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The Question of Intimacy

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Person to person communication, when meeting the human ideal, requires individual embodied participation, and more so, an intimacy with an *other* through an evolving shared co-presencing, co-embodied, co-experiencing. Communication as a rich sharing is not centered on a simple successful transfer of words, but rather on a replete and cyclical shared enkinaesthietic experience where those communicating become more than two people together, and find opportunities for co-sensing and co-experiencing. The present study offers a philosophical engagement with current telematic communication systems where we contrast the human-ideal of intimate communication and co-presence with examples of fractured palettes, where variables of the aspired-to enkinaesthesia are out of sync, disjointed, or misaligned. The paper concludes with implications for further research along these experiential lines.

Keywords: enkinaesthesia, experience, embodiment, HCI, conversation

Introduction

Throughout the past year and a half, we have existed in the uncanny valley of telematic living. We had a not-quite holiday dinner with our college-aged children who shouldn't travel home due to the dangers of COVID. Not quite, did we visit on special days with our parents and grandparents. Not quite did we build social connections with our students as we taught them in environments that were not quite classrooms. In place of a year of connections and deepened relationships, the many layers of coping solutions have left us with memories of these not quite moments, and frustration, unease, and exhaustion. The sudden immersion into a network of telepresent communication systems has offered some viable opportunities: expanded access for participants, expanded opportunities to hear diverse and geographically distant voices, and affords multichannel communication for those who are perhaps less willing to speak. Yet, it has become clear to the authors that designing these teleconferencing systems was approached as an engineering problem, as a set of solutions for the technical problems of teleconferencing, leaving questions of the experiential, emotional, and somatic unaddressed. Here the authors' past year of research explores the various ways that the designed telepresent communication experience foregrounds (or sadly misses) socio-technical attention to human needs and desires.

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Apr 3rd 2020, 4 tweets, 1 min read

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I spoke to an old therapist friend today, and finally understood why everyone's so exhausted after the video calls. It's the plausible deniability of each other's absence. Our minds tricked into the idea of being together when our bodies feel we're not. Dissonance is exhausting.

It's easier being in each other's presence, or in each other's absence, than in the constant presence of each other's absence.

Our bodies process so much context, so much information, in encounters, that meeting on video is being a weird kind of blindfolded. We sense too little and can't imagine enough. That single deprivation requires a lot of conscious effort.

I am finding Zoom easier if I don't make eye contact. Then I can mimick a distant presence, which feels more real. If I want intimacy, and we're apart, I'll phone. And If I want to say thinking of you, I'll write.
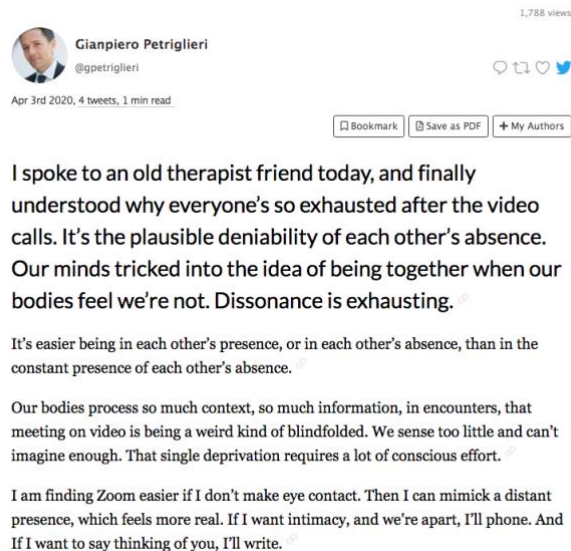
Figure 1. Petriglieri, G. [gpetriglieri]. (2020, April 3). [Twitter moment].

Engineers of early telepresence technologies (telegraphy, radio, telephony) were unconcerned with questions of holistic experience through these mediums (i.e. creating *an experience* (Dewey 1934)). Communication over distance was the instrumental end, and questions of experience were addressed only insofar as the failings of the technology interfered with the clarity of the messaging. The Shannon-Weaver model of communication and its antecedents were quite sufficient (Jakobson 1960; Berlo 1960; Becker 1971) and reduced communication to a discrete signal that must be transferred from one source to another in spite of various conditions that might interfere with clarity. Principal innovations in successive models included a richer accounting for Shannon's problematic noise (Hill, Watson, Rivers, Joyce 2007). Yet, despite the range and complexity of "noise" that might interfere with a successful communication, it was assumed that a successful transfer of signal amounted to a successful communication. Other models included an understanding of a field of experience (Schramm 1954, Maletzke 1963, Arnold Mages 2018) yet these models focus primarily on the construction of memory through the communication experience and do not offer a holistic view of the embodied experience as an aspect of communication.
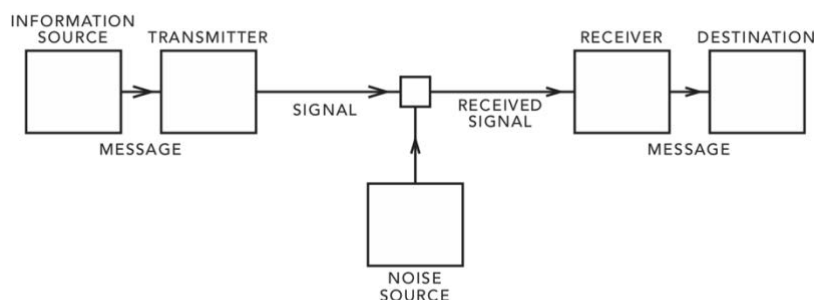

Figure 2. Shannon, C. E. (1948). *A mathematical theory of communication* (page 381)

Dubberly & Pangaro (2009) offer a useful extension of the cadre of Shannon-Weaver based communication models to account for the feedback and constructivist perspective of conversation, detailing one exemplar, the conversation for agreement. Dubberly & Pangaro's conversational models are significantly richer extensions of Shannon-Weaver, yet even so, choose not to engage with accounting for effects of embodied co-presence. In these models, communication is both described and diagrammed principally as a cerebral activity. Communicating humans are literally rendered as heads without bodies, (Figure 3) and thought is modelled separately from cognition. Attention to a holistic experience is unacknowledged as an aspired-to ideal. We argue in this paper that meaningful communication may not be thus separable from a meaningful communicative experience. Simply

completing the cycle of communication exchanges through flickering imagery and sound that ebbs and flows as it is compressed and decompressed across the network is insufficient to be described as the kind of intimate sharing that might be meaningfully understood as co-presence. Perhaps there are deeper levels and aspects of the engaged, mutually present communication experience that are available for design that have been, so far, neglected.
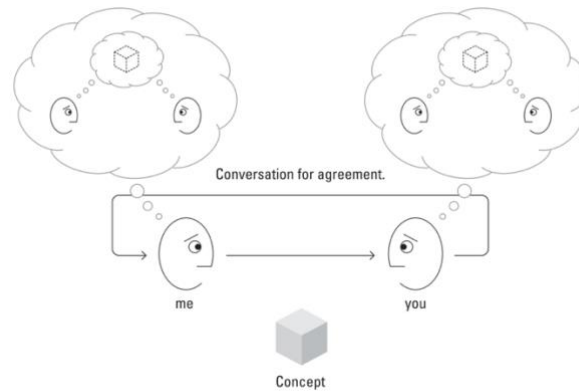

Figure 3. Dubberly & Pangaro (2009 p23) *The Conversation for Action.*

In the current context of 2021, it seems all too clear that while we have impressive technology to successfully transfer our audio and video signals, even able to trade these signals in large conferences with hundreds of participants, the aspiration for using these technologies to create a back and forth that compares to in-person conversation is still out of reach. How might one foster a more holistic communication? While we continue to strive for meaningful shared experience with our family and colleagues, the common reflection on video tele-conferencing is "Zoom fatigue" — the result of striving to achieve shared meaning through this medium. What is fatiguing or less/un-rewarding in the digital communication models? Or we might simply ask, what is so different between remote and in-person dialogue?

Communication through telegraph, telegram, or email permits the transfer of ideas but does not aspire to any sort of embodied intimacy. These technologies permit the transfer of signals without any overture to the experiencing body. The temporality is specifically separated, discreet, binary – we take turns – the rules of the exchange are clear and consistent and as a result, reports of "fatigue" associated with these early technologies are rare.

At its root, the basic difference is one of community rather than simple communication. Holistic communication — that is, intimate communication — is not centered on the successful signal transfer, but rather on a replete and cyclical shared experience. Accounting only for the transfer of ideas omits a significant part of the aspired-to exchange. We are neither minds nor bodies, but inseparable mind-bodies. When bringing this mind-body into a shared space with others, it is in the enkinaesthetic, or the shared "entanglement of our own and the other's felt action" (Stuart 2012), where intimacy is proven. (Radman, 2013; Stuart, 2021). While successful cognition of spoken words is often a critical component, the dialogue experience is forced to be literally distant without the variables of embodied, entrained experience of two entities acting together. Person to person communication, when meeting the human ideal, requires not only individual embodied participation of word or sight, but more so, an intimacy through an evolving shared co-presencing, co-embodied, co-experiencing.

Whisper in my ear

Consider the child's (or lover's) game of cupping a hand and whispering in an ear. Whispering in an ear does not contain any visual information yet can be among the most intimate of exchanges. The exchange engenders an intimacy as (1) only the two bodies participating can know the exchange (creating a sense of privacy) – (2) the lowered volume levels encourage a closeness without losing clarity (drawing the attending parties to focus on each other to the exclusion of the rest of the environment) – (3) the leaning in, touching of hand to ear, and heat of the breath on the receiving ear – all contribute to a heightened experience. The telephone capitalized on much of this experience, gaining a fair amount of intimacy without any need for visual information. The closeness of sound directly (and solely) to the receiving ear without a video component makes for a very specific version of

communication, one with a model of in-person communication. The resulting experience is congruent with the variables at play. *I can hear you; I can feel your presence without any visual cues, as though you are whispering in my ear*. One might even find themself pressing the phone ever more tightly to the ear in an intimate conversation.

An incongruent conversation

I doubt that one could get a sense of how much to trust another person as we stare into each other's prosthetic eyes, even if we were at the same time using our robot arms to shake each other's robotic hands. Perhaps, one day we will stop missing this kind of trustful contact and then touching another person will be considered rude or disgusting. E. M. Foster envisions such a future in his story:

When Vashti swerved away from the sunbeams with a cry [the flight attendant] behaved barbarically—she put our her hand to steady her. "How dare you!" exclaimed the passenger. "you forget yourself!" The woman was confused, and apologized for not have let her fall. People never touched one another. The custom had become obsolete, owing to the Machine.[24]

Figure 4. Hubert Dreyfus (2000), citing E.M. Forster's story "The Machine Stops" (1909)

We can contrast the shared intimacy of whispering in an ear with communication through the various current audio-video platforms. By default of the audio+video multimodality and the *in time* reality of live exchange, we come to the conversation assuming a "shared experience", in the model of in-person communication. However, there is an incongruence in the designed interaction. While we appear to be in the same *room*, and we have the *live* back and forth interaction, there are several aspired-to, shared embodied (enkinaesthetic) cues that are notably absent. Where we have a model for sightless intimacy (as in whispering in an ear), there is no analog model for disembodied audio-visual intimacy. The multimodality of audio+visual draws "our minds into the idea of being together when our bodies feel we're not" (Petriglieri 2020). Here there are just enough cues for co-participation that the user is tempted to search for an authentic experience (Dewey 1934) via an intimate community– *I have a feeling body, I see and hear your investment in the call* – yet with the noted absence of the collective body, the entrained enkinaesthetic communicating bodies, the intimate experience is mostly absent. The inverse of low cubicles in an office space which divide without separating, the Zoom conversation elides participants without bringing them together.

The implicitly embodied conversation

The sudden plunge into full-time digital communication revealed a number of assumptions and gaps in the audio-visual platforms. When digital audio-visual communication became the primary mode for business, schooling, and social communication, we found ourselves in a so-called immersive experiment hoping for the best. Aspects of the platforms that were less bothersome in the prior years now started to show deficiencies. The millisecond lags between utterances in conversation and the inability to achieve "direct mutual gaze" likely increased feelings of distrust and unease (von Grunau & Anston 1995; Roberts & Francis 2013). We are not just our thoughts, but are fully embodied beings (Heidegger 1996; Merleau-Ponty 1962; Dewey 1934; Lakoff & Johnson 1999). Our thoughts and our bodies are intertwined in communication as a holistic activity. The nonverbal cues like touch, body posture, and mimetic responses (Cox 2001) of head nods, posture shifts, and phatic utterances — all significant cues to shared experience — are greatly limited or completely impossible in the digital platforms.

At universities all around the world, classes conducted during the COVID pandemic were forced from their normal routines into virtual classrooms. As an educational institution, Northeastern University assumed a leadership role developing hybridized "technologically enabled presencing" in the classroom (Northeastern ITS 2019; Northeastern University n.d.). Classrooms were outfitted with motion- and voice-sensing cameras and microphones that purport to permit parity between the remote and in-person learning experience. From the engineering perspective, the technical problems of online co-working with students are solved. Given the merest

sound or movement in the classroom, motorized cameras and microphones reorient almost instantly to capture the questions or contributions of a participating student. The various parts of the classroom, the whiteboard, the instructor's projected slides, the instructor's notes outline for students are instantly shared and available. Yet the enkinaesthetic co-presence is not addressed. Communication, if it is to achieve the human threshold of intimacy, is not separable in the fashion of Shannon-Weaver.

The actual experience of teaching in a hybrid classroom involves dividing attention between remote and in-person participants. In the design studio, in the time of COVID-19, in-person students face the walls to minimize breathing into one another. Or students are placed socially distant in a lecture hall seemingly too large for the size of the class. Improved HVAC subtly increases the noise level, while the sum of presences of the online participants are collapsed into a rollable LCD screen and ceiling-mounted speakers. The result of trying to do both results in neither being done well, and these interventions succeed in distancing not just the bodies, but the beings one from another.

The overtly embodied classroom

The shift from in-person teaching to hybrid or fully remote teaching was a particular challenge to overtly embodied classrooms in the fine arts (dance, acting, etc.) and athletics (yoga, weight training, etc.). Historically, these classrooms have thrived as the participating bodies do not merely co-inhabit the space, but because these settings foster a co-presencing of mind-bodies. Participation in the overtly embodied classroom often assumes communication through subtler enkinaesthetic relations. When everyone was forced to move to digital platforms, the routines of these classrooms were more obviously disrupted. Rather than spoken dialogue, it is the enkinaesthetic bodily presence that serves as the primary mode of communication in these classrooms. When dialogue is primarily embodied – exchanged primarily through shared motions or gestures – rather than verbal, the Zoom-type platforms are revealed to have even fewer solutions to offer. The frictions of timing lags and absence of direct mutual gaze are only the beginnings of a list that in these classrooms now also includes the absence of literal haptic and soma-deep touch (Neely 2019) and the altered orientation and proximity of a disembodied camera view. The enkinaesthetic entrainments of an in-person environment are now nearly impossible due to timing lags and literal distance.

While the deficiencies of the platforms to foster any meaningful enkinaesthetic presence is obviously a serious shortcoming for the overtly embodied classroom, the authors here note the identical hindrance for any shared community (implicit or overt) in any digital audio+video platform. Again, we direct the reader's attention not just to the goal of exchanging discrete packets of information, but to the aspiration for an intimate communication, an aspiration for a more-human dialogue, a reality which is more embodied than not.

Fractured vs Cohesive reality – Metaphysics of presence

What we end up with in the Zoom meeting, is a metaphysics of presence that is both loosely connected to a notion of what is real and present, and also loosely connected to a telematic *other*. What Derrida (1973) draws out in his exploration of *the blink* in his critique of Husserl's notions of a unified presence where "nonpresence and nonevidence are admitted into the blink of the instant." (p 65) is this ongoing confrontation between being *there* and *not there*. These blinkering shifts of modality between one reality and another are the modus operandi for the experience of the Zoom meeting, an unstable fluctuation across fractured and transactional presences.

It is through this shifting modality that students are now striving to make sense, make meaning, and even work together. Paul Dourish, coming to an understanding of embodiment through Husserl, Heiddeger, and Merleau-Ponty writes, "Embodiment is the property of our engagement with the world that allows us to make it meaningful. Similarly, then, we can say: Embodied Interaction is the creation, manipulation, and sharing of meaning through engaged interaction with artifacts." (Dourish 2001, p 126). While our everyday acts of meaning-making, creation, and manipulation are undeniably important, following on Gendlin (1999) it is through embodiment that this myriad of interactions depends upon our physical manifestations.

Embodiment requires a cohesive palette. In a partnering of ballroom dancers – the bodies, the room, the gesture, the music, the air – are all shared. In a dialogue between whispering children – the ears, the cupping hands, the warmth of breath, the spoken words, the participating bodies – are all shared. There are not discreet hands/breath/warmth/ideas, but rather, a cohesive co-presence. We contrast this human-ideal with examples of

fractured palettes, where some variables of the aspired-to enkinaesthesia are out of sync, disjointed, or misaligned.

Table 1. Opportunities for designed intimacy: A collection of shared senses

Sight	Mimetic actions such as joint or in-dialogue nodding (Cox 2001)
	Eye contact as direct mutual gaze. (von Grunau & Anston 1995; Mason, Hood, & Macrae 2004; Nurmsoo, Einav, & Hood 2012)
	Considerations of aperture. i.e., Perspective of a single eye or perspective from an immobile head that is out of one's own control. Varying visions of the "room" separate by placing individuals in different spaces, rather than shared spaces.
Sound	Mimetic phatic utterances i.e., "mmm", "Uh huh", "how are you?", breathing, sighing, lip smack, etc.
	Environmental/ambient sounds aid in the creation of the shared space
	Innovations in spatially-informed audio recording techniques: binaural recording (Blau, Budnik, Fallahi, Steffens, Ewert, & van de Par 2021) triphonic spatial audio (such as the Syng Cell Apha (Levy 2021)) and others
Smell	Olfactory shifts signal motion in the living/experiencing/embodied environment
Touch	Touch immediately and unconsciously aids in coupling (Chatel-Goldman et al., 2014) i.e., handshaking
	Shared soma-deep experience – the inwardly understood sensation of kinaesthesia such as shared motion of nodding, the shared crusis of climatic speech (Neely 2019)
Repleteness	In the communal space/experience there is a bottomless opportunity for risk and intimacy (Dreyfus 2000).
	In communal space a participant may support or disrupt the collective experience in any number of ways.
Entrainment	Unison experience vs. millisecond or technical glitch lags (Coan 2015)
Attention	Focused, immersed vs. multitasking vs. attention
Cohesive vs Fractured Embodiment	Embodiment, and shared embodiment as enkinaesthesia, requires a cohesive palette (Neely 2019), i.e., subtle facial expressions, full bodily gestures, conscious and unconscious cues.

The various senses and potentials described here should be thought of not as a totalizing list of what has happened, but read as a set of creative prompts, opportunities for exploration or points of departure that offer more latitude for understanding what a holistic telepresence experience might feel like. Sensory opportunities have been explored in a rather straightforward way, for instance, adding shared smells to an experience through burgeoning digital scent technology. Yet, what we would describe as the deeper opportunities for shared embodied co-presence, touch, entrainment, repleteness are typically out of reach for these technologies. In this paper we ask, rather than experiencing intimacy, consequence, and risk as a by-product of online interactions, how might we design for the holistic intimacy of the whispered conversation in these telematic connections?

"You're still muted"

In 1990, Roy Ascott lauded the capacity of experience that was available telematically, attainable through networked art experiences, "...networking provides the very infrastructure for spiritual interchange that could lead to the harmonization and creative development of the whole planet." Yet 30 years later, we see only the most

quotidian examples of co-presence (merely attempting a telematic conversation with a co-worker) fall victim to the slings and arrows of outrageous demands for a holistic co-presence.

In one attempt to call attention to the limitations of telematic embodied co-presence, Paul Sermon created *Telematic Dreaming* (1992) where two people in two different rooms shared a bed with the projection of the other. Sermon continued these investigations of apparent intimacy and non-intimacy with a series of Telematic Quarantine performances (2020). In an online live-streaming performance, a variety of performers visit Sermon during quarantine in a virtual house, sit together on his virtual couch, and attempt to share a virtual meal, complete with smells, tastes and environmental sounds. The modality of the place that is shared is a posterized image of an interior domestic environment, yet none of the performers quite mesh into this online virtual environment. Feet appear to float in the air, performers walk through the couch that is apparently in use, and performers can never quite make eye contact with one another.

There is no deficit of research being conducted on extending the technical aspects of augmented and virtual realities. In fact, the so-called problems of Sermon's performance detailed above are technically solve-able, and perhaps with the right software, are even solved today. Although these technical aspects of telematic experience are not insignificant, the line of inquiry that we would argue holds the more salient questions are the questions of designing for telematic experiencing. Promising lines of research in virtual reality (Smith, Neff 2018; Roth et al., 2019) explore these experiential aspects of the embodied experience. Yet even in this work, it is the perhaps unreachable goal of having a fully human experience mediated through technology that predominates. The goal of making the virtual experience as real, as affective, or as intimate as the in-person is, like the fabled race between Achilles and the tortoise, a goal that will never be reached. We argue that these systems of systems have a more compelling destiny that might be realized through more productive inquiry, and it is this question pointed to by Ascott 30 years ago: how might this technology extend ideas of human presence, and deepen relations?

What are the ways in which this technology might be explored experientially? How might experiencings of telepresence leverage the benefits of this technology rather than continue to mind the gap of the failings? Perhaps it is our animal nature, as described by Jacques Derrida, where in our zeal to attain Shannon-Weaver's utility of noise-free communication, we can't let the thing be what it is (Derrida & Mallet, 2008 p 159). Perhaps it is time to apply Guy Debord's social critique of the 1980's to these technologies. In 2011 the artist collaborative Benrik (Ben Carey and Henrik Delehag) delved into Debordian-inspired questions of how people might be lifted out of a series of undifferentiated day-to-day experiences. The Situationist app offered serendipitous meetings with strangers, to engage in fleeting and playful *situations*. The experience uses locative media to pair app users when they are close to one another. Both users are sent a picture of the other, given 5 minutes to find each other, and instructions for a short performance together, such as "Hug for 5 seconds exactly." "Ask me what I think of the war." "Give me the finger." and "Ask me for my autograph." After the performance, participants walk away from each other. While the app was banned by the Apple Store after only 6 months due to unauthorized use of Apple's location services (Sweeny 2013), it is this kind of intervention that brings people together in novel, engaging ways, that suggests what future technologies might offer.

Conclusion

"[The] acceptance of the other person beside us in our daily living [...] is the biological foundation of social phenomena: [without this] there is no social process and, therefore, no humanness." —Humberto Maturana (1992, p. 246)

Maturana reminds us that at the root of communication is the will to be more human. While information transactions can be conducted through a variety of technologies, it is the colliding of information exchange with the ever-present need for authentic communication that has created the current frictions. Email and telegraph are obviously outside of the authentic embodied communication loops. Whispering in an ear and the hands-on work of a yoga class are certainly fully embodied. How might we characterize or make best use of these hybrid technologies that offer some of the communication cues but are forced to leave others out?

While industry and the academy continue to search for the more authentic telepresent experience, the authors offer the prior discussion of theory and case studies encouraging continued research exploring enkinaesthetic experience. We offer the enkinaesthetic as a critical variable in the design of telepresent communication systems, and by extension, a primary/foundational variable of all designed experience.

References

Ascott, R. (1990). Is There Love in the Telematic Embrace? *Art Journal*, *49*(3), 241–247. https://doi.org/10.1080/00043249.1990.10792697

Becker, Samuel L. (1971). "Rhetorical Studies for the Contemporary World,". In *The Prospect of Rhetoric*, Edited by: Bitzer, Lloyd F. and Black, Edwin. Englewood Cliffs, NJ: Prentice-Hall.

Benrik. (2011) *Situationist*. iPhone application

Berlo, David (1960). *The process of communication*. New York. New York: Rinehart, & Winston.

Blau, M., Budnik, A., Fallahi, M., Steffens, H., Ewert, S. D., & van de Par, S. (2021). Toward realistic binaural auralizations - perceptual comparison between measurement and simulation-based auralizations and the real room for a classroom scenario. Acta Acustica, 5, 8. https://doi.org/10.1051/aacus/2020034

Chatel-Goldman, J., Congedo, M., Jutten, C., & Schwartz, J.-L. (2014). Touch increases autonomic coupling between romantic partners. *Frontiers in Behavioral Neuroscience*, 8, 95. doi: 10.3389/fnbeh.2014.00095

Coan, J. A., & Sbarra, D. A. (2015). Social baseline theory: The social regulation of risk and effort. Current opinion in psychology, 1, 87-91.

Cox, A. (2001). The Mimetic Hypothesis and Embodied Musical Meaning. Musicae Scientiae, 5(2), 195–212. https://doi.org/10.1177/102986490100500204

Derrida, J., Allison, D. & Garver, N. (1973). *Speech and phenomena : and other essays on Husserl's theory of signs*. Evanston: Northwestern University Press.

Derrida, J. & Mallet. (2008). *The animal that therefore I am*. New York: Fordham University Press.

Dewey, J. (1934). *Art as Experience*. G.P. Putnam.

Dourish, P. (2001). *Where the Action Is: The Foundations of Embodied Interaction*. *Where the action is the foundations of embodied interaction* (Vol. 36). Cambridge, MA: MIT Press. https://doi.org/10.1162/leon.2003.36.5.412

Dreyfus, H. L. (2000). Telepistemology: Descartes's last stand. In *The Robot in the Garden* (pp. 48–63). MIT Press.

Dubberly, H., & Pangaro, P. (2009). What is conversation? How can we design for effective conversation? *Interactions Magazine*, *16*(4), 22–28. https://doi.org/10.1145/1551986.1551991

Forster, E. (1909). The Machine Stops. *The Oxford and Cambridge Review*. Oxford University Press.

Gendlin, E. (1999). Implicit Entry and Focusing. *The Humanistic Psychologist*.

Von Grünau, M., & Anston, C. (1995). The detection of gaze direction: A stare-in-the-crowd effect. *Perception*, 24(11), 1297-1313.

Hill, A., Watson, J., Rivers, D., Joyce, M. (2007). *Key themes in interpersonal communication*. McGraw-Hill Education (UK).

Heidegger, M., Stambaugh, J., & Stambaugh, P. J. (1996). *Being and Time: A Translation of Sein und Zeit*. State University of New York Press.

Jakobson, R. (1960). Linguistics and Poetics. In T. Sebeok (Ed.), *Style in Language* (pp. 350-377). Cambridge: Massachusetts Institute of Technology Press.

Lakoff, G., & Johnson, M. (1999). Philosophy in the Flesh: The Embodied Mind and Its Challenge to Western Thought. Basic Books.

Levy, S. (2021). The Apple Designer You've Never Heard of Is Making Noise | WIRED. Retrieved August 27, 2021, from https://www.wired.com/story/plaintext-apple-designer-you-never-heard-of-making-noise/

Maletzke, G., (1963) *Psychologie der Massenkommunikation*, Verlag Hans Bredow Institut, Hamburg.

Mason, M., Hood, B., & Macrae, C. N. (2004). Look into my eyes: Gaze direction and person memory. *Memory*, 12(5), 637-643.

Maturana, H., & Varela, F. J. (1992). *The Tree of Knowledge: The biological roots of human understanding (Rev. ed)*. Boston : New York: Shambhala Publications, Inc.; Distributed in the U.S. by Random House.

Merleau-Ponty, M. (1962). *Phenomenology of Perception*. Routledge.

Northeastern ITS. (2019, December 15). *NUflex Cart Showcase* [Video]. YouTube. https://www.youtube.com/watch?v=nlLIC4_0F0g

Northeastern University. (n.d.). *Enhanced Classroom Technology*. NUflex. https://nuflex.northeastern.edu/classroom-technology/

Nurmsoo, E., Einav, S., & Hood, B. M. (2012). Best friends: Children use mutual gaze to identify friendships in others. *Developmental science*, 15(3), 417-425.

Petriglieri, G. [gpetriglieri]. (2020, April 3). [Twitter moment]. Retrieved from https://twitter.com/gpetriglieri/status/1246221849018720256?lang=en

Roberts, F., & Francis, A. L. (2013). Identifying a temporal threshold of tolerance for silent gaps after requests. *The Journal of the Acoustical Society of America*, *133*(6), EL471-EL477.

Roth, D., Bente, G., Kullmann, P., Mal, D., Purps, C. F., Vogeley, K., & Latoschik, M. E. (2019). Technologies for social augmentations in user-embodied virtual reality. *Proceedings of the ACM Symposium on Virtual Reality Software and Technology, VRST.* https://doi.org/10.1145/3359996.3364269

Schramm, W. (1954) How Communication Works, in *The Process and Effects of Mass Communication* (Urbana: University of Illinois Press, 1954), pp. 326.

Sermon, P. (1992). *Telematic Dreaming*. Performance and multimedia. https://www.digitalartarchive.at/database/general/work/telematic-dreaming.html

Sermon, P. (2020). *Telematic Quarantine: Telepresent Stories of Self [isolation]*. Performance.

Shannon, C. E. (1948). A mathematical theory of communication. *The Bell System Technical Journal*, *27* (July 1928), 379–423. https://doi.org/10.1145/584091.584093

Smith, H. J., & Neff, M. (2018). Communication behavior in Embodied virtual reality. *Conference on Human Factors in Computing Systems - Proceedings*, *2018-April*. https://doi.org/10.1145/3173574.3173863

Sweeny, E. (2013). *Praxis Makes Perfect | New Situationist City*. Art21 Magazine. https://magazine.art21.org/2013/04/29/praxis-makes-perfect-new-situationist-city/#.YKkhXpNKiDU