'although first-person methods of somatics do not obviously lend themselves to a

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[43] Ibid, p. 270.
[44] Ibid, p. 267.
[45] Hanna, T. (1980), op. cit., p. 21.

natural sciences approach, it is possible to use these epistemologies of practice to enquire into practical reasoning of design in a systematic and critical way'. This can be seen as a response to the invitation within human computer interaction to explore experience in the context of felt-life, an endeavor that has the potential to enliven and enrich knowledge of humanity and the experience of itself.

2.2.5 Summary of First-Person Methodologies

First-Person Methodologies
• Are embodied technical enactments of experience that exemplify reflection-in-action
• Are self-reflexive and self-enacted
• Form part of a larger history of practices of subjectivity and self-cultivation.
• Are the central epistemology of practice and are well-understood within somatics and performance
• Contribute as an epistemology of practice within a number of contemporary disciplines such as phenomenology, biofeedback in neurophysiology, psychology, cognitive science, Western and Eastern forms of movement studies, martial arts and contemplative traditions
• Are often used in partnership with second- and/or third- person methods in order to communicate, describe, document, validate or transmit representation of knowledge
• Can transfer knowledge applicable in empirical methods requiring direct experience and observation. Knowledge Transfer can be directed toward the researcher as an instrument of observation and toward human participants that engage as subjects or objects of experience or study
• As praxis they have their own internal validity, and are authenticated and corroborated through a technical community of practice. Mastery is attained when the techniques and knowledge they represent are fully embodied through experience.

Table 2. Summary of First-Person Methodologies Context and Concepts

2.3 Historical Influences

Moving forward from the definition of somatics and first-person methodologies, we explore the historical influences that provide the context for its contemporary technical development and its epistemologies of practice. Somatics shares a rich cultural history with modern dance and performance, the development of cinema, the emergence of phenomenology, the development of medical empirical science, its description of ‘the body’, the historical links of Taylorism, work studies, ergonomics and the birth of HCI. A comparative historical analysis of somatics and its links to the history of modern dance performance practice illustrates its connection to cultural phenomenon that define ‘markers’ in nineteenth and twentieth centuries history of thought. The earliest origins of somatics are found within ancient cultural forms of movement practice including those of the Hellenistic era, eastern forms of movement, theatre, yoga, martial arts and primitive ritual practices involving body and transformation of body-state: including shamanism and tribal practices that have existed across almost all cultural forms. The historical analysis presented here focuses on European pioneers of body-practices, tracing the migration of their traditions across Europe to America. For the purpose of this analysis the scope is delimited by western traditions. The goal of the historical analysis is twofold: 1) to illustrate the parallel trajectories of epistemologies of practice representing ‘body knowledge’ that emerged following the industrial revolution, and 2) to link these trajectories to historical markers that influenced thought and practices leading to the development of technology, the emergence of ergonomics, Taylorism and the pre-cursors to the field of human computer interaction. The historical influences of somatics occur within the larger *history of subjectivity and the self*: through its intertwining with performance and dance, its eastern influences, and the shared twentieth century ‘history of thought and practice’ that has shaped both HCI and somatics. This historical trajectory is illustrated in Figure 12 (page 73).

2.3.1 The Landscape of a History of Subjectivity

Figure 12 traces the history of western body-based traditions to the present, illustrating their development within three categories of practice: 1) somatics, 2) performance and, more specifically, the modern dance and movement arts, and 3) theories of experience and embodiment. The last category concerns the discursive practice of developing and transcribing historical concepts in the traditions of philosophy and psychology.

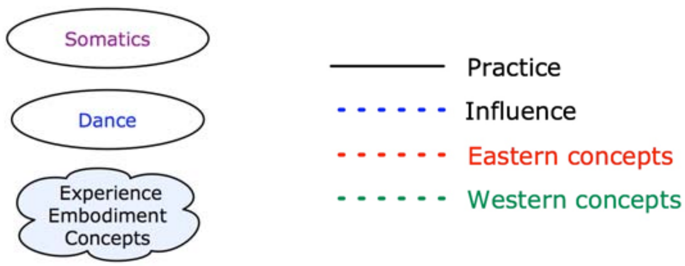

Figure 11. Explanation of Legend for Figure 12 History Illustrations

The connecting lines illustrate the *forms* of transmission of knowledge and influence. Practice is represented as a solid line and indicates knowledge that is *transmitted* through 'physicalization': physical mastery through the body within the practice itself. A dashed blue line indicates influence: concepts or knowledge that have *influenced* or that are concurrent with the development of the physical practice. The historical lineage traces its emergence through a European and western milieu influenced by cultural, social, political and philosophical undercurrents, yet richly influenced by eastern practices and philosophies. The historical illustration in Figure 12 depicts individuals, rather than named techniques. The history of somatics abounds with individuals who pioneered body-based techniques as a personal response to physical injury or illness that threatened their lives or their personal freedom.

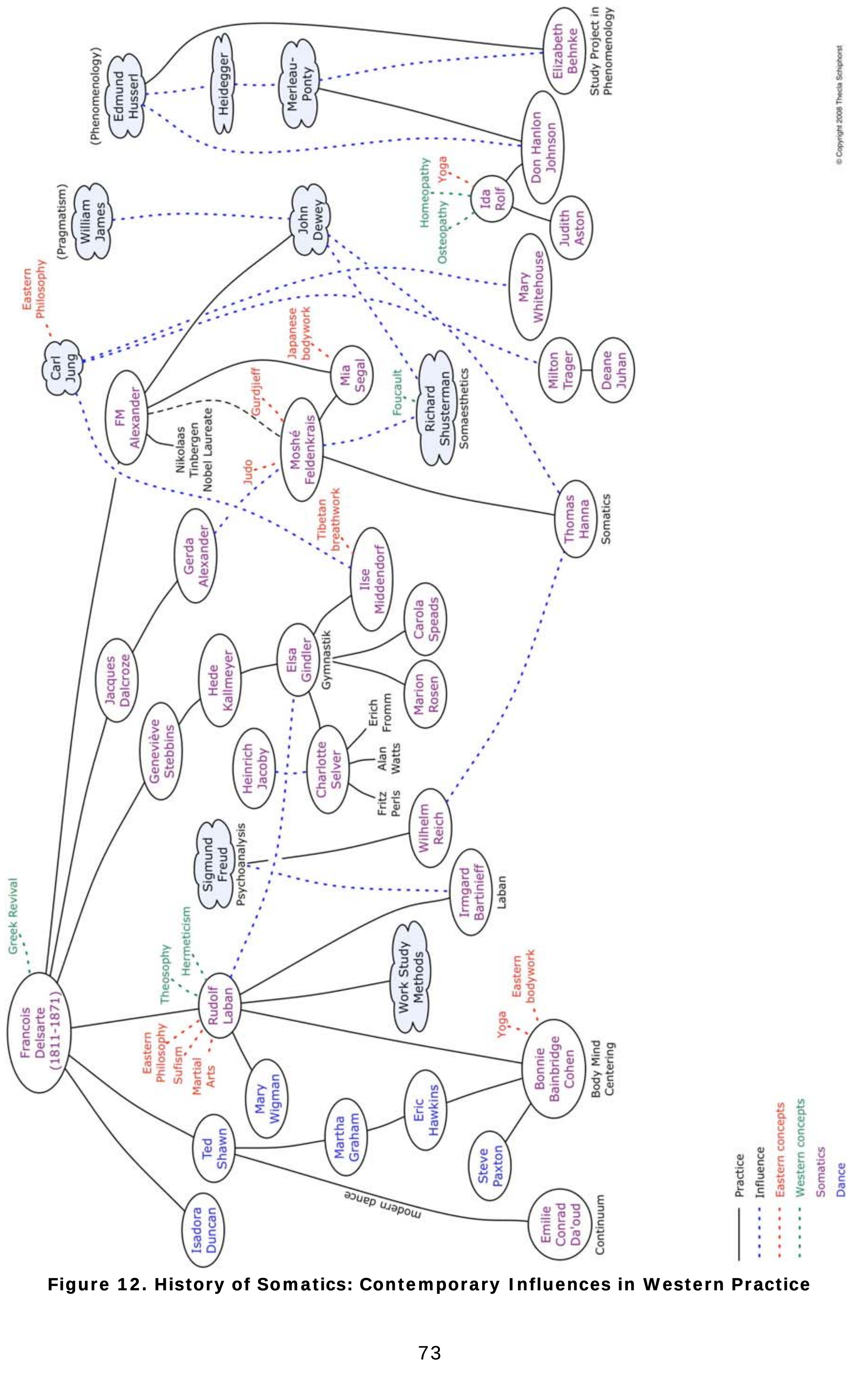

Figure 12. History of Somatics: Contemporary Influences in Western Practice

Don Hanlon-Johnson writes in an impassioned voice about the "feistiness"[46] of these individuals viewing their history as a resistance movement against the dominant notions of the 'knowledge of the body'. The writing of these practitioners frequently acknowledges their marginalized positions within the scientifically and medically legitimized forms of body-knowledge.

> Although muffled by the din of the dominant voices, there has been a steady resistance building among innovators who have devoted their lives to developing strategies for recovering the wisdom and creativity present in breathing, sensing, moving and touching. They worked quietly, wrote very little. Typically, they spent their lives outside the vociferous worlds of university and research clinic.[47]

The necessary interrelationship between the political and the self is acknowledged in Foucault's explication of the *technologies of the self*: a category of subjective processes that operate on the self to effect change or to transform the self in some way in order to attain a certain 'state':

> Technologies of the self … permit individuals to effect by their own means or with the help of others a certain number of operations on their own bodies and souls, thoughts, conduct, and way of being, so as to transform themselves in order to attain a certain state of happiness, purity, wisdom, perfection, …[48]

One of Foucault's key concepts is that an individual's choice and ability to act *upon herself* is at once personal and political: that individual domination is in part the ability to reclaim power over the self, and that this 'care of the self' prepares us to care for the world from a different locus of power.

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[46] Don Hanlon Johnson compiled one of the early collections of texts written by Somatics practitioners and describes the field in *Introduction,* in Johnson, D.H. (ed.) (1995). *Bone, Breath and Gesture: Practices of Embodiment*, Berkeley: North Atlantic Books, p. xi.

[47] Ibid. p. ix.

[48] For Foucault, Technologies of the Self are one of four Technologies each a matrix of practical reason, the others being Technologies of Production, which permit us to produce, transform or manipulate things; Technologies of Sign Systems, which permit us to use signs, meaning, signification; and Technologies of Power, which determine the conduct of individuals and maintain an objectification of the subject. Technologies of the Self permit individuals to effect by their own means operations on themselves. For Foucault these technologies hardly ever function separately, and each is concerned with a certain kind of domination. Technologies of the Self are concerned with individual domination and therefore refer to a power of or over the self. See Foucault, M. (1988c), op. cit., p. 18.

> I have attempted a history of the organization of knowledge with respect to both domination and the self. I am more and more interested in the interaction between oneself and others in technologies of *individual domination*, the history of how an individual acts upon himself in the technology of the self.[49]

These technologies of the self are among the core values operating from within the practices of embodiment with somatics and performance and define the mechanisms by which experience is understood and claimed. Augusto Boal's work in theater echoes the values of developing the self through technical practices where 'care of the self' prepares us to care for the world from a different position of power and knowledge.

> As the most important element of theatre is the human body, this book is concerned with physical movements, distances, volumes, relations ... We should know the world we live in, the better to change it. Theatre is a form of knowledge; it should and can also be a means of transforming society.[50]

The history of the subjectivity of the self is often linked to movements in art, where the context of art practice enables a critical stance and problematization of social, cultural or political structures. Don Hanlon Johnson links this view to the acts of resistance of the pioneers of body-practices:

> The pioneers in embodiment are unwilling to take at face value a poor medical prognosis … or ordinary states of consciousness. Rejecting the bleakness of conventional wisdom, they have chose to survive outside the mainstream...
>
> It is no surprise that the community represented here is not well understood. Its principal teachers have worked to break the 'verbose' hold of rationalism by working on the quieter side of the flesh. With the exception of a few innovators they write little, and often in fragments, close to the logic of bones interlocking with each other without proliferation of unnecessary adhesions. Identifying the harmony of voices of the tradition is similar to the tasks of scholars of other traditions that have existed on the margins of the dominant culture.[51]

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[49] Foucault, M. (1988c), op. cit., p. 19.

[50] Boal, A. (1992). *Games for Actors and Non-Actors*, London, UK: Routledge Press, p. xxxi.

[51] Don Hanlon Johnson compiled one of the early collections of texts written by Somatics practitioners and describes the field in *Introduction,* in Johnson, D.H. (ed.) (1995), op. cit., p. xi.

I seek to identify and to work with the 'harmony of voices' within somatics and body-based performance practice, bridging these practices of embodiment to human computer interaction, while continuing to 'rehearse and perform' the concordances of radical interdisciplinary dialogue. In order to continue this process I will view the historical trajectory illustrated in Figure 12, from three schemas: 1) the intertwining of somatics with modern dance practice and performance, 2) the eastern influences of the development of western body-practices, and 3) the shared twentieth century 'history of thought and practice' that has shaped HCI and somatics.

2.3.2 The Intertwining Relationships of Somatics and Performance

Body-based practices have a long and interconnected history with modern dance. They emerged during the mid-nineteenth century from the same historical source: the Delsarte Method was the precursor to both modern dance, and the emerging body practices that became somatics.

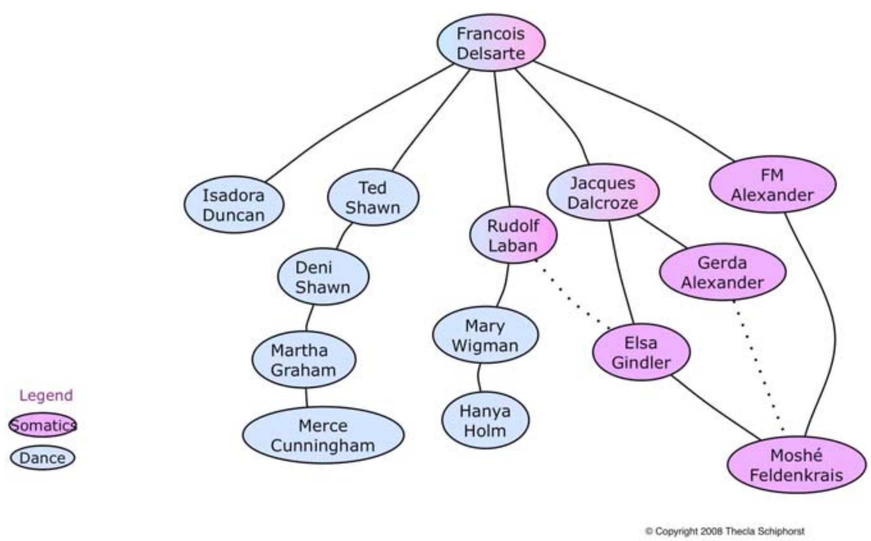

Figure 13. Francois Delsarte's System as Originating Somatics and Modern Dance

Francois Delsarte's (1811-1871) movement system known as *The Delsarte System of Expression* is historically acknowledged as originating the disciplines of somatics and modern dance. Hede Kallmeyer, a student of Genevieve Stebbins who brought the Delsarte system to America, refers to it as the dawning of body consciousness[52]. Figure 13 illustrates the lineage of Delsarte's system, which stimulated the growth and development of the first generation of modern dancers: Isadora Duncan, Ruth St. Denis, Ted Shawn and the Denishawn school. In America, Denishawn produced students such as Martha Graham and Doris Humphrey, continuing the lineage through an entire second generation of early modern dancers. Rudolph Laban and F. Mathias Alexander studied Delsarte's system before they developed their own unique techniques and practices, and through Laban, Mary Wigman and Hanya Holm founded the early European forms of Modern Dance. In the late nineteenth century, Delsarte's method was used to establish the first acting school in the United States. Delsarte's system countered attitudes in the ballet academies that eschewed knowledge of the body for fear that it would produce mechanical movement and a loss of expression.[53]

Delsarte trained as an actor at the Paris Conservatory but was dissatisfied with the lack of authenticity in the posed style of acting. He began a comprehensive quest to understand expressive mechanisms of human movement. Through empirical research, observation and analysis of how humans actually moved, behaved and responded to a multitude of circumstances, Delsarte developed and refined his method.

> Delsarte observed and studied in parks, cafes, hospital wards, churches, mortuaries, and even scenes of disasters. He also studied anatomical medicine. Eventually expressive patterns emerged that he could clearly observe. His "Science of Applied Aesthetics" was a thorough examination of voice, breath, movement dynamics, line and form, and virtually all the element of the body in their roles as expressive agents of the human impulses, mind, spirit, and the vital instinct.[54]

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[52] As quoted by Ilse Middendorf in The Perceptible Breath: A Breathing Science, in Johnson, D.H. (ed.) (1995), op. cit., p. 76.
[53] Stebbins, G. (1886). *Delsarte System of Dramatic Expression*, E. S. Werner, New York. <http://www.openlibrary.org/details/delsartesystemof00stebuoft> see also Williams, J., *the Delsarte project history page*, <http://www.delsarteproject.com/history.htm> (retrieved November 15, 2007).
[54] Ibid.

Delsarte was heralded for bringing experiential knowledge of the body into arenas we now think of as 'movement technologies': techniques to refine knowledge and precision through use of the human body in action. This approach, and the knowledge that was incorporated through it, was carried forward from Delsarte to Rudolph Laban. In the 1930's it emerged in Laban's Work Study Methods, the precursor to ergonomics, and one of the foundations of research that presaged Human Computer Interaction.

Many contemporary practitioners in somatics were technically trained as dancers. Of the practitioners illustrated in Figure 12, these include Emilie Conrad Da'oud, Bonnie Bainbridge Cohen, Irmgard Bartenieff, Mary Whitehouse, and Steve Paxton. The human instinct to move as a form of expression, and to understand that movement as a form of knowledge, intertwine and intersect in a continual cycle of knowing-through-doing that is reflected in the combined practices of somatics and modern dance. As Bonnie Bainbridge Cohen describes her technical practice:

> In Body-Mind-Centering we are the material, our bodies and minds the medium of our exploration. The research is experiential as is the material. We are each the study, the student, the teacher. Out of this research, we are developing the empirical science – observing, contrasting, corroborating, and recording our experiences of embodying all of the body systems and the stages of human development.[55]

The description of her methodological approach highlights the centrality of *observation* as a site and technique for sharing knowledge between self, others and the world. It resonates with the approach of Depraz, Varela and Vermersch in favoring a *continuum* of methodological positions, enabling a greater unity or multivocality between objective and subjective, even science and art: positions that have been unnecessarily cast in opposition to one another. This model allows a co-operative range of validation methods and a return to the notion of supporting *radical interdisciplinary dialogues*

[55] Cohen, B.B. (1993), op. cit., p. 2.

between embodied knowledge in somatics and body-based performance and empirical methods in human computer interaction.

2.3.3 Eastern Influences in the History of Somatics

The Western development of somatics is richly influenced by eastern practices and philosophies. Some of the eastern influences include yoga, martial arts, Tibetan breath work, Sufism, Japanese bodywork, and the contemplative forms of Buddhist meditation. Eastern practices develop mind *through* body, so that the training of one creates knowledge within the other.

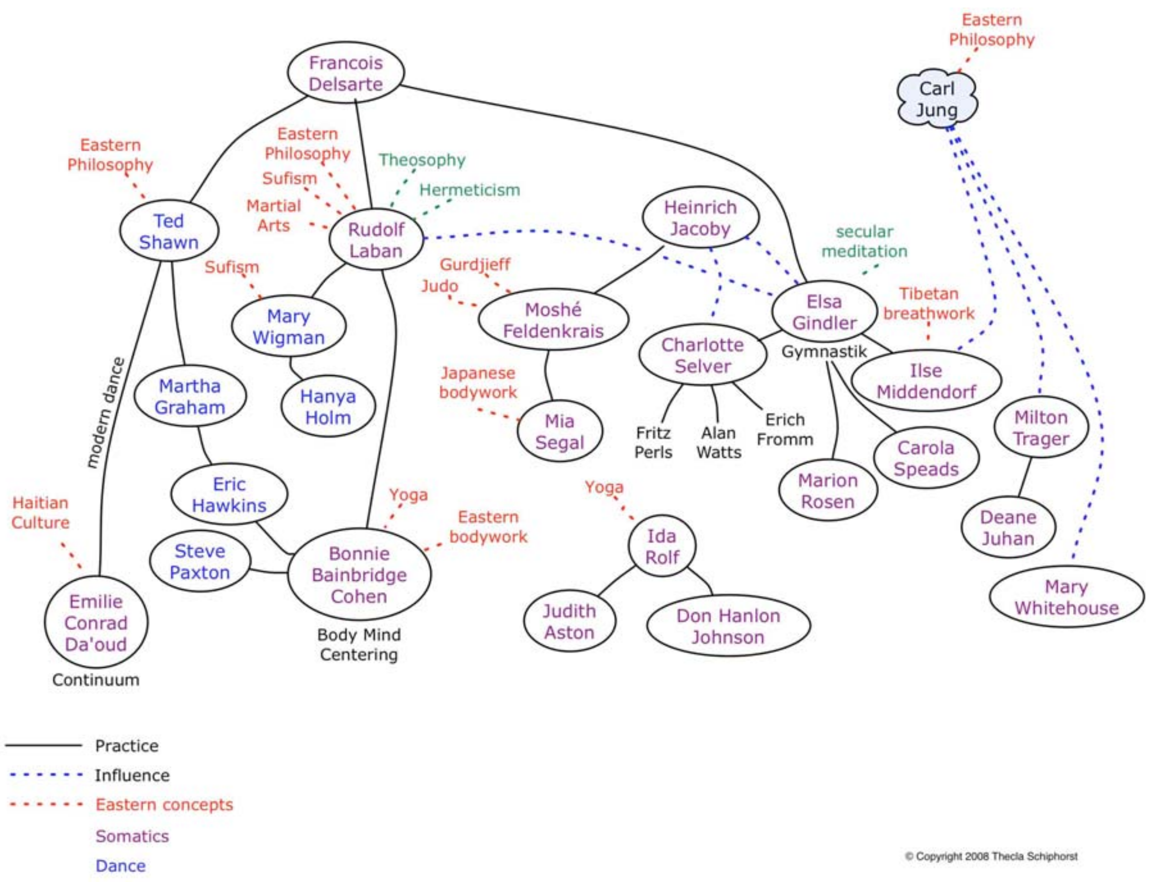

Figure 14. Eastern Influences in the historical development of Somatics

Eastern movement-forms often integrate knowledge from eastern medicine so that movement utilizes a working knowledge of the neurophysiological responses of movement on thought, feeling and action.[56]

In western somatics, the techniques of eastern practices are applied in a secular context, unhooking the necessity for body practice to be bound to non-secular teachings. Within the practice of somatics, the concept of allowing the body to be guided by its own nature does not in any way deny its meaning or the depth of knowledge accessible through its experience. Bonnie Bainbridge Cohen has made considered choices for her approach to teaching:

> It is not that we are trying to change our basic natures. We develop more [knowledge-experience] to be what we already are.
>
> It was a very conscious decision. In my years of working in hospitals [as an occupational therapist] I saw so much physical and psychological suffering, both in the patients and in the people working with them… It was as if everyone was caught up in a labyrinth of some kind… So I wanted to take what I learned [from her experiential work in the studio] back into the mainstream of the general population. Many people have argued with me that I should make my work into a spiritual practice, or more of a psychological practice, but that isn't my goal. That is someone else's goal. I want to bring the physical principles into the culture, where they are accessible to the average person.[57]

Cohen's goals of making the physical techniques accessible within 'everyday' life, echoes the goals of this thesis, which sets out to illustrate how practices of embodiment can be instrumentalized in designing for 'technologies of experience' that embody our choices in enacting technologies of the self.

Eastern philosophy views the concept of self-cultivation as a practice toward the goal of unifying mind and body, a framework that is founded in a long history of integrating philosophy with everyday practice. Self-cultivation is achieved through a set of

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[56] The Japanese philosopher Yasuo describes the correlative system between Eastern practices and their effects of the neurophysiological systems including kinesthesis, somaesthesis and the 'emotion-instinct' circuits. See Yasuo, Y. (1993). *The Body, Self-Cultivation, and Ki-Energy,* Albany, New York: State University of New York Press.

[57] Cohen, B.B. (1993), op. cit., p. 8.

rigorous technical first-person practices based on the somatic self. It uses awareness (or attention) and is cultivated within a somaesthetics of experience[58]. One of its techniques, known as 'meditation in motion', is a form of self-observation that is sometimes referred to as slow-motion walking. The notion of 'slowing-down' the body in order to gain perception of our physical or mental processes is a common technique within many somatics forms and is also noted by Depraz, Varela and Vermersch as a technique to induce 'suspension' in their discussion of *epoché*, and by Augusto Boal in The Arsenal of Theatre of the Oppressed.[59]

> [In Eastern philosophy] all forms of self-cultivation utilize in one-way or another the body, or more precisely "one's own body" as a vehicle for cultivating one's self. The philosophy of self-cultivation stipulates the goal of "enhancing the mind by training the body."[60]

This accords with the concepts echoed in Bonnie Bainbridge Cohen's description of the techniques within Body-Mind-Centering (BMC).

> There is something in nature that forms patterns. We, as a part of nature, also form patterns. Our mind is like the wind and our body is like the sand. If you want to know how the wind is blowing you can look at the sand. Our body moves as our mind moves. The qualities of movement are a manifestation of how the mind is expressing through the body at that moment.
>
> We use maps of Western medicine and science—anatomy, physiology, kinesiology but the work is being influenced by philosophy of the East as well. It is a study coming out of this time of East and West merging, so we are working with the concept of dualities blending, rather than sets of opposites conflicting. We are constantly looking at relationships and are always recognizing how opposite qualities modulate one another.[61]

Cohen's concept of *dualities blending* rather than sets of opposites conflicting can be applied to the varied epistemologies of practice that exist between HCI and somatics. If we work with the concepts of *blending* the 'dualities' of first- and third-person

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[58] Yasuo, Y. (1987). *The Body: Toward an Eastern Mind-Body Theory*. T.P. Kasulis (ed.), (N. Shigenori & T.P. Kasulis, Trans.), Albany, New York: State University of New York Press.
[59] Boal, A. (1992). The Arsenal of Theatre of the Oppressed, in *Games for Actors and Non-Actors*, London: Routledge Press. p. 73.
[60] Yasuo, Y. (1987), op. cit.
[61] Cohen, B.B. (1993), op. cit., p. 8.

methodologies rather than viewing them as sets of opposites with conflicting versions of ‘truth’, then our dialogue can be enlivened with a critical reflective practice that is multi-vocal and rich with methodology.

2.3.4. A Shared History of Thought: Somatics and HCI

The third schema of this historical analysis illustrates the existing resonances between HCI and somatics from the point of view of a shared history of thought and practice. Figure 15 illustrates some of these common influences.

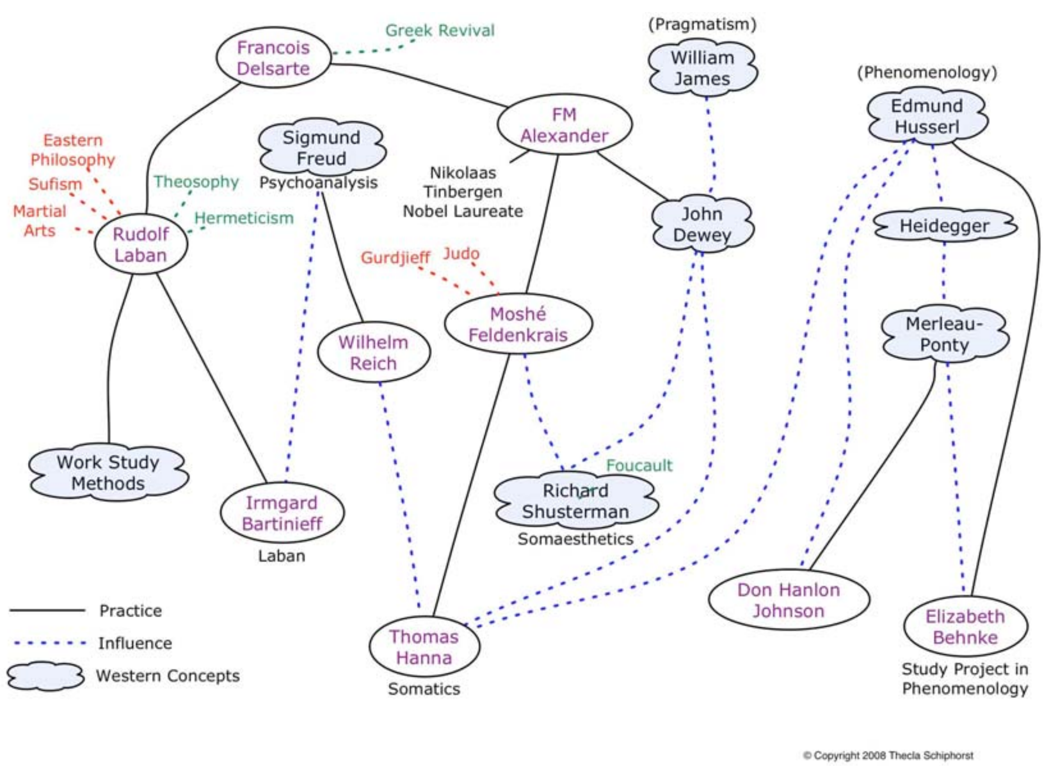

Figure 15. A Shared History of Influence: Somatics and HCI

2.3.4.1 The Influence of Laban on Work-Studies and Ergonomics

Laban's development of movement analysis, methods and applications were prolific. In 1938, like most artists and somatics practitioners living and working in Nazi Germany, Laban migrated, taking refuge in Britain. This marked a new phase in his practice, as he began to work in industry, introducing work-study methods to increase production through humane means. These methods came to be called 'Effort-Shape' Analysis, a rigorous explanatory taxonomy, describing qualities of movement. Although his work-studies were historically related to the studies of Taylorism and later to the development of ergonomics, Laban's approach to work-studies emphasized a whole-body approach where optimal functioning, normally referred to as movement efficiency, was expressed and *validated* through qualities of grace and eloquence in motion.

2.3.4.2 The Influence of F.M. Alexander

F.M. Alexander, a student of Delsarte and the original innovator of the Alexander Method, has influenced a generation of philosophers and scientists, underscoring the ability of self-observation to support the development of a precise technical practice. John Dewey the American philosopher and Nikolaas Tinbergen the Nobel Laureate have both acknowledged its sophisticated approach to observation.

John Dewey's approach to pragmatism and experience has recently gained recognition in the user-experience literature within HCI, primarily through the contribution of McCarthy and Wright in *Technology as Experience*[62]. John Dewey himself was influenced directly by the concepts and practices of somatics. Dewey met F.M. Alexander in New York in 1916 and subsequently trained and worked with him for over twenty years. Dewey's philosophy of learning, education and experience was greatly influenced by his work and practice with F.M. Alexander. Dewey credits his work with

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[62] McCarthy, J., & Wright, P. (2004), op. cit.

Alexander in the development of his philosophical frameworks of experience and education within a social system. In Dewey's Introduction to Alexander's *The Use of the Self,* Dewey acknowledges Alexander's technical work, its wholly embodied nature, its ability to retrain (to educate) perception, and its instrumentality in effecting change or knowledge.[63] Dewey describes how attention to the shifting *qualities* of experience, are definitional in our ability to discern with precision, and eventually with sophistication:

> But, while the principle of continuity [of experience] applies in some way in every case, the *quality* of the present experience influences the *way* in which the principle applies. [italics mine][64]

In their discussion of the techniques of *epoché*, Depraz, Varela and Vermersch also address the ability to observe and discern the *quality* of attention as a fundamental skill of first-person methods:

> You … re-direct your attention from exterior to interior, [and then] you change the *quality* of your attention, moving from an active search to an accepting letting-arrive.[65]

These practices of attention and observation were pioneered in Alexander's methods and the effectiveness of Alexander's observational techniques have been noted by scholars and scientists (Huxley 1937), (Coghill 1941), (Dart 1947), (Sherrington 1946, 1951), and notably Nikolaas Tinbergen, the Nobel Laureate who presented a thoughtful account of Alexander's 'epistemology of practice' in his 1973 Nobel Lecture[66]. Tinbergen noted that Alexander technique is based on "exceptionally sophisticated observation, not only by means of vision but also to a surprising extent by using the sense of touch." He continues by exploring and contextualizing the effectiveness of its practice.

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[63] Dewey, J. (1932). Introduction to Alexander, F.M., *The Use of the Self*, New York: E.P. Dutton, p. 12.
[64] Dewey, J. (1997). *Experience and Education*, New York: Simon & Schuster, p. 37.
[65] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 31.
[66] Tinbergen, N. (1974). Ethology and Stress Diseases, *Science, New Series*, *185*(4145). American Association for the Advancement of Science, p. 20-27.

> "First of all they stress the importance for medical science of open-minded observation – of 'watching and wondering'. This basic scientific method is still too often looked down on by those blinded by the glamour of apparatus, but the prestige of 'tests'… But it is by using this old method of observation that … the body can be seen in a new light…"[67]

Tinbergen appeals to medical science and research to widen their perspectives and their methodologies to enable a richer space for research:

> My … excursions into the field of medical research have much wider implications… but at least in one respect the situation could be improved: a little more open-mindedness, a little more collaboration with other biological sciences, a little more attention to the body as a whole, and to the unity or body and mind, could substantially enrich the field of medical research.[68]

Tinbergen's premise that 'watching and wondering' is a considered basis for research, and his argument that a 'little more attention to the body as a whole and to the unity of body and mind' can substantially enrich research, are a salve to my research goals. There is a clarity and a logic in this approach that I attempt to apply to my own exploration of practices of embodiment within HCI, allowing the 'old method of observation' to enrich the design and the 'humanity' of technology.

2.4 Values Underlying First-Person Methodologies in Somatics

This final section of the chapter explores the *values* underlying the attitudes, practices and methodologies of first-person experience. These values *define* the epistemologies of practice within somatics: how knowledge is accessed and constructed within the first-person techniques. Meaning *emerges* through the application of these values, and for somatics this meaning lies in the body.

> Meaning grows from our visceral connections to life and the bodily conditions of life. … it is through our bodily perceptions, movements,

[67] Ibid, p. 26.
[68] Ibid.

emotions, and feelings that meaning becomes possible and takes the forms it does.[69]

In somatic practice meaning is constructed through self-observation, experience and the inter-connectedness of body with mind. I have summarized and will exemplify four principle values from which the attitudes, practices and knowledge within somatics arise. These values can be summarized as the values of self, attention, experience, and interconnectedness. Each of these values creates an intentional, ethical and aesthetic stance that constructs meaning and frames knowledge production.

1. The value of the **self** as enactor of change, knowledge and transformation.
2. The value of **attention**, self-observation, awareness in relationship to the self.
3. The value of **experience** as a source of knowledge, through which language gains its integrity and ethical connection to knowing.
4. The value of **interconnectedness**, in relation to mind and body, self and world, subjective and objective, theory and practice.

2.4.1 The Value of the Self

The epistemologies of practice within somatics value the self as an instrument of change, knowledge and transformation. The 'self' of somatics, is an *embodied* self, and the ability to enact self-change is at once personal and political. This chapter has presented numerous examples that illustrate self-observation, self-awareness, self-cultivation and self-study. The notion of educating the self is seen as freeing the self from restrictive postures and prejudices, or habits and hidden assumptions. This is represented in the concept of "learning how to learn"[70] that has its history in esoteric practices that have influenced body-based disciplines. Hede Kallmeyer's reference to Delsarte's movement methods as inciting "the dawn of body consciousness" marks a

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[69] Johnson, M. (2007), op. cit., p. ix.

[70] Moshé Feldenkrais was influenced by Gurdjieff's teachings and techniques which included the importance of the techniques of self-observation and the practice of "learning how to learn", see Feldenkrais, M. (1985). *The Potent Self: A Study of Spontaneity and Compulsion*. Harper & Row.

historical juncture in Western European culture when the body's *own experience* was re-appropriated or reclaimed to a wholly 'secular self'. The care of the self and its emergence in a secular frame is also addressed by Foucault, and in Varela's discussion of "Concerning Practice" in *On Becoming Aware*[71].

Foucault analyzes the sister concepts of the 'Care of the self' and 'Know thyself', following them to their historical transformation in our contemporary relationship to self and self-knowledge. In Greco-Roman culture, *knowledge* of oneself emerged as a *consequence* of taking care of the self, applying practices and techniques of subjectivity: self-development and change. In modern society we have inverted this relationship or 'hierarchy'. In Foucault's analysis, this has occurred for two interconnected reasons. 1) As a result of the development of theoretical philosophy born from Descartes, in which the modern day conception of *knowledge of oneself* became a fundamental principle of the 'thinking subject', severing and disenfranchising its connection or need for the 'care of the self'. This was made possible, in part, by 2) western societies' inheritance of the ascetic tradition of Christian morality, which makes self-renunciation the condition for salvation, thereby problematizing the position or existence of the 'body' in either salvation or knowledge, and enables a moral 'rejection of the self'.

> Western culture [also] inherits a respect for *external* law as a basis for morality rather than a morality of the self, so that "Know thyself" has obscured "Take care of yourself" because our morality, a morality of asceticism inherited from Christianity, insists that the self is that which one can reject.

Viewed from this historical context of the 'care of the self', Hede Kallmeyer's reference to "the dawn of body consciousness" becomes an important historical marker in the appearance of a 'secular self' that was able to claim its *own experience* and its own *techniques of change* and transformation in relation to the 'domain of the self'. We also

[71] Francisco Varela acknowledges the first-person knowledge developed within the body-based disciplines and its emergence outside of academic institutional knowledge, linking this with Schön's concepts of reflective practice. See Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 167-168.

see that *Value of the Self* was an important nascent ideological concept that bore fruit to the lineage of somatics, (including modern dance and the first-person body-based disciplines of today), allowing the self to *exist* in a relationship *with* knowledge, experience and practice. Elsa Gindler, a pioneer of bodywork, reminds us:

> Generally speaking, in all of this, the most essential things we have to keep in mind are: that any correction made from without is of little value, and that each of us must try to gain understanding for the special nature of our own constitution in order to learn how to take care of ourselves. [72]

2.4.2 The Value of Attention

The value of attention is in its technical ability to affect change in the body through self-volition. A central characteristic of first-person methodologies is the simple act of paying attention to the self. Based in self-observation, the direction of attention or awareness re-educates perception. Attention is a technical skill that can be applied in specific ways.

> The late Elsa Gindler (1885-1961) is known throughout the world for having created a radically simple way of working with experience, a Western form of meditation, in which participants learn how to simply pay attention – to eating, standing, walking, speaking, lifting a stone. Her school flourished between the two wars in Berlin. Partly in reaction to Nazi demands, she refused to give her work a name. Sometimes she called it "Human Work", or "unfolding at a later stage of life" [73]

As a technical process, attention exhibits specificity, rigour and knowledge: explicit as well as tacit. Attention is also referred to as awareness, attending to, concentration, being 'awake', focusing and consciousness. The goal is learning: retraining or re-educating perception in order to increase discernment and freedom of choice for action. Charlotte Selver, who brought Gindler's work to America, describes this in relationship to the informational and contextual aspect of our sensory life:

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[72] Gindler, E. Gymnastik for Peoples Whose Lives are Full of Activity, in Johnson, D.H. (ed.) (1995). *Bone, Breath and Gesture: Practices of Embodiment,* Berkeley: North Atlantic Books, p. 14.
[73] Ibid, p. 3.

> [The important questions are] how we can become more awake, and how, after we wake up, we can learn to trust our own sensations… *This is the practice.* While people are *attending to* the given task, the attitudes they bring *with* them clearly show… It takes patience and time to discover what the gesture says… The work is partly to discover what amount of energy is needed for every given task and to allow this energy to flow unhindered. This is what it means to be *potent*. And this potency goes hand in hand with seeing more, hearing more, feeling more, and being more in touch with what happens.[74]

These techniques directly address 'felt-life' as introduced to HCI by McCarthy and Wright[75] and resonate strongly with Foucault's discussion of a *morality of the self*, where one's own experience can be *trusted* as a primary form of knowledge, forming a centre *of the self* from which volition, choice and action arise. Selver reiterates the potency of a morality of the self when she says:

> People have usually learned from other people what to think, and we are not going this way because we feel that the person has all the abilities to find out for himself. He doesn't have to look to other people to be told what is right. This possibility of discovering gradually that one can trust one's own reactions can be a very powerful event.[76]

In 1938, as a refugee from Germany, Charlotte Selver immigrated to the United States; her early students included Fritz Perls, Alan Watts, and Erich Fromm. Selver had a tremendous influence on Humanistic Psychology; the radical simplicity of her work led to her frequent invitation as a teacher of Zen students[77]. In *On Becoming Aware,* Francisco Varela acknowledges Fritz Perls and Humanist Psychology as an exemplar of first-person practice enabling 'self-change'. Varela notes that this approach works "directly with human experience, with subjectivity, developing that which one might call a psycho-phenomenological practice."[78] Although somatics is a discipline that has developed outside of academia and has remained 'out of the

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[74] Selver, C. Interview with Charlotte Selver, in Johnson, D.H. (ed.) (1995), op. cit., p. 17.
[75] McCarthy and Wright have explored how 'felt-life' in relationship to technology can foster curiosity and trust. A next step could be how technology could support a first-person relationship to trust, See McCarthy, J., & Wright P. (2004). *Technology as Experience,* Cambridge, Massachusetts: MIT Press, p. 137-145.
[76] Ibid. p. 20-21.
[77] Selver, C. Introduction to Interview with Charlotte Selver, in Johnson, D.H. (ed.) (1995), op. cit., p. 15.
[78] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 167-168.

spotlight', the potency of its concepts, practices and teachings have flourished, and have been widely disseminated. Humanistic Psychology's five postulates[79] illustrate the resonance and concurrence of concepts and values of somatics: these include the notion of irreducibility, intentionality, the value of awareness or attention, and the value of self, including self-volition, self-enactment and self-awareness.

Learning to develop attention requires practice; to become an *expert* in the skills of attentional processes one needs to continually revisit technique. This is similar to the way that we think of a musician or a surgeon developing skill through practice. In the same way that motor skills are developed and fine-tuned through the neurophysiological pathways of the sensory-motor system, the practice of attention is also a physical skill.[80] In Gindler's description of this concept she uses the term 'concentration' to describe the importance of the goal of developing attentional skills:

> The aim of my work is not the learning of certain movements, but rather the achievement of concentration. Only by means of concentration can we attain the full functioning of the physical apparatus in relation to [all human activity]… We therefore advise our students from the very first lesson that the work must be pursued consciously;"[81]

Attention is given *through* activity, and so its practice is also defined by Schön's concept of the epistemology of practice of reflection-in-action:

> "thinking in activity" … is a very *attentive* process. You've got to pay attention. This is something we all find extremely difficult—our attention span is about a second and a half.[82]

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[79] The work of Wilhelm Reich, who postulated an essentially 'good', healthy core self, was an early influence to Humanist Psychology. James Bugental summarized the five postulates in 1964, see Bugental, J. (1988). *The Search for Authenticity: an Existential-Analytic Approach to Psychotherapy,* Irvington Publishers.

[80] Recently, cognitive neuroscientists have successfully used electroencephalography (EEG) to pinpoint, in space and time, the neural activities involved in paying attention. See Green, J.J. & McDonald, J.J. (2006). An event-related potential study of supramodal attentional control and crossmodal attention effects, *Psychophysiology 43*(2), p. 161–171.

[81] Gindler, E. (1995), op. cit., p. 5.

[82] Marjory Barlow is a master teacher of the Alexander Technique and the niece of F.M. Alexander; see Barlow, M. (1995). A Conversation with Marjory Barlow, in Johnson, D.H. (ed.) (1995), op. cit., p. 91.

Depraz, Varela, Vermersch (2007) define attention as one of the 'practical acts of consciousness'. It requires self-cultivation, and can be learned. Attention is pragmatic and a well-tested primary material within body-based disciplines. Somatics recognizes both multiple *qualities* as well as *uses* of attention. Rudolph Laban's Effort-Shape Analysis identifies various ways of defining attention:

> When people interact with you they can focus attention on you in more than one way. In a discussion, when it is necessary for a person to "take you in", to pay attention to you, in order to communicate something to you, he might pinpoint or channel his attention on you directly, "zeroing in" on you with a single focus. Or he might take you in from various angles, keeping his attention scanning around you, allowing his body to move among a number of spatial approaches to you, or foci that continuously overlap. Here, spatial focus appears constantly flexible, sometimes "roundabout" – we call it indirect."[83]

Attention can be focused through a specific sense. We can imagine visual, tactile, auditory, kinesthetic, or visceral attention such as our blood flowing or breath processes. Attention can expand or contract, or move in a path through the body or through space. Attention can be 'positioned' in a location outside the self, such as another person's skin, breathing patterns, movement or even internal organs. The direction of attention *through* touch can create an intersubjective support for awakening perception. Both Sondra Fraleigh and Bonnie Bainbridge Cohen describe this approach:

> When I touch someone in somatic movement therapy, I follow with my hands, or just with my attention, the movement that another person is already doing; I listen to it [with my attention]. The movement thickens between us and becomes more of itself.[84]

> Through holding the head in my hands, I can feel the block. I don't go in and move someone's brain around and say, "Oh, this belongs in this place and this belongs there". Through *focusing attention* on a place where someone simply doesn't move, *they* can become aware of that place and begin to move it themselves.[85]

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[83] Dell, C. (1977). The Space Factor: Changes in the Quality of Spatial Focus or Attention, Becoming Either Indirect or Direct, *A Primer for Movement Description Using Effort-Shape and Supplementary Concepts*, New York: Dance Notation Bureau Press, p. 28-29.
[84] Fraleigh, S. (2004), *Dancing Identity: Metaphysics in Motion,* Pittsburgh: University of Pittsburgh Press, p. 126.
[85] Cohen, B.B. (1993), op. cit., p. 55.

In Sondra Fraleigh's work with somatic movement and in Bonnie Bainbridge Cohen's work with re-patterning and touch, the use of focused attention is an example of intersubjectivity and illustrates the continuum between first- and second-person use of attention. Intersubjectivity requires that first-person attention be accessed in order to contact another body's information. In Cohen's re-patterning method, touch is used in combination with focused attention.

> If I'm working with any area of someone else's body, I will [direct attention] into that area of my own to see. In the process I become more open also. It becomes like two bells ringing on the same pitch. We can resonate each other.[86]

Re-patterning in the Body-Mind Centering can be understood as a learned technical skill using our neuroperceptive systems in a refined and trained way. It is an example of an expert technical practice.

Attention can have specific *qualities* that relate to activating body-state: a constellation of feeling, sensation, thought and 'thought propensities.'[87] In somatics, attention can be focused with physiological processes such as breath, or 'slow-motion walking'. When attention is focused, information is ascertained. Applying attention is a part of a 'knowledge loop': we learn by paying attention.

> .. you should feel a change… at every moment. If you're not, then you should be somewhere else. So training isn't a matter of repeating the same thing for one week or two months and then expecting a result. Each moment should be a dialogue of response and change. I think that relates to the Buddhist principle of the immediacy of experience. Also, it seems that any technique or philosophy ultimately comes back to the axiom, Know thyself. We all come to a common ground, whatever our path, if we follow it far enough.

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[86] Ibid.

[87] Damasio refers to body state as represented in the body's somatosensing maps. A body state is a configuration that represents the combination of thought, feeling and the 'internal milieu', and what Damasio refers to as thoughts of a certain theme, which refer to 'thinking propensities'. The nervous system maps body-states by transforming the neural patterns in those maps into mental patterns or images in the brain. In an evolutionary sense, feelings became possible because of the development of brain maps that are able to represent body states. See Damasio, A. (2003). *Looking for Spinoza: Joy, Sorrow, and the Feeling Brain*. New York: Harcourt, p. 109-111.

Attention is an important ingredient in the common ground that exists between HCI and somatics, where to ‘know the self’ is based on the experience of the self. Somatics takes the approach that we can learn to use our bodies more wisely, more effectively, more gracefully and more fully. Somatics views attention as generative.

> We see over and over again that people who accomplish the most are fresher than those who do nothing. And if we observe successful people we can often see that they display a wonderful flexibility in reacting, in constantly changing from activity to rest.[88]

2.4.3 The Value of Experience

Many disciplines, including HCI, concern themselves with experience, embodiment and the richness of felt-life: the ways in which experience supports knowledge. Somatics values the somatosensory experience of the body as a source of knowledge through which language gains its integrity and ethical connection to knowing. Bonnie Bainbridge Cohen describes the connection of knowledge and perception in sensory-motor experience:

> Learning is the opening of ourselves to the experience of life. The opening is a motor act; the experience is interaction between sensory and motor happenings. When the experience of movement is integrated into our education, our perception of ourselves and the world changes. [89]

It is common within somatics traditions to encounter reticence or even refusal to name concepts or techniques. This reticence is also seen in *setting* exercises or in *concretizing* the development of procedures that refer to learned experience. This is due in part to the attitude of continual learning in the present moment:

> As we analyze our experiences, the challenge is to not be confined by what we have already learned but to continually allow our discoveries to pass into our unconscious and to approach each moment with trust and innocence.[90]

[88] Gindler, E. (1995), op. cit., p. 9.
[89] Cohen, B.B. (1993), op. cit., p. 118.
[90] Ibid, p. 2.

Attitudes toward being 'open to learning through practice' are examples of reflection-in-action. The 'practitioner is not dependent on the categories of established theory and technique, but constructs a new theory of the unique case... She does not separate thinking from doing.'[91] The viewpoint expressed by somatics practitioner Charlotte Selver exemplifies this approach.

> It changes every day because it's "no method", it's always meeting new whatever reality brings, whatever the moment is acute.

Selver's remark is consonant with viewpoints elicited from Donald Schön in design case studies of reflection-in-action:

> This system of teaching appears good to me. I like this kind [of teaching] because it is practical. Because what one *does* is difficult to forget. It is easier to forget when something is only said.[92]

Somatics is pragmatic in nature, where *experience* constructs knowledge directly through practice. Elsa Gindler refused to name her work, in part, because she 'advised her students to replace her words with their own' to develop language from their own experience. This is not a refusal to use language, but to enable her students to articulate and choose to speak their own language from experience. This reticence to 'name' is not positioned as anti-intellectual, or as a disregard for the power, expressivity or eloquence of language. It is a mechanism to give permission to expand the space for the experience of the body in its own right. This fortifies the power, expressivity and eloquence of embodied knowledge. It can be born from the experience of knowing. Language can be uncoupled in its position as an external prerequisite to knowledge. This places experience at the centre; one can learn to know the self. The history of somatics holds a counterbalancing position to the hegemony of

[91] Schön, D.A. (1983), op. cit.

[92] Schön's example is a case study of education in Buenos Aires. In order to shift a growing epidemic of child malnutrition, Dean Wilson worked with educating children in a rural school. The quotation is a response of one of the children to a program that had remarkably positive results in reversing child malnutrition through developing knowledge and skills in the children themselves. See Schön, D.A. (1983), op. cit., p. 198.

linguistic knowledge and its monopoly on the historical 'thinking subject' that has refuted the self. Elsa Gindler explores this position:

> "[in attention or experience] we also become more human because, when a task is executed thoughtfully, and when we are contented with ourselves in the doing, we experience [ourselves]. By that I mean … fully centered, reacts to the environment and can think and feel. I deliberately avoid defining this … as soul, psyche, mind, feeling, sub-consciousness, or individuality. For me, the small word "I" summarizes this. And I always advise my students to replace my words with their own (those words which they use in talking to themselves) in order to avoid getting a knot in their psyche and having to philosophize for hours about what was really meant. In that same time they could be doing something useful."[93]

Somatics does not deny language, but asks that it be initiated from *within* experience, from a first-person position within the self, what Maxine Sheets-Johnson refers to as "the challenge of *languaging experience* [and] the challenge of *being true to the truths of experience".*[94] Somatics supports a practice of languaging experience *from within.* This practice maintains an ethical connection to our experience and our ability to respond (response-ability). Language is a form to be enlivened with the knowledge of the self, so that it can express, communicate, and disseminate wisdom. Charlotte Selver describes this precision:

> One very important part of this is that people speak directly *out* of their experience and not speak *about* what they experience, and by that their way of speaking becomes more direct more precise, more fully backed by their experience. [italics mine][95]

Within somatics, language is understood as a mediator of knowledge emerging from experience.

> Now to the areas of learning: which are breathing, relaxation and tension – words often misused as are all beautiful things in the world. As long as they remain just words, they create mischief; as soon as they are imbued with experience they become great mediators of life.[96]

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[93] Gindler, E. (1995), op. cit., p. 6.

[94] Sheets-Johnson, M., (2009), What Are We Naming? in *The Corporeal Turn: An Interdisciplinary Reader,* Exeter: Imprint Academic, p. 328.

[95] Schick, J. (1995). Interview with Charlotte Selver, in Johnson, D.H. (1995), op. cit., p. 18.

[96] Gindler, E. (1995), op cit., p. 8.

> This essay… is something to be lived or felt or done in your own body. Even the philosophical reflections presuppose direct, first-person, somatic acquaintance with what I am discussing. My job is to put a somatic technique into words as well as I can, so that you can learn the technique (and grasp the principle) by reading my descriptions. And your job, as I see it, is to test my descriptions by actually "cashing in" the words for the experience itself. Only then will this essay be more that "just so much hot air".[97]

Just as physical exercises are designed for various stages of knowledge and are applied and then discarded as expertise is gained, somatics' epistemologies of practice view language as a support, an alliance, and a partner in knowledge, yet the physical practice is not bound by this language in its continued mastery.

> When I was teaching the Mastanang [Tibetan breath system], I did my own explorations between five and seven in the morning before I went to work. I wrote notes, but I never read them again because it wasn't necessary. Once you have had an experience, you don't have to read about it anymore.[98]

Language is a way to elicit experience, reconnecting us to what we know and have known, to states we understand and have understood, and to trajectories we are poised to enact. Susan Bødker, a computer scientist working within HCI, acknowledges this embodied framework, illustrating the connection between words and the experiences from which they derive.

> When writing or reading . . . like this, we face the problem that we cannot learn what we do not already know. Writings are not representations or explanations of the world; they are intended to trigger some awareness by the reader toward his or her own experiences.[99]

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[97] Behnke, E.A. (1995). Matching, in Johnson, D.H. (ed.) (1995), op. cit., p. 317-318.

[98] Middendorf, I. (1995), op. cit., p. 69.

[99] Bødker, S. (1990). *Through the Interface: A Human Activity Approach to User Interface Design,* Hillsdale, New Jersey, Lawrence Erlbaum Associates, p. 3.

2.4.4 The Value of Interconnectedness

Somatics values the interconnectedness of the body, its practice and the world. This concept is also referred to as unity, indivisible nature, inseparability, and unmitigated connectivity. Just as Delsarte's contemporaries in the Ballet Academies feared that knowledge of the body would threaten expressivity, ability and communication, the concept of interconnectedness can be misunderstood as a threat to empirical knowledge and rigour. However, the *experience* of interconnectedness does not need to diminish knowledge; it can expand our experience of the world, inviting additional perspectives that pose challenging scientific, social, cultural and artistic questions.

William James has said: "our fields of experience have not more definite boundaries than our fields of view."[100] Interconnectedness is a perspective that is held by a growing number of disciplines. The value of interconnectedness enables multivocality and radical interdisciplinarity, (McCarthy & Wright) viewing concepts, practices, histories and theories along a continuum (Depraz, Varela, Vermersch). Cohen reminds us that: "we are working with the concepts of dualities blending, rather than sets of opposites conflicting. We are constantly looking at relationships and are always recognizing how opposite qualities modulate one another." (Cohen) Within somatics the concept of self-cultivation is a practice toward the goal of unifying mind and body: the goal moves toward a centre, rather than an end-point. Body-based disciplines engage in 'practices' that develop unity, that explore the continuum of interconnectedness *as experience*. Within somatics, interconnectedness can be understood as a 'state' and a practice, as well as a concept. Interconnectedness enables multivocality and is rich with methodology. It enables open-mindedness (Tinbergen) and in Cohen's words "opens itself out to the world". Somatics, performance and body-based disciplines share the viewpoint of interconnectedness

[100] James, W. (2003). *Essays in Radical Empiricism*, London, UK: Dover Publications, p. 37.

with phenomenology (Husserl, Merleau-Ponty, Depraz), pragmatism (James, Dewey, Shusterman), psychology (Gibson, Johnson, Lakoff), social science (Schön), embodied cognition (Varela, Thompson, Noë, Gallagher) and embodied computing (McCarthy, Wright, Agre, Dourish, Nardi, Bødker). The work presented here proposes to contribute to this growing tradition, illustrating the value of developing rigorous interconnections between first-person and third-person methodologies, that can be applied to the epistemologies of practice bridging embodied methodologies from somatics and performance to human computer interaction.

2.5 Coda

In this chapter I have characterized the technical practice of first-person methodologies as used in somatics and body-based disciplines while outlining their instrumentality in approaches to reflection-in-action: technical problem solving within a broader context of reflective embodied inquiry. Using Schön's concept of reflection in action, I have illustrated how somatics can be viewed as a technical embodied practice with attributes of the reflective practitioner. Revisiting Schön's words:

> The study of reflection-in-action is critically important. The dilemma of rigor or relevance may be dissolved if we can develop an epistemology of practice which places technical problem solving within a broader context of reflective inquiry, shows how reflection-in-action may be rigorous in its own right, and links the art of practice in uncertainty and uniqueness to the scientist's art of research. We may thereby increase the legitimacy of reflection-in-action and encourage its broader, deeper and more rigorous use.[101]

I have illustrated how the epistemologies of practice of somatics exemplify reflection-in-action. Somatics' approach to reflection-in-action supports the dissolution of the 'dilemma of rigor or relevance' that is postulated by Technical Rationalism. I have presented examples of somatics' development of an epistemology of practice, which places embodied 'technical problem solving within a broader context of reflective

[101] Schön, D.A. (1983), op. cit., p. 69.

inquiry', and have shown how somatics' practice of reflection-in-action constructs an internal validity within the discipline that is 'rigorous in its own right'. Its rigor is based on the efficacy of its practice, so that outcomes are continuously validated based on pragmatic 'problem-solving' in the world. Somatics and performance body-based disciplines link 'the art of practice in uncertainly and uniqueness', attending and valuing the specific moment as presented by a body's condition and state. As Schön and others have stated, this has the potential to link to the 'scientist's art of research'. Through my research, I work to 'increase the legitimacy of reflection-in-action' particularly as it is exemplified in body-based practice and 'encourage its broader, deeper and more rigorous use' through bridging these methodologies to the discipline of human computer interaction. The intention is to support the efficacy of experience and embodiment practices while contributing to knowledge that responds to an increasingly technological world. Skills of observation lie within the observer herself, and by beginning from within the self, we can move outward more clearly into the world.

> In this work we seek the development of a person's responsiveness to all life. When one studies human nature and really experiences what is given; when one take it seriously to see, to listen, and to feel, then it is obvious that the wish will come to contribute to the world which makes it possible that more and more people can be open for what they experience ... and lose their aggressions, and feel with others and speak their mind and act their mind.[102]

I invite the reader to continue this exploration of the *experience* of research in Chapter Three, by examining approaches to experience within HCI, while emphasizing the richness of its interdisciplinary traditions, drawing a perspective that can enable knowledge sharing between HCI and somatics.

[102] Selver, C. (1995). Interview with Charlotte Selver in Johnson, D.H. (1995), op. cit., p. 18.

3

User Experience within HCI

"This… is about the way we know the world and ourselves and about an alternative way through which we may know the world and ourselves."[1]

"…designing systems to support rich, meaningful, and pleasurable human experiences requires moving away from the model of engineering experience and towards an interdisciplinary approach to computing, in which technology design is intertwined with philosophical and cultural analysis."[2]

"So as HCI turns its attention to experience then, perhaps it is time to explore new metaphors from other disciplines in order to find a way of answering the problematic questions [of subjective first-person felt-life]."[3]

3.1 Introduction

This Chapter explores User Experience and Embodiment within the field of Human Computer Interaction. Rooted in the disciplines of usability engineering and computer science, HCI has collaborated with an array of traditions as varied as psychology, cognitive science, design, ethnography, philosophy, humanities and the arts. The research within HCI is as pragmatic as it is interdisciplinary, continuously striving to balance innovation, computational eloquence and human-centered design. Its critical approach and collaborative values work to transform knowledge through shared practice. This analysis emphasizes the richness of interdisciplinary collaboration in HCI, positioning 'the turn to experience' within HCI as a partner in the shifting landscape of embodied cognition that is engaging the sciences, humanities and the arts. By

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[1] Neuman, Y. (2003). Processes and Boundaries of the Mind: Extending the Limit Line. New York: Kluwer Academic, p. 3.
[2] Sengers, P. (2003b). The Engineering of Experience, in *Funology: From Usability to Enjoyment.* M.A. Blythe, A.F. Monk, K. Overbeeke & P.C. Wright (eds.), Dordrecht, The Netherlands: Kluwer Academic Publishers, 19-29.
[3] Wright. P., & McCarthy, J. (2005). The value of the novel in designing for experience, *Future Interaction Design,* London: Springer-Verlag, p. 9-30.

surveying approaches to embodiment, this chapter outlines the varied historical influences of human computer interaction: from technical rationalism to its intersection with science, art and the humanities, and the experience-centered histories of somatics. It calls upon the interdisciplinary voices of HCI and orchestrates the varieties of user experience within technology design. This chapter continues to explore the epistemological value centres within HCI, seeking to illustrate complementarity between emerging practices of human-centred computing and the first-person embodied methodologies within the fields of somatics and performance.

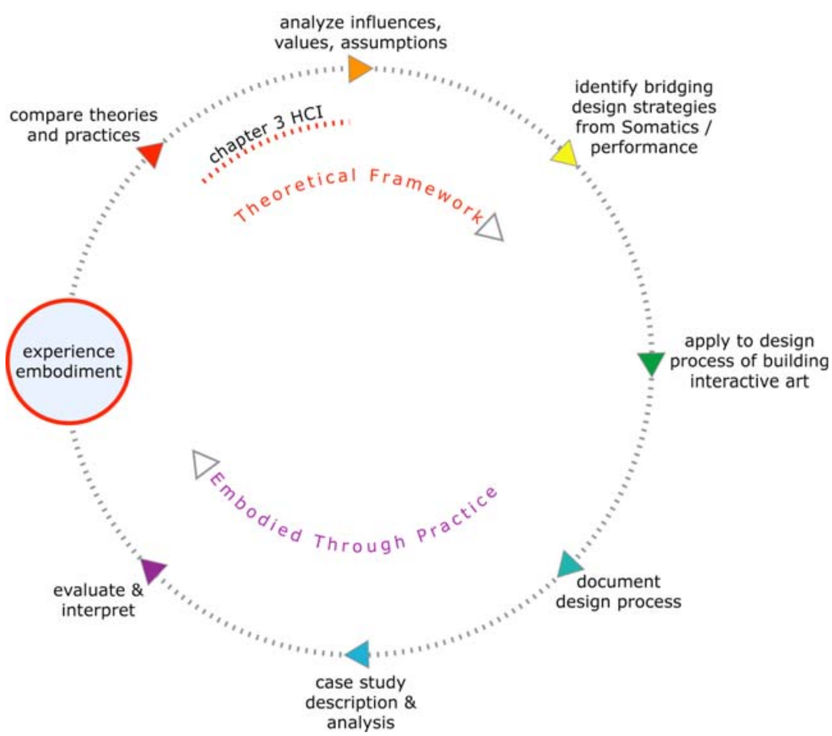

Figure 16. Compares Theories and Practices of Experience and Embodiment within HCI Analyzing Its Influences and Values in a Historical Context

3.1.1 Continued Growth of Embodied Interaction

Embodied Interaction continues to gain significance within the field of Human Computer Interaction. Its growing recognition is evidenced in part by a steady increase in publication and design focused on experience. The emerging role of embodiment explores the need to refine instrumental knowledge of the human body in action, particularly when that action is applied to the use of technology (see for example, Macaulay et al, 2006). The enduring need to interact through experience has spawned a variety of interdisciplinary bridging strategies; the goal is to gain a deeper understanding of human experience in the context of technology design[4]. Along with phenomenology, cognitive science, psychology and the arts, recent interdisciplinary contributions to HCI include the knowledge-rich domains of somatics and performance that carry long-standing traditions of embodied practice[5].

The growing interest in embodied interaction continues to invite conceptual development that can account for subjectivity, and can support design for experience. Acknowledging that we have not yet established substantive theory of the specific technical nature of embodied practice within HCI, Wright and McCarthy suggest that:

> There is … an uneasy silence as to what actually constitutes experience. Questions such as how to set boundaries distinguishing a specific user experience from a general flow of experience, how to account for subjectivity, and whether it is possible to design for experience, have remained conspicuously unanswered. In short, despite a growing acceptance of the need to focus on experience the concept of user experience is *not well developed conceptually*. Without conceptual development, there is a danger that user experience and related concepts such as trust, loyalty, identity, and engagement will not be fully realized in studies of people and technology.[6] [italics mine]

I seek to contribute to the *conceptual development* of user experience, particularly in accounting for subjectivity in the context of research, by presenting explanatory evidence in the form of first-person methodologies that can be applied to design for technology. This research contributes embodied processes to *critical technical practice* where reflection-in-action can invite a radical interdisciplinary dialogue between the technical practices of both computation and embodiment.

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[4] Examples can be found in (Davis, 2003), (McCarthy & Wright, 2004) and (Sengers, 2003a).

[5] For example in phenomenology (Dourish, 2001), cognitive science (Hurtienne & Israel, 2007), psychology and the arts (Höök, 2004; Sengers, 2003a; & Andersen, Jacobs & Polazzi, 2003), somatics and performance (Kallio, 2003; Larssen, Robertson & Edwards, 2006; Kjolberg, 2004; Moen, 2007; Schiphorst, 2007).

[6] Wright, P., McCarthy, J., & Meekison, L. (2003). Making Sense of Technology, in *Funology: From Usability to Enjoyment*, M.A. Blythe, A.F. Monk, K. Overbeeke & P.C. Wright (eds.), Dordrecht, The Netherlands: Kluwer Academic Publishers, p. 43-53.

3.1.2 Richness of Interdisciplinary Exploration

The field of Human Computer Interaction is interdisciplinary by nature and by design, from its birth in usability engineering, ergonomics and computing science: fields that were themselves hybrids by birth [Figure 17][7]. HCI has continued to extend its computational context with a growing area of research *characterizing* the varieties of experiential qualities explored in interaction[8].

> There are varieties of experiences… and we need to characterise these varieties if we are to improve user experience.[9]

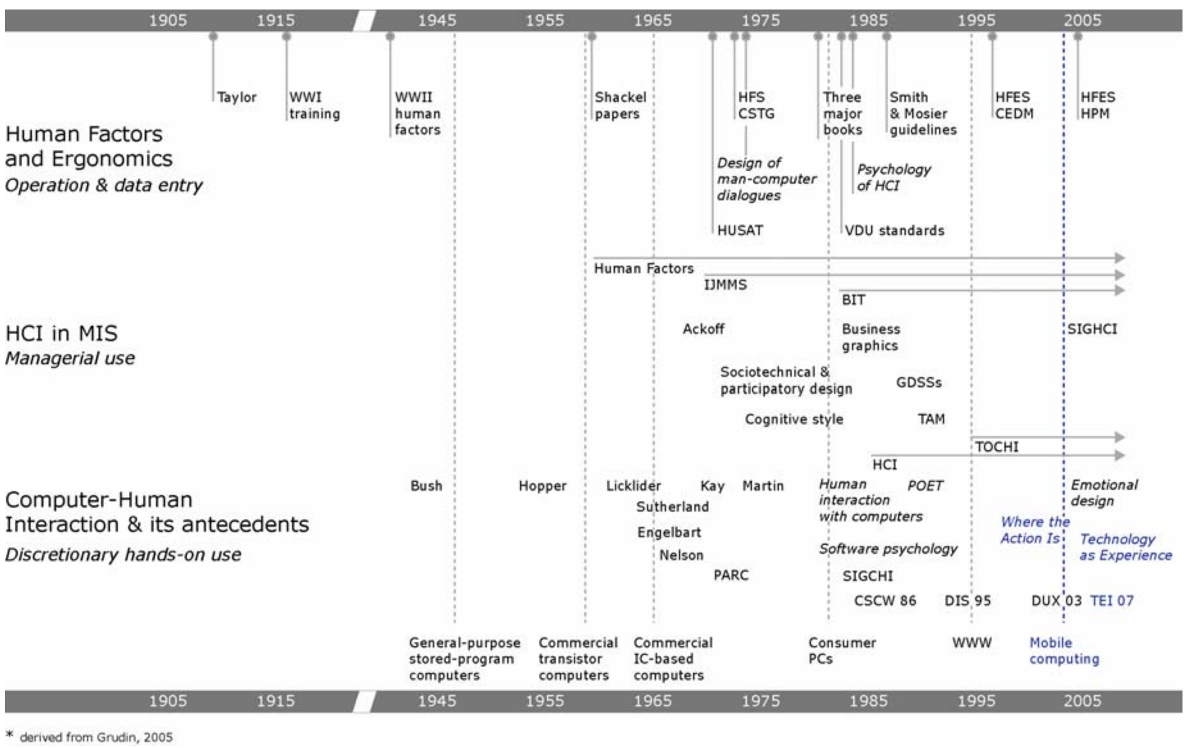

Figure 17. The Three Historical Faces of HCI as described by Jonathan Grudin, 2005

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[7] Figure 17 is derived from Jonathan Grudin's (2005) *Three Faces of Human Computer Interaction*, in which he emphasizes HCI's history in Taylorism, Ergonomics, and Usability Engineering. This view illustrates a history of Technical Rationalism underlying HCI. My own analysis contextualizes HCI within a history of thought and practice focusing on *Embodiment*, and complements this view, emphasizing the larger landscape of cultural and social movements that include philosophy, psychology, the arts and a contemporary history of science. [Refer to Figure 18 in this Chapter].

[8] Figure 17 illustrates the growth of experience from within the HCI as indicated in the 'blue text' [my additions]. As noted, the impact of continued miniaturization and the emergence of new technologies such as mobile computing and invisible computing are some of the technological influences that have accompanied the 'turn to experience'.

[9] McCarthy, J., Wright, P., Wallace, J., & Dearden, A. (2006). The experience of enchantment in human–computer interaction, *Personal and Ubiquitous Computing*, *10*(6), p. 369–378.

This development of the *varieties* of user experience illustrates the richness and specificity used to articulate experience within HCI research. The ACM Digital Library resounds with author title-keywords as qualitative and expressive as: awareness, play, reflection, resonance, empathy, enchantment, forgiveness, appreciation, trust, felt-life, intimacy, sensuality, intuition, embodiment, affect, sex, even love[10]. This list could easily be associated with Literature, Film, Biography or Art: disciplines that derive their practice through meaning making in the world. As HCI extends beyond its normative 'core' of usability research and turns to user experience, it is also engaging in meaning making through technology design. The qualitative richness of interdisciplinary research is central to the history of human computer interaction. The trends that lie beneath the conceptual underbelly of HCI are exemplified in the need to explore and test the specificity of experience. Combine the growing list of experiential qualities with technological keywords such as: invisible computing, nanotechnology, smart-fabrics, organic computing, biological technologies, embedded systems, body-area-networks and we begin to sketch a landscape of increasing ubiquity, personalization, interconnectivity, wearability, miniaturization and mobility. While these technologies are all literally moving closer to our skin and even beneath it, there is an ever-increasing need for techniques that can help us to design for the landscape of the self.

[10] This list is taken from author titles and keywords in the ACM Digital Library and refers to ACM publications based on content described by the list above. These include: aesthetics (Fiore & Wright, 2005), affect (Boehner, DePaula, Dourish & Sengers, 2005; Sengers, Liesendahl, et al, 2002), ambiguity (Gaver, Beaver & Benford, 2003), appreciative inquiry (Denning & Yaholkovsky, 2008), attention (Horvitz, Kadie, Paek & Hovel, 2003), attractiveness (Schrepp, Held & Laugwitz, 2006), awareness (Chalmers, 2002; Heath, Svensson, et al, 2002), contemplative interaction (Hansen, 2005), embodiment (Klemmer, Verplank & Ju, 2005), emotion (Mandryk, Atkins & Inkpen, 2006), empathy (Preece, 1998; Fiore & Wright, 2005; Hall, Paiva, Aylett & Woods, 2004; Treadaway, 2007), enchantment (McCarthy, Wright, Wallace & Dearden, 2006), experience (Desmet & Hekkert, 2007), expression (Moggridge, 1999; Ståhl, Sundström & Höök, 2005), felt-life (McCarthy & Wright, 2005; Larssen, Robertson & Edwards, 2006), feminism (Adam & Richardson, 2001), fluency (Löwgren, 2007), forgiveness (Vasalou & Pitt, 2005), frustration (Riseberg, Klein, Fernandez & Picard, 1998), intimacy (Vetere, Gibbs, et al, 2005), intuition (Hurtienne & Israel, 2007), love (Russo & Hekkert, 2007), magic (Madsen, 2000), materiality (Hallnäs, Melin & Redström, 2002), meaning (Höök, 2004), openness (Sengers & Gaver, 2006), perceptual interfaces (Pentland, 2000), play (Mandryk, Atkins & Inkpen, 2006; Wakkary & Hatala, 2007; Wright & McCarthy, 2008; Andersen, Jacobs & Polazzi, 2003), presence (Hallnäs & Redström, 2002), quality (Alben, 1996), reflection (Sengers, Boehner, Shay & Joseph, 2005), resonance (Hummels & van der Helm, 2004), sensuality (Benford et al, 2005; Isbister, Höök, et al, 2006; Hofmeester, Kemp & Blankendaal, 1996), serendipity (Newman, Sedivy et al, 2002), sex (Blythe & Jones, 2004; Brewer, Williams & Wyche, 2006), slowness (Hallnäs & Redström, 2001), somaesthetics (Lim, Stolterman, Jung & Donaldson, 2007), trust (Bickmore & Schulman, 2007; Riegelsberger, Vasalou, et al 2007), value (Friedman & Kahn, 2000; Boztepe, 2007), wonder (Paulos & Beckmann, 2006).

Embodied interaction requires embodied *methodologies*. Interdisciplinary exploration can contribute to conceptual development of user experience, particularly in relationship to the 'Technologies of the Self'.

> But 'engineering' truly rich experiences requires more of system designers than just technical skills... They can't just love their code; they must learn to love the complexity of user experience as well and be conversant in it. This suggests the incorporation of practices like cultural studies, anthropology, speculative design, surreal art, culture jamming, story-telling, cultural history, sociology, improvisation, and autobiographies, which have found ways to address and understand the complexity of human experience without making formal models of it.[11]

The history of science has developed in an increasingly positivist technological world. It is both outward striving and outward looking. Yet the trend of ubiquity, miniaturization, and invisible computing (Weiser, 1994)[12] asks us to shift our gaze toward experience, embodiment, and the self. Design for experience requires a re-balancing of 'gazes' as well as 'sensory modalities'. Adopting an epistemological strategy that blends rather than opposes these 'gazes' will strengthen interdisciplinary dialogue with a greater *continuum* of viewpoints. Our visual sense allows us to perceive an expansive, distant view. Our more proximal intimate senses can augment the far-reaching data about our world with the informational landscape of the self (Gibson, 1966). Similarly, our third-person observations have supported the outward gaze: visibility, the enlightenment and the development of modern science. Our first-person observations can support our inward gaze: techniques of subjective knowing and the experience of the self within research.

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[11] Sengers, P. (2003b). The Engineering of Experience, in *Funology: From Usability to Enjoyment*, M.A. Blythe, A.F. Monk, K. Overbeeke, & P.C. Wright (eds), Dordrecht, The Netherlands: Kluwer Publishers, p. 19-29.

[12] Mark Weiser (Xerox Parc, Palo Alto) is recognized as coining the term *Invisible Computing*, and in his UIST'94 invited talk, he describes the "humanist" origins of Invisible Computing in post-modern thought. He called for greater interdisciplinary design strategies, stating the need to cross-pollinate technology design by bridging knowledge and practice from the arts and humanities including: philosophy, phenomenology, anthropology, psychology, post-modernism, sociology of science and feminist criticism. Weiser also suggested that we include our own subjective experience in our research and design. (Weiser, 1994).

These trends point to a seismic shift across disciplines softening long held ideologies that have separated body from mind, first- from third-person views, and reason from subjectivity. I seek to position the 'turn to experience' within HCI as a partner in this shifting interdisciplinary understanding of the centrality of embodied cognition and its approach to meaning, reason, thought and the technologies of the self.

3.2 Meaning and Technology: the Confluence of Embodiment and Reason

We are witnessing a reformulation of epistemologies of practice within human computer interaction centered in the need to create richer models of experience. This turn toward experience: toward recognizing the interconnectedness of the parts to the whole, the continuity of the stream of experience, the embodied nature of the rational and thinking mind and the inclusion of the self, are echoed in the rhetoric of many contemporary disciplines throughout the sciences, humanities and the arts.

While scientific thought is being recognized as ideological, relative and value-laden (Putnam, 1981; Lewontin, 1991), historic scientific models and ideologies are being queried by academic and artistic disciplines (Polanyi, 1958; Schön, 1983; Neuman, 2003; Johnson, 2007). Hilary Putnam, in *Reason, Truth and History* (1981) describes:

> [My] aim… is to break the strangle hold which a number of dichotomies appear to have on the thinking of both philosophers and laymen. Chief among these is the dichotomy between objective and subjective views of truth and reason. Once such a dichotomy as the dichotomy between 'objective' and 'subjective' has become accepted, accepted not as a mere pair of categories but as a characterization of types of views and styles of thought, thinkers begin to view [them] as ideological labels.[13]

Putnam follows by suggesting that as dichotomies, these characterizations and ideological frameworks *cannot be whole*: they create views of the world that by definition become alienated or separated:

[13] Putnam, H. (1981). *Reason, Truth and History,* Cambridge, UK: Cambridge University Press, p. ix.

> The current views of 'truth' are alienated views; they cause one to lose one part or another of one's self and the world… my purpose is to sketch the leading ideas of a *non-alienated* view.[14] [italics mine].

Putnam's proposed *non-alienated* view acknowledges that rational thought (including what science refers to as *truth* or *logic*) is based upon sets of values, and that a value-neutral perspective does not exist. His description of a non-alienated view is one that does not forget one's self or the world in which one exists. A description of a non-alienated view that 'remembers the self' echoes Foucault's concept of self-inclusion and 'care of the self' in his description of the 'Technologies of the Self'[15]. Christopher Alexander's (2003) concept of 'the mirror-of-the-self test' resonates with Putnam's non-alienated view, and with the inclusion of the self in methods of knowledge construction as described by Foucault. Alexander describes empirical methods that *include the self* within the observation method.

> When I was observing issues of wholeness and life in a thing, I did not try to observe things as if I myself did not exist. Instead, again and again I tried to discern which of two objects was more like a mirror of my own self, which one had more feeling, which seemed to have more life, which one made me experience greater wholeness in myself, and so on… This kind of observation would have been considered inadmissible in the canon of then-contemporary science.[16]

Alexander goes on to describe the empirical nature of his mirror-of-the-self test, which allows access to empirical investigation of *quality* and life in artifacts. In Alexander's view, his method of observation includes the self within the world, and as such does not alienate the self for the world, nor the world for the self. The cornerstone of Alexander's approach is the observation of *wholeness* as we experience it in the world mirrored within ourselves. This technique is based on the view that as observers of the

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[14] Ibid, p. xi-xii.

[15] A discussion of Foucault and his concept of the Technologies of the Self is described in Chapter Two.

[16] Alexander, C. (2002). Chapter 9: Beyond Descartes: A new form of scientific observation, in *The Nature of Order: An Essay on the Art of Building and the Nature of the Universe, Book One, The Phenomenon of Life,* Berkeley: The Center for Environmental Structure, p. 352.

world we are not separate from it. Alexander, like James and Dewey[17], bases his results on *experience*:

> I want to emphasize that this method of observation, like the method of Descartes, still refers always to *experience. It is empirical in nature*. It dismisses fantasy and seeks constantly to avoid speculation. In this sense it is as empirical as the method of Descartes. But where Descartes only allowed observation to focus on the outer reality of mechanisms in the world, my method requires that we focus on the inner reality of feeling *as well.*
>
> The results I have reported are based on experience, they report experience, and they describe experience. The experience in question is experience of inner feeling. But the amalgamated results of this experience still ultimately refer to facts about the world: the different degrees of life that world has in different places. Because of that, our knowledge can be shared.[18]

Like many scientists and philosophers that critique the *ideology* of science (which differs from critiquing the instrumentality or value of its methods), Alexander offers up a viewpoint in which both ‘objective’ and [inter-] ‘subjective’ observation compliment and ‘add-value’ to one another, supporting a *non-alienated* view of empiricism that in effect unifies and softens the ideological status of these long-held counter-positions. In this regard, he states:

> I should like to call the Cartesian method the *first* method of observation that allows us to find agreement about the world. Nowadays, this first method of observation—the process of obtaining truthful insights about the world, by standing outside the world as an observer—dominates modern science. It has become, in effect the *only* way in which we obtain information about the world.
>
> I believe that what I have described… may be thought of as a *second* method of observation… it might one day seem comparable in value to the first method—and complementary to it.[19]

Alexander is describing an *embodied methodology* that is rigorous in its own right, that can operate in partnership with normative empirical methods, and that can give access to an aesthetics of ‘felt-life’ in a way that can be validated and integrated through

[17] Pragmatist philosophers William James (1999; 2003) and James Dewey (1932; 1934; 1989; 1997).
[18] Alexander, C. (2002), op. cit. p. 353.
[19] Ibid, p. 368.

experience. Additionally, Alexander's descriptions accord with embodied methodologies and techniques found within body-based practices, where engagement with the senses (seeing, feeling, awareness), coupled with attention, enable access to embodied knowledge:

> The first method has helped us to find out how the world works in the machine-like sense. With it we have accomplished miracles, nearly, in the breadth of our scientific understanding. The second method of observation may bring us further miracles. It may perhaps bring us to the doorstep of another kind of world, in which we see, feel, become aware of a second layer of existence, beyond the mechanistic view of science and technology: a layer which is the underpinning of [architecture and the arts] and which is, also, the basis of our emotional and [feeling] relation to the world.[20]

Alexander resolves the notion of dichotomy by acknowledging that there is no need to position observational viewpoints in opposition to one another. This is reminiscent of the multi-vocal approach of Depraz, Varela and Vermersch regarding systems of validation for first, second and third person methodologies, and that of Bonnie Bainbridge Cohen's with regard to Eastern and Western techniques of structuring mind-body knowledge[21]. For Alexander, differing forms of observation can be included along a continuum:

> It is necessary to understand that there is no choice required between the [two methods]... If we follow both methods—the method of Descartes for things that are outside ourselves and can be represented as machines; and the method I have explained, where we have to study or judge wholeness—we shall then arrive at a picture of the world which includes the self and which is able to recognize the personal nature of the universe.[22]

Michael Polanyi's *Personal Knowledge* (1958) accords with Alexander in his association of the *personal* nature of comprehending the world. Polanyi rejects the ideal of scientific detachment, acknowledging Gestalt psychology, and insisting on a form of knowledge that includes the self, and that actively *alters the self*, through its enaction:

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[20] Ibid, p. 369.

[21] See Chapter Two: discussion of Depraz, Varela and Vermersch (2003), op. cit., p. 44-46; and Cohen, B.B. (1993), op. cit., p. 60.

[22] Alexander, C. (2002), op. cit., p. 369.

an active comprehension that requires technical skill and can access a collective objective validity[23]. Like Putnam, Polanyi and Alexander, Lewontin (1991) also argues against an ideology of reduction, and suggests that we need to recast the dichotomies to enable a 'science of the parts' that can operate in collaboration with a 'science of the whole':

> A lot of nature … [as we shall see] … cannot be broken up into independent parts to be studied in isolation, and it is pure ideology to suppose that it can be.[24]

Lewontin suggests that a third 'meta-view' could blend the value systems of two views simultaneously: the views of reductionism in partnership with a view of an interconnected world. Like Lewontin, Yair Neumen (2007) stresses the importance of viewing various research methodologies as *tools* of knowledge building. In *Reviving the Living: Meaning Making in Living Systems*, Neuman acknowledges:

> We should keep in mind that reductionism is only one tool in the intellectual toolkit of a scientist.[25]
>
> The main limit of reductionism is that it cannot guide us in understanding the behaviour of living wholes.[26]

As part of this scientific milieu, HCI is also engaged *within* the shifting views of what constitutes methodologies of reason, knowledge, and validation. And very much like Putnam, Alexander, Lewontin and Neuman, researchers within HCI are extending their intellectual 'toolkits' to design for user experience: a design space that requires methodologies that can 'guide us in understanding the behaviour of living wholes'. The 'turn to experience' within HCI has been incrementally increasing its conceptual frameworks (Agre, 1997; Dourish, 2001; McCarthy & Wright, 2004). Historically, the 'engineering of experience' (Sengers, 2003b) and its accompanying usability research

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[23] Polanyi, M. (1958). *Personal Knowledge: Towards a Post-Critical Philosophy*, Chicago: University of Chicago Press, p. vii.
[24] Lewontin, R.C. (1991). *Biology as Ideology*, New York: Harper Perennial, p. 15.
[25] Neuman, Y. (2007). *Reviving the Living, Meaning Making in Living Systems* (Volume 6 Studies in Multidisciplinarity), Amsterdam: Elsevier, p. 8.
[26] Ibid, p. 7.

favored methods that were able to optimize functionality and quantify efficiency. Now, the turn to experience is *re*formulating a broader range of interdisciplinary and equally rigorous *embodied* techniques for conceptualizing experience. This is due in part to the greater landscape of approaches to scientific knowledge and to the influence of disciplines such cognitive science, the humanities and the arts.

Mark Johnson's *The Meaning of the Body* (2007) bridges concepts of embodiment across cognitive science, linguistics, philosophy, pragmatism and neuroscience. Echoing the epistemologies of practice of somatics, Johnson describes the importance of understanding experience *at the level of bodily processes*:

> The structural aspects of bodily interactions [are] dependent on submerged aspects of bodily understandings. It [is] important to probe below concepts, propositions and sentences into the sensorimotor processes by which we know the world… what is now needed is a far deeper exploration into the qualities, feelings, emotions, and bodily processes that make meaning possible.[27]

The 'far deeper' exploration that Johnson suggests is concurrent with technical practices of the embodied first-person methodologies described by Francisco Varela in the previous chapter. Varela notes that body-based somatic practitioners validate and enrich analysis of the first-person experience of cognition through the development of techniques and practice:

> One can observe that practitioners [of embodied first-person methods] are the only ones to have explored this phenomenology of cognition… [As] practitioners: they use techniques, they diagnose problems and attempt to solve them on bases that are pragmatic, [rather than] scientific, since the science… does not yet exist… [These practitioners] have been inventing new guides, new observables, new techniques of modification, new forms to help in change on the level of cognitive activities, beliefs, emotions. All work directly with human experience, subjectivity, *developing that which we might call a psycho-phenomenological practice.* This represents an immense resource of non-thematized knowledge.[28]

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[27] Johnson, M. (2007). *The Meaning of the Body: Aesthetics of Human Understanding*, Chicago: The University of Chicago Press, p. x.
[28] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 167.

Varela acknowledges practice-based knowledge in body-based somatic disciplines, highlighting its pragmatic technical relationship to Schön's notion of reflection-in-action, and its epistemologies of practice as 'pre-empting' scientific knowledge. In this regard Varela comments: "they are pragmatic, not theoretical or scientific, since the science on which they would need to ground their practice does not yet exist."[29]

This is a precise example of the existence of the two complementary yet differing epistemologies of practice: the trajectory based in first-person experience outlined by Varela, values knowledge enacted through pragmatics of experience and "an epistemology of practice which places technical problem solving within a broader context of reflective inquiry, shows how reflection-in-action may be rigorous in its own right, and links the art of practice in uncertainty and uniqueness to the scientist's art of research".[30]

Mark Johnson's argument for embodied cognition follows directly from this approach. Johnson grounds his arguments firmly in the pragmatist philosophy of John Dewey, weaving an aesthetics of experience that is supported by contemporary research in the sciences (linguistics, psychology and neuroscience) and illustrated by artistic practice. Johnson is among a group of contemporary researchers that has taken up the call of Nikolaas Tinbergen's 1974 Nobel Laureate address, which suggested an increase in "open-mindedness, collaboration, attention to the body as a whole, and to the unity of body and mind"[31].

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[29] Ibid.
[30] Schön, D.A. (1983), op. cit., p. 69.
[31] Tinbergen, N. (1974). Ethology and Stress Diseases, *Science, New Series*, *185*(4145). American Association for the Advancement of Science, p. 26.

Johnson, like Putnam and others argues that there remains a pervasive cultural misunderstanding that has led to misconceptions, based in dichotomies that direct our attention away from a non-alienated view:

> Chief among these harmful misconceptions are that 1) the mind is disembodied, 2) thinking transcends feeling, 3) feelings are not part of meaning and knowledge, 4) aesthetics concerns are matters of mere subjective taste, and 5) the arts are a luxury, rather than a condition of full human flourishing.[32]

Johnson's rich multi-vocal defense of bodily-based feeling in human meaning-making shares acknowledgement of John Dewey's pragmatist approach to the aesthetics of experience:

> Following Dewey, I want to turn these misconceptions on their head by showing that aesthetics must become the basis of any profound understanding of meaning and thought.[33]

In addition to integrating the aesthetics of experience within a view of an embodied self, Johnson illustrates how recent scientific knowledge of neuroscience supports a pragmatic universe in which thinking, feeling and acting are deeply and physically interconnected within a continuity of experience constructed by and through the body.

> How imagination can be both formal and material, rational and bodily – is that there is not an unbridgeable gap between these two realms in the first place. Once we no longer demand a disembodied (or nonphysical) rationality, then there is no particular reason to exclude embodied imagination from the bounds of reason.[34]

Concepts that link the aesthetics of experience with a pragmatist view of embodied enaction are explored by Richard Shusterman (1992; 1997; 2000): a pragmatist philosopher who coined the term 'somaesthetics' to describe an embodied aesthetics that is continuous, whole and grounded in the body's perceptive processes.

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[32] Johnson, M. (2007), op. cit., p. xi.
[33] Ibid.
[34] Johnson, M. (1987). The Body in the Mind: The Bodily Basis of Meaning, Imagination and Reason, Chicago: The University of Chicago Press, p. 169.

These braided views provide examples from within the growing research that supports the centrality of embodied cognition, the interconnectedness of the body within the continuity of experience and the confluence of embodiment, subjectivity and reason. As the relevance of these theories gain significance in HCI, we continue to witness an outpouring of interest in knowledge and methods that originate from within a seemingly endless variety of fields. HCI is seeing the influence of cognitive science, sociology, pragmatism, phenomenology, psychology, neurophysiology, performance practice such as theatre, dance, reflective and contemplative traditions and critical theory[35].

3.3 An Interweaving of a History of Embodied Influences

Drawing a comparative historical perspective across the influences that have led to the contemporary practices of HCI and somatics, we find a variety of historical interconnections that are more than coincidental. These exist between the underlying philosophies of pragmatism, the body-based disciplines of somatics and the applied and engineering sciences of human computer interaction. They also exist in the supporting social, cultural and intellectual structures that define and shape Western cultural thought and practice particularly in relation to technology, experience and the representation of knowledge of the body. While Dewey has richly influenced the emerging views of user experience, the aesthetics of interaction, technology as design and the importance of qualities of experience, Dewey himself had been directly influenced by two decades of work and practice with F.M. Alexander. Alexander's specific embodied practices and technologies of the self profoundly affected Dewey's philosophy of aesthetics, art, experience and education. And where Alexander is an

[35] Some of these influences within HCI include: Cognitive Science (Johnson, M., 2007, 1987; McNeil, 1992; Metzinger & Gallese, 2003), Sociology (Nardi, 2001), Pragmatism (Dewey, 1934; James, 2003; Shusterman, 1992), Phenomenology (Merleau-Ponty, 1964, 1968; Bergson, 1988; Dourish, 2001), Psychology (Gibson, 1966; Lakoff & Johnson, 1999), Neurophysiology (Damasio, 1994, 2001, 2003; Bach Y Rita, 1962), Performance Practice such as Theatre (Boal, 1992; Schechner & Woolford, 1997; Laurel, 1992) and Dance (Kjölberg, 2004; Schiphorst, 1997b), Somatics (Cohen, 1993; Johnson, D.H., 1995; Laban & Lawrence, 1974; Ginsberg, 1999), Reflective and Contemplative Traditions (Yasuo, 1987; Depraz, Varela & Vermersch, 2003), and Critical Theory (Massumi, 2002).

innovator of practice, Dewey's philosophy originated the application of practice to philosophic thought: as such Dewey's work is one of rigorously embodied concepts, an aesthetics that has a direct applicability to living thought, feeling and action. Dewey's pragmatist approach to 'learning how to learn' has influenced cognition, philosophy and the design for experience within technology. Another pragmatist philosopher, Richard Shusterman has entered the literature of HCI through his development of pragmatist aesthetics[36]. Shusterman, also strongly influenced by Dewey, developed and articulated a philosophy of the self which he termed somaesthetics[37]

> Somaesthetics can be defined as the critical study of the experience and use of one's body as a locus of sensory-aesthetic appreciation (aesthesis) and creative self-fashioning. It is devoted to knowledge, discourses, practices, and bodily disciplines that structure such somatic care or can improve it. If we put aside traditional philosophical prejudice against the body and simply recall philosophy's central aims of knowledge, self-knowledge, right action, and its quest for the good life, then the philosophical value of somaesthetics should become clear.[38]

As pragmatists, philosophers that have provided founding concepts supporting theories of experience within HCI, both Dewey and Shusterman have studied and reference somatics practices within their own writing. Chapter Two gave examples from Dewey's writing. In Shusterman's case he writes:

> If self-knowledge (rather than mere knowledge of worldly facts) is philosophy's prime cognitive aim, then knowledge of one's bodily dimension must not be ignored… somaesthetics works at improving awareness of our bodily states and feelings, thus providing greater insight… Outside the legitimized realm of academic philosophy, somatic [practitioners] like Reich, F. M. Alexander, and Feldenkrais affirm deep

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[36] Kallio, T. (2003). Why we choose the more attractive looking objects - somatic markers and somaesthetics in user experience, *ACM DPPI'03*, June 23-26, Pittsburgh, Pennsylvania, p. 142-143; Heinrich, F., (2007). The aesthetics of interactive artifacts: Thoughts on performative beauty, *Proceedings of the 2nd international Conference on Digital Interactive Media in Entertainment and Arts*, (Perth, Australia, September 19-21, 2007), DIMEA '07, p. 58-64; Lim, Y.-K., Stolterman, E., Jung, H., & Donaldson, J. (2007). Interaction gestalt and the design of aesthetic interactions, *Proceedings of the 2007 Conference on Designing Pleasurable Products and Interfaces*, New York: ACM Press, p. 239-254.

[37] This term is also used in Eastern philosophies of embodied mind and practice, see Yasuo, Y. (1989) in Shaner, D.E., & Nagatomo, S. (1989). *Science and Comparative Philosophy: Introducing Yuasa Yasuo*, Leiden, The Netherlands: E.J. Brill, p. 133, 257-258.

[38] Shusterman, R. (1992). Somaesthetics: a Disciplinary Proposal, in *Pragmatist Aesthetics: Living Beauty, Rethinking Art*, Oxford, UK: Rowman & Littlefield Publishers, p. 267.

> reciprocal influences between one's body and one's psychological [and cognitive] development.[39]

Within HCI, Shusterman's concept of somaesthetics has been referred to by Kallio (2003) and Heinrich (2007) and recently taken up by Lim and Stolterman (2007) in their discussion of *Interaction Gestalt and the Design of Aesthetic Interaction*. Just as Shusterman himself worked with Feldenkrais practice, we are reminded that the popularization and use of the term "Gestalt" was introduced through its founder Fritz Perls, who was acknowledged by Varela[40] and Polanyi[41] for his impact on body-based first-person practice, and whose technique was born directly out of Perl's work with Charlotte Selver, a somatics practitioner who brought Elsa Gindler's work to America from Germany. From within HCI, Lim and Stolterman explain their inclusion of somaesthetics in their approach to interaction gestalt:

> Since our goal is to provide practical and useful knowledge, which does not oppose the fundamental concepts emphasized in holistic accounts of experience, we started to look into another concept, "somaesthetics," introduced by Shusterman, which is influenced by Dewey's perspective[42]

Time and time again, we see the influence of these *non-alienated* views so central to the field of somatics and its body-based techniques, in the approach to design for experience and embodied interaction. The ability of HCI to discern the 'usefulness' and instrumentality of somatics-based principles and techniques is illustrative of its own pragmatic approach.

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[39] Ibid*,* p. 271.

[40] Francisco Varela describes Perls contribution to first-person practices in the chapter Concerning Practice, Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 168.

[41] Michael Polanyi in his introduction to *Personal Knowledge* acknowledges the development of his concepts to the findings of Gestalt psychology. "I have used the findings of Gestalt Psychology as my first clues to this conceptual reform", see Polanyi, M. (1958). *Personal Knowledge: Toward a Post-Critical Philosophy,* Chicago: University of Chicago Press, p. vii.

[42] Lim, Y.-K., Stolterman, E., Jung, H., & Donaldson, J. (2007), op. cit., p. 239-254.

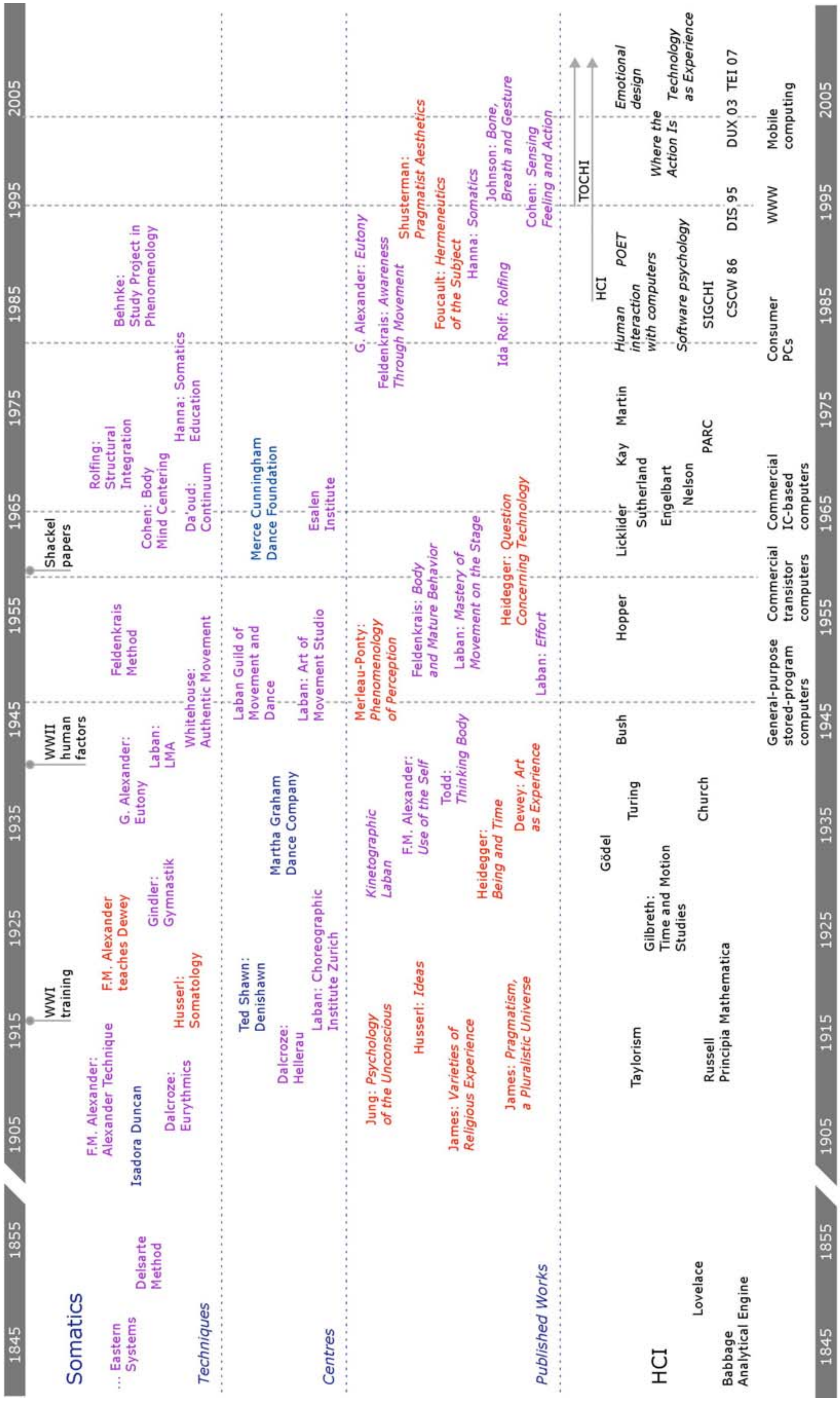

Figure 18. Comparative History of corresponding developments within HCI & Somatics

The examples presented within this Chapter seek to illustrate 1) the overlapping and intertwining of the concepts and physical practices across domains of design for interaction and the practice of the self, 2) the continued threading of HCI with its exploration of concepts of subjective practice and aesthetics of experience and 3) although not popularized, nor highlighted within the rhetoric of science, the dance of interconnection that has existed throughout the nineteenth and twentieth centuries in the shared landscape of what has come to be known as HCI and what has come to be known as somatics: the embodied nature of the rational and thinking mind, and the shifting interdisciplinary understanding of embodied cognition and its approach to meaning, reason, thought and the technologies of the self. This comparative history is a trajectory of interconnected technical epistemologies of practice that have developed along individual paths and yet are partners in the shifting landscape of embodied cognition engaging the sciences, humanities and cultural practices of art and the self.

4

Bridging Methodologies

"It would be possible to describe everything scientifically but it would make no sense; it would be description without meaning, as if you described a Beethoven Symphony as a variation of wave pressure."
Albert Einstein[1]

"The process of embodied meaning in the arts are the very same ones that make linguistic meaning possible…The arts are not a luxury, they are a condition of full human flourishing." *Mark Johnson*[2]

"Movement is alteration in qualities of experience... Mathematically there is no such thing as fast and slow… To be forced to wait a long time for an important event… is a length very different from that measure by the movement of the hands of a clock. It is something qualitative."
John Dewey[3]

4.1 Introduction

This chapter explores *Bridging Embodied Methodologies* from somatics and performance to technology design within Human Computer Interaction. Embodied interaction is articulated through embodied *methodologies:* processes that engage meaning by attending to *quality* of experience. Three case studies are presented that contribute to the conceptual development of embodied practice within HCI. By centering technology design from within a *non-alienated* view[4], I employ the *experience of the self* as an integral component of design processes for technology. Like Polanyi and Alexander my research-through-art seeks to acknowledge the *personal* nature of comprehending a qualitative world.

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[1] Clark, R.W. (1971). *Einstein: The Life and Times*, World Publishing Company, p. 192.
[2] Johnson, M. (2007). *The Meaning of the Body: Aesthetics of Human Understanding*, Chicago: The University of Chicago Press, p. xi, p. 209.
[3] Dewey, J. (1934). *Art as Experience,* Carbondale, Illinois: Southern Illinois University Press, p. 215.
[4] Hillary Putnam (Putnam, 1981) sketches a non-alienated view, which attempts to resolve dichotomies of subjective and objective, and acknowledges the value-laden relationship between truth and reason.

My design strategies are born from the four *values* common to body-based practice articulated in Chapter Two. These are: the value of the self, of attention, of experience and of inter-connectedness. The value of inter-connectedness is the recognition of the indivisible nature of body and mind, self and world, technology and experience, practice and theory. While interconnectedness is an embodied unifying *substrate* of reason, feeling and action, it also supports the specificity of rigorous technical practice and articulation of embodied approaches to interaction design.

This chapter identifies bridging strategies from somatics and performance, applying them to the design processes for personal and wearable interactive art. Design processes include experience inquiry, concept development, materials exploration, technology implementation, and system integration. This is supported through a cycle of ‘research through art’ illustrated in Figure 19. The *artistic practice* is the foundation of the formalization and embodiment of the *theoretical framework*. This cycle as a whole is a balanced representation of the relationship between reflection-in-action and research-through-art.

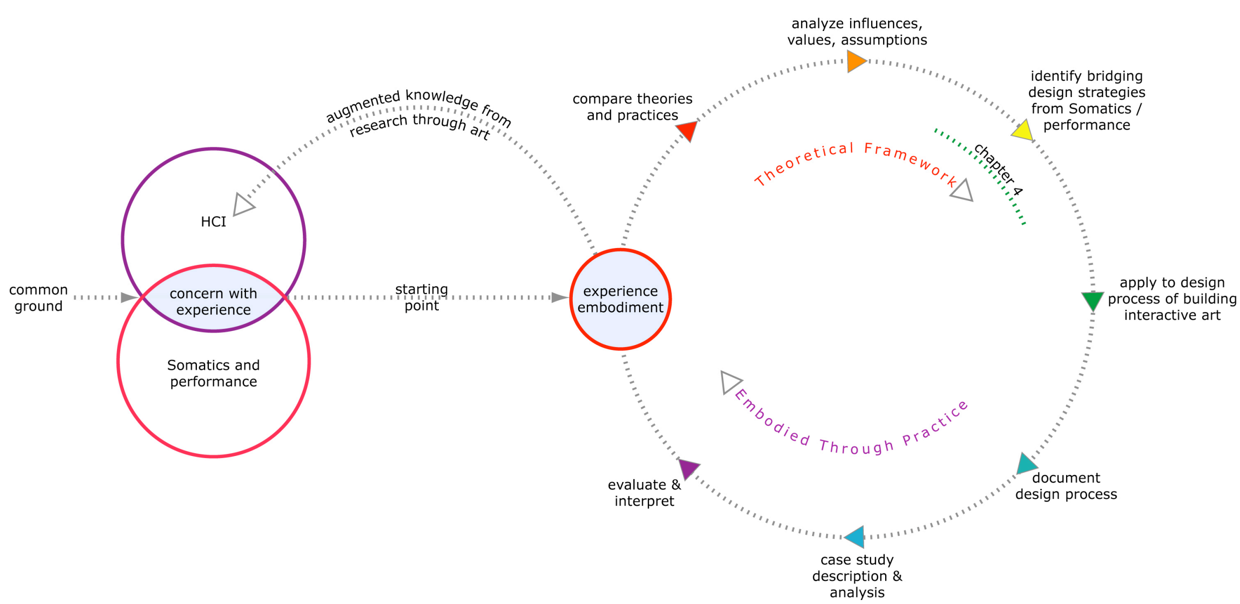

Figure 19. Bridging Design Strategies from Somatics and Performance

4.2 Design Processes for the Technologies of the Self

This section contextualizes the application of embodied methodologies within design processes for technology. A design cycle is typically composed of a set of iterative stages from the initial research and inquiry through to realization and evaluation. Embodied techniques can be applied within various stages of the design process: from discovery-led processes and speculative inquiry, through concept exploration, realization, technological implementation and evaluation processes for efficacy of experience and function.

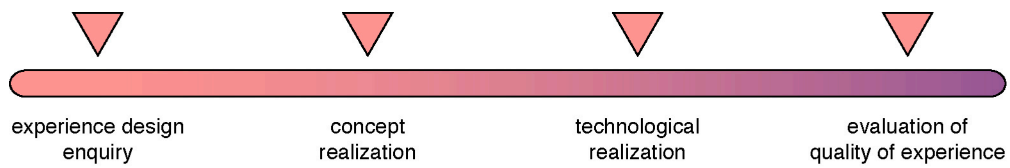

Figure 20. Somatics Techniques can be applied to Various Stages of Design Process

The case studies presented in Chapter Five through Chapter Seven illustrate a variety of ways in which somatics and performance techniques can be applied to technology design at various stages of design process. These case studies differ in what they explore, but together they create a rich exploration of experience, embodiment and the application of somatics techniques within the design process of Interactive Art. Depraz, Varela and Vermersch remind us that the practical knowledge supporting the efficacy of first-person methodologies is a valuable evidential resource for the research community:

> First-person methodologies are available and *can* be fruitfully brought to bear… The proof of the pudding is not in *a priori* arguments, but in actually pointing to explicit examples of practical knowledge, in case studies.[5]

[5] Varela, F.J., & Shear, J. (1999). First Person Methodologies: Why, What, How?, *Journal of Consciousness Studies*, *6*(2-3), p. 2.

The examples from my own research are organized within three case studies. Each case study is based on the design process of a specific interactive art installation, and each is described within its own Chapter. Chapter 5, *From the Inside Out* describes the design process of *whisper*: a wearable interactive art installation based on co-experience of body-state data; Chapter 6, *Designing with Breath* describes the design process of *exhale:* a wearable interactive art installation based on exploring empathy through networked breath; and Chapter 7, *The Somaesthetics of Touch:* describes the design process of *soft(n)*: a networked interactive art installation based on tactile interaction between 12 soft objects in a space.

Each case study provides examples that emphasize a particular stage of the design process life cycle. Chapter Five, *From the Inside Out* focuses on 'experience discovery' exploring concept development for a wearable art installation called whisper. Prior to technology development, five discovery-led workshops were held over a two-month period to explore experience, meaning, and interaction. Placebo objects, props and exploratory game-like structures were enacted based on participants' experience. Workshop data was gathered in order to explore and observe participants willingness to engage with their 'body-data'. These design processes are presented in Chapter Five.

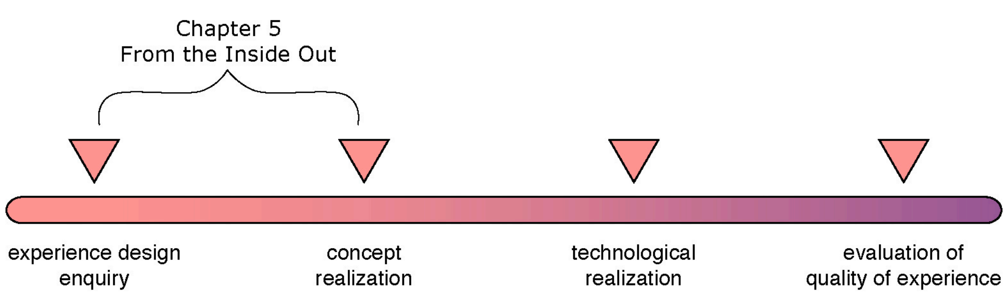

Figure 21. Chapter 5 Focuses on Experience Discovery for Exploratory Concept Design

Chapter Six, *Designing with Breath,* focuses on sensory experience for concept and technology design, including materials exploration and refinement. A series of workshops explored participants' sensory experience with partially operational prototypes in the form of wearable skirts networked to one another. Sensory experience through breath sensing and movement interaction formed the basis of the explorations. These workshops supported conceptual and technological refinement processes for the interactive art installation, *exhale*. These design processes are presented in Chapter Six.

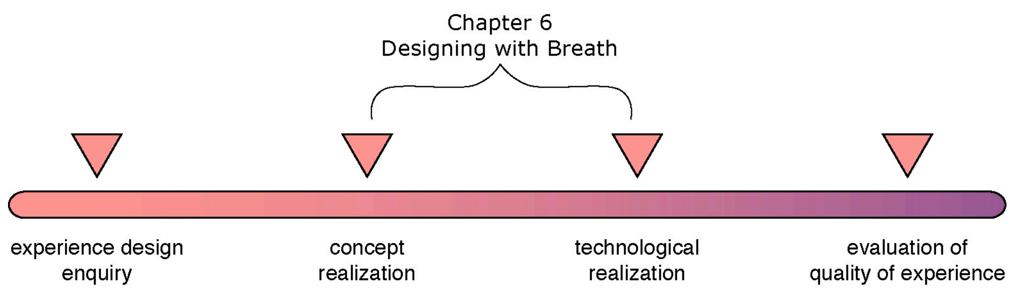

Figure 22. Chapter 6 focuses on Sensory Experience for Concept and Technology Design

Chapter Seven, *The Somaesthetics of Touch* focuses on the implementation and testing stage of a design process, describing the development of a heuristics for recognizing tactile qualities in a fabric-based flexible soft tactile surface developed for the interactive installation *soft(n).* The implementation was based on Rudolph Laban's Effort/Shape Analysis, which defines a set of movement *qualities* that express a range of qualitative meaning. In *soft(n)* these were applied to touch. These design processes are presented in Chapter Seven.

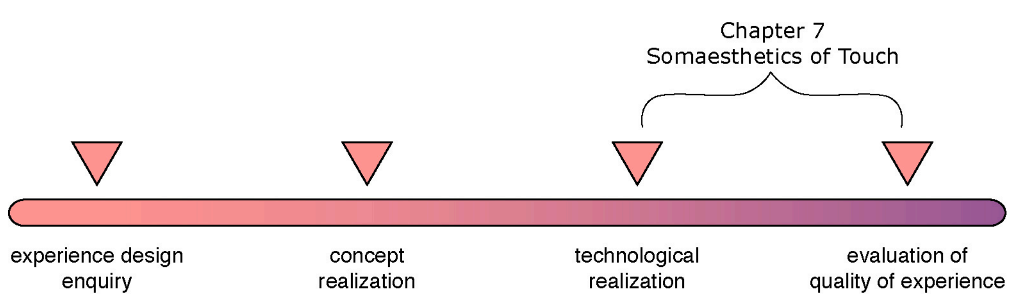

Figure 23. Chapter 7 focuses Implementation of a Heuristics for Tactile Qualities

The figures on the previous page illustrate the variety of ways in which first-person embodied techniques found within somatics and performance can be applied to technology design. The table below summarizes some of the approaches articulated within the case studies in Chapters Five through Seven.

Use of Somatics Techniques within Design Cycle

• In Experiential Discovery Led Processes
  ○ Workshops
    ▪ Attentional skill development
    ▪ Creativity development
    ▪ Field studies "of the self" (self-efficacy)
    ▪ Training acuity of the researcher
    ▪ Experience discovery of participants
    ▪ Exploration of use of body, movement, space
  ○ Cultural probes
  ○ Narrative inquiry

• In Conceptual Design for
  ○ Articulation of experiential qualities
  ○ Interaction Design – mechanisms for choice, sharing, control, presence
  ○ Gestural Interaction

• In Conceptual Development
  ○ Materials Design
  ○ Materials Properties and uses in defining experiential Qualities
  ○ Materials Integration
  ○ Collaborative approaches to creativity, conceptualization and engineering

• Technology Design
  ○ As a basis for an interaction heuristics
  ○ Collaboration between interdisciplinary strategies
  ○ In refining definitions of experiential quality in interactivity

• Evaluation
  ○ Experiential efficacy
  ○ Connection with self
  ○ Incorporating first- and second-person techniques to assess and evaluate "wholeness" (Alexander)

Table 3. Use of Somatics Techniques within Design Cycle

4.3 Somatics Values and Techniques Applied to Case Studies

In addition to approaching the case studies from the point of view of design processes, each case study is also an example of the application of the *values* common to body-based practice. The table below summarizes how each case study has applied the values of embodied practices, and also identifies some of the specific somatics techniques that design methods were based upon. Values are listed in the left most column and somatics techniques are listed in the last row of the table. For more information on body-based disciplines, a list of contemporary Western somatics practices can be found in Appendix B in Volume II of this thesis.

	Chapter 5 From the Inside Out **whisper**	Chapter 6 Designing with Breath **exhale**	Chapter 7 Somaesthetics of Touch **soft(n)**
VALUE			
Self	Body-state Physiological data	Body-state Breath Inner awareness	Self-through-touch Active touch Tactile intention
Attention	Sensory listening Inner - Outer Kinaesthesia Proprioception Movement	Attention to Breath Kinaesthesia Fullness - Emptiness Inter-subjectivity & awareness through shared breath	Tactile Attentions • Intention • Sensation • Quality - Meaning • Content: Pressure, Duration, Path
Experience Qualities	Inner World Rhythm of "life" Joy - Melancholy Expansion - Contraction	Imagination Stillness Connectedness Empathy	Sensuality Intimacy Pleasure Play
Inter-Connection	Body-Data • Within self • Between other • Choice to share • Create extended body	Breath Relationship • To self • Receive from other • Choice to "hold" or "contain" • Create Larger Whole	Tactile Relationship • To object • To self • To other participant • To space
Somatics Systems Applied	Butoh • Slow motion walking Arsenal of Theatre • De-specialization • Sensing self • Moving self Contact Improvisation • Weight, Flow • Gesture Affordance	Body-Mind Centering Kinetic Awareness • Attention to breath (Redirection) • Slowing movement (Suspension) • Expansion (Letting-Go) • Wholeness	Laban Effort-Shape Movement Analysis • Quality • Attention • Intention • Decision/Choice • Continuity/Progression

Table 4. Embodied Values and Somatic Techniques Used in Case Studies

4.4 Data Gathering Methods Applied within Case Studies

The case studies present evidence in the form of rigorously documented design processes that illustrate the multi-faceted techniques applied within embodied design while simultaneously grounding the development of the theoretical framework. Evaluation of the process is based on interpretations of the assumptions, methods and outcomes. The table below summarizes the data gathering methods applied within the case studies.

Data Gathering Methods applied within Case Studies
• Case Studies o Design Processes in Interactive Art o Collaborative interweaving o Research Through Art ▪ Documentation of Process ▪ Narrative Analysis of Process
• Elements of Design Process Used o Experience Prototyping o Concept Development o Physical Prototyping o Materials Selection o Form Design o Interaction Design o Experience Testing
• Methods of Data Acquisition o Workshops o Questionnaires o Participant Observation ▪ Videotaping ▪ Photographs ▪ Journaling o Interviews
• Methods of Analysis o Transcription o Comparative Data Analysis o Video Analysis for Gesture and Meaning o Narrative Analysis

Table 5. Summary of Data Gathering Methods applied within Case Studies

Outcomes are equally balanced between the theoretical framework of embodied methodologies and the artworks created within the framework. This example of research-through-art is applied in the context of experience-design of personal, wearable and social interaction and is illustrated in the following Chapters.

Observation plays a critical role in all research and inquiry and is central to first, second and third person methodologies. Knowledge can be gained by sharing observational strategies and techniques. In my research, the first-person embodied methods used within the case studies are "blended" with second and third person observation. Varela and Shear,[6] suggest that there is a need to harmonize subjective first-person methodologies by building appropriate *links* with third-person studies. Introducing second-person positions is one such link. For Varela and Shear the specific nature of the first-person methodology is crucial. They state that we need to provide rich and subtly inter-connected descriptions so that the questions of "How do you actually *do* it?" [the question of technique], "Is there evidence that it *can* be done?" [the question of expected outcome],"If so what are the *results?"* [the question of visible change in body-state that can enable validation], can be answered. The rich descriptions suggested by Varela and Shear are supplied in this thesis through the process of documenting design processes, experiences and explorations. Each of the case studies incorporates supporting material and data available in Appendices C (whisper), D (exhale) and E (*soft(n)*). The case studies presented in Chapters Five, Six and Seven illustrate and answer questions of technique, outcome and validation, and do so through the exploration of embodiment and experience. This follows from the pragmatist approach of William James, in which "analysis respects experience"[7].

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[6] See Varela, F.J., & Shear, J. (1999), op. cit., p. 2.
[7] Jacques Barzun in his Forward to William James' *The Varieties of Religious Experience,* see James, W. (1999). *The Varieties of Religious Experience*. Modern Library, p. vi.

5

From the Inside Out

"Body-Mind Centering merges the conceptual and experiential, shifting between observing and embodying. From this union arises an understanding, from the inside out of how an individual is doing or being anything."
Bonnie Bainbridge Cohen[1]

"*Workshop is the active research phase of the performance process... Probably the most prevalent kind of workshop is used to "open people up" to new experiences, helping them recognize and develop their own possibilities."*
Richard Schechner[2]

"To workshop something is to produce a prototype or experimental model." *Richard Schechner*[3]

5.1 Introduction

Bonnie Bainbridge Cohen describes embodied experiential practices as merging the conceptual with the experiential: shifting between observing and embodying. This concept follows the design process of *whisper*: a wearable interactive art installation based on co-experience of body-state data. The interaction and concept design for *whisper* came about as a result of a series of five 'experience discovery' workshops in which participants shifted between observing and embodying, exploring first-person observation through their senses, their body-state and their shared experience.

This chapter characterizes the design and enactment of these workshops describing the embodied processes that were employed in their development. It provides context for the workshops in two ways: 1) by describing the whisper installation developed from the workshops, including its exhibition and its design timeline, and 2) by

[1] Cohen, B.B. (1993), op. cit., p. vii.
[2] Schechner, R. (2002). *Performance Studies*. London, UK: Routledge, p. 199.
[3] Ibid.

presenting a background of prior research in performance and body-based explorations applicable to the design processes presented here.

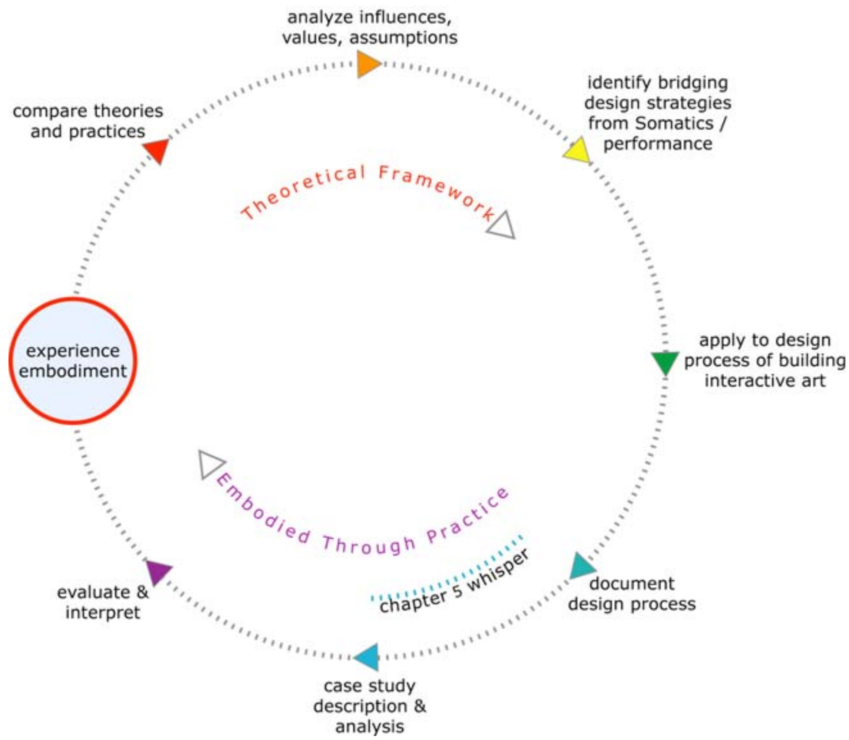

Figure 24. Focuses on Somatic Processes in the Design of whisper

Following contextual and background materials, this chapter describes the five exploratory workshops and their results, summarizing the somatics techniques, values and experiences elicited through participants.

To conclude, it highlights the outcomes of the workshop process. The outcomes illustrate the application and instrumental value of the embodied techniques that were employed in the design of technology. These include: an interaction model, a description of gestural interaction that enabled design of affordances for ‘connectivity’ and ‘communication’, the wearable garment design and the wearable art installation.

The interactive artwork *whisper*, like each artistic and creative endeavor has moved through a full design-creative-implementation cycle; this chapter focuses specifically on processes of ideation and exploration that occurred at the beginning of its lifecycle.

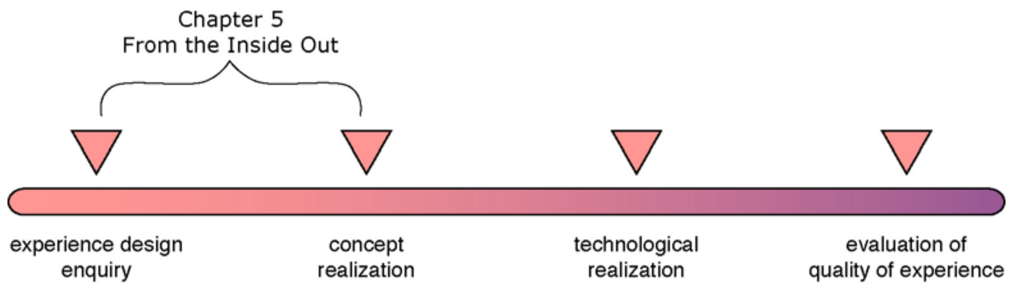

Figure 25. Focuses on Experience Discovery for Exploratory Concept Design

5.2 Artistic Context and Background

One of the major themes of *whisper* is the notion of 'paying attention' to one's self, and using this sense of self or body-state to connect and exchange with another. This requires an *experience* of 'inner' space or intimacy with oneself and an ability to recognize and transfer this 'sense of self' to another person. These types of experiential descriptions are qualitative and uniquely expressive: interactions that afford intimacy, choice, privacy, affect and connection. How can a *system* create a willingness, a trust, the 'suspension of disbelief' required to enter into an exchange of information that is otherwise private and 'unknown'? To explore these questions of experience we turned to performance and somatics methodologies. For example, techniques for extending our bodily awareness through attention to breath and movement are common to performance methodologies found in theatre, dance and body-based disciplines. The techniques within these domains build both intra-body and inter-body experience and knowledge through technical exercises that focus on our *perception* of our own physical data. This includes having access to, and agency over our own breathing, our own heartbeat, our own thoughts, and our own body state. In the whisper installation this is accomplished by measuring physiological data such as heart rate and respiration. This body-data, not normally within our awareness, is mapped as a representation of our self. *whisper* allows us to bring attention to our own body-state and to effect how our body data is displayed, exchanged, and shared.

5.2.1 *whisper* is a Wearable Public Art Installation

whisper is a real-time interactive public art installation based on small wearable physiological sensors, micro-controllers, and wireless network transmission, embedded in evocative and playful kimono like jacket-garments worn by the participants. *whisper* is an acronym for [**w**earable, **h**andheld, **i**ntimate, **s**ensory, **p**hysiological, **e**xpressive, **r**esponse **s**ystem]. Focusing on body state represented through participants' breath and heart rate, whisper aims to monitor physical data patterns of the body, mapping heart and breath physiological data onto linked and networked devices worn within a specially designed garment. *whisper* collects breath and heart rate data from the bodies of participants, and through visualisation and sonification techniques, enables participants to interact, interconnect, and interpret their own and other participants internal data in playful and responsive ways.

Figure 26. *whisper* Garment (left) and Gestural Interaction (right) DEAF Festival

The wearable installation is the outcome and testing ground for an experience modeling methodology described in this Chapter. *whisper* has been exhibited at

DEAF03, the Dutch Electronic Arts Festival, in the public lobby of the Schouwburg Theatre, Rotterdam, in February and March 2003, at Future Physical's Respond festival, in Cambridge, UK in March and April 2003, and at the e-culture fair at the Amsterdam Paradiso in October 2003. Up to six participants are able to listen to and affect their own body-state represented by their physiological data (breath and heart rate). They are also able to connect to and exchange their physiological data with other participants in the interaction space through gestures, which enable connecting, listening and exchanging.

5.2.2 *whisper* Design Process Timeline

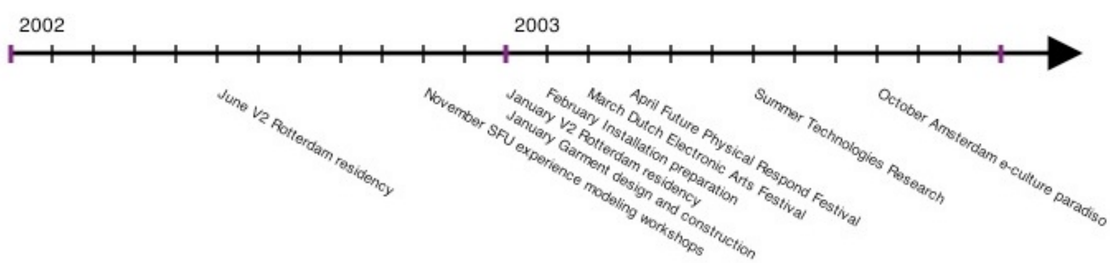

Figure 27. Design Timeline for whisper installation (workshops Nov 2002)

The *whisper* design process timeline is illustrated above. The *whisper* project was developed in collaboration with V2_Lab in Rotterdam during 2002 and 2003. As the principle investigator and artistic director of the project, I worked collaboratively with a rich interdisciplinary team of artist-engineer-designers in the design and development of the artwork[4]. The workshops presented within this case study were held in November 2002 in Vancouver at Simon Fraser University. The outcomes of the workshops included an interaction model and technology design.

[4] *whisper* credits for collaborators and funding support can be found online at <http://www.sfu.ca/~tschipho/html/artDesign.html> scroll down to 'whisper: wearable body architectures'.

5.2.3 Prior Research in Performance, Theatre and Workshop Processes

Chapter Three illustrated the rich interdisciplinary range of experiential qualities that are contained and explored within the HCI literature. In partnership with design for experiential qualities, Human Computer Interaction has engaged a range of practices in performance, theatre and dance. Movement and physical techniques such as body-storming, role-play (Rodríguez, Diehl & Christiaans**,** 2006), and the imaginative world of open-ended play, fun,[5] game-design,[6] props (Strom, 2002), personas and scenarios (Shyba & Tam, 2005) intersects with a number of performance techniques and strategies. Brenda Laurel's *Computers as Theatre* was an early acknowledgment of the place of Theatre in the world of computer technology[7]. A recent issue of *Interacting with Computers* published a special issue on the emerging roles of performance within HCI and interaction design (Macaulay, Jacucci, O'Neill, Kankaineen & Simpson, 2006) in which the editors acknowledged the impact of performance practices on user experience, participatory design and the role of embodied interaction. Continuing with the theme of embodiment, Moen (2005) has explored dance as a basis of kinaesthetic interaction as have others (Ebenreuter, 2006; Kjölberg, 2004; Larssen, 2004; Loke, Larssen, Robertson & Edwards, 2007). Improvisation as a tool for interaction has been explored in Hayes-Roth (1995), theatre as a research tool by Morgan & Newell (2007), and forum theatre as used in requirements gathering and usability (Newell, Carmichael, Morgan & Dickinson 2006; Rice, Newell & Morgan, 2007).

Previous research in the use of exploring experience / performance methods within the HCI community has occurred in the domain of Forlizzi and Ford's exploration of user-centered and participatory design (Forlizzi & Ford, 2000). Also included are Buchenau

[5] Blythe, M.A., Monk, A.F., Overbeeke, K., & Wright, P.C. (eds.) (2003). *Funology: From Usability to Enjoyment*. The Netherlands: Kluwer Academic Publishers.
[6] Wardrip-Fruin, N., & Harrigan, P. (2006). *First Person: New Media as Story, Performance, and Game*. Cambridge, Massachusetts: MIT Press.
[7] Laurel, B. (1992). *Computers as Theatre*. Cambridge, Massachusetts: MIT Press.

and Suri (2000) exploration of *experience prototyping* that fosters an “empathetic” and “embodiment” approach to user-centered and scenario-based design. At Interval Research, Burns, Dishman and Verplank (1994) explored *informance*: informative performance and *bodystorming*: physically situated brainstorming, *repping:* re-enacting everyday people’s performances, and explorations of how low-tech solutions can create a design environment that focuses on the design question rather than the tools and techniques. Scaife, Rogers, Aldrich, and Davies (1997) also developed the concept of Informance Design. Salvador and Howells (1998) shifted the focus group methods to something they called Focus Troupe: a method of using drama to create common context for new product concept end-user evaluations. Simsarian (2003) has explored the use of role-play in extending the richness of the design process. In the *Faraway* project, Andersen, Jacobs, and Polazzi (2003) explored ‘suspension of disbelief’ within a context of play.

Theoretical foundations for designing experiential systems including phenomenology and reception aesthetics (Dourish, 2001; Davis, 2003); the introduction of technology as experience that takes into account the emotional, intellectual and sensual aspects of technology (McCarthy & Wright, 2004); a framework for user experience as it applies to the design of interactive systems (Forlizzi & Battarbee, 2004); and the designer’s role in co-constructing meaningful experiences (Höök, 2004). The turn to experience includes recognition of the bodily matters in the context of technology design. Understanding the value of the body within embodied interaction has been explored in: bodily aspects in CSCW (Knörig, 2007); design themes illustrating how bodies matter (Klemmer, Hartmann & Takayama, 2006); teaching embodied interaction design (Klemmer, Verplank & Ju, 2005); and responding to a user’s internal body state (Tsukahara & Ward, 2001). Weiser’s (1994) definition of invisible computing includes a return to the 'whole person' focusing on experience[8]. Contributions to the discourse of embodiment in technology include the body in everyday life (Nettleton & Watson, 1998). As technology extends its ubiquity, embedding itself more deeply beneath the surfaces of our environment and the surfaces of our skin, it remains material (Hallnäs, Melin & Redström, 2002).

5.3 *whisper* Experience Workshops: Practicing the Self

The *whisper* experience workshops were born from the desire to explore how people engage in the act of 'paying attention' to themselves: their senses, their inner state[9] and their 'world'. The initial intention was to explore whether such an activity could be meaningful: could it have instrumental value in an interactive technologically mediated 'experience'? Based on the act of self-observation that exists simply for its own sake, would people willingly engage and connect in a meaningful way with themselves and with others? In many ways this proposition is extraordinarily simple. Although self-observation, reflection and mindful attention are highly active and purposeful activities, their association with instrumental and purposeful activity in relationship to technological exploration for experience is not well understood. Yet, as we have seen in Chapter Two and Three these questions are central to the comprehension and instrumentality of embodiment within performance and somatics practice. The existence and knowledge of these practices underscored this research and enabled access to a rich, technical, and rigorous set of practices that could be applied to the exploration of experience, with the goal of *Practicing the Self*.

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[8] Mark Weiser (Xerox Parc, Palo Alto) is recognized as coining the term *Invisible Computing*, and in his UIST'94 invited talk, he describes the "humanist" origins of Invisible Computing in post-modern thought.

[9] Neuroscientist, Antonio Damasio defines body state as a constellation of interconnected feeling, thinking and thought propensities (which he terms as thoughts of certain themes). Damasio links body state to a 'feeling configuration'. He posits "a feeling is the perception of a certain state of the body along with the perception of a certain mode of thinking and of thoughts with certain themes". Somatics techniques are based on a similar instrumental regard for the somatosensing basis of body state. See Damasio, A. (2003). *Looking for Spinoza: Joy, Sorrow, and the Feeling Brain,* New York: Harcourt Books, p. 86.

5.3.1 Workshop as a method of Experience Discovery

Within performance processes, workshops have a specific set of functions, which include methods of exploration and discovery that are directed toward the development of new material, or bringing new life to repertory. Richard Schechner, a performance studies practitioner and scholar has written:

> A workshop is the active research phase of the performance process... Probably the most prevalent kind of workshop is used to "open people up" to new experiences, helping them recognize and develop their own possibilities.[10]

In the context of this research, workshops were designed as a formal, scripted experience in which specific physical and experiential concepts are explored, tested and documented for the purpose of developing a set of legible experiences. The workshop material was applied to the design of an interaction model for an interactive wearable art installation. The term workshop is borrowed from its performance context, where a script or form is 'acted out' and 'acted through': it is explored with the intention of testing, developing and iterating a performance or theatrical model.

> To workshop something is to produce a prototype or experimental model. [11]

In the case of *whisper*, the theatrical model also becomes the interaction model and technological model: it includes a set of experience concepts such as intention, gesture, direction of attention, relationship, rhythm, body-state, and attitude to space. This model creates a formal container for experience that includes a physical as well as technological description, and is a process that enables an evaluation, assessment and analysis of the formal relational elements that operate successfully or unsuccessfully in the construction of that experience.

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[10] Schechner, R. (2002). *Performance Studies*. London, UK: Routledge, p. 199.
[11] Ibid.

5.3.2 Experience Through Attention and Movement

The workshops focused on exploring experience through attention and movement. Activities were modeled using a broad range of performance techniques such as improvisation, props, phantom partners, prosthetic devices, ritual space, and placebo objects. **Attention** was used actively and incorporated listening, directing attention and tactile awareness; imagining and visualizing; focus on somatic attributes such as breath, heartbeat, stillness, slow motion movement; journaling as hand-writing and drawing; social navigation using gesture and touch to express permission, trust, exchange, and feeling; and costumes and props to express physical extension, connection and group identity.

The goal of the workshops was to model **experience** that could be re-enacted, and re-played in the context of a public art installation using wearable computing technology. The design goal of the public art space was that it could be simultaneously intimate, playful, and social, while enabling the development of a level of awareness of 'our selves'.

The **movement** processes were improvised and re-enacted by observing participants' interaction in various contexts. As an aspect of active movement, 'gestural protocols' were created and imagined by the workshop participants during playful engagement. This playful movement became the basis for *gestural protocols* which supported the design of the body to body network protocol and the wearable garment, including the design of connection points, placement of wearable computers, sensors, wiring paths, and visual display systems. Movement exploration was used to codify interactions that represented acts of intention and data sharing used in the public art installation.

Workshop activity engaged the sense of self or *body-state* to connect and exchange with another. This formed the basis for enabling the development of an interaction model. This required participants' *experience* of an 'inner' space or intimacy with oneself and an ability to recognize and transfer this 'sense of self' to another person in social and playful ways.

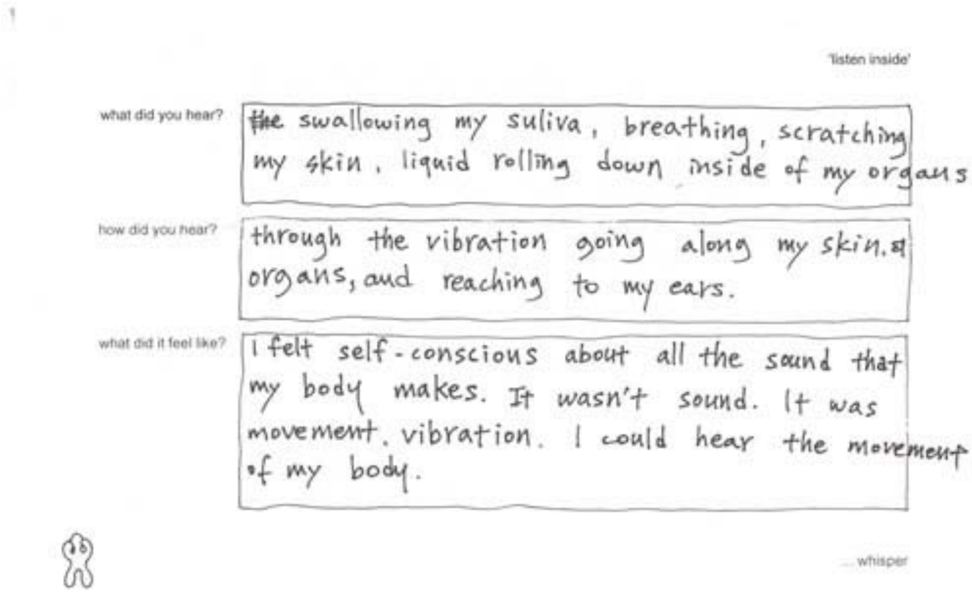
Figure 28. Workshop Participants illustrating *connection* and *extension*

5.4 *whisper* Workshop Design: First Come First Play

The interaction-model and concept design for *whisper* was developed as a result of the series of five 'experience discovery' workshops in which participants explored first-person observation through their senses, their body-state and their co-experience with others in a shared space.

The workshops were designed in the following manner: Each workshop had up to 12 participants with a maximum duration of about 45 minutes. Participants were students and employees at Simon Fraser University and participation in the workshops was assigned on a *first come first play* basis. Invitations were e-mailed to the University School community each week, with a simple subject line such as “invitation to listen”, where <listen> is the title of the workshop. The recipient list included faculty, graduate students and university staff. Invitations gave a specific time and location, and expected duration (less than an hour). Technical information was purposefully left out of the e-mail exchange and workshop formats, creating an affective, metaphoric, poetic and open-ended framework for the invitations. The workshops took place once a week over 5 weeks. Each workshop was divided into two components or exercises that encompassed an overall theme represented by the name of the workshop. Each exercise was based on clearly stated tasks represented by the theme. For example, the exercises in the first <listen> workshop were called: *listen inside* and *listen outside*. The theme of *inside* and *outside* was repeated during the workshop series, and referred to an *inward* attention, and an *outward* attention.

The facilitation of the workshop followed a script, and attention was paid to using everyday non-specialized language. The five themes/names of the workshops were *listen, between, mutate, extend* and *phase*. After each segment (first half or second half) of a workshop the participant was asked to write their experiences on a single card, which included two to three simple open ended questions. Participants were given time to write, note or draw their experiences in long-hand written “journaling” form. The workshops were conducted in an open circular space delineated with ‘theater black’ curtains. The workshops were videotaped and photographed throughout.


'listen inside'

what did you hear? ~~the~~ swallowing my suliva, breathing, scratching my skin, liquid rolling down inside of my organs

how did you hear? through the vibration going along my skin. organs, and reaching to my ears.

what did it feel like? I felt self-conscious about all the sound that my body makes. It wasn't sound. It was movement. vibration. I could hear the movement of my body.

... whisper

Figure 29. Participant Response card example from "listen inside"

Figure 30. Participant Completing Response Card

5.4.1 *whisper* workshop <listen>

In each of the following workshops, I describe a selection of workshop experiences extracted from the overall experiences of the group. Examples are extracted to illustrate and provide analysis for the influences that participant experiences had on the design of the later *whisper* installation. Participant experiences influenced interaction design, garment design, network design, media design and system integration.

<listen> themes: listening | awareness | body-data | self to self

As we have seen, one of the major themes of *whisper* is the notion of 'paying attention' to one's self. The *whisper* installation centers on accessing body-data as a representation of one's own self: data that most people are not aware of in day-to-day life. The first series of experiences relate to how we perceive and act upon shifting attention to our own state: having access to and agency over our own heart rhythm, our own breathing, our own thoughts and our own body.

Figure 31. Workshop <listen> materials for '*listen inside*'

The experience of paying attention to our own body-state was prototyped in the <listen> workshop. Participants were asked to walk around until they found a place for themselves in the space. They were asked not to speak. A facilitator gave each participant a pair of earplugs and they were then left alone with themselves with no further instructions for about 15 minutes. At the end of that time the earplugs were collected and each participant was handed a card. The card asked the questions: What did you hear? How did you hear? What did it feel like?

Figure 32. Workshop <listen> participant '*listens inside*'

In the space of experience, this is the simplest of experiments. By depriving the body of its external hearing we become aware of the internal sound that is otherwise drowned out by the louder external sounds. We are removed from our own ears, but not from our hearing.

In performance practice, artists like Pauline Oliveros and Augusto Boal have created practices such as "deep listening"[12], and "listening to what we hear"[13], which probe and access these very same questions of experience.

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[12] Pauline Oliveros describes *deep listening* as "listening in every possible way to everything possible no matter what you are doing. Such intense listening includes the sounds of daily life, of nature, or one's own

The responses to the question on the cards: What did you hear? focus on this deep relationship to listening. Responses indicated the participants' discovery of the internal soundscape.

> *Heartbeat; earplugs as they settle, breath, slapping sounds from others in the room; humming noise; myself; contact with my own body*

This process of listening seems to trigger varied feelings and emotions ranging from slight unease or discomfort to feelings of elation and discovery in the answers to the question: What did it feel like?

> *I felt self-consciousness about all the sound that the body makes; it wasn't sound; it was movement, vibration. I could hear the movement of my body*

> *Normal, I'm alive; invigorating - breath going in and out with "normal" rhythm, and changing properties*

Some workshop participants were able to shift their internal awareness to recognize that listening occurs not only through the ears, but also through the bones, the resonant cavities of vibration in the body, that the body is a metaphor for listening, and that, what is heard is not only sound: but movement, vibration, feeling, and sensation.

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thoughts as well as musical sounds. Deep Listening represents a heightened state of awareness and connects to all that there is. As a composer I make my music through Deep Listening." See <http://www.deeplistening.org/pauline/>.

[13] Augusto Boal has developed an entire 'arsenal' of exercises for retraining the senses and de- and re-sensitizing the body so that it can dehabituate patterns to enable greater freedom of action and expression, included in these are "listening to what we hear", see Boal, A. (1992), op. cit., p. 88-105.

Figure 33. Workshop <listen> participants '*listen outside'*

The second portion of the <listen> workshop was named *listen outside*. After removing the earplugs from the previous exercise, participants were given blindfolds, asked to 'not speak' and were asked again to simply listen. This exercise was given a 15 minute duration. The removal of the earplugs and the direction of attention to the physical sounds, and to the room itself, created a slow outward movement in many of the participants. Rather than standing or sitting very still, as was the norm in the previous exercise, many crawled along the floor or along the edge of the curtained space, tapping, whistling, coughing or giggling. Some participants sought each other out, reaching and touching, moving slowly and intently.

Figure 34. Workshop materials including blind-folds '*listen outside'*

Exercises which are designed to *exclude* one of our senses, in order to enhance another sense, are a part of the rich material and techniques of many performance, theatre, and body-based disciplines. For example, Augusto Boal's *Arsenal of the Theatre of the Oppressed* includes a set of exercises named *the blind series.*

> In these exercises we voluntarily deny ourselves the sense of sight in order to enhance the other senses and their capacity for perception of the outside world.[14]

Elsa Gindler also uses this approach to shift attention from the monopoly and habitual dependence upon sight:

> In most instances, and especially during the beginning sessions, we work blindfolded so that each person is trying, by himself, to determine [his or her own information] … Suddenly, each student is working in his own fashion. That means each one in the class works differently, with a pervading concentration and quiet that would be the envy in many lecture halls.[15]

Listen Outside enabled participants to work with themselves, *from the inside out,* in order to gather impressions, perceptions and information about the world. These kinds of experiences can often bring out the embodied nature of imagination, of sweetness, and of poetic simplicity. This is exemplified by the participant's response in the card illustrated below… **what did you hear?**

> *birds (trying to sound like shoes) …*

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[14] Boal, A. (1992), op. cit., p. 106-116.
[15] Gindler, E. (1995), op. cit., p. 7.

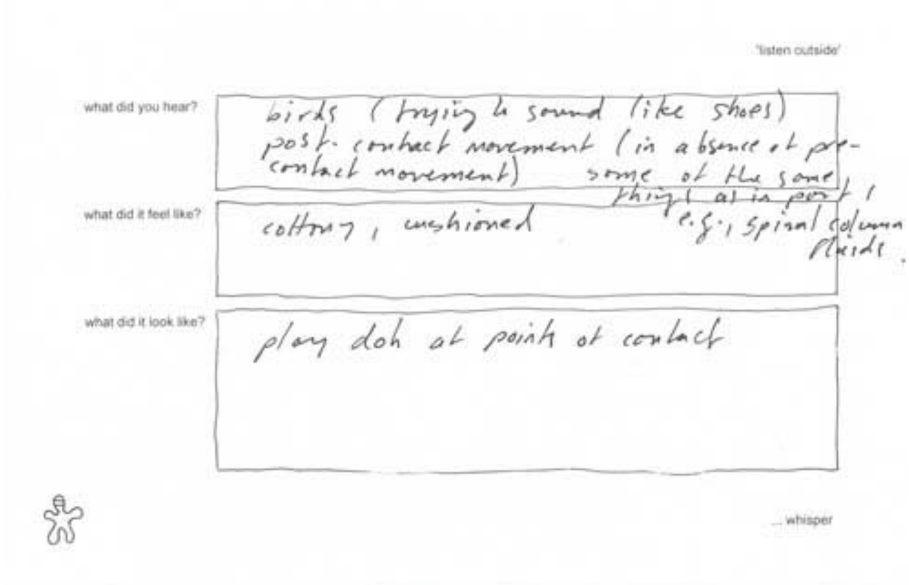

Figure 35. Workshop <listen> Response Card: *"birds trying to sound like shoes"*

5.4.2 *whisper* workshop <between>

Each workshop followed upon the next and was designed based upon the nature of experience and understanding that emerged from the previous workshop session. In this sense, the workshop planning followed Philip Agre's (1997) and Suchman's (1987) alternative and improvisational form of planning, countering a hierarchical view of process.

> Before and beneath any use of plans is a continual process of moment-to-moment improvisation. "Improvisation", as I employ the term, might involve ideas about the future and it might employ plans, but it is always a matter of deciding what to do *now.* Indeed the use of plans is a relatively peripheral phenomenon and not a principle focus here.[16]

The workshops were seeded with the intention to explore attention, self and experience, and followed one upon the other by observing, participating in and re-considering the material that arose from each workshop process. In this way the workshops themselves were also a form of reflection-in-action[17].

[16] Agre, P.E. (1997), op. cit., p. 8.
[17] Schön, D.A. (1983), op. cit.

<between> themes: awareness | attention | sending - receiving | self 2 other

The first workshop focused on the ‘self-to-self’ relationship of body-state and body-data. The *whisper* installation would also enable co-experience and connection with other participants. Therefore the ability to transfer data to another person and the willingness to enter into an exchange of information that is otherwise private and ‘unknown’ was another primary theme for the *whisper* workshops. In order for such a transfer to be negotiated, the participant needs to engage and invite trust not only to the other, but also to the ‘listening’ self. Following from this the workshop <between> investigated the ‘invisible’ transfer of personal data, and trust of the self and of other.

At the beginning of the workshop, the participants were asked to find a space for themselves and begin to move in slow motion, as slowly as possible. They were left to move very slowly for a period of 10 minutes without speaking.

Figure 36. Slow Motion Walking workshop <between>

As introduced in Chapter Two, slow motion walking is utilized in movement practices such as Butoh; this technique is utilized to enable the body to shift its attention to an immersive state in relation to its environment, what Csikszentmihalyi (1990) would term ‘flow’, where attention is intensified, and sensory details are sharpened.

The workshop participants were then asked to pair up, with one person selecting the role of *the sender*, and the other selecting the role of *the receiver*. The sender was asked to silently create an image for two minutes, and then 'send' the image to the receiver, while the receiver was asked to simply pay attention to 'listen' for what image 'came to mind'. At the end each participant was handed a card with the questions: What did you send? What did you receive?

> What did you send? *"A stick cat!"*
>
> What did you receive? *"Not sure, could be a small dog"*

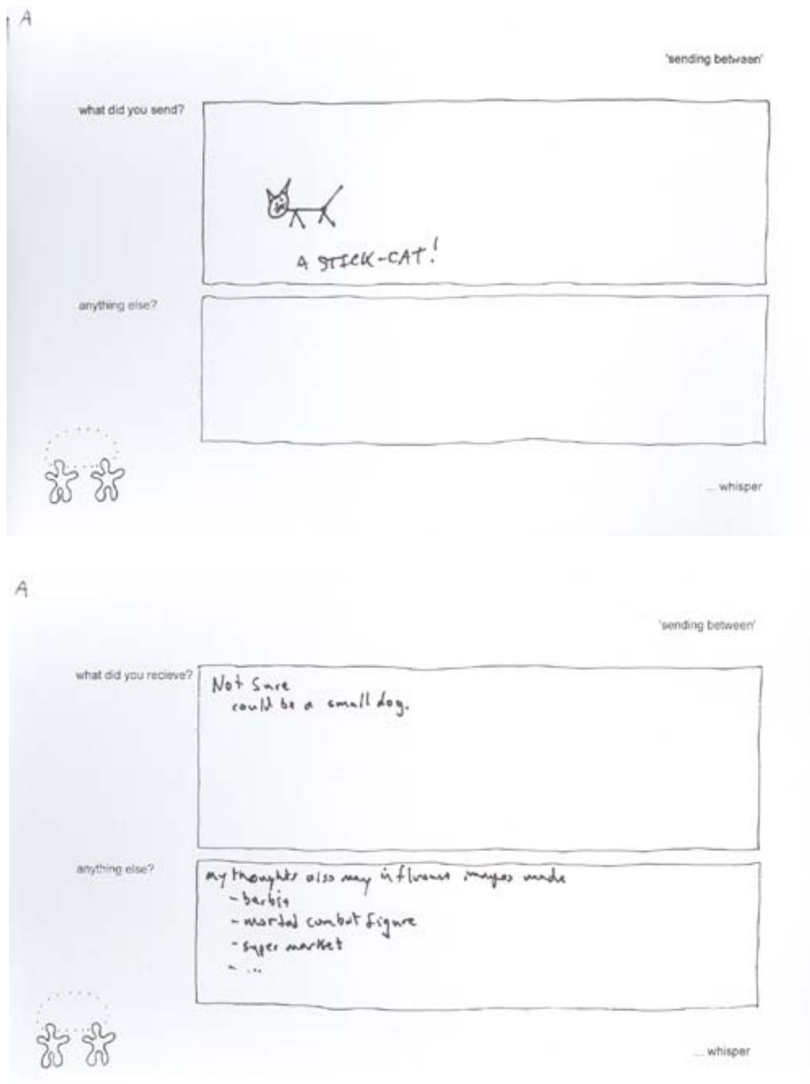

Figure 37. Response Cards workshop <between> "a stick cat, not sure a small dog!"

5.4.3 *whisper* workshop <extend>

The previous workshop engaged communication and exchange between partners in a quiet and inner way. By reflecting upon the results of this previous workshop, the need emerged to *extend* the exploration of exchange and communication into a more open physical and social connection. The next workshop was named <extend>. We wanted to support the transference of private, internal and personal data to another person, exploring how gesture and object or prop could support the negotiation of willingness to enter into a private exchange of information.

<extend> themes: transfer | sharing | play | self to other

In a public space of exchange the participant needs to invite trust with the other, and also engage in a level of agency as to whom, and where, this exchange takes place. We wanted to continue to investigate these issues of privacy and trust using physical objects that could mediate the interaction through physical gesture. We created a workshop experience we called <extend>, which augmented the invisible data with a "non-digital amplification device", in the form of a stethoscope. Participants were given ordinary medical stethoscopes and a small booklet with ten identical blank pages.

Figure 38. Stethoscopes used to exchange and <extend> self & shared body data

On each page there was space to write or draw and each page had the questions:

Where are you listening? What did you hear?

> *I felt like I was inside myself the pounding amplified my perception of myself, yet my breathing made me feel close*
>
> *My friend stood up and tried to hear my heart, it was hard, I heard my heart; I heard low voices.*
>
> *Overall – rather than feeling strong & secure I felt shaky, unsure – when the stethoscope came back I was instantly feeling secure again.*

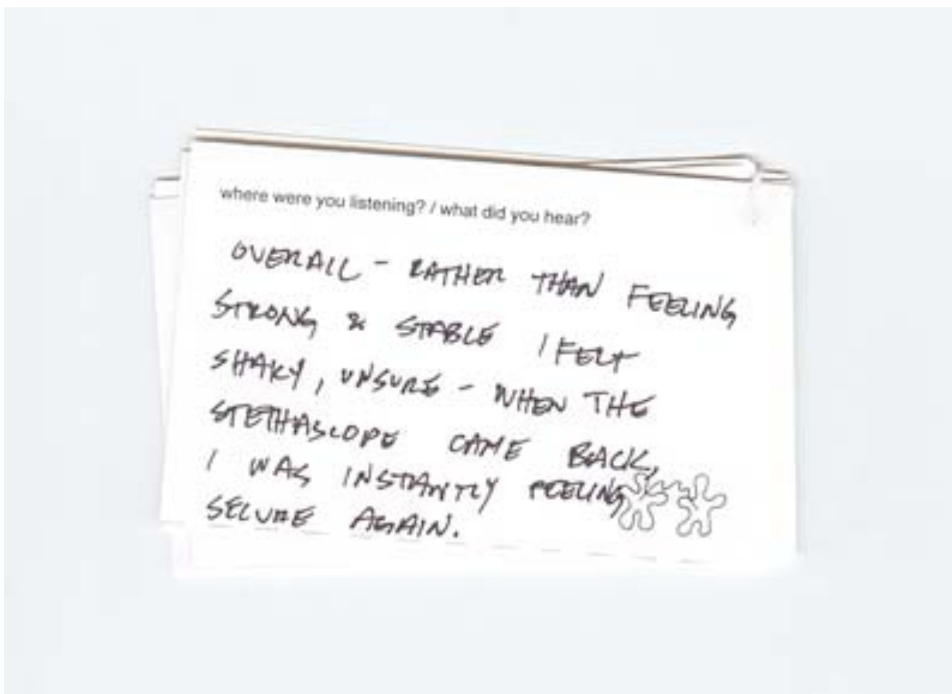

Figure 39. Response Cards workshop <extend> sharing body data

By introducing the stethoscopes we gave access to another type of body data. More importantly, we introduced the possibility of sharing this data with someone else. The design of the stethoscope with a ‘listening’ end and a ‘probing’ end allows for the data to be shared by either *probing* someone in order to investigate their data, or giving someone the earpiece to *offer* them a particular sound.

This was an important discovery, that an object or device could be inverted and it's meaning would be substantially shifted. The gesture of *offering* inverts the interaction model of *probing* or surveillance. The act of *offering* is also an act of self-agency. The act constructs a *meaning* of invitation. Invitation is not a demand, nor is it a probe; it affords intimacy, trust, and peer connection. Another discovery was the coupling between intimacy, safety and the possession of object itself: holding the object could create a sense of safety and security. This is evidenced in the card response above.

5.4.4 ***whisper*** **workshop <mutate>**

The previous workshop illustrated meaning and affordances created by sharing, agency and connection. By introducing the possibilities for sharing we immediately encounter interaction concepts of permission, surveillance and thresholds of privacy. The <mutate> workshop was designed to further develop these concepts, and experiences in a social interactive space.

<mutate> themes: permission | control | exchange | touch | connection

While the previous workshop used stethoscopes to share heart data, the <mutate> workshop introduced Galvanic Skin Response [GSR] data, and investigated thresholds of boundary, agency, and control. In addition, during the first portion the participants were given 'costumes' in order to explore 'wearing' as interaction and 'garment' as interactive device.

In the first exercise of the workshop the participants were given oversized white men's shirts that were attached to one another like 'Siamese Twins' by simple sewing [basting] at various locations such as along the seam of the sleeves, along the back shoulder seam, and along the seam at the cuffs. Each shirt pair had a unique contact seam; no two pairs were connected identically.

Figure 40. Workshop <mutate> Exploring Transfer | Play | self to other

The participants were instructed to put on the shirts and button them up. This is a difficult task that requires the participant pairs to cooperate and coordinate, both physically and socially, and it also necessitates close proximity between the participants. A series of movement related tasks followed. One of the tasks presented was to hand out small Velcro sticky squares, and invite participants to ‘stick’ them onto locations on their shirts or bodies. Following this, participants were asked to ‘connect’ with each other using the sticky Velcro locations. As in each workshop experience, the participants were given cards to fill out following the exercise.

Figure 41. Workshop <mutate> Using Velcro to create connections & greater whole

An example of the challenges in allowing this physical proximity is present in an answer to the question: How did you change?

> *'I wouldn't have gotten that close/intimate under normal circumstances'*
>
> *'Became more receptive to others; going from a closed network to a network constantly in change.'*
>
> *'My forms in relationship to others changed. I was more able to focus on points of connection rather than on social relationships. In other words, because the connection was available, it was like an invitation. It became safe to touch the person at that location.*

In the second half of the workshop the participants were grouped again in pairs and given primitive boards that measured GSR. The boards were constructed in such a way that one of the participants was wearing the sensors [simple metal points of two fingers] and the other had the output [a red LED] pinned on the shirt and connected to the board with a long wire. As the GSR values shifted the red light brightened or dimmed.

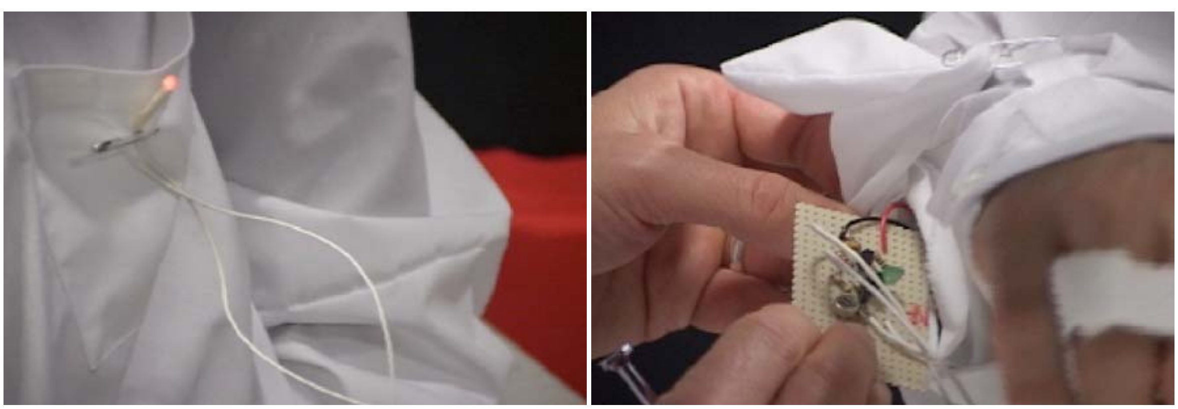

Figure 42. Workshop <mutate> Using GSR as connection sharing affective data

The participants were also given small booklets asking the question: What did you feel?

> *'As an observer, a recorder, an instigator, responsible'*

Here we see an example of one type of response to this particular sharing situation. The first responder classifies him/her self as the passive observer of the other, but since the output of the GSR is closely related to emotional excitement, this observer also feels involved and responsible. By taking the responsibility of the data output a participant also takes responsibility for the one that is observed.

A new set of experiences and behaviors began to emerge in this workshop with the addition of GSR, a 'technical' tool of observation. Participants began to 'distance' themselves from their partners, or to 'protect' themselves from being seen, witnessed or monitored. They seemed to associate the technology itself with a 'third-person' view.

> *'I do not know, Dennis is not showing me my output, I will attempt to limit my input to nil, to avoid detection'*

This is an example of another group of responses. The observed party feels exposed by the observer not allowing access to the output data and as a consequence the observed participant will deliberately try and influence the result. In this way the observed party changes the rules of engagement, hiding from the probe, and continuing to negotiate a site for agency within the system. This is an example of behaviour which positions the interactions of 'emotional probing' within a 'game-like' structure.

5.4.5 *whisper* workshop <phase>

The previous workshop highlighted the intensity of connection that can occur through connection and clothing. By creating objects or costumes that allow certain movement for connection 'gestural protocols' that facilitate sharing and exchange bring about a potential blurring of the boundaries between the participants as well as between what is inside and what is outside.

<phase> themes: extension | body image | creating one larger body

The next exercise is investigating this blur, as we modified the men's shirts by sewing an 'extra' long piece in each arm so that the shirts became 'clown-like' with arms that extended almost to the floor. We asked participants to put on the men's shirts again. The participants were then encouraged to experiment with moving and improvising with the 'shirt object' alone and with one another. Free form exploration and improvisation was encouraged. We asked 'how many ways' can you move within this shirt? We observed various possibilities for movement and control.

Figure 43. Workshop <phase> Exploring Movement as Connected Whole

The cards asked the questions: How did you extend yourself? How did you move?

> How did you move?: *'Held hands with someone other than my husband; became silly; enjoyed the unusual and unknown; became aware of another's movement'*
>
> How did you move?: *'I found myself thinking of our 'body' as a complete unit - it just had this other piece I wasn't controlling; the attached arm felt very unusual once I got complete control back'*
>
> How did you move?: *'I was no longer just myself, I had to extend myself to become a part of a whole; as a whole we had to work together; when we failed it was almost disappointing because we were apart'*

Here we see several examples of body extension. Participants became very 'attached' to the connections with one another, and were able to view themselves as a 'larger body'. It is interesting to see the apparent disappointment when the appropriated body becomes separated or the combined body fails to complete a movement task. The offering and sharing of emotional connection, when given by choice from an interaction perspective of personal agency, created meaning and intent, as well as feelings of loss as well as pleasure. The participant responses point to the presence of agency, movement, and attention within experience, and its potential for full, rich and meaningful interaction.

5.5 *whisper* Workshop Outcomes: From Experience to Interaction

We opened this chapter by describing embodied experiential practices as merging the conceptual with the experiential: shifting between observing and embodying. This concept has followed the design process of *whisper*: a wearable interactive art installation based in co-experience of body-state data. The interaction and concept design for *whisper* came about as a result of the series of five 'experience discovery' workshops presented here. Participants explored first-person observation through their senses, their body-state and their shared movement experience.

The *whisper* workshops were intended to illuminate and validate how we could use first-person attention, and self-observation as a basis from which to extend and connect to others. The concepts explored were applied metaphorically, physically and structurally to the exposition of the *whisper* interactive art design[18], implementation and exhibition.

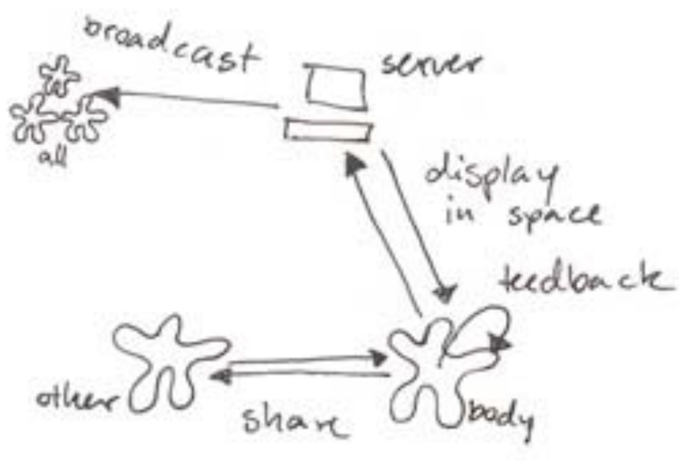

Figure 44. Example of Interaction Model -- State Spaces: Self to Self | Self to Other

Specific outcomes of the workshop process include: 1) an interaction model, 2) the wearable garment design 3) the wearable body area network implementation and 4) the space and media design of the installation. The garment enabled interaction modes of self-to-self, self-to-other and self-to-group within a wearable body area network.

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[18] Interaction Design concepts were introduced by the author in collaboration with Kristina Andersen, in Schiphorst, T., & Andersen, K. (2004). Between Bodies: using Experience Modeling to Create Gestural Protocols for Physiological Data Transfer, *Proc. CHI 2004 Fringe,* New York: ACM Press, also refer to Appendix C full documentation of Interaction Model and Workshop Design Process.

The table below summarizes the Design Techniques that were applied within the *whisper* experience workshops.

Summary of Design Techniques within whisper experience workshops
• Attention was incorporated as listening, 'sending' invisible messages, movement and touch to connect to one's self and to another. • Focus on somatic attributes such as breath, stillness, and slow motion movement supported development of attention skills. • Movement was utilized as an expressive indicator of intentionality, body state, extension of body image, permission, control, exchange and play • Imagining and visualizing were used to explore movement vocabulary. • The workshops were modeled using a broad range of performance techniques. • Improvisation was used in each workshop, improvising movement and stillness, engagement and privacy • Props such as Stethoscopes, earplugs, blindfolds, heart monitors, GSR sensors were used to create relationship and enable expressivity. • Men's oversize white shirts became phantom partners, prosthetic devices and placebo objects. • The simple 'black box' curtained circle became a ritual space. • Journaling through handwritten comments and drawing was used as a method of documenting, archiving and expressing.

Table 6. Summary of Design Techniques used within whisper workshops

The workshop 'experience discovery' process results propelled us to design for experience within the installation. We continually came back to the main theme of the workshops, and the artistic aim of the installation: 'paying attention' to one's self enables greater access to optimal experience. The workshop responses illustrated that the body can become a metaphor for 'listening to the self', and that what is heard extends beyond sound, to movement, vibration, feeling, sensation, and our inner processes.

Figure 45. Gestural Interaction in the Installation

Listening became a kind of ‘attending to’ in which participants could shift their internal awareness to extend beyond listening ears, through to the bones and the resonant cavities of vibration in the body, and to body-state, sensation and action. The workshops met their goal of modeling experience that could be replicated, re-enacted, and re-played in the context of a public art installation using wearable computing technology, where the public art space was simultaneously intimate, playful, and social.

Figure 46. *whisper* Garment Combines Movement with Embedded Connectivity

The *whisper* workshops explored numerous somatics and performance values and techniques, which are summarized in the table below.

	Chapter 5 From the Inside Out **whisper**
VALUE	
Self	Body-state Self-Observation Physiological data
Attention	Sensory listening Inner - Outer Kinaesthesia Proprioception Movement
Experience Qualities	Inner World Rhythm of "life" Joy - Melancholy Expansion - Contraction
Inter-Connection	Body-Data • Within self • Between other • Choice to share • Create extended body
Somatics & performance Systems & Techniques Applied	Eastern and Contemplative Practice • Slow motion walking Kinetic Awareness (Gindler) • Directed Attention to self • Heightening sensory awareness, blindfolding, earplugs Arsenal of Theatre – (Augusto Boal) • De-specialization • Sensing self • Listening to what we hear • Internal Rhythms • Moving self • Placebo Objects, props • Clothing/Costume as extension of self Movement Improvisation (Blom & Chaplin) • Speaking Body - Body Parts • Building Trust and Sensitivity • Movement Quality • Silence • Group Work – Multibody movement Contact Improvisation – Attentive Movement Practices • Weight, Flow, Trust, Awareness • Gestural Affordance Rupert Sheldrake • Seven Experiments That Could Change the World

Table 7. Summary of Somatics Values and Techniques used in *whisper*

5.5.1 Interaction Design: from Workshop to Installation

The workshops were the basis of the concept design and interaction model resulting in the development and implementation of the *whisper* installation. The workshops made it possible to probe and investigate the underlying interaction issues during the hardware and software development process. Table 8 summarizes how workshop outcomes were transferred and applied to the design process of the *whisper* interactive installation.

One of the examples from the workshop outcomes cited in Table 8 below is the importance for each body to have agency over its interaction with itself and with others. This was represented through physical control and access to a body's privacy of their own data and state. It was also represented through the ability to choose, select and allow shared play and exchange of their own body data. When applied to the *whisper* garment design this enabled: self-to-self communication, self-to-other sharing and exchange and self-to-group connection for multiple participants. These connection points were perceived through 'tactile feeling' rather than visual symbol or natural language interface, and are described below as one specific example of workshop outcomes applied to installation design.

Work shop		Installation	
Self to Self			
Ear-plugs Blindfold	Directing attention to inner state – body data	Introductory Guide Process Participant Listens to their own body data	Installation was 'staged' in 3 stages: 1) preparation, 2) self, and 3) others. During Stage 1 a *Guide* assists participant with putting on garment and describes its function and use. This is intimate and one on one. Duration is about 5 minutes.
	Identity	Garment Design: Each participant has Individual LED pattern on sleeve Space Design: Individual Pattern is projected onto floor. Each participant has their own visualization 'pool'	Stage 1: a participant 'recognizes who they are' and can visually identify themselves on their garment through an animated LED pattern. The same 'identity icon' represents themselves in the system, and this icon is animated with changes in their body-state: changes in their heart-rate and breath within the system
Slow motion walking	Stillness Intimacy Preparation	Participant tests garment paying attention to their own body data on sleeve, and visualized in space moving slowly at first to understand experience	Stage 2 – participant explores their own data and experiments with their heart rate and breath testing connecting points. Each participant begins with their 'own visualization pool' and can witness and explore direct effects of their own data through visualization and sonification thereby understanding and identifying themselves IN the system
Self to Other			
Velcro Sticky Patches	Extension Connecting to other body	Garment design 'snaps' and 'islands'	Stage 3 – Participant 'connects' to other person's data. Participants 'effect' upon one another can be witnessed and altered through visualization and Sonification change
Stethoscop e	Permission Agency Privacy Exchange	Giving and Receiving, Offering and Sharing, Choice	Garment 'snap-islands' created with different background textures to enable choice and navigation through 'tactile feeling'
GSR	Permission Agency Privacy Control	Design for 'taking data back to self' with snaps	Participant could 'detach' self from other's data by connecting snaps to self-locations on garment. This would enable Participant to view only their own data in their visualization pool.
Self to Group			
Creating Larger Group	Play Connect and become a part of a Larger Group Body	Design for enabling multiple participants to playfully connect 'snap to' one another creating a single data body	Design of 'gesture' protocols for connecting so that participant could 'wrap arm around' self in order to connect to self, and 'open arms to other' in a 'dance partner style' to connect to an other, and 'improvise' in a 'twister' like game format for larger numbers inviting playful movement
Broadcast			
		Design for Server Communication	Server Data is Broadcast back into space into 1) visualization pools, and 2) Sonification pools

Table 8: Summary of Workshop Outcomes Applied to *whisper* Installation

Figure 47. *whisper* Garment Interaction During Installation

5.5.2 Garment Design: Tactile interface for connecting

A tactile ‘snap’ interface was designed within the kimono style wearable jacket as a direct consequence of the workshop explorations in control, agency, and intimacy. The interface consists of a set of wired clothing snaps attached to the right hand fingers of the participant and a series of tactile ‘islands’ placed in various positions on the wearable device. These islands are small identification chips wired up to matching sets of snaps. By touching the snaps of an island with the finger-snaps the participant can choose and mix between the different sets of body data coming from his or her own body.

Figure 48. Garment Design | Snaps | Connection

The islands are made from materials of different textures, such as terry-towel, suede and soft white leather to allow the participants to select and navigate shared data through 'the feel of touch'.

Figure 49. Snap Islands "Textural" Recognition

This is one of a number of examples cited in Table 8 that supports and validates the instrumentality of the workshop processes. This chapter has explored embodied interaction as a reflective process that is simultaneously inter-body and intra-body. The *whisper* case study has focused on experience discovery for exploratory concept design[19]. The experience with the installation has shown that participants can learn to

[19] Additional material that describes the whisper project can be found in Appendix C, in the accompanying DVD, and also in extensive online website documentation. Appendix C contains design documents, whisper interaction model, workshop data, and workshop transcriptions. The accompanying DVD contains two whisper videos: the first illustrates how the workshop material effected and seeded the installation and

shift their own threshold of attention, awareness and body-state through the interaction. They participate in “becoming expert” users of their own physiological data. As such the installation is also its own experience workshop, and is a starting point to continue to explore methodologies of experience modelling.

follows the structure of this Chapter, and the second video illustrates the whisper installation in its exhibition in Cambridge, UK during the Respond Festival. The web documentation is contained on following web pages: <http://www.sfu.ca/~tschipho/html/artDesign.html>, <http://www.sfu.ca/~tschipho/whispers/index.html> and <http://whisper.iat.sfu.ca/process.html>.

6

Designing with Breath

"One must first come to know, through observing oneself—just what one does with breathing."[1] *Elsa Gindler*

"Clothing is like a language's lining... Language and clothing are intimate technologies indeed."[2] *Jean-Claude Guedon*

"The work with breathing starts with sensing the inner atmosphere of our organism—the basic stance we take to ourselves and the world."[3] *Dennis Lewis*

6.1 Introduction

This chapter, *Designing with Breath* extends and focuses the exploration that began with the *whisper* research. It *extends* the whisper research by working more closely with materials, fabric, texture, sensuality and the concept of 'wearing the self'. It *focuses* the *whisper* research by working solely with breath as a physiological source of information and by exploring breath more specifically in the context of experience.

This chapter describes the design process of *exhale,* the third in a series of interactive wearable art installations. While *whisper* visualized body-data 'from the inside out' projecting it onto localized light-sonic pools, *exhale* positioned its actuators beneath the linings of skirts. As such *exhale's* expression of breath was palpable yet 'invisible', mapping breath data to vibration through small motors and the micro-movement of air

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[1] Gindler, E. (1995), op. cit., p. 9.

[2] Jean-Claude Guédon points to the relationship between our clothing, technology and communication in *Nothing to Wear,* a review of the Banff New Media Insitute's Intimate Technologies Summit, by Jean-Claude Guédon translated by Timothy Barnard, *Horizon 0, Issue 4, Touch, private-public* (retrieved August, 2006) <http://www.horizonzero.ca/textsite/touch.php?is=4&file=2&tlang=0>

[3] Lewis, D. (1998). The Tao of Natural Breathing: For Health, Well-Being and Inner Growth. Delhi: Full Circle.

through small fans sewn beneath the linings of skirts. This shift from public to private ‘viewing’ of data created an intimacy that was unseen by others, yet felt palpably by the self. The exploration of breath as experience was developed through design process that included workshops, concept development and implementation.

This chapter characterizes the concept of *Designing with Breath,* focusing on sensory experience in the design of *exhale.* It provides context for this research by describing the artistic context for *exhale* in relation to the experience design process of interaction and exhibition, and by presenting a background for embodied practices of Designing with Breath.

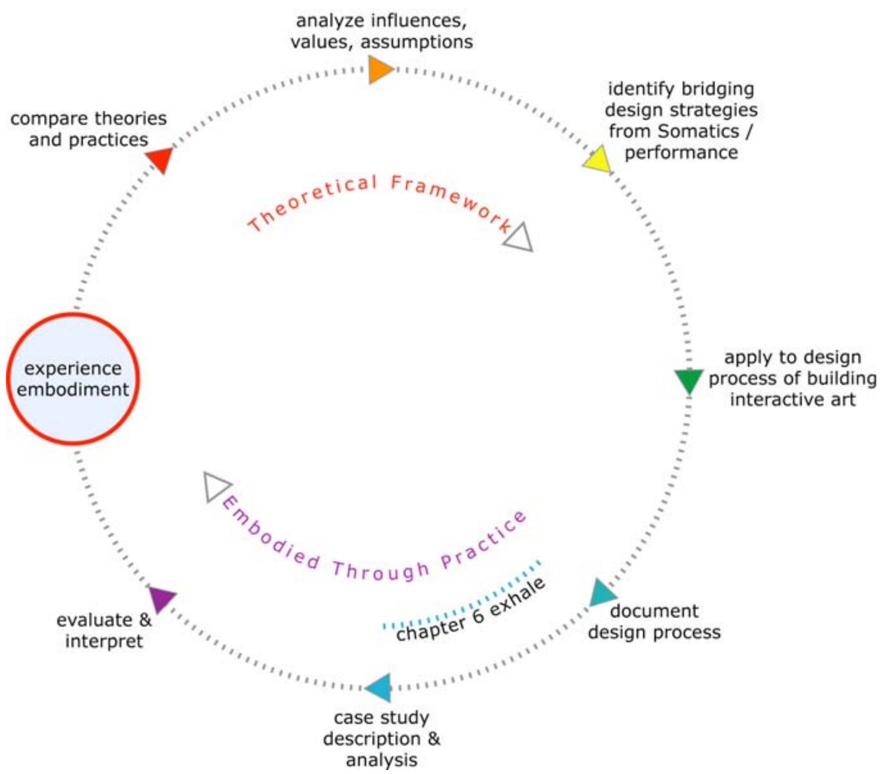

Figure 50. Focuses on Sensory Experience in the Design of *exhale*

Following contextual and background materials, this chapter describes the processes of *Designing with Breath.* This will be illustrated through an analysis of the heart[h] workshops, a series of three exploratory workshops applied during the concept refinement and technology development stages of the design process of *exhale.*

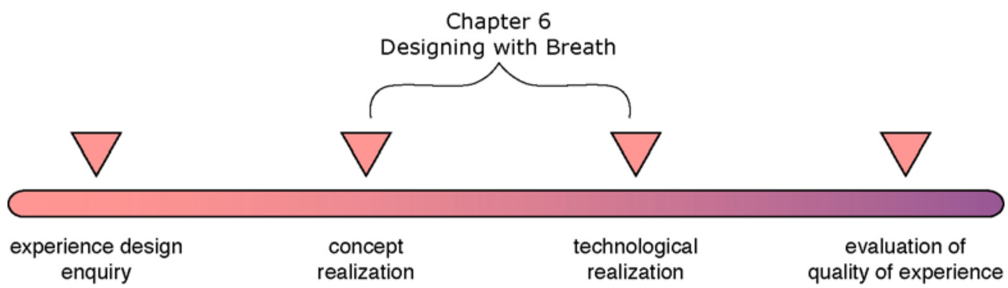

Figure 51. Focuses on Sensory Experience for Concept and Technology Design

The heart[h] workshops occurred at a later stage in the design cycle than the *whisper* workshops viewed in the previous chapter. As such they employed partially operational prototypes including garments and breath sensors that could support greater understanding of the technical processes and constraints involved in designing with breath. As introduced in Chapter One, technical processes include first-person access to the self as well as the computational processes of technology. The workshops incorporated reflection-in-action in relationship to experience, validation and critique. The analysis of the heart[h] workshops is explored through the lens of the embodied *values*, identified in Chapter Two: the values of self, attention, experience, and inter-connectedness.

To conclude, this chapter highlights and summarizes outcomes of *Designing with Breath* illustrated within the heart[h] workshop process, demonstrating concept realization and technological implementation. Again, these outcomes substantiate the instrumental value of embodied techniques, offering examples of how the material properties of technology and experience can support the aesthetics of meaning-making through technology.

6.2 Artistic Context and Background

Designing with Breath, explores the design process of *exhale,* an interactive wearable art installation. In *exhale*, breath, skin and clothing come together within a set of evocative and sensual skirts that are embedded with body-area-networks that exchange and elicit breath within a shared network. There are two central design themes in *exhale* that are summarized by the concept 'wearing our breath'. These themes are: 1) the use of breath as a somatic indicator of state, and 2) the exploration of material, movement and fabric within interactive garments that move with us, that express our selves through strategies of hiding and revealing, and that work with breath to support identity, connection and communication. Aligning with the artistic goal of *whisper,* the underlying concept of *exhale* is cultivating self-observation in such a way that body-state can be observed and shared with others in a networked environment. As described in Chapter Two, many physical techniques in somatics and performance use breath as a mechanism to direct attention to our own physical processes. Within these frameworks, attention to breath is experiential, and can increase self-efficacy.

exhale was the third of a series of wearable prototypes that included *whisper* and *<between bodies>*. In *exhale,* breath is used to actuate small vibrators and fans sewn into the linings of skirts. *exhale's* breath data actuates physical vibration and the micro-movement of air on or close to the skin. The placement of these actuators beneath the skirt lining explicitly hides them from the visual sense. In this way *exhale* explores the *legibility* of physical actuation (such as vibration) *without* dependence upon visual perception.

exhale was exhibited at Siggraph 2005 Emerging Technologies, Olympic Games Showcase, Canada Pavilion, Torino 2006, Future Fashion in Pisa in 2006, and the Digifest Mod Festival, Toronto, Canada, May 2006.

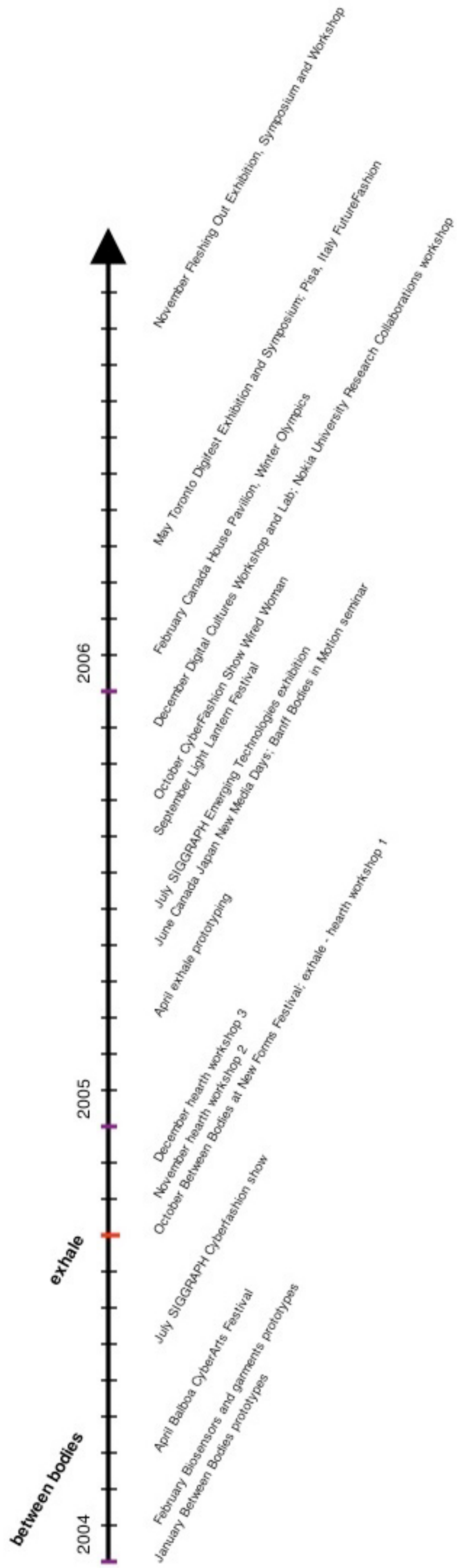

Figure 52. Design Timeline for *exhale* development (heart[h] workshops Fall 2004)

6.2.1 Breath

The artistic concept of *exhale* is based on the act of 'wearing our breath'. Revisiting the simple act of 'paying attention' to one's self, and using this sense of self or body-state to connect and exchange with another, the play between self and others in *exhale* creates a group 'ecology of breath'. Breath lives within the body and is *worn* on the body, shared from self to others through the garments within the network. Breath expresses a state of rhythm and intention. Breath is a marker for representation: mapped through navigation, selection and interaction. Breath is used as a metaphor for synchronizing and coordinating the giving and receiving of data.

Figure 53. Workshop Participant exploring Breath and Sensing in heart[h] workshops

The importance of 'concepts of breath' has been acknowledged throughout Eastern and Western History. Eastern concepts of *care of breathing* are central to the cultural and religious practices of Tibet, China, India and Japan. Breath practice was important to the ancient Egyptians. Ancient Hebrew uses the word *wind,* the breath, in the context of *soul.* The Latin verb *spinare*, to breath, is contained within words such as *respiration:* continuous breathing, and *expiration*: our last breath, and in the words *spirit* and *inspiration*. The ancient Greeks used the word *diaphragm* to indicate the mind in addition to its use to indicate breathing. The pneuma (breathing) theory dominated the healing arts and philosophy during the first century A.D. In the West, interest in breathing was renewed through the teaching of Francois Delsarte in Paris. As introduced in Chapter Two, Delsarte lost his singing voice through poor training and turned to the exploration of movement. Simultaneously, he undertook the study of breathing which became an integral part of his system of movement education.[4]

Within our bodies, breath is a source of information, as well as a pattern in which to communicate that information. Our bodies' respiratory system is directly connected to the body's sensory nerves, so that any sudden or chronic stimulation coming through any of the senses has an immediate impact on the force or speed of our breath. It can stop it altogether[5]. Intense beauty, for example can "take our breath away"; fear "stops us in our tracks"; deep contentment is often accompanied by fuller, more languid and more rhythmically connected breathing.

We can – within limits – intentionally hold our breath, lengthen or reduce our inhalation and exhalation, breathe more deeply, and consciously alter our respiratory patterns. Breathing is both autonomous and conscious, and can move between these

[4] Carola Speads, a student of Elsa Gindler who brought Gindler's work to America. Speads focused on breathing techniques, as quoted in *Carola Speads,* Johnson, D.H. (ed.) (1995). *Bone, Breath and Gesture, Practices of Embodiment*. Berkeley: North Atlantic Books, p. 38-39.

[5] This is documented widely across neuro-physiological, psychological and contemplative practice with breath, see for example: Rama, Ballentine, R., & Hayes, A. (1979). *Science of Breath: A Practical Guide*. Honesdale, Pennsylvania: The Himalayan Institute Press.

two physical control systems of the body. The process of exhaling is a process of release and letting go: 70% of the body's waste products are eliminated through the respiration cycle.

Breathing in concert with another physically shifts and synchronizes body state, enabling an inter-subjective sharing of state-data represented through physiological signals, and synchronized through attention. At times of physical duress or trauma such as death, illness, emotional distress, and states of intimacy, human bodies can instinctually connect with another by synchronizing breath. This is evident in birthing and dying processes, during high-performance athletic physical training, in meditation techniques that calm and quiet the body and in the work of pain therapists that use attention to re-direct the body's proprioceptive state. It is an instinctual response for infants, parents or lovers to synchronize breath to share state information.

The neurophysiologist, Antonio Damasio has studied the connection of 'feeling states' and asserts that a given state is associated with specific physiological patterns (such as breath rhythm) along with a set of processes including thought patterns and emotion. His research indicates that body-state is an inter-connected set of feeling, thought, emotion and physiological functioning: each of these being present and affecting the other[6]. The induction of body-state can be brought about through attention to *any* one of the inter-connected patterns: so that attention to physiological patterning (for example breath) can induce a body state, and conversely, attention to other associated patterns, such as the occurrence of certain thought patterns can also induce the body state[7]. This inter-connectedness between physical data, and the state of the body creates a complex but coherent set of body-data.

[6] Damasio, A. (2003). Looking for Spinoza: Joy, Sorrow, and the Feeling Brain. New York: Harcourt.
[7] Ibid.

What does this mean in the context of the design of technologically mediated experience? Designing with the concept of body-state enables us to initiate ‘state conditions’ from physiological patterns of the body. Breath can be an access point for contacting and sharing state data between bodies. In their rigorous exploration of the technical practice in ‘On Becoming Aware’, Depraz, Varela and Vermersch[8] provide examples of using breath as an initiator of ‘epoche’ in the suspension-redirection-letting go cycle of directing attention within the body. Augusto Boal describes the exercises of bringing attention to breath as working to bring health to a system “that has fallen into neglect, so that one isn’t aware—[it has] become mechanized”[9]. Synchronizing breath enables a tuning of the natural and proprioceptive systems of the body, as breath is both autonomous and consciously controlled. We synchronize breath in order to align communication non-verbally.

Poetically, breath has been attributed to the notion of life force or the presence of life in non-organic objects. In William Goyen’s, novel, *The House of Breath*, memories from childhood are attributed with breath, and the notion of intention, thought and breathing as being one and the same:

> “Through the mist that lay between us it seemed that the house was built of the most fragile web of breath and I had blown it – and that with my breath I could blow it all away.”[10]
>
> *William Goyen, House of Breath*

The beauty of this poeticism is that it is also echoed in concepts occurring in disciplines as diverse as neuro-science (Damasio’s neuro-physiological assertions of body-state and body-maps), and Yogic teachings of Pranayama and the Science of Breath, where breath, thought and intention are also seen to form a coherent union.

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8 Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 216-219.
9 Boal, A. (1992), op. cit., p. 101.
10 Goyen, W. (1999). *The House of Breath*, Triquarterly Books.

6.2.2 Wearing Ourselves

> Clothing is peculiar in the sense that it conceals in its very conspicuousness and reveals what it appears to hide…[11]

Figure 54. *exhale* Networked Skirts Illustrating Breath Sensor, RFID and LEDarray

Another central artistic concept in *exhale* is that of *wearing ourselves*. In *exhale* we *literally* wear our breath beneath the linings of our skirts. The breath-band adorns the ribcage creating a physical caress through a textured cut of fabric that is sensed and felt as it *captures* our breath through its presence. Individual breath is revealed in the linings of the skirts. When two or more participants breathe 'in concert' with one

[11] Guédon, J-G., op. cit.

another it is revealed on the LED-array on the skirts surface, as it shimmers in brightness and dims with each exhale. Our clothing expresses properties of adornment, revealing, concealing, sensuality, pleasure, intimacy and containment.

Figure 55. Actuators such as Vibro-tactile Motors and Fans are Sewn Beneath the Lining

An artistic goal is to develop a flexible, pliable, material interface that can support expressive non-verbal interaction in the context of a wearable or ubiquitous environment. Ubiquity and wear-ability bring our technologies closer to the surface of our body, and sometimes even under our skin. These technologies are metaphorically drawing us closer to ourselves. Mobility sustains movement.

> Clothing is like a language's lining… Language and clothing are intimate technologies indeed.[12]

[12] Ibid.

Our colloquial language uses phrases such as “she wears herself well”, “he wore a smile”, and the well-rendered phrase “I am wearing my heart on my sleeve”. These phrases point to ways in which the body has its own tendency to *reveal* inner states. They are often intimate and personal aspects of the self: affective and feeling states that express the concept of *wearing the self*. To wear the self is the body’s way of communicating its own knowledge and being.

Figure 56. *exhale* Explorations with Fabric, Texture and Movement

6.3 heart[h] workshops: Exploring Breath, Skin and Clothing

Many design attributes of *exhale* were founded upon the successful outcomes of *whisper*. In *exhale* these features have been used as a basis for strengthening and developing practice. For example, the *whisper* experience workshops presented an enormous resource for structuring, documenting and extracting methods of designing for experience. The *exhale* workshop processes (which were given the name of heart[h] workshops) borrowed from the ‘best-practices’ of the *whisper* experience.

Best Practices Applied to heart[h] Workshops
o Workshop sessions are formatted to contained two segments: a 'first-half' and a 'second-half' that complemented each other in terms of content and context, and were structured through a 'script' which enabled a flexible yet directed session. o Rigorous documenting of workshop processes to include video, photographs and exit response cards. o 'Experience-focused' exercises from Somatics and Performance such as slow-motion walking, stillness, attention to senses and sense-states, attention to body-data such as breath, heart-rate, temperature. o Directed improvisational movement to evoke relationship and inter-connection. o Props such as blindfolds and breath-sensors to elicit attentional attitudes within the body. o 'Imagination' and 'visualization' engage suspension of disbelief and to engage participants in their own 'stories'. o Costumes and garments as a mechanism for movement expression. In *whisper* these were men's oversized white shirts. In the *exhale* heart[h] workshops these were the skirts that had been constructed and tested prior to the heart[h] workshops.

Table 9. Best Practices Applied to heart[h] Workshops

The heart[h] workshops also included additional material that was not addressed or included in the original *whisper* experience workshops.

heart[h] Workshops Material Differences from *whisper*
o Additional documentation including participant observation drawings and written observations as well as video-exit interviews.
o In addition to participants that represented 'every-day bodies', the heart[h] workshop also included dancers, who were considered 'expert-users' of movement and body-based techniques.
o The use of partially operational prototypes including breath-bands connected to a network that could sonify and visualize breath data.
o The heart[h] workshops position in the *exhale* design cycle enabled them to be used for concept refinement and technological implementation, rather than 'ideation' and 'concept discovery'.

Table 10. heart[h] Workshops Differences from *whisper*

In addition, one of the key observations resulting from the *whisper* installation was that the visual nature of the output (projected in light pools), although highly sensualized, has a propensity to draw attention out of the self and into the space. For this reason, one of the design goals of *exhale* became an exploration of ways to express body-data in a palpable yet non-visual way. This was not intended to remove visual pleasure, but to explore other forms of physical output that could engage the more proximal and intimate senses: the sense of touch and hearing. This goal also aligned with the concept of 'invisibility' and the legibility of state data that can be represented in a non-visual form.

There were three heart[h] workshops, held on October 12th, November 9th, and December 7th, 2004. Workshop participants were a group of undergraduate fourth year students at the School of Interactive Arts and Technology at Simon Fraser University, and a second group of dancers and performers from the Vancouver dance community. Each of the three student workshops had approximately 25 participants that were divided into documenters and workshop ‘performers’. Documenters had the following tasks: video-taping, photographing, participant observation ‘drawings’, and participant observation ‘hand-written’ observations. All participants were briefed for approximately 15 minutes prior to the workshop. All workshops began with a stillness session in which participants were simply very quiet.

The heart[h] workshops employed partially operational prototypes including garments and breath sensors that could support greater understanding of the technical processes and constraints involved in designing with breath. Technical processes included embodied techniques of the self as well as the computational processes of technology. The workshops incorporated reflection-in-action in relationship to experience, validation and critique.

Figure 57. Workshop 1: Exploring Experience Using *exhale* Skirt Prototypes

Figure 58. Workshop 1: Participants Putting On *exhale* Skirts

The first heart[h] workshop used *exhale* skirt prototypes along with 'directed improvisation' to explore participant movement and interaction in the skirts. The two components of the workshop were 'Something Living in the Skirt', and 'Something Living Between the Skirts' which used skeins of elastic as props for 'making connections'. The purpose of these workshops was to explore participants' responses to 'invisible' yet palpable inner activity in the linings of the skirts, and the concept of networked connections between skirts. The workshop explored movement and interaction that was born from these two propositions.

Figure 59. Workshop 1: Exploring Experience of Something Living in and between the Skirts

Figure 60. Workshop 2: Exploring Sensory Experience of Resonance Within

The second heart[h] workshop extended the experience of the skirts to exploring sensory body-data experience including breath, and was called ‘resonance within’ and ‘resonance without’. The workshop structure mirrored the original *whisper* experience workshops, incorporating blindfolds, sensory imagination, and ‘breath-band’ placebo props that participants explored as a mechanism for sharing data.

The third heart[h] workshop explored breath data between participants using digital breath-bands that were networked and connected to sonification software.

Figure 61. Workshop 3: Breath Sensing with Breath-bands: Partners back to back

The following summary of the heart[h] workshops data is explored through the lens of the embodied *values*, identified in Chapter Two: the values of self, attention, experience, and inter-connectedness. These are only a small sampling of responses that illustrate the experiences elicited by exploring breath and 'wearing the self' but are indicative of the richness and imagination of experience.[13]

6.3.1 heart[h] workshops: the Value of Self

The participant responses illustrated the richness of the experience of the self, and the fullness of imagination at play within these short timeframes of exploration. The self is related to identity, and to a sense of oneself as a 'continuous' experience. The Varieties of User Experience are evident here with qualities that range from peaceful and serene, to verging on ecstatic, to uncomfortable, and sometimes even distressed. Workshop participants commented about their shifting sense of self:

> *Self-awareness, my sense of being; calm and insight towards myself*
>
> *Inside brings out the individual and the private. Your own individualism swayed the masses.*
>
> *Singularity inside a group; the ability to retreat and reflect*
>
> *Emptiness. Maybe I'm not alive. Was I alive? Was it just a dream and I'm just afraid of losing data? Wasn't afraid/scared of doing anything because I don't' even feel myself anymore. It's great. It felt like I was glowing and I push the air away. Or I glow bigger and brighter and stronger when I hold on to myself. It was from within, spreading out flowing from inside me. I think people can see it.*
>
> *My brain went empty and I all I could hear was the sound (NOT MUSIC!) I held myself together or find my most comfortable position to help the data grow. I think if it glows enough it'll transmit to somewhere. Or not transmit, just, like a watercolor. It spreads like water. I move like I'm a paper with watercolor all over me.*
>
> *When I took the blindfold off, I still wanted to close my eyes, to stay within – I noticed a feeling of 'home' in the skirt – of having the skirt hold me in ever-loving arms – my pulse was safe inside the skirt, my movements became larger – easier – I felt at home in the space.*

[13] For a complete set of response cards, observations, data transcriptions, and workshop analysis, see Appendix D: heart[h] workshop data.

6.3.2 heart[h] workshops: Attention, Awareness

The workshops were scripted to draw attention to the senses and to sensory experience, which often created an opening of experience and space. In the participant responses the focus on breath evoked the most notably expansive experiences. The following participant comments are all in relationship to working with breath and breath sensing:

> *Awareness*
>
> *Relaxing; centered*
>
> *I felt as though I was in an endless space. There was nothing on my mind aside from the occasional itch that I would feel.*
>
> *A sense of suspension; the illusion of singularity in a group of people; A unification of breathing tempo*
>
> *A moment of peace, just for a moment*
>
> *A feeling of resistance and occasional acceptance and lapsing in and out of relaxation; self-awareness*
>
> *Seemed like an extended sense of self-awareness moreso than just listening to breath*
>
> *A sense of relaxation traveling up my spine an eerie experience*

6.3.3 heart[h] workshops: Experience

The second workshop focused on sensory experience through the body. Participants described the moment of 'letting go' and the state of flow and connection that Depraz, Varela and Vermersch describe.

> *Uncertainty and questions arose. Then tolerance came and "let go" more free, careless; senses enhanced with curiosity instead of uncertainty and questions. With curiosity came exploration.*
>
> *The data flows in my body as if it is a stream, a stream that wants to explore and contact to another stream*
>
> *I felt a flow, a counter clockwise spinning from the base of my spine. I spiraled around and inside my body. At time it felt hot, this happened when I concentrated on it.*
>
> *It flows like a river*

Focusing on my body data I felt the urge to spin with the flow. I would turn counter clockwise as I walked.

6.3.4 heart[h] workshops: Inter-connectedness

The three workshops explored different aspects of inter-connectedness based on sensing, movement and their relationships with the garments. These first responses are from the first workshop in which participants explored the connection between themselves as a 'network' in the skirts:

I felt some kind of connection between myself and others; It was a connection not only between two people, but also the entire group.

The connection between me and other participants; couldn't control myself freely so I simply let go

It seemed like commotion; one action would trigger a whole chain of other actions; the interconnectivity grew and shrank to its own will, guided by reactions from within

The next responses are selected from the third workshop in which participants explored the connection between themselves and breath:

Loneliness, only not lonely because of the connection to the other person behind you

A sense of suspension; the illusion of singularity in a group of people; A unification of breathing tempo

Calmness, unification

Concentration, oneness

Again, just a sense of boundary-less space. I just felt more light physically

Completeness, sense of being full; expanded

6.4 *exhale* Workshop Outcomes: Supporting Implementation

We opened this chapter by describing *exhale's* focus on designing with breath, shifting the experience of breath data to inner private sensing so that the 'physical' sense of data created an intimacy that was unseen by others, yet felt palpably by the self.

The exploration of breath as experience was developed through a design process that included the heart[h] workshops which supported concept development and technology implementation. Specific outcomes of the workshops included choices for a technological implementation, which included vibro-tactile motors placed in the linings of the skirts, and localized sound data to focus an inner connection with the self through the skirts. Another outcome of the workshops was to implement an RFID system in the skirts so that data could be exchanged and shared between participants.

Figure 62. *exhale* skirts awaiting participants at Siggraph 2005 Emerging Technologies

Like *whisper*, the heart[h] workshops explored numerous somatics and performance values and techniques which were critical to the design process of *exhale*. These are summarized in the table below.

	Chapter 6 Designing with Breath ***exhale***
VALUE	
Self	Body-state Breath Inner awareness
Attention	Attention to Breath Kinaesthesia Fullness - Emptiness Inter-subjectivity & awareness through shared breath
Experience Qualities	Imagination Stillness Connectedness Empathy
Inter-Connection	Breath Relationship • To self • Receive from other • Choice to "hold" or "contain" • Create Larger Whole
Somatics Systems Applied	Eastern and Contemplative Practice • Slow motion walking Kinetic Awareness (Gindler) • Directed Attention to self • Heightening sensory awareness, blindfolding • Attention to breath (Redirection) • Slowing movement (Suspension) • Expansion (Letting-Go) • Wholeness Arsenal of Theatre – (Augusto Boal) • De-specialization • Sensing self • Listening to what we hear • Internal Rhythms • Moving self • Placebo Objects, props • Clothing/Costume as extension of self Movement Improvisation (Blom & Chaplin) • Speaking Body - Body Parts • Building Trust and Sensitivity • Movement Quality • Silence • Group Work – Multibody movement

Table 11. Summary of Somatics Values and Techniques used in *exhale*

One of the primary outcomes of the heart[h] workshops was the technical functional design of *exhale.* This included the design of a body-area-network, using detachable Bluetooth 'islands' that could be positioned in various places on the garment. This enabled a flexible prototyping system for testing various output actuators, particularly in adjusting their position on the garment. The following diagram and table illustrate and describe the technical functional components of *exhale*.

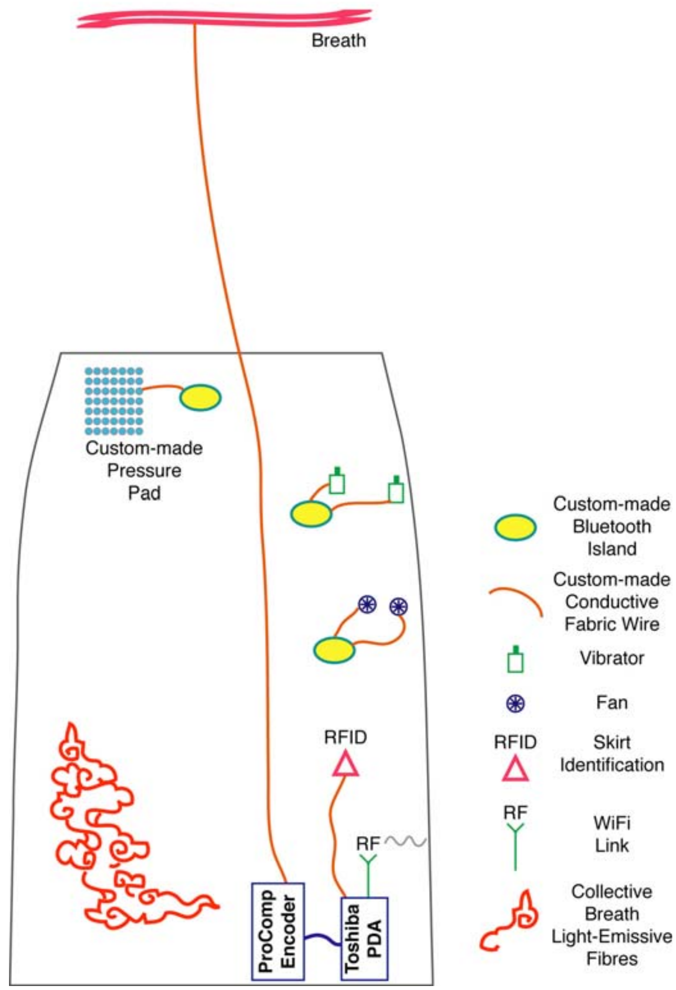

Figure 63. *exhale* Technical Functional Diagram

***exhale* technical attributes**

- An *exhale* skirt is a custom-made garment with electronics embedded within it to form a sensor and communication system that can exchange physiological signals and responses with another *exhale* skirt.

- Each skirt has a small portable computer, or PDA, that coordinates and interprets the data communication. Along with the PDA, there are several very small computers that control embedded transducers – fans and vibrating motors – and that are mounted on individual circuit boards, called 'islands'. These 'islands' interact with the PDA via a Personal Area Network, or PAN, constructed using Bluetooth technology.

- Connections that cannot be made wirelessly are made using conductive fabric 'wires' which are composed of a transparent directionally conductive fabric contained in a non-conductive fabric or sewn directly into the skirt to form portions of the skirt itself.

- There is also a pressure-sensitive pad area, constructed of the conductive fabric wires, connected to one of the Bluetooth 'islands', to provide touch-based gesture data.

- The PDA has two specialized devices attached to it as well: an encoder that converts the analog electrical signals from a breath sensor into digital format, and an RFID sensor that is used to identify nearby skirts via small disks sewn into each skirt.

- The breath sensor is an adjustable, stretchable band worn about the chest that generates an electrical signal on each exhalation and inhalation.

- This signal is conveyed to the PDA via the encoder, where it is analyzed and then transmitted to a central system, along with information on which *exhale* skirts are near to this skirt as well as any gestures reported from the pressure-sensitive pad.

- The central system routes the analyzed signals to other *exhale* skirts, based on the 'neighbourhood' information that has been gathered. At the same time, the breath signals from groups of skirts are gathered together and analyzed; this collective breath is then sent back to the skirts within the group, and displayed on each skirt as a pattern of light using special light-emissive fibres controlled by the PDA. The PDAs also activate their fans and vibrating motors, using their Bluetooth 'islands', when the gesture or breath data matches their criteria.

- The central system converts the data obtained from the skirts – the physiological data, the RFID data and the pressure pad data – into a visible and audible representation of the state of the installation space and its participants. A video projection system and multiple speakers are used to convey this representation to the participants within the space.

Table 12. Summary of Technical Functionality of *exhale* Body-Area-Network

Figure 64. *exhale* in Performance in Torino for the 2006 Winter Olympic Games Festival

This chapter has explored *Designing with Breath*: the design process of *exhale,* an interactive wearable art installation that was prototyped in Siggraph 2005 Emerging Technologies Exhibition. In *exhale*, breath, skin and clothing come together within a set of evocative and sensual skirts that are embedded with body-area-networks that exchange and elicit breath within a shared network. The workshops explored the two central design themes in *exhale* summarized by the concept of 'wearing our breath'. These themes are: 1) the use of breath as a somatic indicator of state, and 2) the exploration of material, movement and fabric within interactive garments that move with us, that express our selves through strategies of hiding and revealing, and that work with breath to support identity, connection and communication. As has been evidenced in the experiences of the workshop participants, the underlying concept of *exhale* is cultivating self-observation in such a way that body-state can be observed and shared with others in a networked environment.

This work resonates with the many physical techniques in somatics and performance that use breath as a mechanism to direct attention to our own physical processes. Within these frameworks, attention to breath is experiential, and can increase self-efficacy.

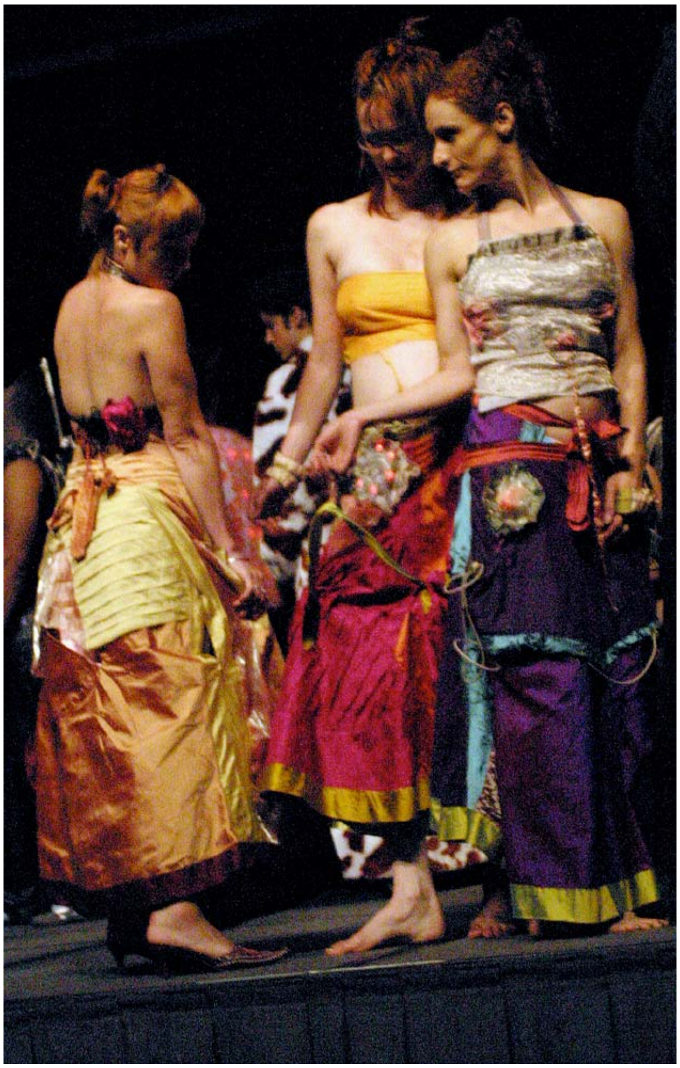

Figure 65. *exhale* at Siggraph 2005

7

The Somaesthetics of Touch

"The experience of touch is basic to discovering who we are and who is other and how we dance this life together..."[1]

"Somaesthetics can be defined as the critical study of the experience and use of one's body as a locus of sensory-aesthetic appreciation (aesthesis) and creative self-fashioning." [2]

7.1 Introduction

This chapter explores the concept of *somaesthetics* as an approach to the design of expressive tactile interaction. It highlights our sense of touch in relationship with technology, focusing on a technological design and implementation based on Rudolph Laban's Effort Shape analysis. Effort Shape (sometimes referred to simply as Effort) is a theory and taxonomy that describes movement *effort qualities* as an inner bodily attitude toward outer movement enactment.[3] In this way, Effort Shape models and *embodies* a subjective epistemology through its articulation of the connection between inner state and outer movement-behaviour. *The Somaesthetics of Touch* explores the experience of a tactile world where the *quality* of tactile experience can be modeled within interaction design. Rudolph Laban, one of the key movement theorist-practitioners to emerge from the somatics traditions of the twentieth century, states that *all* our senses are a variation of our unique sense of touch. For Laban, touch enables the relationship between movement and space to be discerned within bodily-experience.[4] Maxine Sheets-Johnstone refers to this as our tactile-kinesthetic

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[1] Cohen, B.B. (1993), op. cit., p. 118.
[2] Shusterman, R. (1992). Somaesthetics: a Disciplinary Proposal, in *Pragmatist Aesthetics: Living Beauty, Rethinking Art*, Oxford, UK: Rowman & Littlefield Publishers, p. 267.
[3] Laban, R. (1950). *The Mastery of Movement*. Plymouth, UK: MacDonald and Evans, p. 11.
[4] Laban, R. (1966). *The Language of Movement: A Guidebook to Choreutics*. Boston: Plays Inc., p. 29.

experience, a bodily attitude that enables us to know the world and make sense of it.[5] Other somatics practitioners such as Sondra Fraleigh recognize that touch precedes and informs vision as well as movement through our bodies' evolutionary development of somatic tactile-kinesthetic sensitivity[6]. By attending to the sense of touch, we can develop discernment and skill in accessing our bodies' knowledge. Touch is applied in many somatics techniques such as the work of F.M. Alexander[7], Moshe Feldenkrais[8], Marion Rosen[9], Bonnie Bainbridge Cohen's Body-Mind Centering[10] and Sondra Fraleigh's Somatic Movement Therapy[11].

The case study described in this chapter explores the sense of touch through a *somaesthetic* design framework for technology. This is articulated in the design, development and implementation of the tactile interface for *soft(n),* an interactive tangible art installation exhibited at DEAF07 in Rotterdam, April 2007.

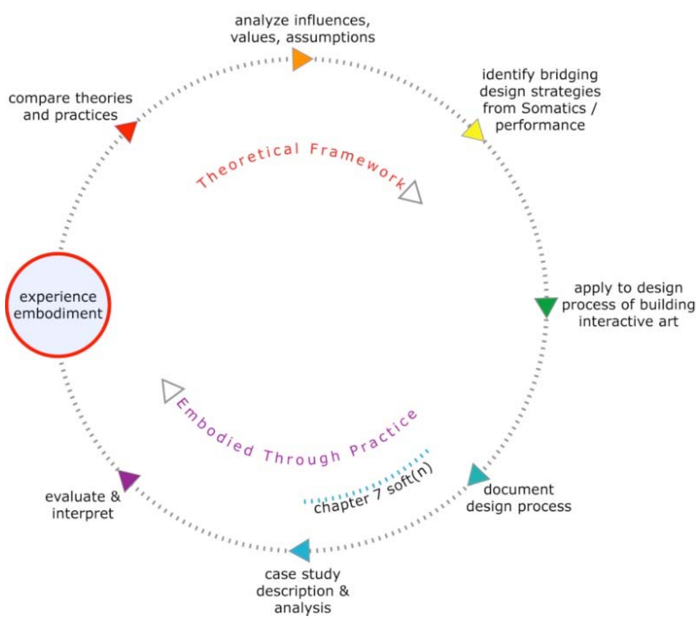

Figure 66. Toward the Implementation of a Somaesthetics of Touch

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[5] Sheets-Johnstone, M. (2009), op. cit. p. 143.
[6] Fraleigh, S. (2004), op. cit. p. 127.
[7] Alexander, F.M. (1932), op. cit.
[8] Feldenkrais, M. (1972). *Awareness Through Movement*. San Francisco: Harper.
[9] Rosen, M., & Brenner, S. (2003). *Rosen Method Bodywork: Accessing the Unconscious Through Touch*. Berkeley: North Atlantic Books.
[10] Cohen, B.B. (1993), op. cit.
[11] Fraleigh, S. (2004), op. cit.

Somaesthetics is a term coined by Richard Shusterman, a philosopher and somatics practitioner following in the pragmatist tradition of Dewey[12] and William James.[13] Shusterman has defined somaesthetics as the development of sensory-aesthetic appreciation that can be cultivated through attention to our bodily experience. He refers to critical practice within somatics and aesthesis (perception) that can support self-agency of the soma[14]. Shusterman's stance has much in common with philosophers such as Maxine Sheets-Johnstone who describes how "self-movement structures knowledge of the world" [15], with Alva Noë[16], whose enactive approach to perception suggests that our ability to perceive is constituted directly by somatic sensorimotor knowledge, and with Mark Johnson[17] who explores aesthetics of human meaning as growing directly from our visceral connections to the bodily conditions of life.

Like Dewey, Shusterman's approach to somatic philosophy has been developed through practice-based experience of somatics that has deeply influenced his philosophical framework. Dewey's somatics practice was articulated through 15 years of working with F.M. Alexander and the Alexander technique, while Shusterman's experience has evolved through his work as a professional practitioner of the Feldenkrais Method[18]. Dewey and Shusterman illustrate the integration of a radical interdisciplinary dialogue within their own research, which provides a leading example for the pragmatist exploration of embodied interaction within technology design.

[12] Dewey, J. (1934), op. cit.
[13] James, W., (1999), op. cit.
[14] Shusterman, R. (1992), op. cit.
[15] Sheets-Johnstone, M. (1998). *The Primacy of Movement,* Amsterdam: John Benjamins Publishing Company, p. xv.
[16] Noë, A. (2004). *Action and Perception,* Cambridge, Massachusetts: MIT Press.
[17] Johnson, M. (2007). op. cit.
[18] Shusterman, R. (1992), op. cit.

The term somaesthetics has also been referred to in the writings of Yuasa Yasuo, a Japanese philosopher and scholar investigating comparative philosophy and the *science of subjective experience*. Yasuo contrasts this with the epistemological approach taken by our modern science of objective experience. Yasuo, like Shusterman, describes somaesthetics as an approach to the development of self-cultivation, a transformative practice enacted through self-observation within practical lived experience. He argues that somatic techniques are the key to these transformative practices.[19]

This case study contributes to the need for practice-based methods that can provide practical examples of conceptually rich theories of somaesthetics. In this case study somatics practice is applied to articulating aesthetic *qualities* within experience, linking practices of *soma* with the practice of *aesthetics*. This work is positioned within an ongoing sustained and reflective artistic practice that exemplifies technologically mediated design. It demonstrates the application of a somaesthetic framework to tactile interaction for tangible networked technologies. This case study explores the pragmatic articulation of philosophical concepts of embodiment that focus on *touch* and *quality* of experience.

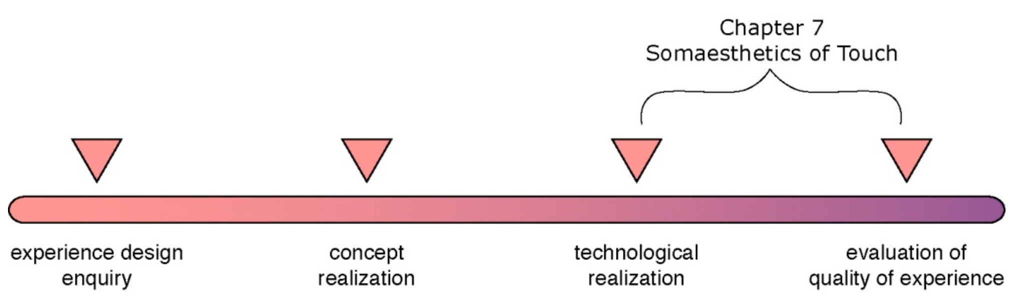

Figure 67. Implementation of a Heuristics to Recognize Touch Quality

[19] Yasuo refers to somatic techniques in which the 'whole of the mind' engages body and matter, which are closely connected with the Eastern tradition of philosophy. Shaner, D.E., Nagatomo, S. (1989). *Science and Comparative Philosophy,* Leiden, The Netherlands: E.J. Brill Publishers, p. xv.

While the case studies *whisper* and *exhale* outlined in Chapters 5 and 6 provided examples of the application of somatic techniques exploring body-state and breath, these techniques were applied to the early stages of technology design in which concept exploration and realization were generated from participant's exploration of felt experience. While *soft(n)* also incorporated early design exploration based on participant experience workshops (as illustrated in Chapter 5) and technology prototyping (as illustrated in Chapter 6), the focus of this chapter is the application of somatics knowledge to a functional *computational model* for technological implementation. These three case studies taken as a whole are intended to illustrate the breadth of approaches that can be used in the application of somatics knowledge and techniques to the design cycle of creating technology. In the case study for *soft(n)*, Laban's Effort Shape system is used as a model to develop tactile input that recognizes *touch effort qualities*. Laban's Effort Shape system embodies experiential knowledge that was tested and iterated throughout Laban's lifetime. The importance of Laban's work is in the development of rigorous theoretical models born directly from empirical observation, testing and practice. These features provide a system that has an inner validity with regard to sensing and moving. My own research is based on an articulation and technological 'intervention' of Rudolph Laban's Effort Shape analysis, a system for defining movement quality within a technological design, as applied to touch.

This chapter introduces the Laban Effort Shape system and provides a rationale for its use and application within a technological design framework. It then provides a context for this approach by positioning *soft(n)* within my artistic practice. This includes the historical development of incorporating touch as an active and interactive sense within a series of artworks leading to *soft(n)*. It outlines the somaesthetic framework that was developed and applied to the design and development of *soft(n),* describes the artistic concept for the *soft(n)* installation, and then articulates the case study in relation to the implementation of a somaesthetics of touch.

It concludes with an assessment and critical analysis of the application of the Laban Effort Shape system to the development of a model for input recognition of touch qualities within a tangible networked interactive art installation, summarizing the somatics values and techniques used in the context of the installation.

7.2 Laban Effort Shape and its Tactile Application to *soft(n)*

Within the field of somatics, Laban was unique in his ability to apply his first-person experience of movement knowledge to a *formalized symbolic* movement analysis system that is both rigorous and expressive. While many somatic practitioners amassed expertise, pragmatic knowledge and mastery that was articulated physically and passed on from one body to the next through physical entrainment, Rudolph Laban was amongst a much smaller number of somatics practitioners that formally codified his system in written and symbolic graphical form. Laban wrote extensively throughout his lifetime, articulating his observation and exploration of movement practice. Laban's legacy included the *symbolic systems* of 1) movement notation called Kinetography (later known as Labanotation), 2) movement's trajectories or *trace forms* in relation to the Kinesphere (the body's reach in space) known as Space Harmony and 3) the expressive *feeling* qualities of movement, known as Effort Shape. These symbolic systems combine to describe a unified whole, in which the body's inner attitude, outer movement expression and connection within space and time form an interconnected harmony where intention, agency, movement and environment continuously effect and shape one another in the greater flow of life.

It is precisely because of the symbolic nature of Laban's system of movement analysis that his work resonates with the application to technological design.[20] Digital technology is based on symbolic and computational systems of representation, and Laban's symbolic descriptions of movement form, movement properties and movement qualities provide a starting point for constructing technological movement models that can be applied equally to user experience and computational design. My own work with technology has sought mechanisms for exploring experiential quality in the context of interaction. Laban's theoretical framework is well suited to its computational modeling.

7.2.1. Laban and Touch

For Laban, touch enables the relationship between movement and space to be discerned within bodily-experience.[21] Laban viewed *touch* as the precursor to our sensory capability, describing touch as the perceived change in the relationship of our bodies to the space-time continuum. Laban describes all of our senses as fundamentally tactile impressions perceiving changes in space: changes in air pressure, in the light spectrum, or in the chemical fluctuation in bodily fluid. Each of the senses and sensory receptors is tuned or 'sensitive' to change within a different range of vibrational frequencies. The modulation of frequency enables the body to perceive tactile impressions or differences in rhythmic changes in space. Laban describes this as:

> All changes in space which we see, hear, smell or taste are literally tactile impressions. All our senses are variations of our unique sense of touch. Two approaching objects touch one another when they finally meet without a noticeable space between them. … This is what happens in any condensing matter in which the outer parts move towards a centre… Each single part of matter approaches its neighbouring part until the two collide, causing an impact or a pressure. It is space, which appears and disappears between and around objects and in the movements of the particles of the object.[22]

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[20] See for example: Loke, L., Larssen, A.T., Robertson, T., & Edwards, J. (2007). Understanding movement for interaction design: frameworks and approaches. *Personal Ubiquitous Computing, 11*(8), December 2007, p. 691-701.
[21] Laban, R. (1966). *The Language of Movement: A Guidebook to Choreutics*. Boston: Plays Inc., p. 29.
[22] Ibid.

Laban refers to touch as a property of condensing matter, the displacement of space within the influx of time. Our body is always in contact with space even as it disappears between our self and another. Within our body, certain movements created by our muscular energy can create condensation (contraction) that generates both inner and outer tactile impressions.

> Intensity, tension, weight and energy which the different contractions of the body communicate to our perceptive faculties are different terms for another fundamental function of space, that of condensation. Condensation in space gives us the impression of a single peak, or selected part, within the infinite flux of time, which is in fact disappearing space. It gives us the capacity to produce new positions, encounters and percussions, new contact and possibilities of tactile experience both within the body itself and in relation to its surroundings. This capacity is muscular energy or force.[23]

Rudolph Laban made an enormous contribution to the systematic application of movement analysis, notation and the symbolic models of movement language. His work combines biomechanics with the underlying qualities, meanings and interpretations of movement in space. Laban perceived all movement as following different rhythms, and the difference in these rhythms relate to varying effort qualities. For Laban effort, rhythm and space are interconnected, and touch is the unifying sensual property within all perception.

7.2.2. Laban Effort Shape

The evolution and development of Effort Shape (also simply called Effort) was born from Laban's early exploration of movement qualities and his migration from Nazi Germany to London in 1938. War-time England marked a new phase in Laban's movement practice and analysis as he moved toward working in industry, introducing work-study methods to factory workers to increase production through humane means.

[23] Ibid. p. 30.

> Unable to work under the Nazi regime, which looked upon his teachings of harmony and fulfillment through re-educating the sense of rhythm and movement as a threat … Laban and some of his pupils sought sanctuary in the U.K. Remarkable developments followed in that country, where previously little awareness existed of the common basis which movement provides to both dance and work.
>
> During the war Laban turned to industry and established the Laban-Lawrence Industrial Rhythm, which comprised new approaches to … investigating work processes based on his research into the natural rhythm of man's movement.[24]

Rudolph Laban collaborated with F.C. Lawrence, an industrialist, to articulate and define a system, which came to be called 'Effort Shape' Analysis. This rigorous explanatory taxonomy described movement *quality* as the connection between a body's inner attitude and its outer movement expression and flow. Laban linked movement *efforts* with what he named as effort 'affinities', the natural path or trace-form that an effort quality tends toward. An example is the correlation between *Light* and the affinity path of upward motion, and between *Strong* and the affinity path of downward motion.

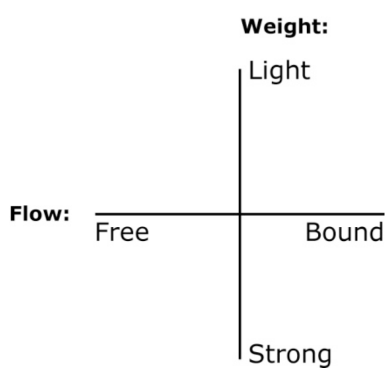

Figure 68. Rudolph Laban's Simple Grid of Exertion (Weight) and Control (Flow)

Light and Strong refer to the poles along Laban's *Weight* motion factor, defining the amount of 'exertion' used in a movement. The *quality* of weight is associated with the body's *intention* in the world, and answers the question, 'what is my impact in the world?'. This qualitative relationship to intention describes meanings such as asserting

[24] Laban, R., & Lawrence, F.C. (1947). *Effort*. Plymouth, UK: Macdonald and Evans, Biographical Note, p. xi.

oneself, creating a strong or light impact, or sensing of self in the world.[25] Laban notes that varying movement effort qualities result from an inner attitude (conscious or unconscious) toward outer movement expression: specifically toward the four definitional motion factors of Weight, Time, Space and Flow[26]. Laban evolved the effort graph illustrated in the figure below. Efforts are associated with a *value* along the four motion factors of weight, time, space and flow.

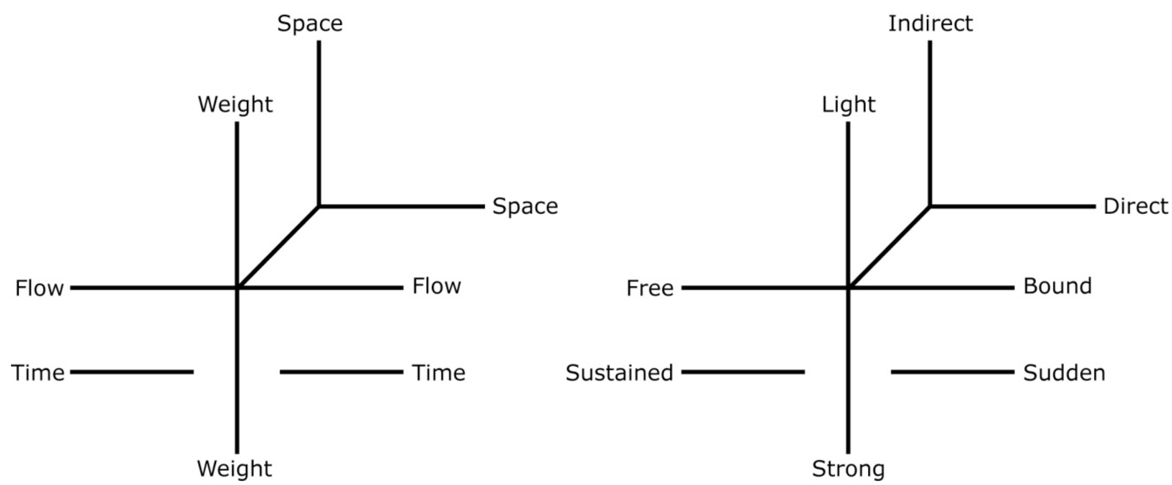

Figure 69. Laban's Effort Graph based on Four Motion Factors of Weight, Time, Space + Flow

For example, weight can be varied along a continuum between *light* and *strong*; time can be varied along a continuum of *sustained* and *sudden [or quick]*[27]*;* space can be varied along a continuum of *indirect [or flexible]* and *direct;* and flow can be varied along a continuum of *free [or fluent]* and *bound.* Combining these motion factors in different ways creates varying movement *efforts* or *experiential qualities*. These inner impulses to move initiate the outward manifestations of our effort qualities.

> Even before any visible movement manifestations, there were inner impulses toward these preparations. First, an inner impulse to *attention* to *space* around [oneself] and what it included; second, to the sense of [one's] own body *weight* and the *intention* of the force of its impact;

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[25] Bartenieff, I., & Lewis, D., (1980). *Body Movement: Coping with the environment*. New York: Gordon and Breach Science Publishers.
[26] Laban, R. (1950), op. cit. p. 11.
[27] The different terminology of Effort motion qualities such as sudden or quick, and fluent or free is based on historical evolution of the terms, and the European and American naming conventions that developed through the history of educating and developing Laban's system of movement.

> third, to awareness of *time* pressing for *decision* [choice or agency]. All of this inner participation interrelated with the *flow* of [one's] movement whose inner impulses fluctuated between freedom and control [continuity]. Such inner participation is a combination of kinaesthetic and thought processes that appear to be almost simultaneous at different levels of consciousness.[28]

Bartenieff describes the similarity between "kinaesthetic and thought processes" linking the concept of thought directly to movement (thought *as* a form of movement). Bartenieff also describes Laban's effort qualities as attitudes toward movement that reflect an organism's "urge to make itself known". The efforts have characteristic *qualities* that suggest an inner state of mind, which prepares the mover to act in the world. Each effort has a particular *quality*, which describes its enaction potential.[29]

EFFORT	QUALITY
Space	**Attention**
In what manner do I approach the space?	Thinking. Orienting, specifically or generally.
Weight	**Intention**
What is my impact?	Asserting. Creating strong or light impact. Sensing my weight, myself.
Time	**Choice - Decision**
When do I need to complete the act?	Urgency or non-urgency. Rushing or delaying.
Flow	**Progression**
How do I keep going?	Feeling alive. How to get started and keep going. Freely or carefully.

Table 13. Laban's *Efforts* suggest Inner States that are Enacted Through *Qualities* of Movement[30]

In Laban's definition, the various combinations of the four motion factors produce all legible expressions of movement in life. Laban also describes a property specific to the human use of effort through a concept he called *humane effort*:

> Besides the comparative richness of human effort capacity, one can notice an effort specialty, which might be called the humane effort… Humane effort can be described as effort capable of resisting the influence of inherited or acquired capacities … that is capable of *developing* qualities and inclinations creditable to man, despite adverse influences.[31]

[28] Irmgard Bartenieff worked with and was mentored by Laban and continued his work through her teaching and writing. See Bartenieff, I., & Lewis, D., (1980), op. cit. p. 51.
[29] Ibid.
[30] Ibid, p. 53.
[31] Laban, R. (1950), op. cit. p. 13.

Laban's concept of *humane* effort is akin to self-cultivation and the ameliorative goals of Foucault's technologies of the self, where the cultivation of inner attitude produces an expression of effort *quality* that increases or improves self-agency. Laban's concept *appropriate* effort, was less concerned with social moral conduct than it was with the graceful, expressive forms of effort that are appropriate for, or have affinity with, a given activity. These affinities are experienced where there is aesthetic recognition, where enjoyment is fulfilled without undue effort and where the *effort* is balanced with the ease of the *outcome*. This form of ecological and sustainable effort is one in which the aesthetic relationship between function and feeling produce eloquence and economy of movement. Laban spoke of the economy of effort, where certain kinds of movement could be more economically performed (without wasted, negative or inordinate effort). When an *appropriate* effort is applied to a movement activity, the result is a fluidity and articulate fluency in movement. Figure 70 illustrates a 'Strong-Free' effort as the most appropriate for a movement example of swinging a heavy object. Other combinations of weight and flow, such as a 'Light-Bound' quality would not support the movement in its most elegant and articulate form.

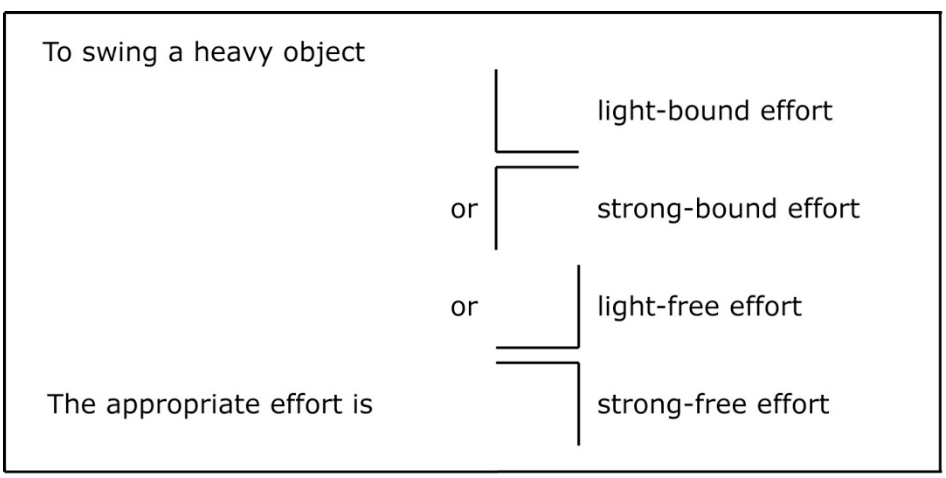

Figure 70. Illustration of Appropriate *Weight* and *Flow* for Swinging a Heavy Object

An appropriate effort is simultaneously aesthetic, elegant and technical. The effort is matched *to* the movement so that an ecological state of harmony is created through its enaction; neither it does require additional expenditure nor does it create wasted energy. This approach to effort is applied not only to large exterior movements, but also the inner movements of our thinking and feeling, which are reflected in our body's exterior attitude. Laban worked with movement quality and effort in relationship to its sense gathering and meaning-making.

Laban, like Delsarte, developed his movement analysis system through empirical observation coupled with practice. His theory of movement was born from the first-person experience of movement. Although his work-studies were historically related to the studies of Taylorism and later to the development of ergonomics, Laban's approach to his work-studies in factories and industrial settings emphasized a whole-body approach. Optimal functioning, normally referred to as movement efficiency, was expressed and *validated* through qualities of grace and eloquence in motion.

The design and development of *soft(n)'s* technological implementation is based on Laban's 8 Basic Effort qualities. These are illustrated in the Effort Graph depicted in Figure 71 below. Each Basic Effort is represented by a combination of line segments that depicts the 'pole' of the graphical effort quality. For example: *Light* Weight uses only the upper vertical stroke of the weight continuum and *Strong* Weight uses only the lower vertical stroke of the weight continuum. The diagonal stroke orients the motion vector between *Space* and *Weight*, so that each effort can be easily identified. The Effort graphical symbols map movement affinities to positions of the line segments, where up, down, left, right, backward and forward are movement tendencies based on an inner-state or predilection toward an outward movement expression.

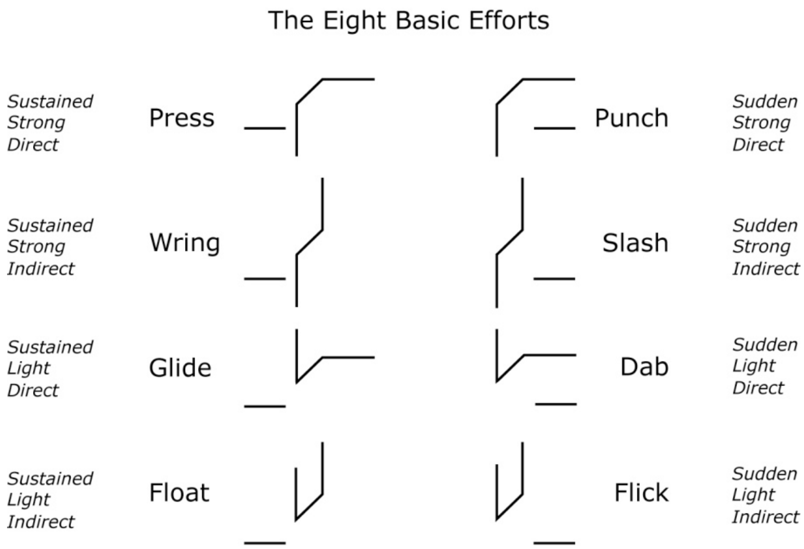

Figure 71. Laban's Eight Basic Efforts Derived From Effort Graph (Illustrated in Figure 69)

Laban's basic efforts are named 'basic' because they *crystallize* effort qualities found in daily movement and activity. As descriptors of the *Action Drive*[32] the crystallization of effort is a 'moment' in movement that punctuates expression and gesture (or action). In everyday life and activity we move through these basic efforts continuously as punctuations that are only sometimes expressed in their heightened, 'crystallized' and most dramatic forms, yet the basic efforts are a part of the rhythm of all movement. In *soft(n)*, these basic efforts are applied to qualities of touch, and are referred to as tactile efforts (or touch efforts). The implementation of a tactile recognition that can differentiate between a Punch, a Flick, a Dab and a Glide are incorporated into the tactile recognition of the networked *soft(n)* objects.

This summary presented a brief overview of Laban Effort Shape as a basis for grounding the movement theory of the *soft(n)* tactile input technology design. Laban also extended this theory to Effort *States* (combinations of two effort Elements that produce mood-like qualities in movement that are also sometimes called *Incomplete*

[32] Each of Laban's Effort Drives combine 3 efforts elements, and leave out a 4th. The Action Drive describes the *8 basic efforts and l*eaves out Flow because it describes a crystallized action movement in which flow 'concludes' a movement thought. The other Drives are the Passion Drive, which is Spaceless, the Vision Drive which is weightless, and the Spell Drive which is timeless. See Bartenieff, I., & Lewis, D., (1980), op. cit. p. 58.

Efforts or *Inner States*), Effort *Drives* (combinations of three Effort elements in which Flow becomes an active element are called *Transformations* or *Drives*), *Full* Effort (combinations of four Effort elements also called *Complete Drives;* these rarely occur because the movements are extreme)[33]; however, the Incomplete Effort and the Effort Drive aspects of Laban's Effort theory are not directly implemented in the *soft(n)* tactile recognition technology.

7.3 An Artistic History of Touch

The sense of touch has been a theme in my artwork since 1995 and in my somatics training since 1984. Its application spans decades and illustrates a range of expressiveness and application. In these artworks, touch and tactile interfaces are used as an exploration of *active touch* within experience[34]– in particular, experience that 'attends' to our inner state through touch. Touch is sometimes called 'the first sense', and is associated with intimacy and empathy. Touch is an important sense in the field of somatics; it functions as an intersubjective channel in which body state and information can be shared, and is associated with empathic connection.

In many somatic practices this empathic connection is used to shift or match body state in order to ameliorate the functioning of the 'soma'. My early tactile artworks remain influential in my research trajectory today. For example, *soft(n)* further articulates concepts that I began to develop in 1995 in the artworks Bodymaps and Felt Histories, and is a historical result of the development and iteration of a *semantics* of caress.

[33] Ibid, p. 57-58.
[34] *Active touch* is defined by J.J. Gibson in *The Senses Considered as Perceptual Systems.* Gibson identifies that touch can be simultaneously Objective and Subjective "the same stimulating event has two possible poles of experience, one objective and the other subjective. There are many possible meanings of the term *sensation* but this is one: the detection of the impression made on a perceiver while he is primarily engaged in detecting the world". See Gibson, J.J. (1966). *The Senses Considered as Perceptual Systems*. Westport, Connecticut: Greenwood Press, p. 99.

7.3.1 Bodymaps: Artifacts of Touch

Bodymaps: Artifacts of Touch (1995-1997), was the first interactive artwork I created that bridged the tactile aspect of my somatics training with my background in computer design[35]. The interaction concept is autobiographical in nature and has an intensely personal, sensual, sometimes disturbing, experiential quality. At the time of Bodymap's inception the 'hand' in HCI was used primarily as a pointing and clicking device or as a text command-based driver of interaction, remaining conceptually divorced from its tactile nature. I was interested in counterpointing the prevalence of goal-directed interaction, exploring interaction that simply 'made space' for the existence of experience for its own sake.

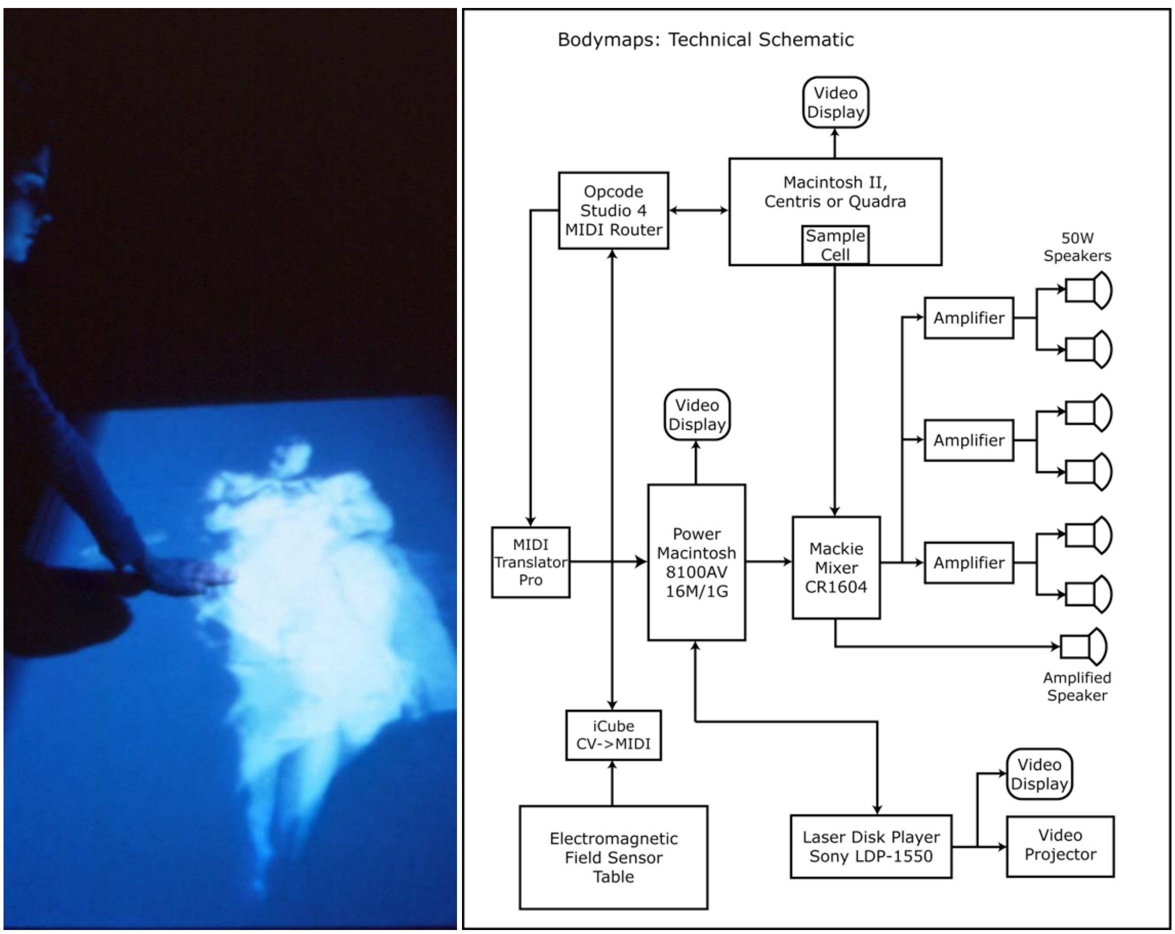

Figure 72. Bodymaps: Artifacts of Touch Installation and Technical Schematic Design (1995-1997)

[35] Video documentation of Bodymaps is contained on the accompanying DVD described in Appendix A.

The intention of the artwork was to explore the sense of touch by inviting participants *into* a state of attending to their own act of touching. In Bodymaps, the treatment of the video and audio content was influenced by Luce Irigaray's book "Marine Lover", an essay written to Nietzsche in a lyrical dialogue form, interrogating him "from the point of view of water"[36]. As such it has a sensual and erotic poeticism and a feminist positioning with regard to gendered qualities within technological design and concepts of agency, control, vulnerability and power. This work used white silk velvet fabric as the top layer of the table surface. Silk velvet has an unexpectedly warm, sensual texture that invites touch through its soft and yielding quality. Its warmth is distinct from the cold metal of computer circuitry and more akin to the temperature of skin. It also imparts a kind of 'tactile history' through the traces left behind from the contact and movement across its surface. This is a feature of its 'fabric nap', a property of the textile weave of velvet[37]. These tactile traces are also reminiscent of Laban's concept of movement trace forms that define the language of movement effort quality. The table itself contained two layers of specially designed sensors, both tactile and proximal. This technological design was attempting to map a *surface intelligence* that I referred to as *skin consciousness*. Our skin is a tactile organ, but can also sense proximity. This notion of surface *awareness* is referred to in Laban's description of tactile impressions created by the displacement of space. The sense of touch does not only come into play at the moment of contact, but also at the moments leading up to the physical contact of skin to surface. Our sensory awareness perceives the approach of touch, as well as the moment of touch, all contained within the range of our bodily tactile impressions through the mechanoreceptors and thermoreceptors within the skin. These tactile impressions are the sensations we receive and are also the basis for our movement intention, our reciprocal act of touching back. It is our attention that

[36] In *Marine Lover*, Irigaray ruptures conventional discourse, writing in dialogue form in a lyrical style that defies distinctions among theory, fiction, and philosophy. A leading French feminist and psychoanalyst, Luce Irigaray holds doctorates in both linguistics and philosophy and is a director of research at the Centre National de la Recherché Scientifique.

[37] A fabric with nap usually has a pile and will have different shades from different angles based on the direction of the short pile. In Bodymaps this enabled the movement traces of the hand to be visible.

enables the reciprocity, the shift in state and the choices to continue or alter our engagement. The technological design of Bodymaps enabled participants to explore active touch, and to *attend to* an inner state through touch. This goal of opening up an interactive space where attention can be explored through touch is common to Bodymaps and *soft(n)*.

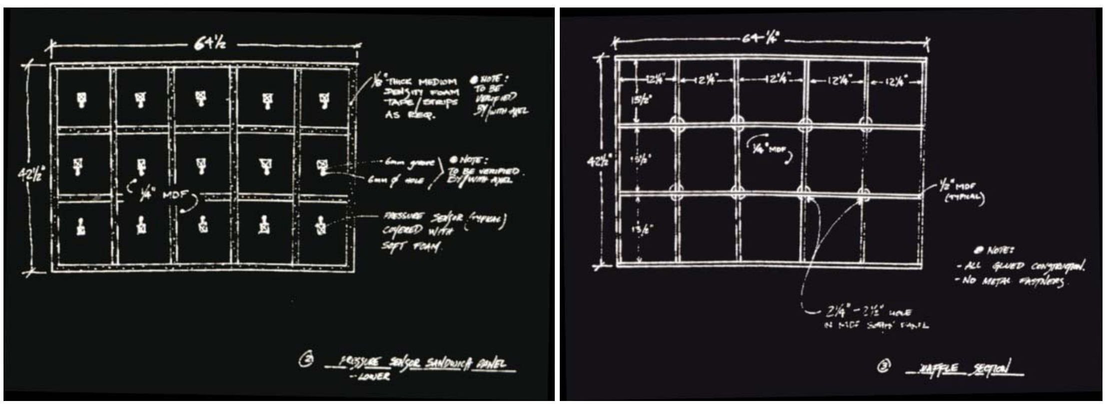

Figure 73. Bodymaps: Artifacts of Touch Sensor Design for Touch and Proximity (1995-1997)

The exploration of tactile semantics began with the layered tactile and proximity sensor grids in Bodymaps, and evolved into the soft flexible sensor grids, or *taxels* that were used in *soft(n).* This technical exploration can be seen as a historical progression that was iterated, tested and evolved over a number of artworks and technological experiments. Like *soft(n),* the sensors used in Bodymaps were hand-crafted, and hand-constructed. This was an interdisciplinary process supported by working with an electrical engineer to design the tactile and proximity electromagnetic field sensors. Figure 73 illustrates the two sensor sandwich layers, the top layer containing 8 proximity sensors mounted at the intersection axis illustrated in the right image, and the bottom layer containing 15 touch pressure sensors located in the centre of each grid illustrated in the left image. The tactile sensors were FSRs (force sensing resistors). The proximity sensors detect our body’s electromagnetic field as it comes into contact with (and disrupts) the electromagnetic field of the sensor. This approach uses the body as an antenna, that re-radiates low-frequency electromagnetic energy. In particular, the standard power-line signals (of 60Hz) are picked up by the body and re-radiated in the vicinity of the sensor, which detects the increased amplitude of the signal through our body's reflection. As our body (usually our hand) moves closer to the sensor, the amplification of the sensor's electromagnetic field increases.

Figure 74. Bodymaps: Interacting through Touch (1995-1997)

These experiments were developed in the creation of Bodymaps, but were also the basis for a 'Sensor Product Line'[38]. These interdisciplinary practice-based explorations combine a bodily somaesthetic concept (the tactile nature of perception through our sensory organs at the site of our skin) applied to an experimental technological solution (the concept of tactile impressions that are both proximally and contact sensitive). These interdisciplinary strategies are a common thread in my artistic research and practice. The integration of body and aesthetics in the act of creating experience through technology is another somaesthetic thread in the historical trajectory of this work. In Bodymaps, tactile recognition was mapped to pressure, duration, path and time. These perceptual cues were applied to a rule-based interaction that engaged participant's responses based on variation in tactile qualities. The system 'knew' what video segment was playing and could therefore map tactile quality to the image content. Although the Laban Effort qualities were not incorporated directly into the Bodymaps tactile rule base, the system's attention to qualitative experience was based on the *quality* of touch, and this grounded future directions.

[38] Axel Mulder worked as an electrical engineer on the development of the I-Cube and 'Reach' Proximity Sensor that became part of the product line of sensor-based interaction marketed by Infusion Systems, which was founded by Axel Mulder during the development of Bodymaps. The Bodymaps project was a beta-tester for the development of this technology which continues to be developed and manufactured today. <http://infusionsystems.com/>

7.3.2 Felt Histories

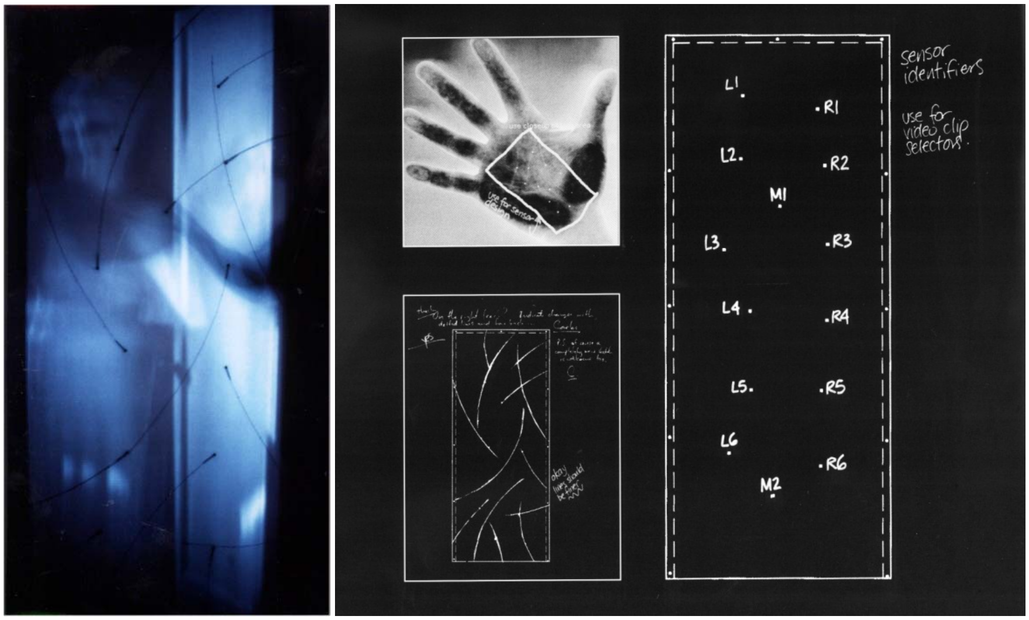

Figure 75. Felt Histories Installation Image and Technical Sensor Surface Design (1998-2000)

Felt Histories (1998-2000)[39], continued the artistic and technological theme of Bodymaps, but extended its technological exploration to include real-time mixing of video and sound through a networked system. Its thematic content was biographic in nature, based on an aural history of my mother's memories of her upbringing as a Dutch child in a large Catholic family, exploring the tensions between her femininity and the physical nature of her body and bodily memories. Felt Histories incorporated a tactile surface of sensor embedded plexiglass on which video images were rear projected. The rear projection created a transparent surface in which the sensors were visible through the projected image. Rather than constructing a grid of sensors connected by horizontal and vertical wires, the sensors were positioned at the end of curved lines that represented a close up image of the lines on the palm of my hand [Figure 75]. These sensor lines and the entire projected sensor surface became a metaphor for the surface of the hand, which held, remembered and transformed video segments through the installation participants' touch. The technological development in Felt Histories included a more 'intelligent' rule-based recognition of tactile

[39] Video documentation of Felt Histories is contained on the accompanying DVD described in Appendix A.

information, which used trajectory, direction and pressure to determine the rule that would select and mix the upcoming video segment. This was structured seamlessly so that caressing the image of the shoulder in a downward motion could cause the image of the garment to drop down from the shoulder, or caressing the open hand could cause the figure to step back or to turn around. The images and episodes were less narrative than poetic. Each episode created a different poetic frame within the physical doorframe. Episodes included a white wooden door that opened and then later, slowly caught fire, a series of transparent curtains moving in a breeze, a set of bars, a glass surface against which rain was falling, and an open black ‘hole’. The frame was intended as a threshold space in which installation participants invited the female body to respond *bodily* through her movement and *aurally* through her body’s story. The video image was desaturated (by aesthetic choice) and the video playback was not always smooth due to technological limitations of networked video. However, these decomposing features of the interaction supported the aesthetic nature of the work. My mother was 73 years old at the time Felt Histories was created, and the threshold of the doorframe alluded in part to death, aging, decay, and the transformative nature of the body through its own gendered state. Again, Felt Histories illustrated a poetic relationship to touch, a conceptual and aesthetic relationship to the design of the technology, where the sensor surface was hand- crafted and constructed. It became clear from observing participants within the installation that the tactile nature of the interaction created a ‘slowing’ process and ‘sensitizing’ to the surface being touched. It was also clear that different tactile qualities were used as both response and initiation. These observations led the continuing research that developed with regard to tactile recognition.

7.3.3 Developing a Semantics of Caress

In the years 1999-2003, I began an exploratory research process that conceptualized, prototyped and tested possible applications for multi-touch surfaces. This research was led by interdisciplinary practice-based explorations that combined a bodily somaesthetic concept applied to an experimental technological solution. The poetics of Bodymaps and Felt Histories had been potent and yet the tactile resolution of the sensors remained limited. The electronic sensors were not yet able to support a more intelligent qualitative recognition of touch. The intelligence in these artworks was created through the video content, compositional construction and poetic layering during interaction. There was still an enormous gap between the tactile nature of perception through our bodily sensory organs and the concept of tactile impressions that could be derived and understood from an input device. This next phase of tactile research began in response to a desire to develop a more qualitative understanding of touch *from within* a technological model. This research was instantiated with a multi-touch optical fibre array surface embedded within in a desktop graphical controller called the MTC Express. It was designed and engineered by Tactex Controls Inc., a company that was innovating multi-touch surfaces. It housed a 12 x 6 optical fibre array with 72 taxels. Each taxel is an intersection point between the X and Y coordinates of an optical fibre matrix. When the touch pad is depressed, the displacement of light within the optical fibres enables the detection of pressure and position over time.

Figure 76. Tactex Multitouch Controller with Embedded 72 Taxel Optical Fibre Array (2001)

When the surface is touched, stroked or caressed, the device creates tactile pressure imprints over time, a metaphor for the skin's surface. This surface has a tactile quality with a far higher resolution than was used in the Bodymaps or Felt Histories tactile grids. The potential lies in tactile data with sensitivity to characteristics of pressure, location and duration that could be correlated to the effort factors used in Laban's 8 Basic Efforts: pressure could be correlated to *Weight* (light or strong), location (including area and path) could be correlated to *Space* (direct or indirect), and duration could be correlated to *Time* (sustained or sudden). These correlations may have noticeable similarities, but they could not be considered literal mappings for a number of reasons. The Laban Efforts are *internal attitudes* to movement, and we could not expect the tactile surface to measure inner state as a result of hand movement. Laban Efforts represent an outward movement of an inner attitude and we need to consider the subtleties of representation within our heuristic scheme.

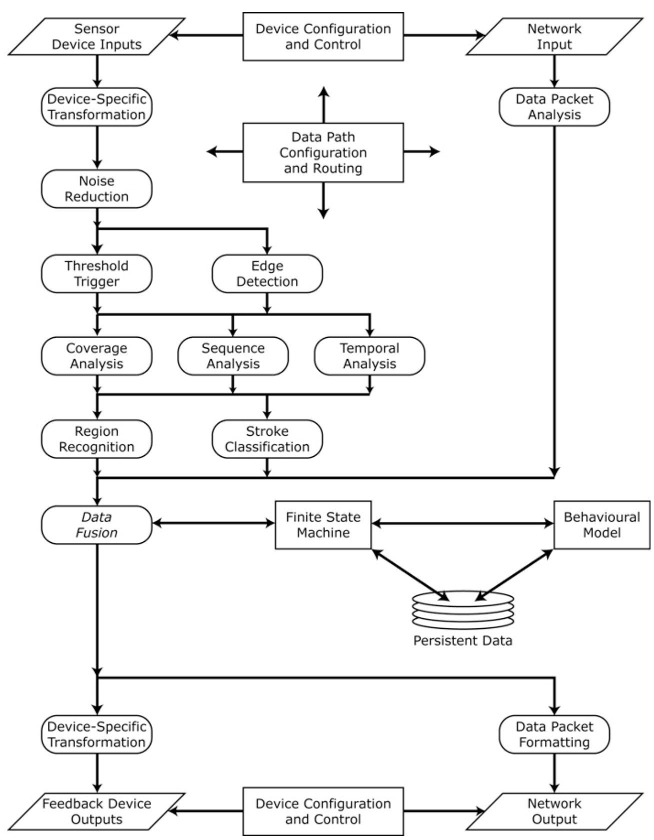

Figure 77. Tactile Effort Recognition Data Flow based on Tactex MTC Express (2002)

For example, the Spatial quality of *Indirect* cannot be literally correlated to an 'Indirect motion path' on a tactile surface since Indirect Space is an *attentional attitude* toward space; nor can the *Sustained* quality of Time be literally correlated to a 'Longer touch'. Effort qualities in movement are evident in their changing states and in their whole body rhythms. However, despite differences in the *measurable* parameters of the tactile surface of the Tactex MTC Express and the *discernable* qualities of movement efforts, the similarities between pressure and *Weight*, duration and *Time*, and location and *Space* were great enough and legible enough to test and iterate a *heuristics* for the recognition of tactile qualities. The value in exploring experiential *quality* through touch and recognizing the meaning-tendencies associated with specific tactile qualities illustrates a means for addressing pragmatic outcomes of somatically based technology design. The potential for extracting qualitative tactile data was the starting point of these explorations. The goal was to generate a computational heuristic model that could recognize expressive tactile qualities based on the Laban Effort grid.

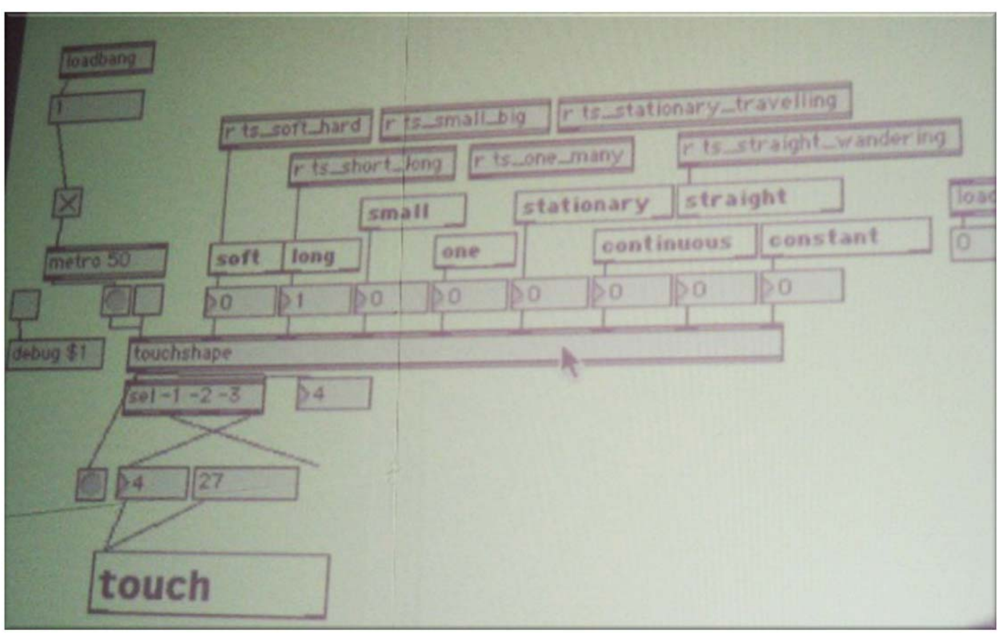

Figure 78. MAX/MSP Tactile Effort Recognition based on Tactex MTC Express (2002)

At that time, most applications for the Tactex multi-touch controller were based on detecting pressure, or alternately mapping areas (grids) of the tactile surface to specific functions such as drum machines or electronic musical instrument controllers. There was little existing exploration of tactile meaning or expressive qualities of touch. I worked with a small interdisciplinary team[40] to develop a heuristics for tactile recognition based on Laban's Effort Qualities, using the 8 basic efforts as a starting point. We were able to develop an interface using the Tactex MTC Controller connected to MAX/MSP[41]. We developed a series of MAX objects that extracted data from the MTC express [Figures 77 & 78]. We used a pressure map as input to image-processing algorithms to extract pressure hills and contact regions. This approach enabled us to successfully recognize a number of touch efforts.[42]

This prototype and the successful recognition of Laban touch efforts became the basis for the exploration of touch within the wearable and tangible artworks conceived and implemented from 2002-2008, including the basis for the tactile fabric exploration that resulted in *soft(n)*. Yet it also remained a technological research thread that continued in parallel to the artistic production. This was due in part to the technological constraints of a graphical tablet as an input device in a wearable or tangible context. Despite the quality of the optical fibre array it required a rigid surface in order to extract usable tactile data. The rigid surface of a graphical tablet was not a comfortable, soft or viable option for textiles. However, eventually this exploration of qualitative recognition and expression through the sense of touch found its way into the material and fabric explorations of soft-circuits for wearable and fabric-based technologies, and became the basis for the *soft(n)* tactile recognition.

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[40] Comprised of Rob Lovell, a Computer Scientist and dancer, and Norman Jaffe, a senior software engineer. Both these collaborators have contributed to a number of the artistic projects described within this thesis.

[41] MAX/MSP is a visual programming language developed by Cycling '74. It is primarily used by composers, performers, software designers, researchers and artists for creating interactive software.

[42] Schiphorst, T., Lovell, R., & Jaffe, N. (2002). Using a gestural interface toolkit for tactile input to a dynamic virtual space. *CHI '02 Extended Abstracts on Human Factors in Computing Systems* (Minneapolis, Minnesota, USA, April 20-25, 2002). CHI '02. New York: ACM Press, p. 754-755.

7.3.4 Working with Fabric Tactile Arrays

Led by the goal of expressing and articulating experiential *qualities* within networked interaction, the ability to work with soft-circuit or fabric-based tactile recognition provided a number of implementation challenges. One of the design concepts was the ability for the body to represent itself within a network. The body-area-network was born from this underlying philosophical concept and required a rethinking of the locus of a networked activity. When the body 'became' the network, and in order to operationalize a body-as-self centre within the network, there was a need for a portable microcontroller or 'pocket computer' that could be easily carried or embedded within a garment, pocket or small object and that was capable of executing the tactile recognition software. In 2003 we ported the tactile recognition software to a small portable computer in the form of the Toshiba Pocket PC PDA, taking our first step towards portable tactile recognition. This was the first of a series of pocket computers or microcontrollers that were used for this purpose.

Figure 79. Tactile Pressure + Location Recognition Ported to Toshiba PDA (2003-4)

The second implementation challenge was to design and build a replacement for the Tactex MTC Express that was capable of recognizing and translating tactile information that could be flexible, soft and sewn into textiles. Along with the growing explorations and developments in artworks *whisper* and *exhale*, this created a radical interdisciplinary shift between the crafts of sewing and engineering, inviting the craft approach of the sewing circle into the engineering paradigm of technological design and implementation. This non-trivial methodological intervention enabled the exploration of and experimentation with soft-circuit, hand-sewn, fabric-based, tactile arrays that explored aesthetic and expressive surfaces for measuring and recognizing tactile impressions. These construction processes required garment designers, electrical engineers and software developers to work side by side and even ‘hand in hand’. These experiments in fabric textile arrays were developed in tandem with the wearable technology explorations of *whisper* (2002-2004) and *exhale* (2005-2007).

Figure 80. Touchpad with Conductive Foam as Taxel and Conductive Fabric as Wire (2005)

The first experiments developed from the exploration of conductive foam as a taxel or ‘touch pixel’. In Figure 80 the touchpad is constructed from conductive foam. Each taxel is cut and placed in a grid. Conductive Fabric is used as a passive conductor of electrical current, both functional and aesthetic. These explorations incorporated aesthetic materials, poetic response and experiential tactile quality with the goal of developing a semantic tactile model. These processes were later reflected upon in defining the properties of a somaesthetic framework for technology design. The image on the left illustrates one of the first prototypes of the conductive foam taxels. When they are sewn and placed this far apart, they function as switches, rather than as a fluid or contiguous touch surface. The image on the right illustrates the use of silk organza as flexible passive conductive cabling.

Figure 81. Exploratory Research in Fabric Tactile Arrays (2005)

From the initial experiments with conductive foam fabric switches [Figures 80 & 81], we began to build up soft tactile array surfaces. Foam taxels are proportionally larger than optic fibre array taxels. While conductive foam taxels can be 'sewn' and are able to create a soft flexible surface, the number of taxels is reduced for any given surface area. Through a generous amount of testing and prototyping, we discovered that we were able to recognize tactile effort qualities using a grid as small as (4 x 4) and that a conductive foam grid of (6 x 6) enabled a similar precision as we had utilized with the (6 x 12) Tactex grid[43].

Figure 82. Exploratory Research in Fabric Tactile Arrays (2005)

In support of a somaesthetic approach to materials design, conductive silk organza is used simultaneously as an aesthetic selection of material based on sensual and tactile properties, and as a functional 'soft-wire' that conducts an electrical signal, indicating the pressure and duration of a taxel press. These individual tactile 'presses' are the

[43] Video documentation of Fabric Prototype is contained on the accompanying DVD described in Appendix A.

basis of the object’s sense of tactile recognition and correspond with the tactile mechanoreceptors of the skin. Various textures and fabric weights were explored as a skin (cover), as a surface (rough, smooth, warm, cold), and as a pocket within a garment or a container (able to be stuffed and hold embedded electronics).

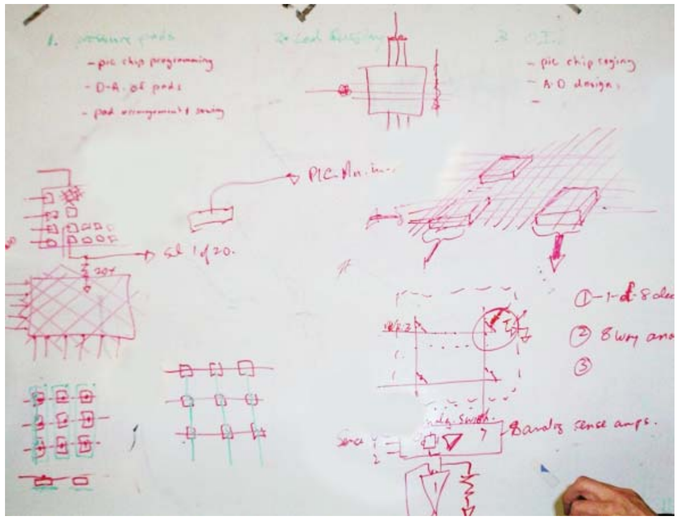

Figure 83. Designing Electronic Functionality of a Fabric Tactile Array (2005)

While the early fabric tactile arrays were constructed with the taxels further apart, the *soft(n)* iterations enabled us to place the taxels much closer together creating a more equalized and unified surface that continued to invite touch.

Figure 84. Exploratory Research in Fabric Tactile Arrays (2006)

In addition, each iteration was explored playfully with both the design team and with users. The image below, on the left, illustrates an early touch pad prototype, where the taxels are arranged in a grid of 6 x 6. Once again, the conductive fabric is used as a passive conductor or soft conductive cable. The image on the right illustrates an early electronic breadboard prototype of a 3x3 touch pad connected to a Gumstix board, the precursor to the *soft(n)* development. These examples illustrate a rich aesthetic and materials component to the craft and engineering of the fabric tactile arrays. Although this section has described examples of creating these arrays so that they could operate as tactile input devices, many participant workshops were also held in order to gather experiential feedback regarding the quality of the experience as well as the quality of the technological implementation.

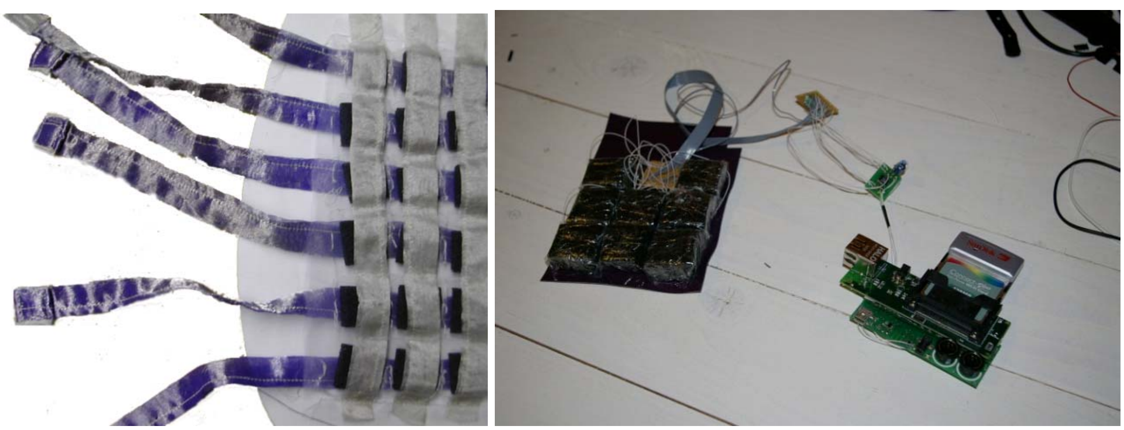

Figure 85. Exploratory Research in Fabric Tactile Arrays (2006)

This section has positioned my artistic practice within an *Artistic History of Touch* that provides a context for the development of a somaesthetic framework for design that resulted in the creation of *soft(n)*. The historical development of incorporating touch as an active and interactive sense within the artworks presented spans over a decade of practice and experimentation, led by concepts of the efficacy of embodiment, while attending to questions of how we can implement concepts of experiential quality within the design of technology interaction. This history of practice represents a continuum of exploration within which *soft(n)* was created.

7.4 Toward a Somaesthetics of Touch

The case study of *soft(n)* explores the pragmatic articulation of philosophical concepts of embodiment that focus on *touch* and *quality* of experience. This research contributes to the need for practice-based methods that can provide practical examples of conceptually rich theories of somatics. In this case study the somatic model of Laban Effort Shape is applied to articulating aesthetic qualities within experience, linking practices of *soma* with the practice of *aesthetics*. This work is positioned within an artistic practice that explores how bodily intelligence can influence and ground technologically mediated design. In *soft(n)* this is demonstrated through the application of a somaesthetic framework applied to tactile interaction for tangible networked technologies. *soft(n)* is an interactive tangible art installation developed in conjunction with V2_Lab in Rotterdam[44].

Figure 86. *soft(n)* an ecology of soft networked objects that respond to touch

[44] V2_ is an interdisciplinary center for art and media technology in Rotterdam. V2_'s activities include research and development of artworks in its media lab, organizing presentations, exhibitions and workshops, publishing in the field of art and media technology, and developing an online archive. <http://www.v2.nl>

Like Bodymaps and Felt Histories, *soft(n)* invites experience that 'attends' to our inner state through touch. *soft(n)* further articulates concepts that were nascent in the artworks Bodymaps and Felt Histories, refining the integration of experience, poetics, materiality and the development of a computational model for a semantics of caress.

7.4.1 Somaesthetics in the context of technology

The term *somaesthetics,* originally framed by Richard Shusterman, explicitly references somatics through the embodied nature of an aesthetics of use.[45] While somatics is a field of practice that references the experience of the lived body,[46] Shusterman's philosophy of somaesthetics couples somatics with aesthetics, while making a case for bringing the somatic embodied nature of aesthetics into everyday experience. Shusterman's somatic philosophy is evident in his definition of somaesthetics, which we revisit here from its introduction in Chapter 3:

> Somaesthetics can be defined as the critical study of the experience and use of one's body as a locus of sensory-aesthetic appreciation (aesthesis) and creative self-fashioning. It is devoted to knowledge, discourses, practices, and bodily disciplines that structure such somatic care or can improve it. If we … simply recall philosophy's central aims of knowledge, self-knowledge, right action, and its quest for the good life, then the philosophical value of somaesthetics should become clear.[47]

Shusterman's concept of somaesthetics brings the practice of somatics into the pragmatics of aesthetic valuation and experience. Based on Dewey's pragmatist work, *Art as Experience*[48] and Shusterman's own somatic practice, somaesthetics reinvigorates the field of aesthetics by reclaiming the lived experience of the body and particularly the notion of cultivating the self through attention to experience. A pragmatic aesthetics gives precedence to enactment by referring to the importance of experience to produce or enact aesthetic response. Like Laban, the philosopher Alva Noë regards perception as a method of *enacting* within a world that is inherently

[45] Within the HCI literature see: Fiore, S., Wright, P., & Edwards, A. (2005). op. cit., Petersen, M.G., Iversen, O.S., Krogh, P.G., & Ludvigsen, M. (2004), op. cit., and also Shusterman, R. (1992), op. cit.
[46] Hanna, T. (1980), op.cit.
[47] Shusterman, R. (1992), op. cit., p. 267.
[48] Dewey, J. (1934), op. cit.

tactile[49]. Somaesthetics embraces the *quality* of attention and awareness and provides an opportunity to explore the self's relationship to experience through technology. Within HCI, previous references to somaesthetics are sparse but include an introduction in Kallio[50] and in Lim, Stolterman, Jung and Donaldson's development of a model for Interaction Gestalt[51]. This case study brings a somaesthetic framework to the design of tactile interaction within human-computer interaction.

Figure 87. *soft(n)* explores a tactile aesthetics of interaction

7.4.2 Somaesthetics within a history of Soft Sculpture

In *soft(n)*, the sense of touch is based on qualities that can 'soften' experience[52]. The *soft(n)* title references the Pop Art and Feminist Art history of soft sculpture that was originally credited to the artist Claes Oldenberg in the 1960s. Oldenberg's work was ripe with satire and humor in its playful and wry commentary on mass culture. Soft sculpture refers to a cultural shift in materials of production that embraced "radically soft things" and that generated a new vocabulary of form that also resisted form,

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[49] Noë, A. (2004), op. cit.
[50] Kallio, T. (2003), op. cit.
[51] Lim, Y. K., Stolterman, E., Jung, H., & Donaldson, J. (2007). op. cit.
[52] Acknowledging the embodied and experiential nature of tangible interaction and highlight the coupling of somatics (Bødker, 2006, p. 1-8) with aesthetics (Kallio, 2003, p. 142-143). Attention to aesthetic qualities is being instrumental to interaction design (Fiore, Wright & Edwards, 2005, p. 129-132; Petersen, Iversen, et al, 2004, p. 269-276).

inventing the concept of the anti-form.[53] Soft Sculptures permeated the Feminist Art movement in the 1960s and 1970s, seeking ways in which these soft anti-forms could bring into play domestic materials and techniques such as sewing, knitting and quilting. These appropriations of domestic process sought to create a material inclusiveness and were often, playful, subversive and cheeky[54]. The concept of the *sewing circle* enters into the methodological rhetoric of *soft(n)* with its emphasis on sewing, crafting and weaving together textiles with conductive materials and conductive concepts born within electrical engineering[55]. In *soft(n)* the physical tactile surface is flexible, warm, pliable and intelligent. Its sensory surface is crafted from conductive strands of fabric and foam that are able to interpret qualitative meaning from tactile gesture. One can think of *soft(n)* as a counterpoint to, or a critique of, the hard: a survival strategy for interaction that allows intimacy, misplaced action, mistake, forgiveness, softness, weakness, stillness, giving in, and letting go.

Figure 88. *soft(n)* references soft sculpture and explores embodied interaction

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[53] Rainforth, Dylan (2009). *Through the Past, Softly,* Editorial Column in artguide Australia online <http://artguide.com.au/features/through-the-past-softly/>

[54] Ibid.

[55] The concept of the *sewing circle* was originally introduced in the *whisper* concept development and was influenced by collaboration with Susan Kozel an artistic collaborator and partner in the whisper[s] project.

Rather than aligning with a contemporary 'edge', *soft(n)* gives in to the liminal centre within subjectivity. *soft(n)* situates its critique within the computational act of *quality*. Tactility and kinesthesia are rich, intricate, and full of resolution and expressivity.[56] Like its Pop art predecessors a poetics of interaction allows for the playful imagination of participants. The somaesthetics of tactile interaction emphasizes a concern with creating meaning through 'softening' experience. *soft(n)* follows in the tradition of soft-sculpture through the critical practice of somaesthetics.

7.4.3 Four Themes of Somaesthetics

soft(n) explores somatic approaches to design aesthetics that highlight the senses, body, and movement through critical physical inquiry.[57] This approach to *somaesthetics* forms the bases of an underlying design framework that encompasses four themes: 1) Experience, which frames questions of cultivating embodiment, sensory perception and links to techniques of somatics; 2) Poetics of Interaction including meaning-making and open interpretation, which explores perception and cross-modal relationships between touch and other sensory expression; 3) Materiality, which emphasizes the importance of the physical body as well as the physical material, texture, shape, and form that support experience within the installation; and 4) Semantics of Caress, investigating the meaning of touch as applied to tactile interaction (how models for tactile meaning may be applied to a computational model of interaction). This framework has been developed historically through ongoing artistic inquiry and practice spanning over a decade. Each of the four thematic elements in the somaesthetic framework of Experience, Poetics, Materiality and Semantics are present in prior artistic work. In the first theme of *Experience* the artworks of Bodymaps and Felt Histories create a resonant space for developing attentional 'skills' through

[56] Gibson, J.J. (1962). Observations on active touch, *Psychological Review*, *69*(6), p. 477-491.

[57] Within the HCI literature, see: Gaver, B. (2002). Provocative Awareness, *Computer Supported Cooperative Work* (*CSCW*), *11*(3-4), September 2002, The Netherlands: Kluwer Academic Publishers, p. 475-493; Hansen, L. (2005). Contemplative Interaction: Alternating Between Immersion and Reflection, *Proceedings of the 4th decennial conference on Critical computing: between sense and sensibility* (*CC '05*), p. 125-128.

interaction. The second theme of *Poetics of Interaction* is incorporated in the poetic and lyrical framing of aesthetic interaction. Bodymaps evoked a poetics rich with sensual, contemplative, and tactile attention where participants were invited to observe and affect their response. Felt Histories explored the poetics of dissolution and decay and the volitional act of a tactile voyeurism that was enacted through interaction with the Felt Histories 'doorframe'. The third theme of *Materiality* is grounded by a history of artistic exploration where the selection of material properties and tactile quality enabled interaction experience to be drawn toward the human senses: 1) in Bodymaps the tactile quality of the velvet and its property of memory traces, 2) in Felt Histories the transparency of the sensor surface and its hand-crafted metaphor of the palm of the hand, and 3) in the fabric tactile array research with its lush saturated color and raw textures using conductive thread, fabric and foam. The fourth somaesthetic theme of a *Semantics of Caress* has enabled experience, poetics and materiality to be understood and executed through *technological* models that could invite response, reaction and interaction. These *qualities* of experience, of touch and of movement continue to compel and develop the research within *soft(n).*

7.5 A Somaesthetics Framework Applied to *soft(n)*

The four themes of the somaesthetic framework are experience, poetics of interaction, materiality and semantics of caress. The first theme in the somaesthetics framework presented here, is that of experience. In Shusterman's conception of somaesthetics, bodily experience is inextricably tied to the meaning of our sensory selves. Experience is at once sensory and aesthetic.[58] Other philosophers such as Dewey have defined art itself *as* experience[59] and, more recently, the field of HCI has recognized the centrality of experience within technology design,[60] exploring concepts such as gestalt[61] and

[58] Shusterman, R. (2008), op. cit.
[59] Dewey, J. (1934), op. cit.
[60] McCarthy, J., & Wright, P. (2004), op. cit.
[61] Lim, Y.K., Stolterman, E., Jung, H., & Donaldson, J. (2007), op. cit.

empathy[62] within a focus of interaction. The design of *soft(n)* explores experience from the perspective of embodied interaction, incorporating Laban's somatic concepts of experiential quality of movement and touch within its somaesthetic framework. The theme of *Experience* is described from the perspective of the participant's interaction with *soft(n)* and is also defined through the poetics, materiality and semantics of interaction. The *Poetics* of *soft(n)* supports the participant's experience through its lyrical metaphors. The *Materiality* theme describes the construction and design of textile and electronic materials that support the aesthetics of interaction. The *Semantics of Interaction* theme describes how meaning is encoded and extracted from a tactile interface to support the participants' experience.

7.5.1 *soft(n)* Experience within the Installation

The *soft(n)* installation is an intelligent tangible network comprised of 10 soft physical objects that exhibit emergent behavior when touched or moved about in the space. Aesthetic qualities that engage the senses (feeling, listening, observing, moving) reflect the embodied nature of user experience design. Each of the 10 interactive soft objects contains a specially designed and custom-engineered multi-touch soft input surface and accelerometers that detect motion. Tactile recognition is implemented using Laban Effort Shape analysis[63]. Participants' tactile quality is recognized and communicated through a wireless network as 'meaning' to other participants. Each soft object has an ability to actuate vibration, light and sound in response to its tactile induced state. The actuation patterns enable a specific proximal layer of communication: local, mid-range and distant. Vibration (movement) is a local or intimate sense.

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[62] Wright, P., & McCarthy, J. (2008). Empathy and experience in HCI, *Proceedings of the Twenty-Sixth Annual SIGCHI Conference on Human Factors in Computing Systems* (Florence, Italy), CHI '08. New York: ACM Press, p. 637-646.

[63] Schiphorst, T., Jaffe, N., & Lovell, R. (2005). Threads of Recognition: Using Touch as Input with Directionally Conductive Fabric, *Proceedings of the SIGCHI conference on Human Factors in computing systems*, April 2–7, 2005, Portland, Oregon.

Figure 89. Vibration is a local or intimate sense that is felt through direct contact

Vibration patterns can only be felt when a participant is in direct contact with the soft object, holding it, or placing ones' hands or head or body in direct tactile contact with the object. While vibration is the most proximal sense requiring contact through touch, sound is mid-range, and light is the most distant sense. Sound output is relatively quiet, and can be heard in the near vicinity of an object without physical contact with the object. A lower sound volume is designed to maintain a need to be in close proximity to the object. For example, if objects are 'sleeping' but not being interacted with, a specific 'wheezing' and 'teasing' sound can be heard that is quiet, relatively local, and intended to invite contact.

When an object is thrown in the air, the soft object sings out an elongated 'wheeee' sound reminiscent of a small child being thrown in the air [Figure 90]. The participant who has thrown the object and others in the near vicinity can hear this sound. The state of the 'thrown' soft object is communicated to other objects and the sound is then shared between and amongst objects that are 'listening'. Sound is a 'mid-range' sense, localized, but not requiring one-on-one tactile interaction in order initiate or to witness the sonic response.

Figure 90. Accelerometers trigger the sound of '*weeeeee!*' as soft objects are thrown into the air

The *light* pattern output of the soft objects is perceptible as the most distant sense. Light patterns move through the objects in groups much the same as sonic patterns. However, light patterns can be seen and recognized from a greater distance, and can therefore illustrate and communicate group dynamics and behaviors from a more non-local perspective.

Figure 91. Moving Light Patterns Communicate the Inter-relationship of a Group

Movement is actuated in the form of continuous vibration and intensity, light in the form of color, pattern and intensity, and sound in the form of simple tones and sequences. Communication between the soft objects elicits behaviors such as sighing, humming, shaking-shivering, and a shared ‘glow-on’: moving light patterns that communicate the inter-relationship of the group. The output patterns that move between the objects illustrate the physical path of the communication of state-qualities. A computer screen displays their interaction and communication, which is both effected and disrupted by participants.

7.5.2 From Embodiment to Poetics of Interaction

The second theme is poetics of interaction. A poetics of interaction supports a somaesthetics framework because it acknowledges that meaning is simultaneously constructed on multiple levels: conceptual, experiential, material, and computational (or technological). Meaning derives from our experience and the imaginative interplay between our self and our environment.

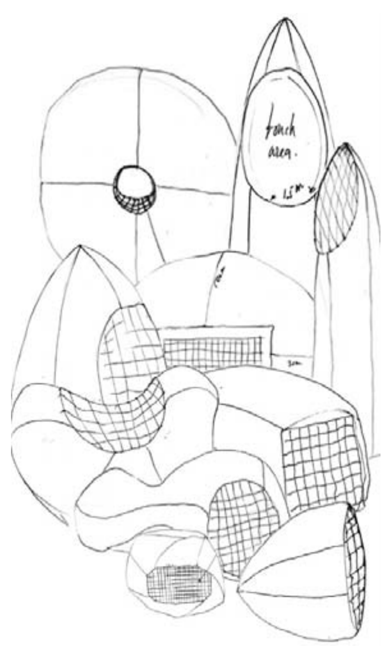

Figure 92. Concept illustration of soft(n) family of tactile objects each unique in form

A poetics of interaction allows for a critical and playful approach to design and affords access to the imagination of users, allowing both feeling and thought to be engaged.[64] Tactility and kinesthesia are rich, intricate, and full of resolution and expressivity.[65] Patterns and movement of light, sound and vibration purposely allow an open interpretation, multiple meanings and associations.[66] This design strategy is commonly used in artistic practice as a way of poetically evoking experience, thoughtful reflection, and resonance.[67]

Figure 93. a *soft(n)* family portrait illustrating the 10 interactive soft objects each containing a hand-sewn tactile array

7.5.2.1 Poetics and Metaphors

soft(n) encompasses a number of poetic metaphors. These include the notion of 'past lives' of objects, cherishing and memory, the impression of softness and pliability, and emotional attributes contained within objects such as forgiveness, stubbornness, resistance and glee. Touch is a proximal sense, and combined with the soft pillow-like object can 'arrest' us, creating a window of stillness, creating a space to be held, to bolster, to cushion, to dream.

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64 Blythe, M.A., Monk, A.F., Overbeeke, K., & Wright, P.C. (eds.) (2003), op. cit.
65 Gibson, J.J. (1966), op. cit.
66 Sengers, P., & Gaver, W. (2006), op. cit.
67 Hummels, C., Overbeeke, K., & van der Helm, A. (2003), op. cit.

Figure 94. *soft(n)* a poetics of interaction

Other artists have explored poetics in objects such as pillows[68] and have acknowledged the importance of open interpretation, interaction that is resonant, contemplative or that provokes awareness through ambient approaches to design. The installation is also contained within a poetic frame of space. It takes place within a social setting where the space of a room holds a soft tangible network. The network lives through its own interaction, and is intervened by its audience. The network can be 'troubled' or 'held' by its visitors.

These poetic concepts create a set of somaesthetic markers[69] that we used in a design process to construct possible experiences for participants within the system. The use of somaesthetic framing through poetic forms allows for flexible, meaningful, value-laden design choices that support experiential outcomes.

Figure 95. *soft(n)* a poetics of space

[68] Dunne, A., & Gaver, W.W. (1997). The Pillow: Artist-Designers in the Digital Age, *CHI Proceedings*, March 1997, p. 361-362.
[69] Kallio, T. (2003), op. cit., p. 142-143.

7.5.3 Materiality: Sewing the Pieces Together

The third theme of the proposed somaesthetic framework is that of materiality. This theme emphasizes the importance of embodiment and its application to physical materials; the texture, shape, fabric and form that support experience within the installation. Recent work in HCI has recognized the value of exploring textiles to investigate computational technology as design material.[70] *soft(n)* contributes to this investigation with an emphasis on materiality of the physical form designed to enhance the experience of touch. The theme of materiality is dependent upon and inter-connected with the somaesthetic framework as a whole: sustaining experience for the participants (theme 1), the poetics that frame its meaning and sense perception (theme 2), and the soft objects technical design, or 'semantics of caress' that can recognize and respond to tactile states (theme 4). This research integrates custom engineering to enable tactile quality recognition.

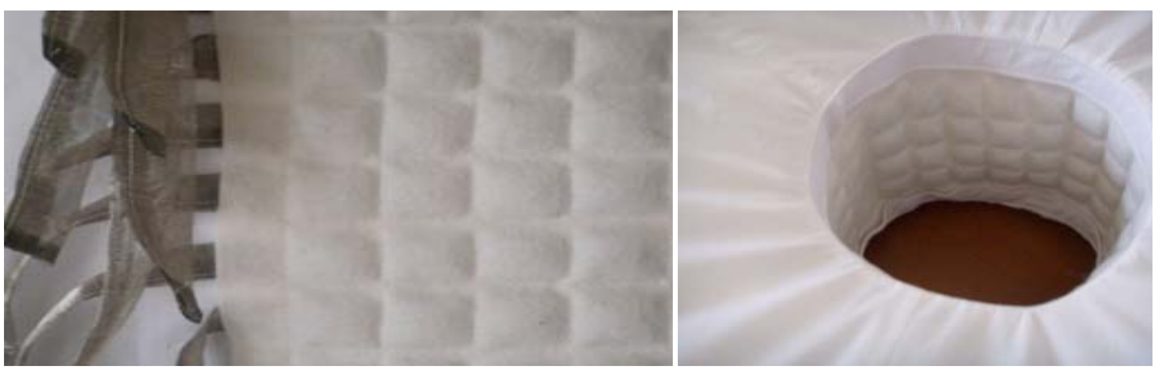


Figure 96. Tactile Interaction Surface Custom Sewn

The scale of each soft object ranges from 0.6 to 1.0 meter, an almost human scale. This scale of the soft objects does not overwhelm the participant's own body, thereby

[70] Recent explorations in wearable technologies and properties of material and textile within HCI include: Berzowska, J. (2005). Memory Rich Clothing: second skins that communicate physical memory, *Proceedings of the 5th conference on Creativity and Cognition* (*C&C 05*), London, April 12-15, p. 32-40; Hallnäs, L., & Redström, J. (2002). From Use to Presence: On the Expressions and Asethetics of Everyday Computational Things, *ACM Transactions on Computer-Human Interaction, 9*, p. 106-124; and also Post, E.R., & Orth, M. (1997). Smart Fabric, or Washable Computing, *First IEEE International Symposium on Wearable Computers*, Cambridge, Massachusetts.

bestowing each object with a sense of conviviality. The shapes are intended to be somewhat abstract or non-literal (not shaped like people, not like animals, not like known living things) yet reminiscent of large vegetables or perhaps human organs. They can be moved, thrown, or placed, so interaction is flexible and various scenarios may emerge based on participants' imagination.

7.5.3.1 Materials Exploration and Conductive Fabric Cables

The *soft(n)* materials exploration was based on preliminary research that was constructed in prior technological explorations of fabric tactile arrays (see Section 7.3.4). These prior experiments used conductive foam and conductive fabric and were enhanced during the development of *soft(n).* In particular, the construction and hand-crafting of the tactile fabric arrays was refined both aesthetically and technically. The *soft(n)* conductive silk organza cables send data signals from the fabric touchpad to the embedded processing unit. The soft object serves mainly as an affectionate sensory transmitter that provides a basic analysis of the signals, using pressure, temporal and spatial location to parse tactile qualities, which are then shared within the network. Each *soft(n)* object has a custom-made fabric exterior pouch filled with soft material and embedded with a small gumstix controller that coordinates and interprets the data communication.

Figure 97. Materials Exploration in *soft(n)* tactile fabric arrays

There are several small circuits that control embedded transducers – which include light array(s) and vibrating motors – that are mounted on individual circuit boards, called ‘islands’. Connections that cannot be made wirelessly are made using conductive fabric ‘wires’ made from silk organza, a transparent directionally conductive fabric along one axis, woven through a non-conductive fabric in the other axis. The silk organza is sewn directly into the soft object tactile surface to form portions of the soft object itself.

The following page illustrates how a fabric array is hand-sewn to create a flexible tactile surface. The description of the construction and buildup of the fabric tactile matrix is contained in Table 14 below. These steps correlate to the images in Figure 98. Each of the soft objects contained a distinct tactile surface individually designed to match the soft object’s form, size and shape.

Construction and Buildup of Fabric Tactile Matrix
1. Each cell of the Touch-matrix consists of a square piece of resistive foam, in series with a Schottky diode sewn into the fabric between the row- (outputs) and column-electrodes (inputs). Schottky diodes were used for isolation between the cells because of their low forward voltage. Here we see one row of the diodes. 2. Here we see the top layer of the grid, after the diodes have been inserted. 3. To make better contact with the foam squares, the leads of the diodes are ‘curled’. 4. The leads on the side of the diodes away from the foam squares are also ‘curled’ for ease of connection. 5. Another view of the top layer, prior to adding the foam squares. 6. Placing the foam squares in contact with the diodes, using silk organza as a conductive layer. 7. The external connection to the foam squares is made via a ribbon of silk organza, here being attached to a column of cells. 8. Here we see all four columns with their silk organza ‘wires’ attached. 9. The cells are protected from mechanical damage by a fabric layer over the silk organza ‘wires’. 10. Here we see the bottom side of the assembly, ready to have the bottom silk organza ‘wires’ attached.

Table 14. Description of Construction and Buildup of Fabric Tactile Matrix

The following illustration shows how a fabric array is hand-sewn to create a flexible tactile surface.

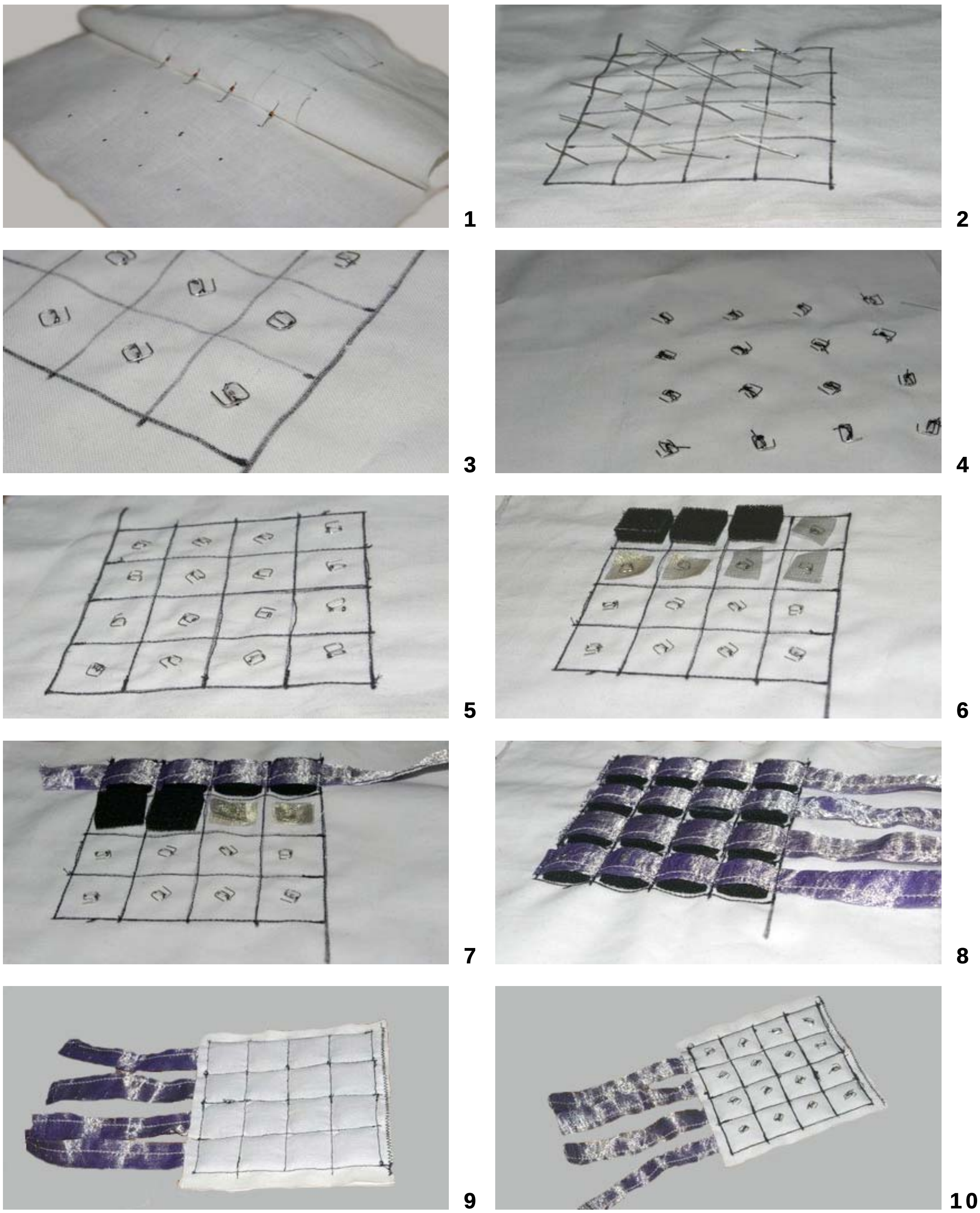
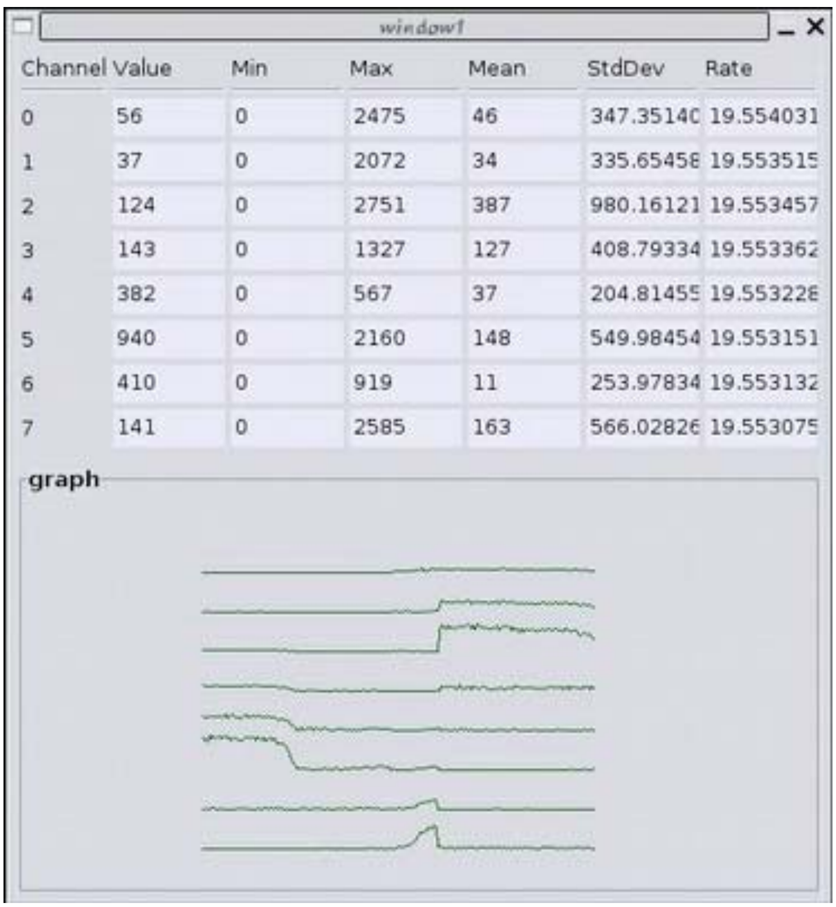


Figure 98: Illustration of Buildup of Hand Sewn Conductive Tactile MultiTouch Surface

The material exploration presented in the support of a somaesthetics of interaction was guided by the goal of expressing and articulating experiential tactile qualities based on Laban's 8 Basic Efforts. The proposition is that if one's movements or tactile gestures can be *recognized* and if that recognition can be used to create a space for *self-recognition* and if this language of recognition can provide a source of rich interplay between movement and sensory expression then our technologies can support the development of our *skills of experience* including self-awareness in a shared ambient space in which an installation could invite an 'attending to' our state of being. Although this proposition may appear quite general (and perhaps therefore unattainable), the specific example presented in the *soft(n)* installation is one particular instantiation of an exploration which fulfils and articulates some of these properties.

7.5.4 ***soft(n)*** **Semantics of Caress**

The fourth theme of the somaesthetic framework presented is the Semantics of Caress, which investigates *how* the meaning of touch can be applied to tactile interaction. Once again this continues from prior work implemented on the Tactex MTC Express that was outlined in Section 7.3.3, Developing a Semantics of Caress. In *soft(n)* the tactile meaning is implemented based on data extracted from a soft fabric tactile array, following a similar model based on Laban Effort Shape analysis which describes qualitative tactile *impressions* in a computationally definable form. In the construction of the fabric tactile array, pressure is an essential data value extracted to define a caress and its effort. Figure 99 illustrates the data extracted while a tactile surface is being caressed, stroked, or touched. Touch qualities are extracted based on pressure, number, size, speed and direction of the touch data. Table 15 correlates these tactile parameters with their features and describes how the parameters are used to parse specific effort qualities. Using a simple set of heuristics, up to 12 tactile qualities can be recognized, and differentiated.[71] These tactile qualities are based on Laban's 8 basic efforts as defined in section 7.2. Tactile qualities remain a qualitative indicator of meaning and of the *soft(n)* object's state. These touch-efforts [see Table 16] can suggest soft states expressed through various mappings to actuators including vibration, sound and luminous qualities. Touch efforts are derived from the parameters extracted from the tactile data in the fabric array. In the *soft(n)* installation the touch-efforts are the basis of shared network communication between soft objects. This shared 'state data' exhibits emerging behavior between the *soft(n)* family as participants hold, flick, slash, dab, or stroke these soft objects.



Channel	Value	Min	Max	Mean	StdDev	Rate
0	56	0	2475	46	347.35140	19.554031
1	37	0	2072	34	335.65458	19.553515
2	124	0	2751	387	980.16121	19.553457
3	143	0	1327	127	408.79334	19.553362
4	382	0	567	37	204.81455	19.553228
5	940	0	2160	148	549.98454	19.553151
6	410	0	919	11	253.97834	19.553132
7	141	0	2585	163	566.02826	19.553075

Figure 99. Pressure data over time from a 4 x 4 *soft(n)* fabric tactile array

[71] Schiphorst, T., Jaffe, N., & Lovell, R. (2005), op. cit.

‘Touch qualities’ are derived from parameters extracted from the input sensors. Parameters derived from the touch pad are shown below. The description in the table shows how the parameter is mapped to a touch quality. From the parameters illustrated in the table, touch qualities are extracted based on pressure, number, size, speed and direction of the hand’s moving tactile impression. Up to 12 tactile qualities can be recognized. These tactile qualities are based on Laban’s 8 basic efforts. The key to this system is that movement qualities can be measured, but they themselves are not quantitative but qualitative. In that sense, the extraction of a quality is a fuzzy extraction, and can suggest soft states that can be expressed through various mappings to actuators including vibration, sound and luminous qualities. These concepts are founded on an implementation of a system that represents touch and movement as meaningful, and can network and communicate on the level of quality sharing.

Parameter	Description	
pressure	soft, hard	The intensity of the touch. (light, strong)
time	short, long	The length of time a gesture takes. (quick, sustained)
size	small, medium, big	The size of the part of the interaction object that touches the pad. (light has affinity to small)
number	one, many	The distinction between one finger or object and many fingers.
speed	none, slow, fast	The speed of a touch-effort. This is the overall velocity of movement. This parameter is not used directly to distinguish efforts, but is used to determine space. (Laban Space is flexible [indirect] or direct)
direction	none, left, right, up, down, diagonals	The direction of movement. This parameter is not used directly to distinguish efforts, but is used to determine space and path. (direct, indirect)
Secondary		
space (speed)	stationary, travelling	A function of speed. If speed is zero then the gesture is stationary, otherwise it is travelling.
path (direction)	straight, wandering	If the speed is not zero and there is only one direction registered, the gesture is straight. (direct, indirect)
disposition (pressure)	constant, varying	If the pressure maintains a single value after an initial acceleration the gesture is constant, otherwise it is varying.
pattern (gesture)	continuous, repetitive	If a gesture is unique in relation to the gestures immediately before and after, it is continuous. Any repeated action or gesture is classified as repetitive.

Table 15. Parameters derived from pressure pad data

Laban Basic Effort	Touch-Effort	Description
Dab	dab (tap)	A soft (light), short (quick), small, touch (direct), usually rendered with a single finger.
	dab (pat)	A bigger version of “tap” and a soft version of “slap”. Usually rendered with an open hand or palm. (light, quick, direct)
Glide	glide (hold)	A lingering (sustained), soft (light), big, touch. A “hold” has an encompassing feel. (direct)
	glide (touch)	“Touch” is a small version of “hold”. It is an indication of comfort and is rendered with the fingers, hand, or palm. (sustained, light, direct)
	glide (stroke)	A traveling (sustained) touch, soft but directional (direct), rendered with fingers, hand or palm.
Float	float (caress)	A traveling (sustained), meandering (indirect), touch. Soft (light) and directionless and rendered with the fingers, hand, or palm.
Flick	flick (jab)	A brief (quick), short, small (light), hard (direct) touch. A direct poke by a finger or blunted object. Also known as “poke”.
Punch	punch-thrust (knock)	A medium-sized, fist against, rapping hard (direct, strong, quick). In our scheme, it is different than “jab” and “slap” in size only.
Slash	slash (slap)	An open-handed, fast (quick, light), short (direct), touch. In our scheme, a large version of “jab” and “knock”.
Press	press	This is a long (sustained, strong), hard (direct), touch.
Wring	wring (rub)	This is a moving (sustained), hard (strong), touch (indirect).
	wring (knead)	Kneading involves many fingers moving hard (strong) and in a slightly wandering (sustained, indirect) fashion.

Table 16. Touch-efforts as derived from Laban Basic Efforts with Description

This section has illustrated the development of a somaesthetics framework and provided a detailed description of its implementation within *soft(n,* proposing the inclusion of design criteria that articulate a concern with experience, poetics, materiality and semantics of interaction. An underlying somatics concept is that by attending to the sense of touch we can develop discernment and skill in accessing out bodies’ knowledge.

7.6 Summary of *soft(n)* Values and Somatics Techniques

The somatics values of self, attention, experience, and inter-connection outlined in Chapter 2 are incorporated into the somaesthetics framework described. Although the somatic system of Laban Effort Shape has been highlighted with regard to technological implementation, the design of *soft(n)* also included participant workshops and experience prototype sessions similar to those described within Chapter 5 and 6. This case study explored a specific somatic implementation used as a proof-of-concept to exemplify the articulation of Laban's Effort Shape system in a technological system. Laban Effort Shape and somatic techniques and knowledge can be applied to many access points within a technological design process.

	Chapter 7 Somaesthetics of Touch ***soft(n)***
VALUE	
Self	Self-through-touch Active touch Tactile intention
Attention	Tactile Attentions • Intention • Sensation • Quality - Meaning • Content: Pressure, Duration, Path
Experience Qualities	Sensuality Intimacy Pleasure Play
Inter-Connection	Tactile Relationship • To object • To self • To other participant • To space
Somatics Systems Applied	Laban Effort-Shape Movement Analysis applied to technological design • Effort - Quality • Space - Attention • Weight - Intention • Time - Decision/Choice • Flow - Continuity/Progression

Table 17. *soft(n)* Somatics Values and Techniques

7.7 Conclusion

This chapter has explored the concept of *somaesthetics* as an approach to the design of expressive tactile interaction. It has highlighted our sense of touch in relationship with technology, focusing on a technological design and implementation process based on Rudolph Laban's Effort Shape analysis. Because Laban describes movement effort qualities as an *inner bodily attitude* toward outer movement enactment, his approach has tremendous value in modeling experience within HCI. The exploration of felt-life within HCI holds a nascent and yet-to-be fulfilled place within the design of technology. There is a continued need for such a discourse to develop and flourish within HCI. I revisit McCarthy and Wright's statement articulated in Chapter Two:

> A radical approach to the mediation of our subjectivity by technology requires us to linger in the gap between inner life and external behaviour, where our subjectivity or sense of self is created, and *we have not yet done that in reflecting on our practices with technology*.[72] [italics mine].

Laban's Effort Shape is an example of a model that *embodies* a subjective epistemology through its articulation of the connection between inner state and outer movement-behaviour. Within the field of somatics, Laban was unique in his ability to apply his first-person experience of movement knowledge to a *formalized symbolic* movement analysis system that is both rigorous and expressive. It is precisely because of the symbolic nature of Laban's system of movement analysis that his work resonates with the application to technological design. Digital technology is based on symbolic and computational systems of representation, and Laban's symbolic descriptions of movement form, movement properties and movement qualities provide a starting point for constructing technological movement models that can be applied equally to user experience and computational design. Laban's theoretical framework is well suited to its computational modeling. For this reason, the exploration and

[72] McCarthy, J., & Wright, P. (2005 op. cit.p. 267.

implementation of Laban's Effort Qualities can support "a radical approach to the mediation of our subjectivity by technology that allows us to linger in the gap between inner life and external behaviour."

Soft(n) was positioned in three ways in this Chapter: within an *artistic* frame, as an example of a soft sculpture that creates a poetic and tactile intervention in a technological aesthetics of use; within a *somaesthetic* frame, highlighting the somatic knowledge within Laban's Effort Shape system; and within the frame of *human computer interaction*, illustrating how somatics knowledge can be applied to technological design for interaction.

The Somaesthetics of Touch explored the experience of a tactile world where the *quality* of tactile experience can be modeled within interaction design. Rudolph Laban, one of the key movement theorist-practitioners to emerge from the somatics traditions of the twentieth century, reminds us that *all* our senses are a variation of our unique sense of touch, which enables the relationship between movement and space to be discerned within bodily-experience.

Somaesthetics can provide a critical study of bodily experience as a focus of sensory-aesthetic appreciation and agency, and can offer a bridging strategy between embodied practices based in somatics and the design of aesthetics of interaction within HCI. The design and implementation of *soft(n)* exemplifies a process of designing within a somaesthetic framework where embodied techniques are proposed within the design method (process) as well as the design outcome (goals).

8

Self-Evidence: A Non-Alienated View

"The current views of 'truth' are alienated views; they cause one to lose one part or another of one's self and the world… my purpose is to sketch the leading ideas of a non-alienated view."

Hillary Putnam[1]

"When I was observing issues of wholeness and life in a thing, I did not try to observe things as if I myself did not exist."

Christopher Alexander[2]

8.1 Introduction

This chapter analyzes, evaluates and critically reflects upon the three case studies *as a whole*[3], summarizing their contribution to the thesis objectives. Within the heart of these objectives is the hypothesis that *self-evidence* is a critical component of a non-alienated view of technology design. The concept of *self-evidence* invites a re-thinking of the process of design for technology, one that includes design for the experience of the self. Supported by concepts of somatic phenomenology and discourse surrounding 'felt-life' within HCI, the case studies articulate the concept of self-evidence through the application of somatic body-based practices as a resource for technology design within HCI. The case studies share a central proposition that experience within interaction is not only *given* but also *enacted* through the participation of the user. Including affordances for self-experience and self-awareness *within* technological design brings an ethical dimension to the assessment of technological systems within HCI. By engendering a role for cultivating self-awareness within interaction, our digital technologies can support the development of an *attentional skill-set* for experience.

[1] Putnam, H. (1981), op. cit., p. xi-xii.

[2] Alexander, C. (2002), op. cit., p. 352.

[3] The three case studies *whisper*, *exhale* and *soft(n)* are described in Chapter 5 From the Inside Out [whisper], Chapter 6 Designing with Breath [exhale], and Chapter 7 Toward a Somaesthetics of Touch [soft(n)]

Viewing experience as a skill that can be evolved, is an epistemological framing that is central to somatics practice[4]. In *Personal Knowledge*[5], Michael Polanyi uses the concept of *indwelling:* the application of experiential skills within our use of tools and technology. Polanyi describes the way in which we 'share a field of experience' by extending ourselves into our tools and technologies. Polanyi's concept of indwelling exemplifies the connection between an experiential self-evidence leading to a non-alienated view of technology design:

> [the tools] can never lie in the field [outside ourselves] … they remain necessarily on our side of it, forming part of ourselves, [as] the operating persons [in our creation of technology]. We pour ourselves out into them and assimilate them as parts of our own existence. We accept them existentially by dwelling in them.[6]

This chapter discusses insights gained from applying somatic practice to the design of technology, and describes how these design processes can be operationalized as a resource within an HCI context. Among these resources, is the practice of somatic connoisseurship, and the significance of 'somatic facilitation' as a role within a technological design process that is shaped by somatic sensibilities. This chapter synthesizes data extrapolated from the case studies creating an argument for the inclusion of somatic awareness within an interdisciplinary framing of HCI. Finally this chapter summarizes case study data through a comparative analysis of design process that evaluates assumptions, methods and outcomes: the self-evidence that results from these case studies as a whole.

Central to this thesis is the inclusion of self-evidence and the non-alienated view of technology design in which the *self*, embodied within the multiple roles of researcher, designer, artist, and participant or user, is included in the methodological structure of design for technology, both as design goal and as design process.

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[4] The concept of *experience as skill* has been described in detail in Chapter 2 Embodiment in Somatics and Performance.

[5] Polanyi, M. (1958). *Personal Knowledge: Towards a Post-Critical Philosophy*, Chicago: University of Chicago Press, p. 59.

[6] Ibid.

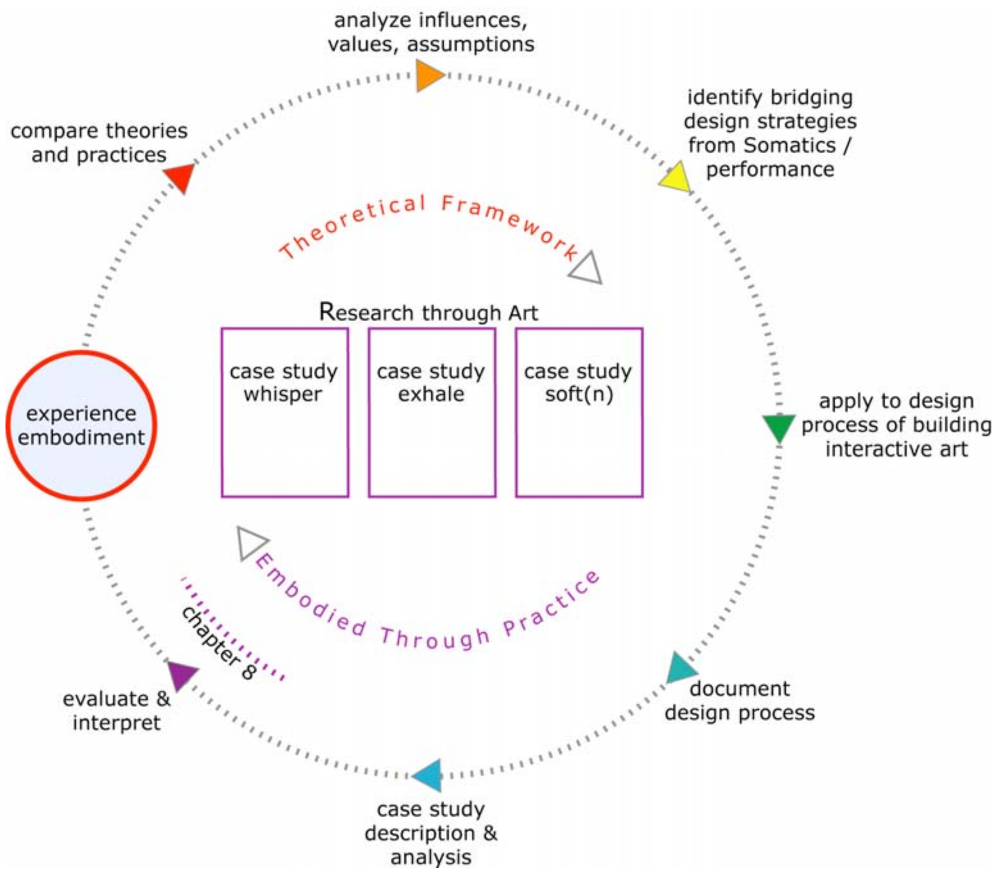

Figure 100: Analyzes, Evaluates and Interprets Case Studies as a Whole

These three case studies taken as a whole are intended to illustrate a breadth of somatics approaches and techniques applied to the technology design cycle within HCI. The case studies *whisper* and *exhale* outlined in Chapters 5 and 6 provided examples of the application of somatic techniques exploring body-state and breath. In these examples somatic techniques were applied to the early stages of technology design in which concept exploration and realization were generated from participant's exploration of felt experience. The third case study, *soft(n)* also incorporated early design exploration based on participant experience workshops and technology prototyping. However, the case study analysis of *soft(n)* in Chapter 7 focused on the application of somatics knowledge to a functional computational model for technological implementation, which illustrated an approach that embeds somatic knowledge within a computational model in the design process.

Chapter 4 Bridging Methodologies, introduced the case studies through their contribution to design activities, and focused on describing design exploration within a design lifecycle. Daniel Fallman[7] has noted the link between design exploration and artistic practice.

> …design exploration is a way to comment on a phenomenon by *bringing forth an artifact* that often in itself, without overhead explanations, becomes a statement or a contribution to an ongoing societal discussion. In this way, the activity of design exploration is clearly linked to some of the ideals of contemporary art, as well as to the interpretative attitude of many humanities disciplines.[8] [Italics mine].

Although each of the case studies *brought forth* an artwork as artifact, that artifact is more appropriately understood as an 'artifact of experience' generated by the conditions within the technological design of the art installation. The case studies also simultaneously brought forth an 'artifact of design process' in which Polanyi's concept of indwelling is articulated in the design of technology. The indwelling of experience in which we "pour ourselves out into our technologies and assimilate them as parts of our experience"[9] resonates with the design explorations of these case studies. The concept of indwelling synthesizes the notion of artifact as experience where subject and object intersect. This chapter expands upon the examples introduced in Chapters 5, 6 and 7 providing analysis and context regarding somatic facilitation and collaboration. Each case study applied a variety of somatic techniques within a design exploration process.

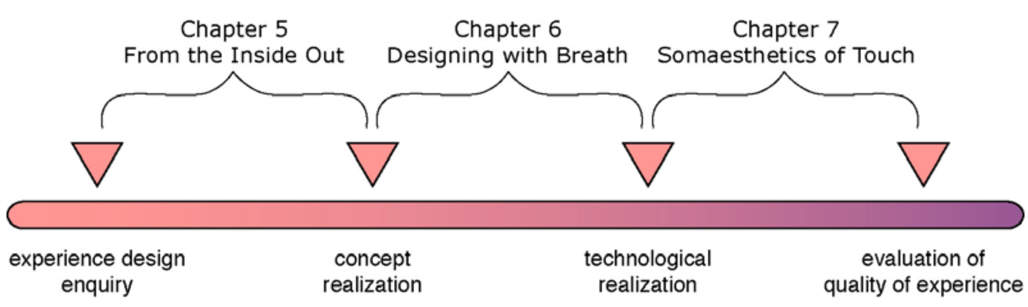

Figure 101. A Variety of Somatic Techniques applied to Different Stages of Design Process

[7] Fallman, D. (2008). The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Exploration*, Design Issues*, *24*(3), Cambridge, Massachusetts: MIT Press, p. 4-18.
[8] Ibid, p. 8.
[9] Polanyi, M. (1958), op. cit., p. 59.

8.1.1 Contextualize Research Strategy within Thesis Objectives

The research strategy is based on an overarching process of research through art that has explanatory value with the HCI community in the context of design for embodied interaction. The proposition is that if technology can be used to create a space for the experience of *self-awareness,* thereby providing a source of rich interplay between movement and sensory expression, then our technologies can support self-cultivation through the development of our *skills of experience*. Shared ambient technological spaces can create affordances for ‘attending to’ our state of being. The comparative case study analysis of the whisper, exhale and *soft(n)* installations enables a rich variety of somatic body-based techniques to be evaluated in the context of this proposition. This chapter provides a comparative analysis that articulates this proposition through the practice of somatic connoisseurship within a design process, and an evaluation of assumptions and values based upon self-evidence that results from these case studies as a whole.

8.1.2 Case Studies Contribution to the Thesis Objectives

The propositions, design exploration and evidence gathered from the case studies has followed from an inquiry based on a set of research objectives derived from the research questions outlined in Chapter 1. These are summarized to frame the discussion that follows. These objectives are to:

1. Illustrate the application of body-based somatic practices within an HCI context in order to expand the practical application of embodied theory and its application to technology design, particularly in its use as a design resource within HCI.
2. Enhance a reflective space for ethical valuation of technology design within HCI through a radical interdisciplinary approach utilizing ameliorative properties of first-person methods of somatics and contemporary dance.
3. Reframe user experience within HCI and between HCI and somatics through an articulation of the epistemological nature of body-based somatic practices.

8.2 Connoisseurship: the Role of Somatic Sensibilities in HCI Collaboration

The practice of somatic connoisseurship highlights the significance of *somatic facilitation* as a role within the technological design processes. The role of somatic connoisseurship can enrich interdisciplinary design space and bring new knowledge and new practices to the design of technology within human computer interaction. In *The Enlightened Eye: Qualitative Inquiry for the Enhancement of Education*, Elliot Eisner describes connoisseurship as the art of appreciation.[10] Connoisseurship characterizes expertise that is developed, expressed, and passed on through the constantly refining process of *practice*. Somatics practice develops expertise that can access and train *experiential acuity* including observation, discernment, synthesis, empathy, focus and clarity. The somatic body-based traditions require techniques that use attention, observation, and discrimination, applied to the material of experience for the purpose of self-cultivation. These techniques are developed through training that is tested and validated through the efficacy of practice. Michael Polanyi expresses connoisseurship as an example of personal knowledge that underlies much of what remains *unspecifiable* at the heart of science and technology[11]. Elliot Eisner has contributed insightful and persuasive arguments in support of the concept of connoisseurship as a methodology within educational research and the arts that focus on experience as a source of knowledge:

> Perception manifests itself in experience… The character of that experience is in large measure influenced by our ability to differentiate among the qualities we attend to… The ability to make fine-grained discriminations among complex and subtle qualities is an instance of what I have called *connoisseurship.* Connoisseurship is the art of appreciation.
>
> It can be displayed in any realm in which the character, import, or value of objects, situations, and performances is distributed and variable.[12]

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[10] Eisner, E.W. (1998). *The Enlightened Eye: Qualitative Inquiry and the Enhancement of Educational Practice,* Upper Saddle River, New Jersey: Prentice Hall, p. 63.
[11] Polanyi, M. (1958), op. cit., p. 55.
[12] Eisner, E. (1998), op. cit., p. 63.

Through connoisseurship, the *role* of somatic facilitation can invite *somatic sensibilities* into the valuation and evaluation of technological interaction design within HCI. Modeling user experience within HCI is indeed distributed and variable, and the need to develop mechanisms to explore experience as material in the design process can be fulfilled in part through somatic facilitation.

The field of HCI is inherently interdisciplinary and its history is one of the inevitable disciplinary ‘multiculturalisms’ spawned by the expansive impact of technological growth. Just as ethnography was repurposed through the historical collaboration between Victor Turner and Richard Schechner, changing the face of performance studies, ethnography has also shared an interdisciplinary collaboration within human computer interaction. Within HCI, ethnography has altered values, methods and approaches to studying users in the context of their homes, environments and cultures. As human computer interaction has responded to the democratization of technology in work, play, home and mobile social networks, so it has continued to collaborate with domains from the social sciences and humanities, expanding the reach of its knowledge and methods. It is now commonplace for ethnographers to work within a technology design team, where outcomes are published and peer reviewed within a growing interdisciplinary HCI community.

> HCI has long found gainful employment for ethnographers and ethno-methodologists who are probably as surprised as anyone that their sociological training should turn out to be useful to [technology] design.[13]

Like ethnography, somatic facilitation enacted through connoisseurship can play a role in the technological design process that is a central theme and outcome of HCI research.

[13] Wright, P., Blythe, M., & McCarthy, J. (2006), op. cit., p. 13.

> In its customary mode connoisseurship is concerned with matters of quality, in the sense of value…. Judgments concerning quality depend upon… refined sensibilities [that] allow us to make fine-grained discriminations from what concepts may be formed.[14]

In somatic connoisseurship, matters of quality refer to the ability to recognize and discriminate between qualities of experience. Somatic sensibilities support fine-grained discrimination regarding the use of experience as material within the design of interaction. In this way somatic connoisseurship can facilitate the development of techniques of awareness, the simple act of paying attention. Depraz, Varela and Vermersch have used the term 'reduction' (borrowed from Husserlian phenomenology) to describe this technique. They suggest that apprenticeship requires facilitation, and that training is the key to developing access to the 'fine-grained discriminations' of connoisseurship as referred to by Elliott Eisner and his discussion of connoisseurship and judgments of value. Depraz, Varela and Vermersch insist on the importance of *apprenticing* in the practice of experience:

> We have to count [apprenticeship and] training among the more fine-grained aspects of the basic cycle and the work session [of training people to use their attention more skillfully within experience]. We stake our claim here: if reduction [a technique of paying attention to first-person experience] means anything, it means that, with proper training, it can become part and parcel of everyday life.[15]

The term 'work-session' as used by Depraz, Varela and Vermersch can be translated to somatic facilitation events within the case-studies such as "participant workshop" as used in whisper, exhale and *soft(n)*, "facilitated interaction" as used in whisper and exhale and "use of guides as facilitator" as used in whisper and exhale. Specific examples of these types of experiential training events are described in section 8.4. Examples of Somatic Facilitation through Connoisseurship.

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[14] Eisner, E. (1998), op. cit., p. 69.

[15] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 99.

> Connoisseurship, like skill, can be communicated only by example, not by precept. To become an expert wine taster, to acquire a knowledge of innumerable different blends of tea or to be trained as a medical diagnostician, you must go through a long course of experience under the guidance of a master.[16]

Although somatic connoisseurship requires expert training, and a ‘long course of experience’ in order to refine experiential discernment and evaluation, these experiential skills can be communicated by example. Somatic facilitation within technology design aims to make experiential skills accessible for ‘everyday’ bodies including participants, researchers and design team members. The role of the somatic facilitator as connoisseur makes is possible to apply somatic body-based skills throughout many levels of the design process, from participant workshops, to collaborative team development, to participant guidance during an installation or in technology prototyping. Eisner describes connoisseurship in terms of “potential experience”. This potential has to do with our ability to recognize specific qualities inherent within experience. This ability is an experiential skill that can be learned. Eisner uses the metaphor of the wine connoisseur to describe this potential experience:

> I say “potential”, because whether we can in fact experience [a specific quality within experience] such as ‘the wine’s perfume’, for example, depends on *both* the existence of the perfume, and our ability to notice it.”[17]

Somatic connoisseurship facilitates access to potential experience. It accomplishes this through training *our ability to notice*. Somatic connoisseurship facilitates self-learning and the development of self-knowledge through co-experience. Within a technology design process, the experience of the facilitator’s somatic sensibilities can also help to develop the somatic sensibilities of participants, researchers and design team members.

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[16] Polanyi, M. (1958), op. cit., p. 54.
[17] Eisner, E. (1998), op. cit., p. 64.

Polanyi was among the first to describe connoisseurship as a learned *ability*, as well as a *method* of knowledge acquisition. His concept of personal knowledge proposes that connoisseurship contains an unspecifiable element of knowledge.

> The large amount of time spent by students of chemistry, biology and medicine in their practical courses shows how greatly these sciences rely on the transmission of skills and connoisseurship from master to apprentice. It offers an impressive demonstration of the extent to which the art of knowing has remained unspecifiable at the very heart of science.[18]

Although Polanyi suggests that personal knowledge is in part *unspecifiable*, I argue that the value of articulating somatic body-based techniques within a technology design framework is their *ability* to specify some aspects of bodily awareness. In my view this specifiability does not counter Polanyi's view, but augments it. Kieran Egan describes somatic knowledge as being a foundational experience that can ground language. Egan refers to the qualitative experience of unity that can occur between somatic understanding and linguistic comprehension as an "ultralinguistic experience".

> The tension between the Somatic foundation of consciousness and the… flexible, linguistic superstructure allows… an understanding of ultralinguistic experience; this Somatic experience provides us with something below language that our language can strive to be true to.[19]
>
> Somatic understanding is the first kind [of understanding] in the sequence… The Somatic is a somewhat distinctive kind of understanding… coalescing and accommodating with each subsequent kind of understanding as they develop on Somatic foundation. Somatic understanding, then, is not something that exists only prior to language development but rather, like each of these kinds of understanding, it ideally remains with us throughout our lives, continuing to develop within.[20]

Egan echoes the position of many of the somatic practitioners described in Chapter Two, who view somatic facilitation as enabling one to speak from *within* experience, rather than *about* experience, extending how we consider *specifiability.*

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[18] Polanyi, M. (1958), op. cit., p. 55.
[19] Egan, K. (1997), op. cit., p. 170.
[20] Ibid, p. 163.

Somatic practice 'exploits' the *malleable* property of our own state, and can directly affect and increase our properties of agency and, echoing Foucault, to act upon our self in order to transform the self[21]. Somatic practice *specifies* the art of recognizing experiential qualities through *functional* techniques, which use attention as an *operation* in order to shift the *variable* of experience. Attention operates on experience in order to alter our state, and that state includes access to specific qualities and types of knowledge. This ability to recognize and value qualities within experience and to transform our own state includes the art of appreciation.

> Connoisseurship is the art of appreciation. We see it in the arts all the time, as will as in other areas of life where someone knows by virtue of experience and study what he or she is attending to.[22]

8.3 Self-Evidence in Support of Connoisseurship

Because somatic connoisseurship focuses on experience as material, and on using attention as an operator to transform that experience, this section summarizes the variety of ways that one can focus attention in experiential activities. This description serves as a contextual grounding for specific examples used within the case studies described in Section 8.4.Examples of Somatic Facilitation through Connoisseurship. Attention directs our observational focus. The redirection of attention can shift the quality of our experience, knowledge and body-state. Somatics offers techniques that can train an attentional skill-set. These techniques identify the *praxis* of somatic facilitation, illustrating how the direction of attention is a "concrete action"[23] that has the ability to transform personal understanding and knowledge.

> Praxis [defines] the plane of action as a self-sufficient conduct. In *praxis,* conduct finds its truth in itself and does not need a prepared blueprint. Praxis also entails changing the world and yourself by *concrete action*.[24] [italics mine].

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[21] Foucault, M. (1988c), op. cit., p. 18-19.
[22] Eisner, E.W. (2002). *The Arts and the Creation of Mind,* Connecticut: Yale University Press, p. 57.
[23] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 17.
[24] Ibid.

In the context of this thesis, one of the primary goals of somatic facilitation is to expand the practical application of embodied theory within technology design through the application of somatic awareness techniques. Figure 102 differentiates between first-, second- and third-person perspectives. It illustrates how observation serves as a form of directed attention. Although represented as distinct positions, there are multiple gradations between first-, second, and third- person perspectives including a multitude of collective and intersubjective relationships between these views[25]. The intentional act of attention enables us to consciously observe various activities both external and internal to ourselves. Amongst others, Depraz, Varela and Vermersch argue that intentionally redirecting our attention or observational focus, effects transformation of our state. This technique of redirection is a concrete action involved in the process of developing somatic sensibilities of *becoming aware.*[26]

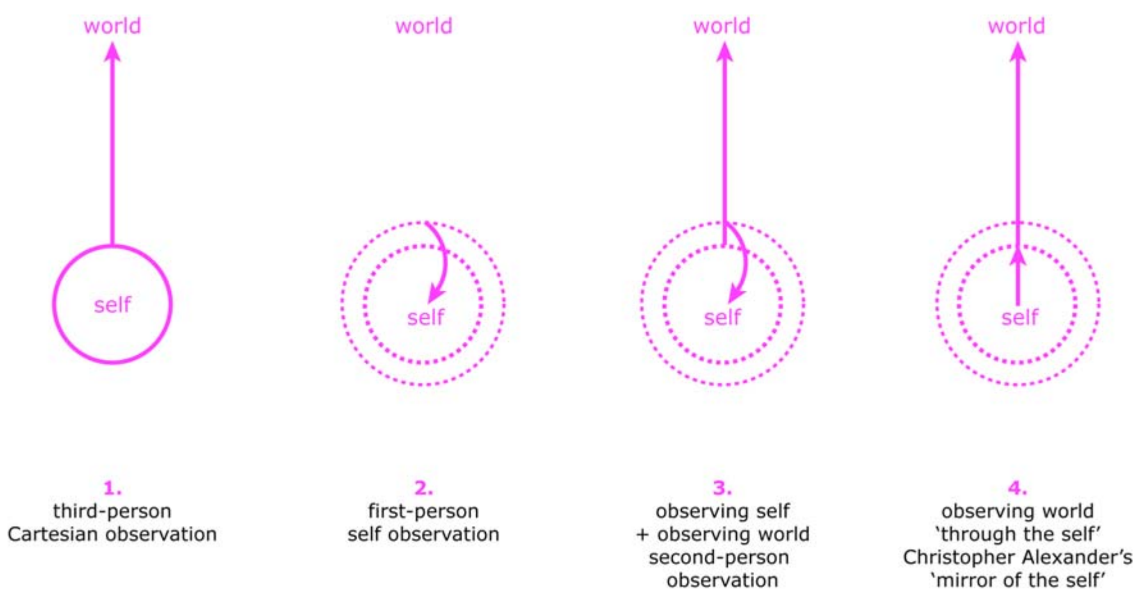

Figure 102. Modes of Observation provide us with different qualities and types of information

Attention can be focused through a certain sense. We can attend through the sense of touch or sight, or through a physical bodily process such as breath or movement.

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[25] The concept of first-, second- and third- person observation as describing a continuum along a social network has been described in Chapter 2; see Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 79.
[26] See also Alexander, C. (2002), Boal, A. (1992), Burrow, T. (1999), Deikman, A. (1983), Fraleigh, S.H. (2004), Gendlin, E.T. (1996), Johnson, D.H. (1995), Shusterman, R. (2008), Yasuo, Y. (1987).

We can attend directly or diffusely. We can attend to another, or we can attend to another *through* our self. These variations are a matter of practice and can be facilitated through the application of somatic sensibilities. The *values* of self, attention, experience and inter-connectedness as somatic sensibilities have been described in detail in Chapter 2. Their importance to articulating somatic connoisseurship is reintroduced here, as they play an important role in somatic facilitation described within the case studies.

Third person Cartesian perspective and 'everyday' awareness

For the purposes of the case studies, the use of third-person observation can be viewed in two ways, 1) in the formal sense of third-person Cartesian observation as reflected in the scientific method, and 2) in the informal notion of 'everyday awareness'. With regard to the experience of participants, users, design team members and collaborators interacting with a technological system, it is this second category of 'everyday awareness' that defines our understanding of third-person experience within somatic facilitation in the case studies.

One can expect that most workshop/installation participants enter into the space with a natural attitude and 'everyday awareness'. Depraz, Varela and Vermersch describe this mode of attention as a *realist prejudice*: the perception that "what appears to you is truly the state of the world"[27]. One of the goals of whisper, exhale and *soft(n)* was to enable a scripted procedure for moving participants from their 'everyday awareness' which tend towards an outward direction, to an awareness of their own 'attending to' their body-state, which tends towards an inward direction.

First person perspective and self-observation

Another one of goals of this research is to support an experiential 'container', supported through technology, in which participants can simply "pay attention to the self". Since

[27] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 25.

the practice of various forms of awareness training use a set of procedural techniques or 'steps' to facilitate the transition from everyday awareness to self-observation, this type of structured facilitation is also used within the case studies.

> We seek the explicit characteristics of a very specific human *ability*: becoming aware as *coming to know in the first person*[28]

First-person processes were used in participatory workshops that occurred throughout the design of whisper, exhale and *soft(n)*. This resulted in the design of 'attentional stages' incorporated into the interaction. The goal was to support specific experiential characteristics within the installation. Additionally, many aspects of the technology design process required somatic facilitator-led design exploration and discovery. This included the facilitator exploring their own experience in a number of settings including: testing sensor experience, and developing garment design and interaction movement with the goal of seeking interaction that could "afford" self-connection.

Second-person perspective and somatic facilitation

Somatic facilitation exists within the continuum of second-person perspectives. This includes participant observation in workshops, facilitating co-experience in collaborative teams with researchers, building a shared knowledge of techniques that enable 'connecting' to the experience of another, and building empathic relationships to all aspects and materials of the design process including: accessing body state, use of space, exploratory process, and technology development. Depraz, Varela and Vermersch clarify that observational positions sit along a continuum, and that there are gradations between first, second and third person positions.

> The three positions [first-, second- and third] … each have multiple gradations defined as a function of the *emphasis* one puts on accomplishing a particular mode of validation…
>
> [in the second person perspective] we move from the position of anthropologist to that of coach or midwife, to the subject … opening up to intersubjectivity [during the interview].[29]

[28] Ibid, p. 3.

Somatic facilitation is instantiated through multiple approaches available within second-person perspectives. Somatic facilitation uses skills of empathic mediation, resonance with the experience of others and personal familiarity with the various possible subtleties of participant experience, based upon the intimate preparation generated cumulatively from the experience of living deeply within the design process. In this sense, somatic facilitation exists during all phases of the exploratory design process, building up shared experience between collaborators and design team members as well as unique personal experience that can be used as material 1) in the iterative design and genesis of the technology and 2) in the co-experience with participants within the interaction during exhibition.

> A second-person position is an *exchange between situated individuals* focusing on a specific experiential content developed from a first-person position. The second-person position is thus typically instantiated in a tutor or guide, someone who has more training in or exposure to a certain domain, and who tries to help the expression and validation of someone else.[30]

As a result of somatic facilitation within the case studies, the technological design process constructed affordances for second-person interaction in whisper, exhale and *soft(n)*. This interaction concept (named *self-to-other*) was initially developed within whisper, and was then extended to exhale and *soft(n)* because of its success in representing second-person empathic interaction in a technology model. The interaction mode of *self-to-other* is a second-person position in which the exchange of breath, heart rate, or tactile effort quality could be observed and shared 'as sensory experience' through the interaction models within these installations. Additionally, facilitator second-person participant-observation was an instrumental component of monitoring the workshop activities in whisper, exhale and *soft(n)*, and in gathering data from participatory activities that revolved around qualities of experience.

[29] Ibid, p. 84.
[30] Ibid, p. 81.

Observing through the self into the world

Observing through the self into the world is a form of second person observation based on the 'mirror of the self' technique developed by Christopher Alexander. This technique was generated through decades of design practice in Alexander's architectural practice. Alexander defined the 'mirror of the self' as a method for observing relative wholeness within a situation, action or object.

> [This is] a very general type of observation that relies on the observer's study of his or her own state of wholeness as it exists in front of different things or systems being observed *and then uses the observer's experience as a measurement on the system being observed to determine that system's objective degree of life.*[31]

This technique enables comparisons of relative wholeness measured through the experience of the self. It answers the question: "*Which of the two [situations, actions or objects] makes me experience a deeper feeling of unity or harmony within myself?*[32]" Within the case studies, the 'mirror of the self' was used as a somatic facilitation technique in a number of facilitator-led explorations that required design choices to be made based on various conditions. Examples include: exhibition space design in Rotterdam for the whisper exhibition, garment design in whisper and exhale, and interactive object design in *soft(n)*. The benefit of this technique is that it enables the discernment within somatic connoisseurship to operate within the *value* of inter-connectedness (or wholeness) as a design goal,[33] and to experientially compare and evaluate design choices base on this goal. Alexander intended the 'mirror of the self' to be used as an evaluation tool. This evaluation tool can assist us when we are trying to observe conditions or knowledge that create an experience of greater wholeness in our relationship with the world. [34]

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[31] Alexander, C. (2002), op. cit., p. 364.

[32] Alexander poses a series of possible approaches to 'wording' the question of relative wholeness, Ibid, p. 355.

[33] The value of inter-connectedness was described in Chapter 2 as a core value of somatic epistemology.

[34] Alexander also uses the experiential qualities of harmony, unity, aware, 'a greater feeling of life', 'expansion of my humanity', 'my best self', 'a picture of my eternal self'. Note that Alexander's descriptions are intended to evoke an experiential quality, not to *describe* the experience. This is based on the concept that our experience has verifiable value that exists within the subject in its relationship to the world.

Alexander also acknowledged that not all discernment of the world is equally perceivable. Although he intended the ‘mirror of the self’ technique as having widespread use, he also acknowledged that there are varying degrees of abilities used in this type of second-person observation, and in some situations a level of expert attentional knowledge is required. I have been using the term somatic connoisseurship to refer to this type of self-knowledge, one that requires time and practice to develop. Alexander acknowledges that:

> …in these very difficult cases, accurate judgment requires a level of self-knowledge on the part of the observer. This may take a long time to develop, and often does not exist until a person has spent years looking at things, sharpening his or her power of discrimination.[35]

In the case studies, somatic connoisseurship was used in order to assess and select optimal design choices that could facilitate greater self-connection within the installation experience, and to design for this goal. This often required a second-person empathic stance that could imagine the participant’s experience through one’s own, and could assess interaction ‘tasks’ as enabling self-connection for an ‘everyday’ body in an ‘everyday’ situation. These kinds of choices clearly require a trained attentional skill set to support and evaluate effective design choices.

> In order to *measure* [the] degree of life [in any living situation] it is difficult to use what, in present-day science, are conventionally regarded as “objective” methods. Instead, to get practical results, we must use *ourselves* as measuring instruments, in a new form measuring process which relies (necessarily) on the human observer and that observer’s observation of his or her own inner state.[36]

In the case studies the ‘mirror of the self’ test was used in facilitator exploratory movement workshops where optimal modes of interaction created and maintained connection to one’s self even while connecting to another. The interaction paradigm required that an ‘act of connection’ require a physical action by the installation

[35] Alexander, C. (2002), op. cit., p. 366.
[36] Ibid, p. 354.

participant. For example, in the garment design of whisper, the choice between using connection symbols that could be seen, or fabric texture that could be felt, was decided through the 'mirror of the self' test enacted in conjunction with members of the design team.

Procedural Description: Suspension, Redirection and Letting-Go

The previous descriptions have accounted for varying ways in which we can approach observation and the praxis of attention. Another aspect of the application of attention is that its redirection can enable varying degrees of the experience of wholeness or inter-connection: the techniques of *becoming aware.*

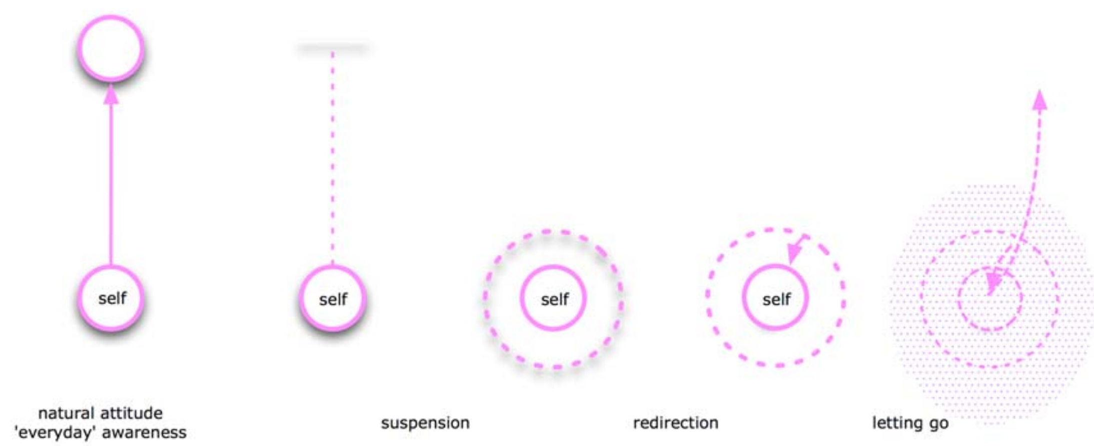

Figure 103. Moving between modes of Observation is a Somatic Attentional Technique that can be supported through Somatic Facilitation and takes the Form of a Procedural Description

Because the experiential goals of whisper, exhale and *soft(n)* shared the goal of creating 'affordances' for the experience of inter-connectedness with networked participants 'as a whole', this process has relevance for the technological design of these installations. Figure 103 illustrates the transitions between observational focus, (attentional redirection), that result in transformation of awareness and the perception of inter-connectedness. This diagram illustrates an attentional technique described by Varela, Vermersch and Depraz*.* The reference to suspension, redirection, and letting go [illustrated earlier in Figure 9, Chapter 2, page 60] is the movement from one state to another through the first-person process of directing attention to one's experience.

This process of self-connection is shared among many first-person approaches within somatics, movement arts such as contemporary dance, psychology, mindfulness and other self-transformational practices[37]. Depraz, Varela and Vermersch summarize this process using three procedural steps:

- *Suspending* your "realist" prejudice that what appears to you is truly the state of the world; this is the only way that you can change the way you pay attention to your own lived experience; in other words, you must break with the "natural attitude"
- *Redirecting* your attention from the "exterior" to the "interior"
- *Letting-go or accepting* your experience.[38]

These procedural steps were used as a guide for leading experiential stages within the participant workshops of whisper, exhale and *soft(n)*, in various facilitator-led explorations and within the installation design itself. For example, the whisper and exhale installation use guides (somatic facilitators) to lead participants into the space, helping them put on the garments, facilitating their first steps of interaction with their own body data, and then leading them to being interacting with another participant within the space (self-to-other interaction). This facilitation included stepping back once participants could interact in the space on their own, and observing the interaction space from an empathic mediation perspective.

Each of the stages represented in Figure 103 also represent different experiential *states* within the body. Each state uniquely results from the body's inner attitude. These stages can be correlated to Laban's effort drives, which correspond to inner attitude. The first stage, the natural attitude of everyday awareness, corresponds to the *action* drive (in which flow is absent, and in which movement is crystallized in action). The second stage, *suspension*, which reflects suspension of judgment, which in Laban's language relates to suspension of the attentional space effort; this would correspond with Laban's *passion* drive (in which space is absent, which is akin to

[37] This has been discussed in detail in Chapter 2.
[38] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 25.

attention being suspended momentarily). The third stage, *redirection*, corresponds to directing our attention inward, releasing our exertion or weight in the world; this corresponds to Laban's *vision* drive, in which weight is absent. Finally, the fourth stage, *letting-go*, corresponds to Laban's *spell* drive, the timeless drive, in which the experience of passing time is absent. Notably the experience of timelessness is often associated with unity, inter-connectedness and a sense of 'being one with the environment'. Victor Turner's acknowledgement that somatically based techniques used in ritual are *designed* to shift the neurobiological state of the entire soma toward a shared group experience of gestalt, timelessness and transcendence,[39] is an example that was cited in Chapter 2. The psychologist, Shellie Levine, has described awareness as a 'topology' in which multiple levels of awareness construct varying experiential 'logics', so that knowledge is state-dependent.

> I offer a theory of the topology of awareness having significant implications for our understanding of the nature of mind… Topology—the study of architectural wholes as contrasted with a linear summation of parts—reveals that levels of awareness are organized according to multiple levels of logical types. Lower levels are closer to consciousness and construct reality according to the organizing principle of Aristotelian logic, binary oppositions, and the experience of entities as unitary, bounded and independent. Higher levels of awareness… articulate the fact that entities are gestalts in intimate relations to one another. The organizing logic or higher levels is dialectical logic, a logic that disposes of binary oppositions in favor of harmonious synthesis and relations between gestalts.[40]

Levine, like Turner, Laban and Alexander, acknowledges that embodied knowledge is state dependant. Because attention operates on experience in order to alter our state, and because state includes access to specific qualities and types of knowledge, our goals of developing attentional skill through technology also has multiple levels of social and ethical value. This approach can expand resources for technological design that transforms the self and the world.

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[39] Turner, V.W. (1986), op. cit., p. 43.
[40] Levine, S. (2000). Topology of awareness: therapeutic implications of logical modalities of multiple levels of awareness, *Journal of Poetry Therapy, 14*(2), The Netherlands: Springer, p. 79-95.

8.4 Examples of Somatic Facilitation Through Connoisseurship

This section describes examples of somatic facilitation through connoisseurship, focusing on the case studies as a whole. These examples support the goal of engendering a role for cultivating self-awareness within interaction, thereby enabling our digital technologies to support the development of an *attentional skill-set* for experience. They also illustrate the application of the *values* of self, attention, experience and inter-connectedness, described in Chapter 2 as central to defining somatic sensibilities. The proposition is that somatic facilitation can be a resource within a technological design process when there is a need to design for a relationship to the self within the user experience. This could have application in systems that rely on contextual awareness, reminder systems, approaches to computer gaming and in research in technological design for health or well-being as well as 'design for the self'.

Some specific questions that are illustrated through the following examples include: What are examples of somatic goals that can be used when designing for experience? How can the relationships of *self-to-self*, *self-to-other* and *self-to-group* be applied within a somatic framework of interaction?

8.4.1 Facilitating Experience Through Procedural Description

Depraz, Varela and Vermersch used the phrase *procedural description* to describe a delimited scripted procedural process that occurs within a *session* in which the techniques of 'becoming' aware' are enacted and practiced[41]. A session lasts for a limited period of time that is situated outside of 'everyday' activity. It frames a procedural process in which the stages of suspension, redirection and letting-go are supported by a facilitator, and it includes both the expression and the validation of the experiential 'findings' or insights produced by this basic cycle. Depraz, Varela and Vermersch describe this as follows:

[41] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 65-96.

> We focus on the time-scale inherent in *a session that lasts for a few hours…* [this time frame] refers to social practices, which set the boundaries to the way in which most of use are able to develop the practice of becoming aware… The reason why we center our analysis on the temporality is simply because it corresponds best to the way in which most people are likely to encounter these practices. By referring to the session as the context of the act of becoming aware, we maximize its situated and embodied dimensions.[42]

Depraz, Varela and Vermersch site exemplary variations of such *sessions* including guided introspection, *shamatha-vipashyana* meditation practice, stereoscopic vision, a psychoanalytic session, the heartprayer, a writing session and a beginning philosophy course[43]. Other examples from within the fields of somatics and modern dance performance could include an Alexander session[44], a Feldenkrais Awareness through Movement session[45], contact improvisation, a Viewpoints session[46], Ashtanga yoga practice[47], a Butoh class[48], an improvisational movement session, one of the many actor's exercises described within Augusto Boal's 'The Arsenal of the Theatre of the Oppressed'[49], or a Deep Listening session as developed by Pauline Oliveros.[50] The common features of these kinds of processes are 1) that they are guided by a facilitator who has refined the technique through practice of *connoisseurship*, 2) that they move through a guided experiential process of becoming aware in which everyday experience moves through suspension, redirection and letting-go, 3) that they occur within a delimited timeframe that is distinguished from everyday experience, and that 4) they involve both expression and validation, where expression is framed within the first-person perspective of the participant and validation is framed within a second-

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[42] Ibid, p. 21.
[43] Ibid, p. 22.
[44] Brennan, R. (1996). *The Alexander Technique Manual: A Step by Step Guide to Improve Breathing, Posture and Well-Being*. Boston: Journey Editions.
[45] Feldenkrais, M. (1972), op. cit.
[46] Bogart, A. & Landau, T. (2005). *The Viewpoints Book: A Practical Guide to Viewpoints and Composition.* New York: Theatre Communications Group.
[47] Swenson. D. (1999). *Ashtanga Yoga: The Practice Manual,* Austin, Texas: Ashtanga Yoga Productions.
[48] Fraleigh, S.H. (2004), op. cit., p. 153-193.
[49] Boal, A. (1992), op. cit., p. 60-222.
[50] Oliveros, P., see <http://www.deeplistening.org>

person framework that takes place between the participant and the facilitator guiding the participant back to everyday experience in order to complete or close the session, thereby bringing the *value of the experience* of the session back into everyday life.

The whisper and exhale workshops described in Chapter 5 and 6 are examples of *work-sessions* that utilize scripted procedural processes to guide participants through an experiential process. The exploratory design process of *soft(n)* also employed similar participant workshop processes (see Figure 104).[51]

Figure 104. *soft(n)* Workshop Participant – Another Example of Somatic Facilitator Led Exploration

Somatic facilitation uses skills of empathic mediation, resonance with the experience of others and personal familiarity with the subtleties of participant experience. The function of *guides* in the workshop process is to facilitate shared experience, recognizing qualities of attention, and demonstrate how to recognize the self within interaction. The goal of these sessions is to support the development of somatic sensibilities in an everyday context in order to support both a contemplative and a playful approach to self-awareness.

[51] Examples of guided scripts used in participant workshops for whisper, (p. II-51, II-62-64, II-72, II-92) exhale, (p. II-120-122, II-160-162), and soft(n) (p. II-269-271) are located in Appendix C, D and E respectively. These Appendices also include workshop feedback cards, transcription of video interviews, and written response cards, as well as data summary. See also <http://whisper.iat.sfu.ca/process.html>

Figure 105 illustrates somatic facilitation during workshop processes for whisper, exhale and *soft(n)*[52]. In each of the case studies, guided scripts were used during participatory user workshops in order to facilitate experiential exploration of first-person participant experience. Participants practiced their 'ability to notice' their own awareness of their body/sensory data.

Figure 105. Workshop Guides support Scripted Procedural Description in whisper, exhale + *soft(n)*

The images in figure 105 illustrate workshop explorations of body data facilitated through a scripted experience (from left to right): heart data (whisper), listening inside (whisper), breath (exhale), body-state (exhale), and touch (*soft(n)*). Guided somatic processes include *attending to* the participant process, *speaking* a prepared script to guide participant experience, and *recording* participant experience as evidenced by their movement and behaviour. The recording processes involve participant observation, in which facilitation moved *between* digitally recording activities, and *sensing* or *interpreting* the participants experience to assess timing, flow, rhythm and duration of activities. These assessments were made through empathic mediation, with the goal of increasing the participants' ability to stay 'connected' to their own experience, and to support self-observation.

[52] Figure 105 depicts whisper and exhale somatic facilitators and artistic collaborators Thecla Schiphorst and Susan Kozel (in the first 4 images), and Thecla Schiphorst as a soft(n) workshop guide and facilitator in the final image. Kristina Anderson also contributed to supported workshop processes during the whisper workshops.

Guided procedural processes are also incorporated in the final public exhibitions of whisper and exhale. This design choice was incorporated as a result of the instrumental success of guided somatic facilitation during the earlier participant workshops. Both whisper and exhale incorporate *guides* as somatic facilitators during the public interactive art exhibition. Guides support participant experience by facilitating transition through the stages of the installation experience. The guide's somatic facilitation process is enacted in five stages. 1) During the first stage, the guide directs the participant's attention toward their body-data through the activity of 'putting on' the garment. This ritualized act invites the participant into the installation space, setting an experiential *tone* for attending to their state. This includes an explanation of garment functionality using physical illustration of connecting to one's own data through the garment (self-to-self interaction).

Figure 106. Guides support the 5 stages of participant interaction within whisper
From left to right: Stage 1 Dressing Participant, Stage 2 self-to-self exploration + Stage 4 self-2-other

2) During the second stage, the guide *steps back* to enable the participant to become familiar with self-to-self interaction. The guide maintains an attentive stance of empathic mediation that includes co-experience with participants, paying attention to the participants experience and engagement within the interaction of self-to-self. The guide's ability to employ these techniques is based upon the intimate preparation generated cumulatively from both somatic training and the experience of participating within the design process. The participant *practices* self-to-self interaction during this stage, learning to recognize and interact with their body-data within the system. The

end of the second stage is signaled by the participant's ability to create expressive self-led interaction within the system. The guide recognizes this signal by discriminating the shift in quality of the participant's experience. 3) During the third stage the guide re-enters the participant's space by demonstrating how to 'connect with' another participant in the space. This demonstration is not utilitarian in the task-oriented sense, as it is not required in order to 'operate' the garment. Rather it supports fine-grained subtleties of the participant's experience, and is executed by physically guiding the participant into self-to-other interaction. 4) During the fourth stage, the guide steps back once again, to allow participants to explore collective experience and self-to-other interaction through shared data articulated within one another, through the garments. Participants typically remain within the installation for an average of 20 to 30 minutes. 5) The fifth stage is signaled when a participant elects to end their interaction by moving out of the space. The guide assists in the removal of the garment, while inviting feedback regarding participant's experience of the installation. This provides a space for experiential validation and evaluation between the participant and the guide. It also provides valuable feedback of the interaction model to facilitate self-observation while *supporting a participant's ability to notice and discern their sensory body data*.

8.4.2. Somatic Facilitated Phenomenological Inquiry through Movement

The previous section explored the application of guided somatic facilitation using procedural scripts with users, workshop participants and members of the public that interact within the installation. In the case studies as a whole, many aspects of the technology design process required somatic facilitator-led design exploration and discovery. Somatic facilitation can also be applied to a technology design process through an inward focus that can be directed through the somatic facilitators themselves. In whisper, exhale and *soft(n)*, somatic facilitation was also operationalized within the evaluation process of the design team. This included the somatic facilitator exploring their own experience in a number of settings including developing garment design and interaction movement with the goal of seeking interaction that could “afford” self-connection. This section explores facilitator led movement exploration incorporated into the garment design process of whisper. A subset of these techniques were also used within exhale and *soft(n)*.

Data gathered and analyzed from whisper participant workshops resulted in an interaction model,[53] which defined a conceptual starting point that included a set of experiential design goals for interaction. Design refinement was required in order to evaluate design criteria that could produce specific garment features, interaction affordances, functional specifications for wiring placement, and materials selection for interaction. These design criteria were explored and evaluated through *somatic facilitated phenomenological inquiry through movement*. This approach was selected for two primary reasons, 1) one of the goals of the whisper installation was to utilize *participant movement* in order to support self-connection, and 2) the whisper collaborative design team was led by two dance and somatic trained facilitators[54] who possessed the skills necessary to articulate fine-tuned discernment and judgment in evaluating this goal.

Figure 107. Somatic Connoisseurship through Movement Interaction Studies for whisper garment

Just as we can direct our attention to our breath, we can direct our attention to our movement in order to create a space for self-connection.

[53] See Appendix C, whisper interaction model, p. II-31, II-43-49.

[54] Somatic facilitators for the whisper movement sessions are Thecla Schiphorst and Susan Kozel, who collaborated in concept development and articulation, particularly in relation to somatic sensibilities.

In *The Primacy of Movement*[55], Maxine Sheets-Johnstone notes how movement can function as an attentional operator, shifting our state from our natural attitude, suspending judgment and redirecting our attention through the process of phenomenological *epoché,* as described in Section 8.3, by Depraz, Varela and Vermersch. Sheets-Johnstone writes:

> But the different way of looking [at movement] can be extended still further by breaking ties to the natural attitude. When we begin our investigations by suspending judgment, but instituting the phenomenological *epoché*, the familiar becomes strange. In effect, we examine the experience of movement anew, as if experiencing it or meeting it for the first time. In this way, we discover what is there in the phenomenon of movement in kinetic variants. Through this phenomenological methodology, we come to ground the fresh and innovative finding… in the deeper truths of animate life.[56]

In the somatic movement facilitation within whisper, movement was explored in order to assess qualities of self-connection that could be "afforded" through the garment design. Design goals included questions such as: what kinds of movement can be enacted through the garment, and of those movements, what movement is best supported in the garment in order to increase self-connection? Somatic facilitators used self-directed movement in a structured improvisational setting to explore how movement could support self-knowledge articulated through the garment design. Sondra Fraleigh has recognized this goal of movement within dance studies as articulating concerns for 'the self':

> As self-directed movement, dance is also a source of self-knowledge. Thus dance studies may be designed around concerns for human development. In their study of perception and movement affectivity, cognitive psychologists articulate concerns for "the self" that could enrich research in dance somatics… Self-knowledge has a basis in sense perception including proprioception, the movement sense. All our movement is constantly being somaesthetically processed in the interweave of our senses, perceptions and emotions.[57]

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[55] Sheets-Johnstone, M. (1998), op. cit.
[56] Ibid, p. 265.
[57] Fraleigh, S.H. (1999). Family Resemblance, in Fraleigh, S. & Hanstein, P. (eds.) (1999). *Researching Dance: Evolving Modes of Inquiry,* Pittsburgh: University of Pittsburgh Press, p. 11-12.

The movement explorations utilized within the whisper garment design illustrate the intersection of somatics practice with contemporary dance processes, where movement exploration is intrinsic to interaction. Fraleigh considers this as a focus of the body-for-self that shifts its attention in an inward direction and can be considered a kind of *intrinsic dance:*

> *Intrinsic dance* is performed as body-for-self, not as body-for-other as in theatrical contexts, but looking inward to the experience. Logically speaking this would not be a type of dance, but a shift of attention.[58]

It is precisely this shift of attention that was a desired 'affordance' of participant's movement while wearing the whisper garment, where the interaction gesture could support a participant's ability to 'look inward to the experience' during interaction. This *phenomenological inquiry through movement* was based on exploring the interaction modes within the interaction model: self-to-self, self-to-other, and self-to-group. We sought specific design solutions that would enable the development of a wearable garment. The goal was to further refine specific interaction 'gestures' and garment interaction affordances. This design approach modeled choreographic movement processes, where a choreographer prepares movement material in a studio and then brings that material to a group of dancers in order to further explore and improvise.

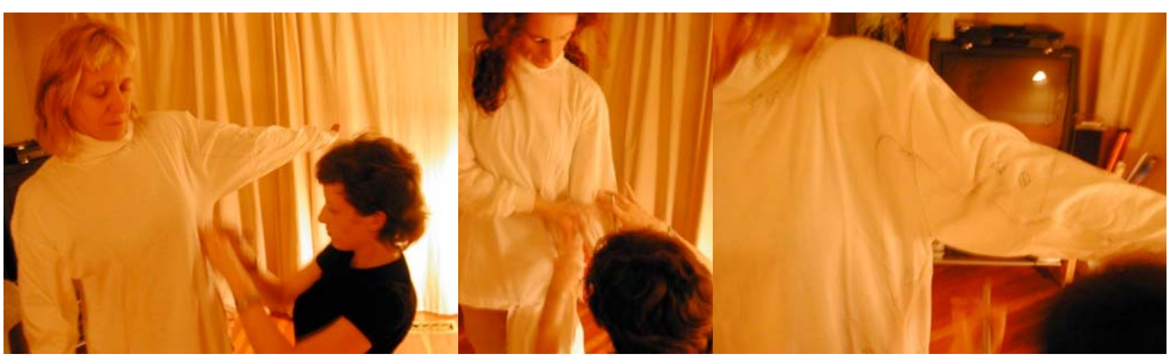

Figure 108. Low Fidelity Prototype: Drawing the Wiring & Connection Results from First Workshop

[58] Ibid, p. 15.

The *somatic phenomenological inquiry through movement* operated in the following manner. Based on the interaction model designed as an outcome of the whisper workshops, a set of initial design decisions were made and corresponding design constraints were identified. These included the selection of a shirt-like or jacket-like garment that could house breath and heart-rate sensors, a microcontroller, batteries and supplementary wiring that could connect sensors and actuators to the microcontroller within the garment. The decision was also made to utilize a wireless body-area-network between each participant-garment and the central server, which would visualize and sonify participants' body data. This would enable whisper installation participants to move about freely in the exhibition space. Based on collective design team processes, a set of initial design suggestions were made regarding the garment configuration. These included an LED array situated on the left sleeve that would display the identity of the participant, a breath band sensor inside the shirt-jacket, a heart-rate sensor on the left hand, and a 'connecting snap' on the right hand. The concept of the connecting snap was developed from the Velcro 'attachments' explored within the workshops. The connecting snap would enable participants to select their own body data, and to share their body data with other participants within the exhibition. It would also function as a unique identifier for the participant, which would be transmitted to the central server.

Figure 109. Low Fidelity Prototype whisper Garment with Hand Drawn Wiring & Connection Position These Design Choices Resulted from "Mirror of the Self" Test Used in First Movement Workshop

The design goals for the movement workshop were to *evaluate* optimal solutions for a series of design decisions that would support the somatic values of self, experience, attention and inter-connectedness. The resulting design *decisions* were evaluative, and based on the outcomes of a set of design questions. These included: are the initial *suggested* design choices regarding placement of LED arrays, sensors, and connectors, in *optimal* locations for use (in both the physical gestural sense and attentional sense)? How can their positions support self-connection during interaction? Where are the optimal locations of *self-to-self* connection-snaps that *access one's own* breath and heart-rate? Where are the optimal locations of *self-to-other* connection-snaps for *sharing* breath and heart-rate with others? How can we optimize the location of connection-snaps based on the design constraint that requires self-to-self and self-to-other connection-snaps to be co-located on the garment[59]? Do the connection symbols that identify connection type (breath or heart-rate) "afford" recognition? Are they easy to identify and to locate on the garment? How can the connection symbols support the shift of attention from self-to-self to self-to-other, while maintaining self-connection during this interaction?

Although the underlying concept of whisper was 'the simple act of paying attention', the design decisions that would support this goal were variable, specific and complex. Somatic sensibilities influenced the high level goals of self, experience, attention and inter-connectedness, yet these high-level goals required the refinement of a specific technical, aesthetic, and experiential design that could be built and tested while it supported these somatic values. In order to effectively operationalize these values, the inclusion of *self-evidence* and a *non-alienated view of technology* is necessary.

[59] Connection-snaps were conceived of as identifiers. They were able to recognize the identity of the participant that was *connecting into* the snap. This enabled the system to parse whether the snap belonged to 'self' or 'other'. They could also recognize the specific identity of the 'other' thereby enabling connections between multiple participants. The whisper technical design solution utilized 'sewing snaps' which were conductive and could therefore close an electrical circuit when in contact through the act of 'snapping together'. Although both functional and aesthetic, this solution did pose some difficulties for some installation participants because the snaps were sometimes 'finicky' and required precise positioning. The concept of the identifier was evolved in the exhale design, producing a better design solution through the use of RFID tags which simply required proximity without precise contact.

I revisit the proposition stated earlier in this chapter. The inclusion of *self-evidence* and a *non-alienated view of technology* can occur in technology design when the *self,* embodied within the multiple roles of researcher, designer, artist, and participant or user, is included in the methodological structure of the design for technology, both as design goal and as design process.

The design approach within whisper was to 'live within' the system as deeply as possible, evolving appropriate somatic facilitation throughout the exploratory design process. The resulting approaches described here, were developed within the whisper design process and then cumulatively evolved during exhale and *soft(n)*. Cumulative design processes enable greater levels of validation regarding their efficacy as a resource for technological design within an HCI context.

In order to evaluate the design questions outlined on the previous page, two movement workshops were held. Each workshop was facilitated through *somatic phenomenological inquiry through movement*. The goal of the first workshop was to evaluate the initial design suggestions regarding placement of sensors, actuators and connectors on the garment. The goal of the second movement workshop was to evaluate the experience of the connection-snaps 1) connecting to one's own breath and heart-rate data through self-to-self interaction, and 2) connecting to another participant's breath or heart-rate and sharing that data in self-to-other interaction. Both of these workshops used a form of Alexander's "mirror of the self" test in which one possible design outcome is compared to another to evaluate which of the two "enables a greater connection to the self".

> The method which I propose is therefore different from currently accepted forms of observation… you are asked to record your own inner feeling, your own inner wholeness—and this is used then as the measure of the degree of life in some system of the outer world you are observing.[60]

[60] Alexander, C. (2002), op. cit., p. 367.

This approach has a historical resonance with many movement practices including dance somatics and intrinsic dance as described by Sondra Fraleigh[61], Augusto Boal's theatre exercises[62] and those found in the martial arts:

> A comparable test [of observing greater wholeness or unity between self and world] in which exponents of Aikido are asked to compare the inner state they find themselves when comparing two actions; these Aikido-trained individuals are quite used to discerning, and then using, their inner awareness of relative greater harmony in themselves as a measure of the goodness of the action contemplated.[63]

The movement workshops consisted of two (approximately) 45-minute improvisational movement sessions that were facilitator-led. Design goals were articulated and reviewed prior to each movement session. Discoveries and insights were noted and recorded during and following the movement sessions. The movement sessions were witnessed and documented by members of the garment design team[64]. The first movement session resulted in design choices that enabled garment design refinement regarding placement for LED array, wiring, sensors and the microcontroller (see Figure 108). The second movement workshop explored symbol placement for connection-snaps in self-to-self and self-to-other interaction. An additional design exploration based on Applied Kinesiology was incorporated to augment and refine movement workshop findings. These design explorations are described in the next two sections.

8.4.3. Connection between Participants: Symbol versus Feel

The second movement workshop explored design criteria related to the connection-snaps on the whisper garment. The goal of the workshop was to develop an optimal solution to enable both *self-to-self* and *self-to-other* selection within the interaction design of the garment.

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[61] Fraleigh, S.H. (1999), op. cit., p. 11-12.
[62] Boal, A. (1992), op. cit., p. 60-222.
[63] Alexander, C. (2002), op. cit., p. 354.
[64] The garment design team consisted of Thecla Schiphorst, Susan Kozel, Kristina Anderson and Maryan Meek-Schiphorst. The two latter team members witnessed and recorded the movement sessions.

Movement improvisation began by focusing on exploring *locations* on the garment that were *accessible* to the self, that made *sense* to the body, and that supported *movements or gestures* that expressed relationships to the self. The male-end of connection-snap was worn on the right hand on the second and third fingers, like a small finger glove, so that the female-end of the snaps would be positioned on the garment. This allowed the hand to 'reach' for the self in self-to-self interaction, or to reach for another in self-to-other interaction. During movement exploration a number of gestures were found that supported self-to-self movement. One was the right hand reaching across the front of the body to hug the ribs on the left side of the body. Another was the right hand reaching up and across the body to the left shoulder and then the collar of the neck. It became evident that affordances for *everyday* range of motion would constrain potential solutions, and that gestural comfort and ease, were additional design factors. Everyday range of motion dictated that the garment connection-snap positions would lie on the front of the garment since most people are not flexible enough to reach around to their backs. A movement discovery process led to the identification of positions that included the left waist, left ribs, left shoulder, and left collar. Note that all of the self-to-self gestures included *self-wrapping*, the metaphoric gesture of holding, or comforting the self.

Figure 110. Initial Connection-Snap Locations

The next stage in the movement improvisation focused on exploring *locations* on the garment that were *accessible* to the self but that could also be located by *another.* Because the self-to-self movements had identified a number of possible locations, these same locations were explored to assess their expressiveness and meaningfulness in self-to-other interaction. One of the movement discoveries was that the frontal location of the connection-snaps required two people to face one another, in a similar relationship to partner-dancing or intimate conversation. This face-to-face social convention also positioned the male-end on right hand of the connection-snaps in direct line with the partners female-end on the left sided garment connection-snaps. When both partners reached out to connect with one another, the gesture was one of dancing together. In this way the movement discovery was made that connection-snap locations that afford self-connection, were also able to afford self-to-other sharing.

Figure 111. Movement Discovery Leads to Self-to-Other Metaphor of Partner Dancing

The final stage of the second movement session explored the *representational* choice of the connection symbols, and the effect of that representation on self-connection within experience. This segment of the movement session answered the design questions: Are the connection symbols easy to identify and to locate on the garment? How can the choice of *connection symbol representation* support the shift of attention from self to other, while maintaining *inner* self-connection during this interaction?

During the first movement workshop a set of connection symbols were hand drawn on the low fidelity garment prototype to represent breath and heart-rate. The location of the connection-snaps enabled installation participants to *choose* which type of data (breath or heart-rate) they selected to 'attend to'. This created a need to distinguish between differing types of body-data alongside the connection-snaps. The original symbols were borrowed from the whisper interaction model, and are illustrated in Figure 112. The goal of this final movement exploration was to explore interaction with the symbols, putting oneself in the position of an installation participant entering the system.

Figure 112. Visual Symbols Representing Breath and Heart Data Reduce Self-Connection

The movement discovery was that searching for the visual symbol on the garment increased the cognitive load through the act of visual scanning. This discovery was surprising at the time, and was enabled as a result of *somatic phenomenological inquiry through movement.* The observation made during the movement session was that while the movement gestures of reaching out and connecting through the snaps supported self-connection and attention to one's body state, the added cognitive load of visually searching for the type of sensory connection negated that focus. It was also assessed that this would be particularly challenging for first-time participants and 'everyday' bodies within the system. This movement discovery resulted in further explorations with textural textile symbols that required *tactile recognition*. Consequently, a mirror-of-the-self test was enacted which compared 'visual symbol reading' with 'tactile symbol sensing'. The tactile approach created far greater affordances for self-connection, maintaining attention to the self *while* connecting with another. The workshop results included documentation of design choices and next steps. Figure 113 illustrates notes taken following the second movement exploration which record that "symbols flatten experience", and recommend the use of fabric textural materials such as leather, flannel and wool that can be differentiated through touch.

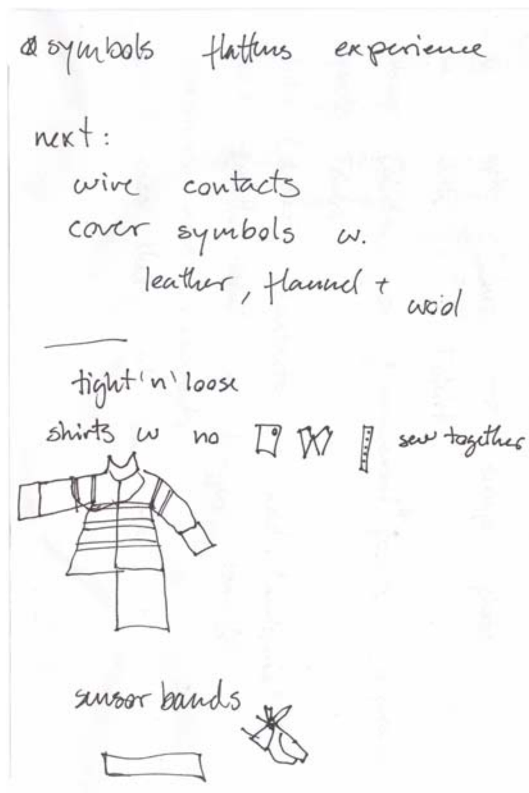

Figure 113. Example Notes Taken From Movement Sessions - Symbols Flatten Experience

As a result of the design choice to use tactile symbols for the connection-snaps, a series of tactile materials were explored and tested for tactile aesthetic quality, ease of recognition and discernment.

Figure 114. Comparison of Recognition between Symbol + Feeling of Leather, Cotton and Wool

Figure 115. Design Process Selecting Tactile Nature of Fabric for Connection

Figure 114 and 115 illustrate tactile symbols and notes corresponding to design process that supported this stage of garment design.

8.4.4. Using Applied Kinesiology as a Facilitated Somatic Design Process

The movement workshops evaluated gestural interaction and raised queries regarding the effect of electrical energy in close proximity to the body. The human body is affected by electricity and magnetic fields because of their ability to induce currents. There is a continuing debate concerning the effects of power frequency (50/60 Hz) fields on the human body, particularly with the increasingly widespread use of local magnetic stimulation in diagnostic and therapeutic modalities, and the increased use of cellular phone electromagnetic radiation[65].

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[65] Reilly, J.P. (1998). *Applied Bioelectricity: From Electrical Stimulation to Electropathology,* New York: Springer-Verlag.

Figure 116. Applied Kinesiology (Muscle Testing) Queries Optimal Path for Wiring on Garment

This design concern led to the adoption of the application of Applied Kinesiology as a somatic technique to help to evaluate an optimal wiring configuration within the whisper garments. This technique (illustrated in Figure 116), was selected because somatic facilitators within the whisper research project had experiential expertise using Applied Kinesiology, and could design an Applied Kinesiology session to target specific queries regarding optimal body functioning under specific conditions. In order to employ the Applied Kinesiology session, a targeted set of design criteria was prepared.

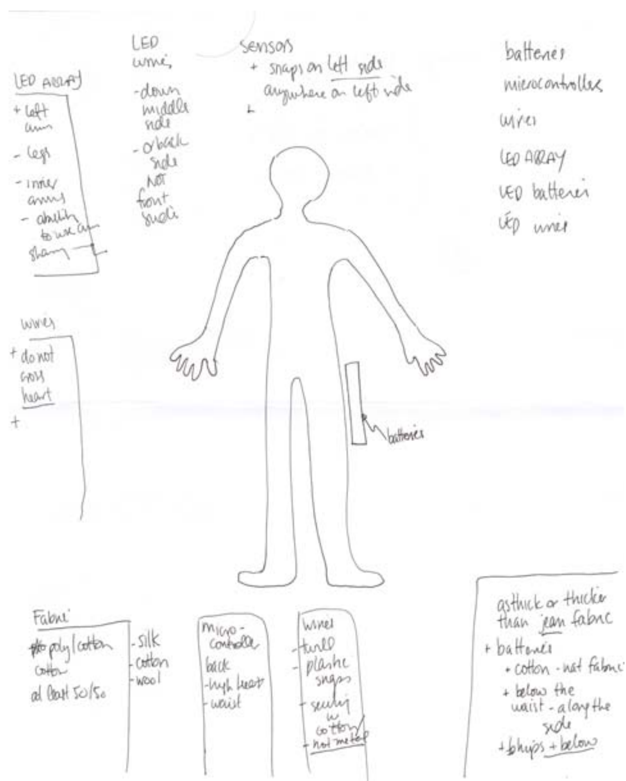

Figure 117. BodyScan Chart Created for Applied Kinesiology Queries

The design criteria was directed towards selecting the best path for the flow of electrical current through the garment, as it is positioned in proximity to the body. The goal was to facilitate optimal design choices regarding location, position and flow of electrical conduits near the body, to support the greatest possible 'health' for the body during interaction. Figure 117 illustrates the 'BodyScan' chart created for Applied Kinesiology queries. Results from the Applied Kinesiology testing provided a series of design decisions that affected garment attributes and constraints. One of the resulting design choices was to move the microcontroller from the centre of the upper back (see Figure 118 left image) to the pelvis area of the lower back (see Figure 118 right drawing). This was based on the assessment of electromagnetic disturbance to the heart organ.

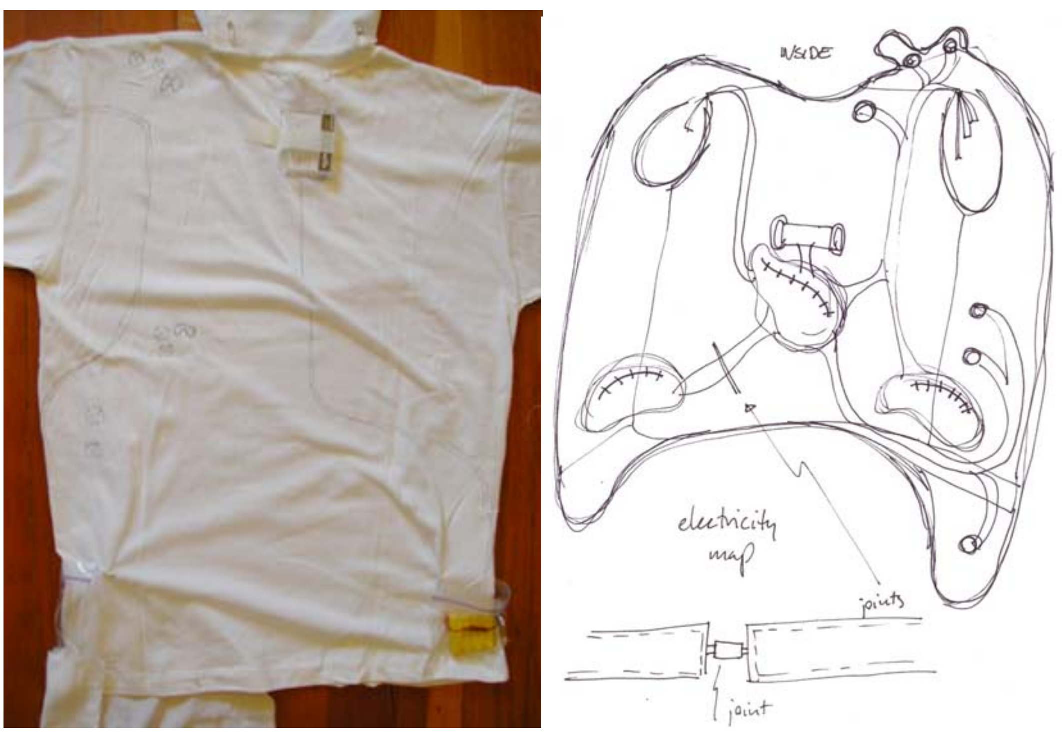

Figure 118. Electricity Map Before and After Applied Kinesiology Testing

Another design choice was to provide a specific depth of 'padding' between electrical wiring and its proximity to the body. These design decisions resulted in a revised 'electricity map' and design requirements for padding electrical activity in relation to optimal functioning of the body. Specifically, the batteries and the microcontroller required specific padding requirements in order to enable optimal body functioning. These revised design criteria were used in the development of the whisper garment design. An example of before and after wiring requirements for garment design is illustrated in Figure 118. The final whisper garment design was the result of somatic facilitation explored through participant workshop sessions, as well as the somatic facilitated phenomenological inquiry through movement. These design processes were evolved in their application within exhale and *soft(n)*, and became the basis for exploring the practice of somatic connoisseurship as a resource for technology design within HCI.

Figure 119. Final whisper Garment Design Including Padding for Batteries & Microcontroller

8.4.5. Rotterdam space exploration

The final example of somatic facilitation included in this section is based on the design of the whisper exhibition space, located in the lobby of the Rotterdamse Schouwburg Theatre in the centre of Rotterdam. This example serves as an illustration of somatic facilitation that attends to spatial qualities for interaction design. The whisper collaborative design team worked with V2_Lab in two residencies before the final exhibition at DEAF03 in Rotterdam[66]. During the second residency, the whisper design

[66] For full list of collaborators and credits, refer to Author's Acknowledgements in the Front Matter p. 15-17

team occupied the exhibition space for one full week during January 2003[67]. This time period enabled the design team to 'inhabit' the space, observing the flow of people moving through the lobby, exploring spatial relationships, designing and positioning projection areas and testing the effects of lighting, movement and ambient sound levels. During this time period, daily movement explorations took place. These movement explorations supported a design analysis reflected in the categories of flow, sound, projection, body and space. One of the primary goals during the seven days was to 'live' within the space, infusing the sense of space within the somatic value of *inter-connectedness*. The simple *intentional* act of inhabiting the space over a period of time saturated our bodies with aesthetic sensitivity that 'tuned' our attention, state and knowledge. We incorporated the somatic sensibilities of the space *into and through* ourselves[68]*.* Although this description of *indwelling* is imbued with a poetic framing, somatic connoisseurship requires sensibilities that support fine-grained discrimination of experience as material within the spatial design of interaction. Space plays a living role in this system of discernment, supporting and grounding the "potential experience" of future participants. Specific and varied spatial explorations applied somatic facilitation through the "mirror of the self" test as outlined by Christopher Alexander, a method of observation that includes the self within the space:

> I have expressed the view that space must be considered an almost living entity—a kind of stuff, which depending on the recursive structures that are built upon it, becomes progressively more and more alive… different parts of space are *seen* to have different degrees of life. But precisely because the observational method of *Descartes* [third-person observation] forbids us from seeing these facts—or indeed these *kinds of* facts—these observations and these observed facts have dropped out of awareness in the modern era… Where Descartes only allowed observation to focus on the outer reality of mechanisms of the world, my [Alexander's] method requires that we focus on the inner reality of feeling *as well.*[69]

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[67] To view the design timeline for the whisper development process, see Chapter 5, Figure 27, 135.

[68] During the Rotterdam Schouwburg residency, the whisper design team was supported by somatic facilitation of Thecla Schiphorst and Susan Kozel with the interaction design expertise of Kristina Anderson. Other design team members including Robb Lovell also had contemporary dance training and were familiar with somatic approaches of 'attunement' to space.

[69] Alexander, C. (2002), op. cit., p. 353.

Figure 120. Schouwburg Spatial Exploration: Garment Prototype in Space

Daily movement explorations included ‘warming the body up’ in the space, as well as focused movement explorations that assessed how the moving body would suggest spatial features such as lighting, spatial boundaries, spatial design for sound domes, projection pools, and legibility of garment LED arrays.

Figure 121. Schouwburg Spatial Exploration: Pools, Window Shades, Sound Dome

The original spatial configuration included café style tables and chairs that were removed in order to facilitate the movement of bodies, sensing and inhabiting the space. Experiments with projector pools that suggested visual concepts for the final installation were prototyped. Sound domes, which localize and focus sound within directed areas, in order to create intimate sonic regions were installed. Movement explorations continued with the goal of creating a felt sense of bodily scale that could enable a more personal relationship within the larger exhibition space.

Figure 122. Schouwburg Spatial Mock Up including Sound Domes Hung from Grid

The result of this residency was a spatial design and plan for hanging the grid that included projector and sound dome locations. These plans were required so that theatre technical production could prepare the lobby prior to the exhibition opening.

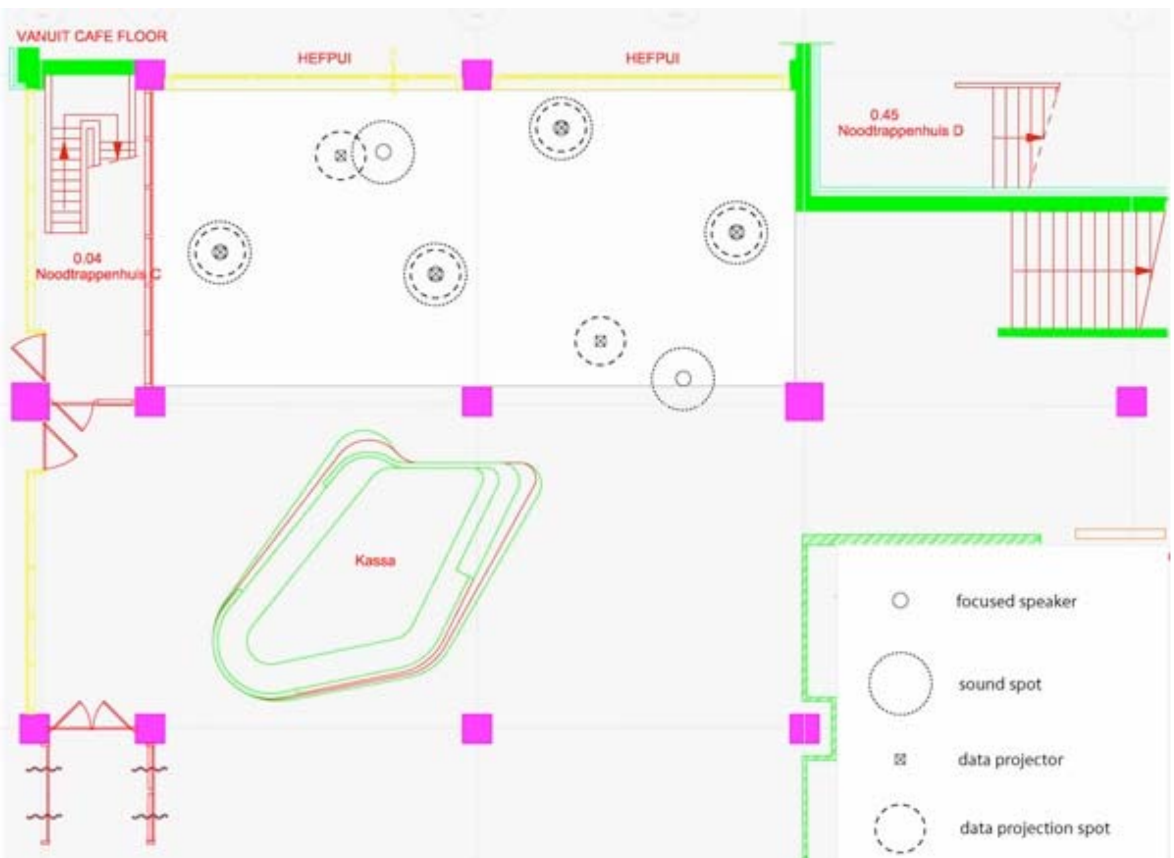

Figure 123. Schouwburg Spatial Plan for whisper Installation Resulted from Design Team's *indwelling* in Space during Week Residency

The whisper residencies provided a week to explore and inhabit the space in preparation for the exhibition, a luxurious time frame in comparison to many other installs. However, observing the space from within the self as suggested by the 'mirror-of-the-self' practice can be applied within many varied time frames, from hours to months. Spatial approaches to somatic *indwelling* that supported design choices for movement and interaction were evolved from these initial tests and then applied to the exhale exhibition during Siggraph Emerging Technologies exhibition in July 2005, and to the *soft(n)* exhibition during April 2007. Somatic facilitation supports technology design that invites participants to 'live' within interactive spaces more fully, attending to the concept of 'wholeness' or inter-connectedness within experience.

8.5 Conclusion

As human computer interaction has responded to the democratization of technology in work, play, home and mobile social networks, it has also extended its collaborators to include domains from the social sciences, humanities, arts and performance, expanding its knowledge and its methods. Like the multiple disciplines that partner within HCI research, somatic facilitation can play a role in the technological design process that is a central theme and outcome of HCI research.

This chapter has discussed insights gained from applying somatic practice to the design of technology and has described how these processes can be operationalized as a design resource within an HCI context. It has illustrated how somatic connoisseurship can apply body-based awareness skills to technology design, from participant workshops to collaborative team development, and from guided participant interaction to prototyping for wearable or tangible computing.

The practice of somatic connoisseurship highlights the significance of somatic facilitation as a role within the technological design process. I have illustrated how the role of somatic connoisseurship can enrich interdisciplinary design space, bringing new knowledge and practices to the design of technology within human computer interaction.

The research strategy outlined in this chapter has been based on an overarching process of research through art that has explanatory value within the HCI community in the context of design for embodied interaction. These examples have sought to frame the following proposition: if technologies can be used to create a space for the experience of *self-awareness,* thereby providing a rich interplay between movement and sensory expression, then our technologies can support self-cultivation through the development of our *skills of experience.*

The case studies presented within this thesis are interwoven within applications of somatic connoisseurship, from the highest level goal setting, in which somatic values of self, experience, attention and inter-connectedness set a resonant 'tone' that aligns creative intention, to the detailed and specific design choices which form the fundamental material of interaction, aesthetics, technologies, and artifacts of experience.

Within this common case-study framework, the whisper design process was highlighted as an examplar in this chapter. Because the quantity of case study documentation is sizeable, and the sheer number of examples abound, I chose to select a delimited set of examples that could illustrate the interconnected process of somatic facilitation within a coherent design process, in which design choices are multi-layered, complex and inter-connected. This illustrative approach has explanatory value and demonstrates foundational evidence that can be applied within other technological design processes, where somatic goals that seek to support self-experience exist within an overall design framework.

In addition, the somatic approaches that were tested within the whisper design process have direct corollaries in the development of exhale and *soft(n)*. Both exhale and *soft(n)* utilized scripted procedural descriptions in participant workshops to explore and define experiential possibilities. Within the case studies as a whole, somatic connoisseurship established a foundational role in conceptualizing, implementing and refining these artworks.

The concept of self-evidence presented within this chapter, invites a re-thinking of the process of design for technology, one that includes design for the experience of the self. The inclusion of self-evidence and the non-alienated view of technology design supports technology design in which the *self*, embodied within the multiple roles of researcher, designer, artist, and participant or user, is included in the methodological structure of design for technology, both as design goal and as design process.

9

Toward Richer Models of Experience

"Everything real must be experience-able somewhere, and every kind of thing experienced must somewhere be real."
William James[1]

"...to continue the investigation ... will require a paradigm shift in multimedia research away from purely technical concerns satisfied with incremental progress within established paradigms to a radically interdisciplinary approach to research, design and development."
Marc Davis[2]

"*Academic disciplines are most active at their ever-changing interfaces."* *Schechner*[3]

9.1 Introduction

This thesis has presented a radical interdisciplinary dialogue, one that draws upon a necessary collaboration between divergent knowledge traditions and epistemologies of practice within human computer interaction, somatics and contemporary dance performance. By weaving together strands of theory, practice and methodology this dialogue has produced a body of work articulated through the case studies, whisper, exhale and soft(n). This final chapter draws upon the collaborative nature of these case studies by summarizing their contribution to human computer interaction. These collaborative and radical interdisciplinary methods are based on an epistemological *reframing* of the nature of user experience within HCI and between HCI and somatics. This chapter articulates the thesis's contributions to HCI, drawing conclusions about the relationship between theory and practice, and outlines future possibilities for research in the area of somatics and embodied interaction within HCI.

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[1] James, W. (2003). *Essays in Radical Empiricism*. London, UK: Dover Publications, p. 83.
[2] Davis, M. (2003), op. cit., p. 51.
[3] Schechner, R. (2002). *Performance Studies*. London, UK: Routledge, p. 19.

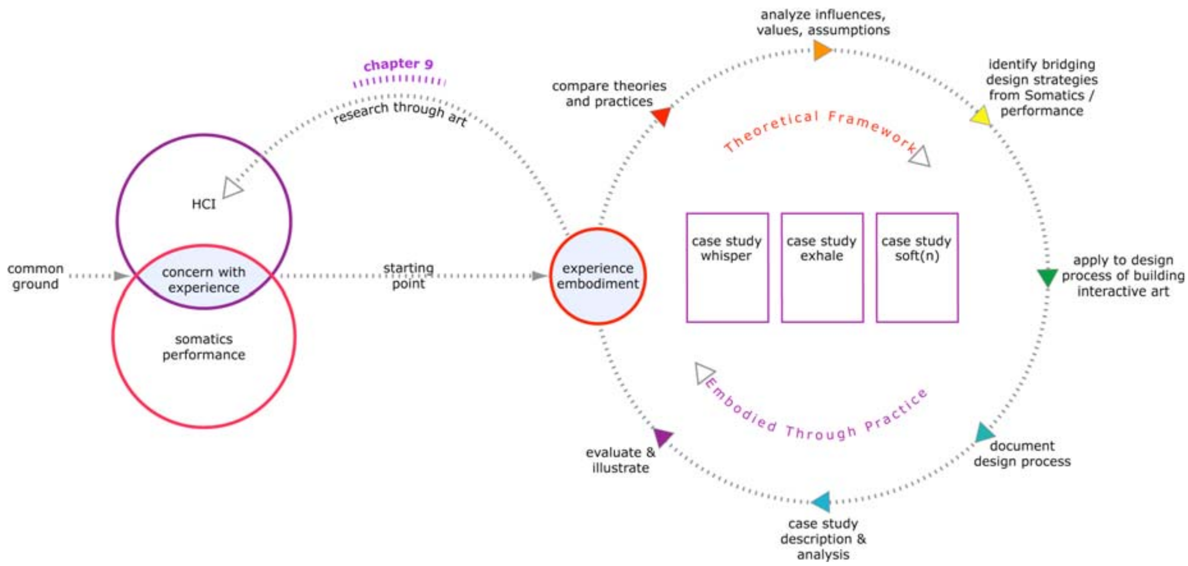

Figure 124: Chapter 9 Summarizes a Radical Interdisciplinary Dialogue Based on Collaboration between Body-based Somatic Awareness Techniques and Human Computer Interaction

9.2 Summarizing and Contextualizing Research Objectives

The thesis research strategy has been based on an overarching process of Research through Art that has explanatory value within the HCI community in the context of design for embodied interaction. The case studies provided examples of somatic body-based techniques that were applied to technology design. This ‘Research through Art’ supported a discovery-led, exploratory design process that resulted in the development of a theoretical framework, grounded in practice. Because the HCI literature offered no insights into how we can apply somatic body-based techniques and embodied theory to the design and implementation of technology, and because this research is framed within artistic practice, I utilized a Research through Art approach, with the goal of gaining insights into the application of somatic practice to the design of technology. The application of somatic techniques to technology design has been described, analyzed, interpreted and critically reflected upon throughout the thesis, as illustrated in Figure 124. This explication has framed somatic theory and practice, identifying the need for expanding embodied methodologies within HCI, and has contextualized a range of somatic techniques that can be applied to technology design for experience.

This approach has illustrated *how* somatic body-based practices can be applied as a *resource* for technology design within HCI. The Research through Art strategy has also influenced the collaborative processes engendered within the research. The case study art-works were large-scale projects developed over multiple year periods, requiring collaboration within interdisciplinary design teams. Team membership spanned disciplinary domains including: somatics, contemporary dance, computer science, electrical engineering, interaction design, media arts, sound design, mathematics, phenomenology and project management. Because the outcome for each case study was an art installation, the overarching artistic goals *led* the design process, and therefore *aligned* the various interdisciplinary domains *within* the artistic strategy and directive[4]. The case studies were highly collaborative processes that were artist-led.[5]

The theoretical framework utilized in the case studies was developed through personal experience articulated within somatic connoisseurship, combined with empirical data gathered from the design processes of whisper, exhale and soft(n). Robert Yin's analysis of case-study research suggests that this combination optimizes and strengthens the case-study design because it can articulate converging lines of inquiry that ground a theoretical framework[6]. By positioning the *phenomenon* of body-based somatic practice within the *context* of design for technology within HCI, the case studies enable a deliberate inquiry into contextual conditions arising from the differences between two distinct epistemologies of practice, one that focuses on self-evidence gained from first-person experience, and the other that directs its attention toward "technical concerns satisfied with incremental progress within established

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[4] This distinguishes these case studies from other technological design projects that can be encountered within HCI, however, the contribution of somatic-based techniques within a technological design process can be applied to any technology design process in which design for the user's self awareness can increase the instrumentality of a computer mediated interaction.

[5] In each of these projects my own role as a conceptualizing artist required developing and refining artistic concept, strategy and implementation, thereby guiding design decisions throughout the implementation process. In both whisper and exhale, Susan Kozel also contributed in the role of collaborative artist, supporting the development of artistic conceptualization and refinement. In whisper, Kristina Andersen's role in interaction design also had a tremendous impact on the development of the concept iteration.

[6] Yin, R.K. (2003), op. cit. p. 98.

paradigms".[7] The intersection of these contextual frames creates a space for radical interdisciplinary inquiry in which both somatic practice and human computer interaction can collaborate to transform and extend their own domain boundaries.

> Collaboration creates an environment where the partners can push the boundaries of themselves and integrate their differing personal characteristics. Interactions among partners create new properties that build on each other toward creative outcomes, identities, and relationship possibilities. [this can lead to] both personal transformation and domain transformation.[8]

The 'somatic turn' invites a rethinking of the process of making technology, one that includes design for the experience of the self. Including self-experience and self-awareness into technological design brings an ethical dimension to the assessment of technological systems within HCI, enabling us to answer the question, how can technological design support self-awareness in the context of the personal, social and global communities of practice? The benefits of this radical interdisciplinary approach, extends beyond the user experience of technology. It also influences and transforms the collaborators embodied in the roles of researchers, artists, designers, scientists and technologists, and finally extends to transform the domain knowledge itself.

9.2.1 Research Objectives

The propositions, design exploration and evidence gathered throughout the thesis has followed from an inquiry based on a set of research objectives derived from the research questions outlined in Chapter 1. These are summarized to frame the thesis contributions that follow. The research objectives are to:

1. Illustrate the application of body-based somatic practices within an HCI context in order to expand the practical application of embodied theory and its application to technology design, particularly in its use as a design resource within HCI.

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[7] Davis, M. (2003), op. cit., p. 51.

[8] Miell, D., & Littleton, L. (eds.) (2004). *Collaborative Creativity: Contemporary Perspectives*. London: Free Association Books, p. 21.

2. Enhance a reflective space for ethical valuation of technology design within HCI through a radical interdisciplinary approach utilizing ameliorative properties of first- and second- person methods of somatics and contemporary dance.
3. Reframe user experience within HCI and between HCI and somatics through an articulation of the epistemological nature of body-based somatic practices.

These three research objectives are the basis for the discussion of the thesis contributions to human computer interaction.

9.3 Contributions to Human Computer Interaction

This research is focused on the varieties of user-experience from the pragmatic to the exquisite, and articulates this focus by bridging embodied methodologies from somatics and contemporary dance performance to human computer interaction. The contributions to human computer interaction derive from the development of theory, practice and methodologies that support the process of applying the ameliorative approaches of somatic body-based awareness practice to the technology design in HCI[9].

9.3.1 Application of body-based somatic practices as a design resource for HCI

The first research objective was to *illustrate the application of body-based somatic practices within an HCI context in order to expand the practical application of embodied theory and its application to technology design, particularly in its use as a design resource within HCI.*

A design resource is a technique or tool that supports design: creative processes that result in the development of an artifact or experience, that affect an outcome by improving the self or the world. Within this research, the design resource is a collection of somatic body-based techniques that can be applied to design for technology,

[9] For clarification, contributions to HCI articulated within the text are presented in *italics*.

supporting pragmatic approaches to experience design within HCI. Depraz, Varela and Vermersch define a pragmatic approach to knowledge generation as:

> the implementation of techniques, means and know-how. In pragmatism, one cares about how well something adapts to its situations rather than how well one formulates *a priori* principles. From this viewpoint, truth consists in the success, efficacy, and functionality of the realized action.[10]

A somatic design resource illustrates techniques for exploring experience, sustaining pragmatic approaches within HCI, and thereby enabling designers to "think more precisely" in order to improve design knowledge and practice.

Bill Gaver has argued for the value of augmenting design practice by articulating design resources within the HCI community:

> Our purpose is to reveal some of the techniques that interaction designers use in creating compelling designs, and to enable other designers to think more precisely—whether critically or constructively…[11]

This thesis contributes to HCI by articulating somatic body-based techniques as a design resource, in order to enable HCI researchers and designers to more accurately conceive, develop and reflect upon appropriate uses of embodied awareness theory and practice.

This research also provides opportunities to select specific technical approaches to incorporating somatic techniques within technology design processes. In doing so, it illustrates the application of the *values* of self, attention, experience and inter-connectedness, described in Chapter 2 as central to defining somatic sensibilities. This research supports the concept of *Technology as Experience,*[12] and facilitates access to technology's *potential experience*[13] through training *our ability to notice.* This thesis

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[10] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit. p. 17.
[11] Gaver, W., Beaver, J., & Benford, S. (2003). Ambiguity as a resource for design, *CHI Letters, Proc. CHI 2003*, New York: ACM Press, p. 233.
[12] McCarthy, J., & Wright, P. (2004), op. cit.
[13] Eisner, E.W. (1998), op. cit., p. 64.

also contributes to the concept of somatic connoisseurship as a pragmatic approach to somatic facilitation within technology design in HCI. Somatic connoisseurship highlights matters of quality, and refers to the ability to recognize and discriminate between qualities of experience in precise ways. Somatic sensibilities support fine-grained discrimination regarding the use of experience as material within the design of interaction. In this way somatic connoisseurship can facilitate the development of techniques of awareness, the simple act of paying attention that can be supported through technology design processes.

Incorporating somatic facilitation through the practice of connoisseurship within a technology design process expands the practical application of embodied theory and its application to technology design.

The varied somatic knowledge and techniques that underlie these contributions have been described in Chapters 5, 6, and 7, and analyzed in Chapter 8. In particular, Chapter 8 articulated the concept of somatic connoisseurship as a framework for analyzing and evaluating the application of bridging embodied methodologies from somatics and contemporary dance performance to human computer interaction.

This thesis has contributed to the field of HCI by 1) illustrating the application of body-based somatic practices within an HCI context, thereby 2) expanding the practical application of embodied theory and its application to technology design, and 3) demonstrating the value of body-based somatic techniques as a somatic design resource within HCI.

9.3.2 A Radical Interdisciplinary Approach to Collaboration

The second research objective was to *enhance a reflective space for ethical valuation of technology design within HCI through a radical interdisciplinary approach utilizing ameliorative properties of first-person methods of somatics and contemporary dance.*

Chapter 8 described attentional methods used to facilitate awareness. Because attention operates on experience in order to alter our state, and because state includes access to specific qualities and types of knowledge, our goals of developing attentional skill through technology has multiple levels of social and ethical value.

This approach contributes to HCI by expanding ethical resources for technological design that transforms the self and the world.

Body-based awareness practices in somatics are based in self-cultivation and self-agency; they act upon the self in order to ameliorate and to improve our *technical skills* of accessing experience. However, the application of first- and second- person methods of phenomenological somatics within this research can be differentiated by its context.

This research contributes to HCI by articulating first- and second- person methods through the design of technology, so that the ameliorative process is at once individual, cultural and systemic: it becomes simultaneously inter-subjective combining a form of social self-inquiry through somatic facilitation. Awareness of one's own organism leads to recognition of the commonality of all human organisms.[14] *Attention is an ecological process.*

The proposition is that as the self is cultivated, an ethical relationship can emerge between self-awareness and technologies created from the application of attention to our experience. An ethical valuation of interdisciplinary technology design also requires an evaluation of the nature of collaboration within interdisciplinary design teams, exploring the collaborative frameworks that have supported the three case studies. Marc Davis has suggested that in order to investigate new methodologies for

[14] Burrow, T. (1999), op. cit.

experiential systems within HCI, we require a paradigm shift that moves beyond incremental progress based on technical solutions to a:

> … radically interdisciplinary approach to research, design and development. To facilitate such a paradigm shift, we will have to question and be willing to change basic components of our work: our methodologies, objects of study, and the composition of the research community for experiential systems. This reorientation will be challenging, but the technologies we can develop and the experiences may be able to facilitate will be worth the effort.[15]

In the research presented within this thesis, somatic facilitation existed during all phases of the exploratory design process, building up shared experience between collaborators and design team members as well as unique personal experience that were used as *material* throughout the iterative design and genesis of the technology. Radical interdisciplinary design requires collaborative creativity within the design team in order to support the *indwelling* that facilitates co-experience shared within team processes.

> Inherent in these contemporary approaches to collaborative creativity is an emphasis on studying *processes* involved rather than a sole focus on examining the quality of the products of creative endeavours. It is not only cognitive processes that are implicated in creative work. Creating collaboratively can be a highly emotionally charged and deeply personal meaningful process—involving the construction of subjectivities and relationships as well as ideas and artefacts.[16] [italics mine]

Chapter 8 introduced Polanyi's notion of indwelling. Within this thesis, indwelling is used both as an approach to user experience, and as an approach to collaborative processes. By *indwelling* within a design process, design team members negotiate and construct shared understanding of experiential language. This shared co-experience accumulates throughout the life of the exploratory design process, iterated and refined

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[15] Marc Davis makes this statement in the closing Future Work section that ends his discussion of Theoretical Foundations for Experiential Systems. His suggestion of future work summarizes the strategies and practice that has been outlined within this thesis. See Davis, M. (2003), op. cit., p. 51.
[16] Miell, D., & Littleton, L. (2004), op. cit., p. 1.

multiple times throughout the life of the creative cycle[17]. Within the research elaborated in this thesis, the collaborative design process centered on exploring self-experience as *material* for design. This focus on experience *as design material* required that each design team member personally experience, and have access to the knowledge embedded in processes of 'technologies of the self' within the collaboration. This resonates with Foucault's observation that that 'care of the self' is a precursor to the concept of citizenship and the Hellenistic understanding of the 'care of the city'[18]. In this case, citizenship within the design team includes shared somatic experiential processes in the context of collaborative creativity. These first-person experiences are facilitated through techniques of somatic connoisseurship and are distinct from the everyday experience and 'natural attitude' in their specific application of attentional skill[19]. Including ameliorative properties of self-cultivation in roles of citizenship within a design group, echoes Trigant Burrow's view that first-person attention is the process by which we connect in a sustainable way to our environment. These views of the relationship between the care of the self, and attention *through the self* to the world illustrate theoretical and reflective positions that are put into practice within this research. This approach redefines a radical interdisciplinary dialogue that is included in the collaborative nature of design exemplified within the case studies. Defining collaboration as a 'critical technical practice' as articulated in Chapter 1, becomes relevant in this instance. The collaborative processes distinguish between technologies of the self, and the concept of "individualism": two politically distinct views reflecting the relationship between self and world. Individualism dissociates the self from the world privileging the boundary-separation of self from world, and enabling the

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[17] The design processes of whisper, exhale and soft(n) each occurred over a period of over two years. These lengthy design processes enabled more in-depth accumulation of design experience, knowledge and shared practice, and also created an internal set of personal stories that imbue multiple experiential layers within a design process.

[18] Refer to the discussion in Chapter 2, pp. 62-65, in which Foucault traces subjective practices including self-observation to the ancient Hellenistic concept of the 'care of the self' illustrating how first-person practices such as 'attending to the self' were utilized as a foundation of knowledge.

[19] Many of the whisper and exhale design team members participated in the whisper and exhale workshops as facilitators and/or participants including: Thecla Schiphorst, Susan Kozel, Kristina Andersen, Robb Lovell, Jan Erkuu, Calvin Chow and Camille Baker. Additionally, many of the soft(n) design team also participated in the soft(n) user workshops.

traditional positivist view of the world as existing outside of the self; whereas, ‘technologies of the self’ enables an integrated articulation of both self and world by valuing interconnectedness as a strategy for accessing state-based knowledge and the experience of wholeness: the ecology of the self within the world[20]. The original conceptual description of the whisper project used the term *collective first-person methodologies* to describe the creative process that included the self within the radical interdisciplinary process of collaborative design.

> The ‘first person’ of these methodologies comes into play through emphasis on design that is intimately connected to the body. Like phenomenology, collective first person methodologies are based primarily upon physical experience, but emphasis is shifted to the collective. The design process involves a strong commitment to material and physical experimentation. Each stage of the research period is linked to exploration in the (dance) studio. Physical improvisation techniques determine emergent movement vocabularies and inform the design process. The process is not simply to import pre-fabricated devices into the studio. All materials and devices are tested physically so that the body knowledge and the hardware/software design occur simultaneously. The creative development of the wearable devices is an embodied and performative process.[21]

The creative collaborative design team processes utilized within the case studies contributed to HCI by defining design features of a radical interdisciplinary collaborative approach that utilized ameliorative properties of first- and second- person methodologies of somatics and contemporary dance.

Figure 125: Design Team Workshop Participation in Creative Collaboration

[20] Refer to the discussion in Chapter 8 regarding distinct topologies of awareness, p. 268, where the psychologist, Shellie Levine, has described awareness as a ‘topology’ in which multiple levels of awareness construct varying experiential ‘logics’, so that knowledge is state-dependent.

[21] Cited from design brief and planning document *whisper: wearable body architectures*, concept description document, and funding application for the Daniel Langlois Foundation, the Canada Council for the Arts and the Arts Council of British Columbia. This document was co-authored by Thecla Schiphorst and Susan Kozel.

This research objective is operationalized in two ways within the collaborative team processes: 1) design team members share in somatic awareness techniques facilitated by somatic connoisseurship in order to develop a collective experiential knowledge of the specific qualities that formed the basis for *experiential material* used within the design process, and 2) design team members *ground* their individual areas of domain expertise in the shared experience constructed through the process described above, allowing the team to develop a common *experiential* language. Developing a radical interdisciplinary dialogue through the *material* of experience becomes the basis for pragmatic design outcomes that define aesthetic, technological and experiential features of the wearable tangible networked art installation. Both 1) and 2) are part of an overarching artist-led process in which artistic goals are used to align the various interdisciplinary domains *within* the artistic strategy and directive, guided by somatic facilitation.

An example of design team members sharing in somatic awareness techniques facilitated by somatic connoisseurship (described in 1. above) is illustrated in Figure 125, in which design team members participated in exploratory experience workshops, side by side with workshop participants. This is an example of the application of collective first-person methodologies to support shared knowledge and *indwelling.*

An example of design team members *grounding* their domain expertise (such as textile design, sewing, engineering, programming) in the cumulative shared knowledge gained through shared experience (constructed through exploration in workshops and other exploratory experiential somatically facilitated processes), are illustrated in Figures 126 and 127 (described in 2. above).

Figure 126: The Shared Sewing Circle includes Sewing, Soldering and Engineering Design

These examples illustrate the concept of the sewing circle, a collaborative design approach to prototyping in shared space that can share aesthetic development as a result of aligning to experiential goals, 'mixing' the methodologies of engineering, sewing, movement and aesthetic design. Like the definition of 'collective first-person methodologies', the *sewing circle* was originally articulated during the conception of the whisper installation:

> … generally attributed to groups of women, domesticity and textiles, the term is associated with 19th century social and creative processes employed in the interests of rehabilitating a largely dismissed creative activity: crafting an artifact according to an inherently social and collective design process. Like the members of sewing circles and other creative collectives, we are building our own vocabularies, physical techniques and methodologies working with textiles and mapping the skills of knitting and stitching onto device design. Our sewing circle may stitch …and knit with [materials and textiles], but we will also wire our bodies into wearable devices and physically improvise, fabricate, and engineer in the studio.[22]

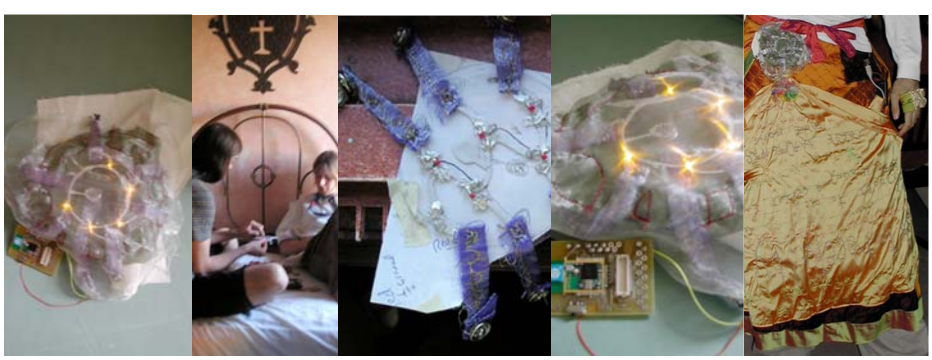

Figure 127: Aesthetics Evolved from Collaborative Approach to Sewing Circle

[22] Ibid.

As the self is cultivated within a technology design process, an ethical relationship can emerge between self-awareness and technologies created from the application of attention to our experience. An ethical valuation of interdisciplinary technology design requires an evaluation of the nature of collaboration within interdisciplinary design teams, exploring the collaborative frameworks that have supported the three case studies.

The benefits of this radical interdisciplinary approach, extends beyond the user experience of technology. It influences and transforms the collaborators embodied in the roles of researchers, artists, designers, scientists and technologists, and finally extends to transform the domain knowledge itself.

This thesis has contributed to HCI by 1) enhancing a reflective space for ethical valuation of technology design within HCI, 2) applying this to a radical interdisciplinary approach that evaluates the nature of collaboration, that is articulated through 3) the utilization of ameliorative properties self-cultivation supported through somatic facilitation within collaborative design processes.

9.3.3 Reframe Epistemologies of Practice regarding User Experience within HCI

The third research objective in this thesis was to *reframe user experience within HCI and between HCI and somatics through an articulation of the epistemological nature of body-based somatic practice.*

The exploration of felt-life within HCI holds a nascent and yet-to-be fulfilled place within the design of technology. There is a continued need for the development of a theoretical and pragmatic exploration of the mediation of our subjectivity in the context of HCI. This thesis has explored the epistemological nature of body-based somatic practice, grounding this exploration in the historical development of the parallel yet differentiated epistemologies of practice that represent somatics and human computer interaction.

The thesis has differentiated between historical trajectories that construct knowledge from *within the subject* and those that construct knowledge from the externalized frame of an *empirical body*. Chapter 2 has described the historical emergence of these distinct epistemologies of practice. Chapter 8 has elaborated on the historical differences by articulating specific attentional techniques that support the development of experiential skill that can bridge these epistemological methods through their application within technology design, providing possible approaches to reframing user experience within human computer interaction.

In somatic practice meaning is constructed through self-observation, experience and the interconnectedness of body with mind. Chapter 2 has summarized four principle values that ground attitudes, practices and knowledge within somatics. These values are summarized as the values of self, attention, experience, and interconnectedness. Each of these values creates an intentional, ethical and aesthetic stance that constructs meaning and frames knowledge production.

Somatic connoisseurship focuses on experience as material, and on using attention as an operator to transform that experience. Chapter 8 summarized a variety of ways that one can focus attention in experiential activities. Attentional skill requires discernment and agency. Discernment is the ability to recognize the subtle qualities of experience, and agency is the ability to choose to move toward one or another quality within an experiential stream. Christopher Alexander uses the example of the practice of mindfulness to describe this process:

> …the Buddhist student is taught to recognize, feel, and experience the precise inner state which he or she is in at each instant. The key to this method, as practiced by Buddhists, is to recognize the inner states that are wholesome, and then to move toward those phenomena in the inner and outer world which cause or tend to create this state of wholesomeness in the observer and in which wholesomeness is

> considered to be the most important and the most fundamental internal condition.[23]

The proposition is that shifting attention to our own body-state is a step towards increasing our bodily awareness, thereby gaining insight into perceptual habits, personal knowledge and somatic sensibilities.

> Acknowledging the realm of embodied habits, which the process of becoming aware is to reveal[24]

By engendering a role for cultivating self-awareness within interaction, our digital technologies can support the development of an *attentional skill-set* for experience. Viewing experience as a skill that can be evolved, is an epistemological framing that is central to somatics practice.

This research contributes to HCI by reframing user experience through an articulation of the epistemological nature of body-based somatic practice. By engendering a role for cultivating self-awareness within interaction, our digital technologies can support the development of an attentional skill-set for experience. Viewing experience as a skill that can be evolved, is an epistemological framing that is central to somatics practice.

9.4 Future Work

As science and technology continues to discover, invent and mediate living systems that will alter our lives on the planet, human computer interaction can play an active role in increasing the legitimacy of a non-alienated view of technology through its ability to critically respond *through* the imagination and design of future technologies. The democratization of technology has increased technological mediation of experience in work, home, play and mobile social and ubiquitous networks. Our futures include organic technologies that can be grown both inside and outside our bodies, and

[23] Alexander, C. (2002), op. cit, p. 368.
[24] Depraz, N., Varela, F.J., & Vermersch, P. (2003), op. cit., p. 3.

networks that use ‘self-awareness’ strategies to intelligently reconfigure themselves in response to adverse conditions including error recovery based on ‘self-healing’, where devices can detect lost connectivity, locating another active route, and supporting the network goal of inter-connectedness. Since the birth of the ENIAC[25], technological language and metaphors have been appropriated to describe our bodies and minds, embracing our cognitive and computational selves, while leaving out our intuitive, subtle-sensing and subjective selves. Yet, as our human history begins to bridge its own epistemologies of practice, integrating ‘Technologies of the Self’ more actively within design processes, language that describes computer network processes are also beginning to appropriate somatic awareness metaphors, describing intelligent autonomous behaviour within a network as mirroring the intelligence of self-awareness. There is no doubt that HCI is extending its collaborators, knowledge and its methods. Like the multiple disciplines that partner within HCI research, somatic facilitation can play a role in the technological design process that is a central theme and outcome of HCI research.

> How can we begin to conceptualize and prototype our applications of tomorrow? Our ability to design our futures requires some hand-holding: bringing closer connection to the communication between art, science, and research in the technology industry. This hand-holding can be uncomfortable at first, with a requisite period of sweaty palms, uncomfortable silences, and social faux pas. But hand-holding can also invite affection, curiosity, and vulnerable data: which, if respected, can result in knowledge sharing and building.
>
> This research domain extends embodied cognition, expanded perception, adaptive environments, and interactive systems. It considers these differing aspects as layers of architectures that embrace and include the body and its own data, affectionate computing, sensual interfaces, models for intention, smart materials, textiles, shape-shifting forms, and spaces that can move and transform.[26]

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[25] Electronic Numerical Integrator and Computer (ENIAC) was the first general purpose electronic computer. ENIAC was designed to calculate artillery firing tables for the U.S. Army's Ballistic Research Laboratory, but its first use was in calculations for the hydrogen bomb. See Goldstine, H.H. (1972). *The Computer: from Pascal to von Neumann*. Princeton, New Jersey: Princeton University Press.

[26] Schiphorst, T. (2006a). Affectionate computing: can we fall in love with a machine?, *IEEE Multimedia*, *13*(1), January–March 2006, 20-23.

The proposition that somatic facilitation can be a resource within a technological design process has been the central argument of this thesis. How can technological design support self-awareness in the context of the personal, social and global communities of practice? Although the focus on processes of somatic connoisseurship has been artist-led practice, somatic facilitation has future potential within HCI whenever there is a need to design for a *relationship to the self within the user experience*. This could have application in systems that rely on contextual awareness such as CSCW and wearable and mobile technology systems, reminder systems, computer gaming, immersion, research in technological design for health and well-being as well as 'design for the self'. New applications of organic materials, medical technologies, and bio-medical processes require ethical practices that enable the mediation of subjectivity. In the social sector, appreciative inquiry for social change, and experiential research that employs first and second-person values such as empathy, trust and forgiveness require subjective evaluation within design processes.

The need for expanding tools, techniques and resources that can support design for experience within technology continues to increase. Human computer interaction has acknowledged the need to develop and expand methods of exploring experience. Depraz, Varela and Vermersch acknowledge the lack of precedence in integrating somatic awareness techniques within interdisciplinary practices. Because there is little interdisciplinary precedence in articulating these techniques to a wider audience, the research is still exploratory and its' ultimate acceptance not known:

> Because of this lack of precedence … we have no clearly defined audience. Our hunch is that we are addressing ourselves primarily to those people *within…* the domains [of cognitive neuroscience, philosophy, psychology, the many professions dealing with human transformation such as education, remedial therapies, knowledge management] who have become sensitive to the need for further work on the method of exploring experience.[27]

[27] Ibid, p.4.

This unknown future points to the *potential experience* that can be articulated through the skills of somatic connoisseurship. This thesis has articulated ways in which human computer interaction can incorporate new "methods of exploring experience". The research presented here can also be of interest to researchers that apply body-based somatic awareness practices to interdisciplinary methods in the sciences, social sciences and humanities: those interested in a radical interdisciplinary dialogue that includes somatic awareness practices.

9.4 Coda

This Chapter has drawn together theory and practice, revisiting the theoretical framework presented at the beginning of this thesis, and crossing back on itself with greater knowledge and appreciation for the wealth and richness that exist in the technical practices of human computer interaction, and the depth and rigour that exist in the technical practices of somatics and performance. This theory and practice has been grounded in a discourse of radical interdisciplinary collaboration, in which we have questioned and reoriented our "methodologies, objects of study, and the composition of the research community for experiential systems"[28].

We exist in an expanding circle of practice, from creation and ideation to constructing, interpreting and reframing. I have articulated an argument for bridging embodied methodologies from somatics and performance to human computer interaction, by reframing epistemologies of practice between these disciplines, illustrating the intersections, alliances, histories and influences that have existed between them even before either was named into existence. The inclusion of self-evidence and the non-alienated view of technology design supports experiential technology design in which the *self*, embodied within the multiple roles of researcher, designer, artist, and

[28] Davis, M. (2003), op. cit., p. 51.

participant or user, is included in the methodological structure of design for technology, both as design goal and as design process.

I have acknowledged the pragmatic and critical reflection within HCI, in its ever evolving integration of new knowledge, techniques and approaches to "understanding the human in human computer interaction,"[29] positioning it as a partner within the shifting landscape of embodied cognition that is engaging the sciences, humanities and the arts. I have surveyed approaches to embodiment from within the sciences and from within the practices of body-based disciplines finding strands and threads of continuity, similarity and resonance. I have adopted an approach of 'blending' differences in values and assumptions, leaving openings for critical reflection, comparison, and historical perspective. I have introduced the importance of the Technologies of the Self, and the relationship between the personal and the political in our positioning of self-practice and the 'first'-person in the greater landscape of validity, reason, and subjectivity. I have defined and explored somatic connoisseurship as an instrumental approach to positioning 'the somatic turn' within a technological design process, supporting the varied somatic techniques that can offer a *somatic design resource* experience design within HCI, incorporating collaborative creativity through a radical interdisciplinary dialogue.

I have braided a story that maintains and values its differences, but can look up to see that the cloth is shared between many, many threads. I have brought my self to this task, and I have stood back from myself to loosen my own biases and assumptions, aiming to create clarity and objectivity, and yet to remain within the frame. This frame, while encompassing the self, also includes the expanding knowledge and methodologies within HCI. I have illustrated how somatic facilitation can be used to create a space for the experience of *self-awareness* within technology design,

[29] Wright, P., Blythe, M., & McCarthy, J. (2006), op. cit., p. 13.

supporting self-cultivation through the development of our *skills of experience* in a non-alienated view of technology.

I have contributed to theory and practice of human computer interaction, recommending the inclusion and embrace of a set of practices of embodiment exemplified in the form of somatic connoisseurship throughout the case studies, supporting the design of embodied interaction and increasing the efficacy of experience. These are framed under the rubric of somatic connoisseurship, as a facilitating role within the radical interdisciplinary dialogue of collaboration within HCI. I support the concept of a continuum of practices incorporating a range of methodologies that can co-operate between one another in the expansion of knowledge and of experience. Collaboration within a radical interdisciplinary framework includes methodological collaboration between first, second and third person methodologies, as it does between researcher, artist, scientist, designer, technologist and participant-users in creative discovery.

Like Valerie Janesick, I have engaged in Stretching Exercises for the Qualitative Researcher,

> In qualitative work, the fact that the researcher is the research instrument requires that the sense be fine-tuned. Hence, the idea of practice, on a daily basis, sharpens the instrument. Many individuals can look at something and not see what is there…. The qualitative researcher must understand the functions and *feel* of observations, interviews, writing and so on, before the final written report of the study is created.[30]

Earlier, I invited the reader to explore the *experience* of research through the reading of this text imagining that the art of practice in uncertainty and uniqueness can develop the *researcher as an instrument* through the disciplined inquiry of the research itself. Schechner has also invited a radical interdisciplinary dialogue when he says:

[30] Janesick, V.J. (2004), op. cit., p. 3.

> Cultures are most fully expressed in and made conscious of themselves in their performances… We will know one another better by entering one another's performances and learning their grammars and vocabularies.

If we consider the differing cultures of human computer interaction and the body-based practices of somatics and performance, imagining our research as a kind of performance, then the growing shared grammars and vocabularies described by Schechner become our epistemologies of practice.

One of the promises of the 'somatic turn' within technology design, and the corresponding ubiquity and 'disappearing' visual presence of the computer is that by its very disappearance, we are left with ourselves in our world. Herein lies the opportunity to perceive our selves more clearly in connection to our own felt-life. Perhaps this trend can make visible connections and interactions with ourselves that we were not able to perceive when the physical technology was 'in the way' obscuring our lines of sight and insight. In the opening quotation of this chapter, William James claimed that, "every kind of thing experienced must somewhere be real."[31] We have the pragmatic opportunity to *create new realities* through our engagement with experience. Bonnie Bainbridge Cohen states:

> When someone says, "I don't know what I'm feeling", then I say, "Wonderful, because if you are interested in what you do not know, you have a whole wealth of *experience* ahead of you… Sometimes people think that my knowledge was a given for me. It wasn't. It was something I wanted.[32]

As Cohen suggests, what we do not yet understand, can become *experience*. It is not simply a matter of 'knowledge'. It is also a matter of choice.

[31] James, W. (2003), op. cit., p. 83.
[32] Cohen, B.B. (1993), op. cit., p. 1.

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