Notes Towards a Transactional Interpretative Model for Personal Biometric Technologies and Self-Tracking

Gene Lyman

Department of Teaching Learning and Sociocultural Studies, The University of Arizona

ANTH 612 – Anthropology of Modernity

Dr. Brian Silverstein

Notes Towards a Transactional Interpretative Model for Personal Biometric Technologies and Self-Tracking

In the seven years that have elapsed since the publication of the essays in *Quantified: Biosensing Technologies in Everyday Life* (Nafus, 2016) wearable computing devices of all types have become increasingly common. Projected market growth for "wearables" is over 11 percent per year between 2022 and 2027, with nearly 88 percent of that market comprising smartwatches and fitness/activity tracking wristbands (Khaustovich, 2022). And capitalist discourses of manufacturing sales and markets are only a few among many potential measurements of the cultural impact of personal biomeasurement/self-tracking devices. As Nafus observes, "[technologies] are never a done deal" (Nafus, 2016, p. xii); the social interpretations applied to biosensing and self-tracking practices have not stabilized

Because I am a specialist in literacy practices, especially the contested—and, unfortunately, often nebulous—area of "digital literacies" (Coiro, 2021; Goodfellow, 2011; Jacobs, 2013, 2014), I gravitate towards focusing on how we socially "read" personal biomeasurement/self-tracking devices and the data streams they record. From a dedicated social sciences perspective, I recognize this approach might be viewed as "new wine in old bottles." The interpretive turn in anthropology is a half-century old (Bachman-Medick, 2016). Goffman's (1959, 1961, 1962) analyses of social performances and institutions older still. Nonetheless, by carefully scoping the field of inquiry, it is possible to adapt methods developed in the context of text literacy to a broader range of cultural practices and semiotic artifacts. This is, in part, because even text literacy practices are embedded in, and act upon, structures of social representation and control (Street, 1984). Cultural practices framed as texts are even more so.

Method

I will be adapting a method I have previously used to examine communication practices in computer-mediated environments: Louise Rosenblatt's transactional model of literacy. Rosenblatt's model is one of several theories loosely categorized as "reader response" which happens to be particularly robust and translatable across domains (Said, 2017). Although related to the mainstream of literary studies Rosenblatt's theory of reading draws on Pragmatist semiotic and epistemic models developed by C.S. Peirce and, later, John Dewey (2005a). "Transaction" and "transactional" in this context have a specific philosophical meaning denoting a lack of status separation between observer and observed –both are subjects of equal epistemic status—though of differing function—within a common overall context.

Meaning is defined as an event or action that is enacted by readers in transaction with texts, whether written, spoken, or presented in other communicative modes as semiotic artifacts (Rosenblatt, 1978, 2005b, 2005a). Individual readers evoke meanings, but in doing so are constrained by the text-objects themselves, as well as the social contexts within which both texts and readers are embedded. A text, or semiotic artifact (such as a cultural practice) may have an indefinite number of potential interpretations, but *warrantable* interpretations must take socially established systems of meaning into account.

A further nuance is added by reader's stance with respect to a given text or object, which exists on a continuum between seeking information (denotative, or public aspects of sense) and seeking personal, esthetic, or connotative meanings (emotional, artistic, or private aspects of sense) (Rosenblatt, 2005a). Rosenblatt's transactional reading model provides a constrained but flexible method for investigating both private and public interpretations of texts, objects, and cultural practices. This is advantageous, in that personal biosensing/self-tracking devices and the

data streams they record occupy both an objective space (as machines that record and report physical phenomena) as well as a subjective one (markers of social positioning and co-generators of personal narratives).

In the following essay I will present three short autobiographical encounters with different biosensing or personal tracking devices: one concerning a medical event, a second discussing DNA testing services, and finally, a discussion of my current use of a personal fitness/activity tracker. Each encounter will be followed by a brief analysis referencing concepts from the essays in *Quantified* and reviewing these insights in light of a transactional interpretive approach. My conclusion will note any general insights that may become available through transactive reading of personal biosensor/biomeasurement devices, enunciate the limitations of the current essay and present future directions for inquiry.

Encounters

2010: Bravo

A Stressful Month

My first experience with a portable medical biomeasurement device was in April 2010. I had started having intense episodes of acid reflux –sharp pains located, unnervingly, in the middle of my chest. Although I was reassured when my primary care doctor told me my heart was fine, the stabbing pain under my sternum kept coming back. So, she referred me to a gastroenterologist. He, in turn, ordered an esophageal pH test (Bravo test). A few weeks later, a biosensor and radio transmitter, collectively the approximate size and shape of a small cockroach[1] was attached to the lining of my esophagus, just above my stomach.

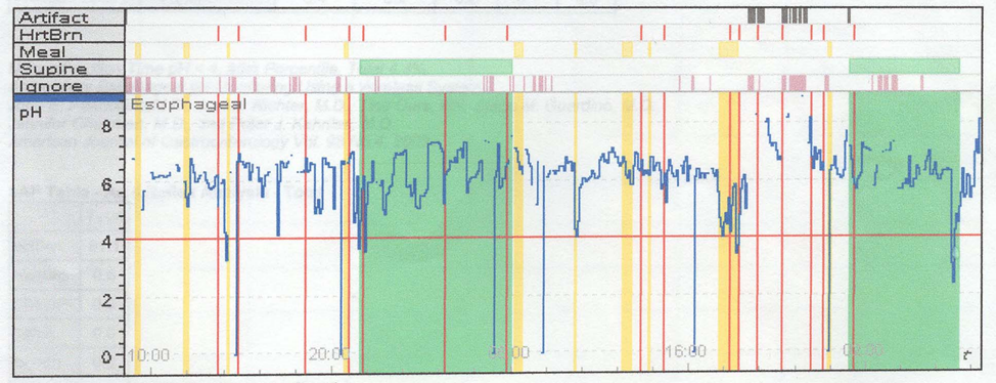
[1] I still have the endoscopic photograph of the Bravo capsule. Outside a human body it looks innocuous –a tiny circuit board with some plastic shielding and tiny metal projections. Inside, in place –it looks like a parasitic insect.

At that time, a Bravo test involved a combination of automated and manual self-tracking. The biosensor sent pH measurements to an external recorder about the size of a portable cassette player (I have read they are smaller now) I wore on a strap, and which was supposed to stay as close to my abdomen as possible. I was supposed to note, on a paper chart, the times of any of the following events: meals, sleep, identifiable heartburn, chest pain, vomiting. After 48 hours, the capsule would detach and make its way through my digestive system –which I assume was what eventually happened.

Diagnosis

The gastroenterologist seemed less concerned about the diagnosis than with the possibility I might not believe it. Based on the feedback from the probe (see Figure 1. below) I was experiencing acid reflux. But the episodes were brief and exhibited a fairly normal pH level. So, the diagnosis was "visceral hypersensitivity syndrome." The nerves in my digestive system were transmitting pain signals to my brain out of proportion to the actual injury to my esophagus. I was taken aback, but as he described the clinical tests that had established the existence of the syndrome, I could see how the data on the chart lined up with what he was describing. I still sometimes have episodes of discomfort, but I am much less concerned about them.

Figure 1.
48 Hours Output from Wireless Esophageal pH Monitor



Analysis

I have a basic understanding of concepts like pH as a measurement of acidity, but even with the tabular data summaries that accompanied the trace in Figure 1, I would not have been able to interpret it. In fact, one might argue my experience, in this case, was the opposite of an *n of 1* take on biosensor/biomeasurement and self-tracking (Greenfield, 2016). The sensor apparatus itself was designed with a short physical life/data transmission expectancy, required surgical insertion, and—at the time—there was no public "community of practice" (Kragh-Furbo et al., 2016) dedicated to exploring the information produced.

Sherman (2016) argues that the temporal and spatial specificity of experience is equivalent to Walter Benjamin's concept of 'aura' for a work of art. The segmentation and recording of specific aspects of personal experience as self-tracking fix—in the sense of immobilize and preserve—those aspects such that they may become commensurate across "people, places, and time" (Sherman, 2016, p.36). This is only true, however, of what might be considered, from a transactional interpretive standpoint, the public aspects of experience. An entirely private encoding of my experiences with acid reflux or an attempt to encode the ineffable aspects of it—say, *this* specific experience of heartburn pain—would not constitute data as such, and could not be shared or considered publicly (Rosenblatt, 1989, 2005a).

This seems like a statement of the obvious, but it does something interesting to how Sherman applies Benjamin's concept of artistic aura to lived experience versus the data record of lived experience. Rather than leaching away the specificity of my firsthand experiences of reflux pain, the data track from the Bravo probe enabled me to compare the warrantability of different interpretations of it. Certain interpretations—that I had a damaged esophagus, or that there was some kind of cardiac involvement—became less warrantable, and therefore less worrisome. Rather than acting as a proxy for my lived experience, the data stream from the Bravo probe—

interpreted as a text—enabled the gastroenterologist (and me) to negotiate the most warrantable interpretation of it. I remain—from the standpoint of acted and interpreted experience—a total assembly of actions called "me"; a specific painting in the Louvre, from the same standpoint, remains "*La Joconde"* –the specificities making up its "aura" intact. What has changed is not the specificities of the objects themselves, only our interpretation of them.

2020: Sample the Dog

Existentially Exhausted

By the end of November 2020, my wife and I—along with, probably, most of the country—were "existentially exhausted." We had both been working—and I also taking classes—over Zoom for the entire fall semester. Our dogs, on the other hand, had been thrilled to have both humans home all day for months. So, despite the prevailing stress of the pandemic quarantine, Thanksgiving recess was not entirely a bust –at least the dogs continued in high spirits.

We were starting our annual day-after-the-holiday ritual of ignoring the Black Friday sales and watching B-movies, when my wife noticed Embark Veterinary was offering a special on its breed and health DNA tests. Partly out of pandemic boredom and partly due to genuine curiosity, we decided to order the kits. I should note neither my wife nor I thinks we—or anybody else—has much privacy left by pre-Internet standards. But this was also as close as either of us will ever come to taking a commercial DNA test ourselves.

The Terrier That Wasn't and Other Surprises

In early February 2021, Embark emailed my wife. The company had posted our dogs' test results to her account on its website. The first surprise was our elder dog, Linus (see Figure 2).

Figure 2.
One of these dogs is part German Shepherd



Despite his terrier-like personality, and his "probably-a-terrier-mutt appearance," he had absolutely no terrier in his ancestry. His very terrier-like coat came from a mix of straight- and curly-coated ancestor breeds. On the other hand, some genetically "predicted" characteristics, such as overall bodyweight and length-of-snout, turned out not to match up. The "weirdest" result, however, we could never have predicted: Linus is part German Shepherd. A tall order for an animal who stands one foot at the shoulder.

Lucy was, in her own way, also surprising. We knew she was part Australian cattle dog – she turned out to be more so than we, or the Pima Animal Care Center, had realized. She also

had a full sibling in the Embark DNA registry. This led to our (secondhand) acquaintance with "Egon" who, with the exception of some color patches, is a mirror image of Lucy.

Analysis

In addition to other factors shaping interpretive contexts, transactional reading tries to take into account the effect of reader's approach, or 'stance' with respect to a given text. In many cases, the public meanings of a text cluster around a denotative, or informational (efferent) approach to reading, whereas personal, associative or private meanings tend to cluster around a more personal interpretive approach (Rosenblatt's term here is 'esthetic') (Rosenblatt, 1978, 2005a). The most clinical and denotative approaches to interpreting the "text" of a genetic sequence, however, can yield deeply personal reactions and meanings. These encompass a wide range: anxiety over inheritable health disorders, concern over privacy protections, and seeking to contribute to the broader public good, to name only a few (Gregory & Bowker, 2016; Kragh-Furbo et al., 2016).

One might expect that shifting the wider interpretive context from human to animal genetic analysis would yield a separate set of expectations and interpretations. To an extent this may be true –as I noted in my personal account, my wife and I have little interest in direct-to-consumer human DNA tests. But Embark Veterinary's website actually suggests similarities, rather than differences.

Embark provides DNA testing for dog breeders and veterinarians as well as "ordinary" dog owners such as my wife and me. The company offers slightly different DNA assay kits for each group (or at least differently packaged assay kits) and also bundles and depicts its services differently for each. The breeders' section of the site, for example, foregrounds information on genetic evaluation of inbreeding in pedigree lines. The veterinary section offers Embark genetic

testing as a—presumably resaleable—service, with extended test evaluation options. By way of contrast, the "owner" section emphasizes options for genetically targeted veterinary care, recommended dog accessories, networking opportunities with owners of related dogs and an opt-in selection to contribute pet DNA information to ongoing veterinary research.

What this suggests is that many of the same interpretive outcomes, and subsequent actions, around genetic data carry over into the context of veterinary DNA analysis. Dog breeders using Embark's services want information that will help them to make decisions to avoid or minimize inheritable health issues. "Ordinary" dog owners make significant emotional—and financial—investments in their animals' health and well-being, as well as, in some cases, wishing to contribute to the overall good of animal health. Veterinarians seek interpretations of genetic data that will facilitate serving both of the other populations. This suggests that shifting the species context of genetic information may only partially shift the interpretive approaches that humans apply to it.

2023: Self-Tracking

Consumption

For about five years, I have worn an activity/fitness tracker on my wrist. Though it is not the first digital device I have used to track my activity, it is the first one that keeps an automated—albeit intermittent—record online. I purchased it thinking that if I could keep a longer trace of my physical activity (or inactivity) this would motivate me to exercise more. In fact, for extended periods, my tracker was an expensive—yet somehow, cheap-looking—digital watch. While I have a personal preference for function over form, it's worth noting that even Consumer Reports, a staid bastion of product efficiency testing, includes remarks about "style" in its reviews of fitness trackers and smartwatches (Consumer Reports, 2022, 2023).

I have upgraded models at least once, and I have made a desultory attempt to anonymize myself by creating different user accounts linked to different secondary email addresses. Though, truthfully, I assume my information can be easily correlated with my other online "digital exhaust" and already has been.

Production

Over the past year I finally began to use my tracker for its intended purpose. Last fall, I started taking 5km walks around my neighborhood. Starting in January, a colleague and I have mostly kept our resolution to go to the Campus Recreation Center and work out two or three times a week. Over the course of this evolution, I have figured out my tracker actually provides me with more information than I need.

The advantage, for me, of an activity tracker lies mostly in its ability to monitor my heart rate. I can set a target rate, exercise until I have reached it, and then sustain it for a preselected length of time, thereby keeping myself within a zone of healthy effort. At the same time, however, I am capturing—or, in theory, can capture—additional information that is less useful to me. The company that manufactures my device claims it can, among other functions, track my respiratory variations when I sleep, tell me if I am meditating successfully, and even create a printable EKG trace –which I have no idea how to interpret. All of this is, I am sure, useful for someone, though not for me, at least not yet.

Analysis

I have noted, previously, that both self-tracking devices and the data streams that they record function socially as texts (or, using my preferred terminology, as semiotic artifacts). I have a personal history of anxiety over self-representation, but this has not usually extended to accessories such as watches and activity trackers. It does not seem unreasonable to speculate

there may be socio-semiotic hierarchies structured around activity trackers, whether based around actual fitness activities and workouts, or around style, conspicuous consumption, and additional non-exercise functions. This would be a more suitable topic, however, for a paper on interpretations of style.

In the context of self-monitoring and tracking, however, I adopt an information-seeking stance with respect to the data-stream that my device generates. This is, perhaps, where my own goals align with the pursuit of self-knowledge and self-improvement that Greenfield (2016) describes in her essay on the Quantified Self community. My version of *n of 1* is based on interpreting two information sources from two different reading stances. As noted above, my interpretive stance to the data from my tracker is purely information-seeking: what is my heart rate and for how long have I sustained it? This interpretive transaction with my tracker data, however, informs my interpretation of the immediate, experiential feedback my muscles provide as I exercise. In this second interpretive move, I am focused on the purely personal, and ultimately unwarrantable, meanings of *this* feeling in my muscles while performing *this* exercise at *this* rate, and so on. The data track, in being interpreted, becomes a tool for further interpretation as well as a record of my current exertion.

Further Observations and Conclusion

Clifford Geertz (1983) wrote that ethnography ought to be "an historical, sociological, comparative, interpretive, and somewhat catch-as-catch-can enterprise" (p. 152). This essay is, admittedly towards the "catch-as-catch-can" side of the scale. That said, each of these small encounters and accompanying analyses suggest the potential of a transactional reading approach for interpreting the social texts created by biomeasurement and self-tracking technologies. Of course, these are very preliminary and limited samples from a large, and growing, set of new

technological and social phenomena. Further, I can only present readings/interpretations from my own perspective –Rosenblatt (and Dewey) would rightly insist on a wider social discussion as the basis for warrantable assertions about biomeasurement and self-tracking (Dewey, 1941; Rosenblatt, 1978).

Continually recreated and reinterpreted meanings for social phenomena, the kinds of meanings evoked in transactional reading, may seem in a sense destabilizing and incoherent – Geertz, for example remarks that the concept of culture as text depends on "fixation of meaning" (p. 31). The process of inscription, however, does not require us to stop assembling convergent data, "descriptions, measures, observations...which are at once diverse, even rather miscellaneous...which yet turn out to shed light on one another" (Geertz, 1983, p. 156). And, in fact, we might look to the ongoing process of making meaning from these collections of data to start asking, as Alex Taylor puts it, "different questions about and with the product of (bio)sensors—possibly more profound questions about the places we live in and how we live together" (Taylor, 2016, p. 205).

References

Bachman-Medick, D. (2016). *Cultural Turns: New Orientations in the Study of Culture*. de Gruyter.

Coiro, J. (2021). Toward a Multifaceted Heuristic of Digital Reading to Inform Assessment, Research, Practice, and Policy. *Reading Research Quarterly*, *56*(1), 9–31. https://doi.org/10.1002/rrq.302

Consumer Reports. (2022). *Smartwatch Buying Guide*. Consumer Reports. https://www.consumerreports.org/electronics-computers/smartwatch/buying-guide/

Consumer Reports. (2023). *Fitness Tracker Buying Guide*. Consumer Reports. https://www.consumerreports.org/electronics-computers/fitness-trackers/buying-guide/

Dewey, J. (1941). Propositions, Warranted Assertibility, and Truth. *The Journal of Philosophy*, *38*(7), 169–186. https://doi.org/10.2307/2017978

Geertz, C. (1983). *Local Knowledge: Further Essays in Interpretive Anthropology*. Basic Books.

Goffman, E. (1959). *The Presentation of Self in Everyday Life*. Anchor Books.

Goffman, E. (1961). *Asylums : essays on the social situation of mental patients and other inmates* (1st ed.). Anchor Books.

Goffman, E. (1962). *Stigma: Notes on the management of spoiled identity*. Simon & Schuster.

Goodfellow, R. (2011). Literacy, literacies and the digital in higher education. *Teaching in Higher Education*, *16*(1), 131–144. https://doi.org/10.1080/13562517.2011.544125

Greenfield, D. (2016). Deep Data: Notes on the n of 1. In D. Nafus (Ed.), *Quantified: Biosensing Technologies in Everyday Life* (pp. 123–146). MIT Press.

Gregory, J., & Bowker, G. (2016). The Data Citizen, the Quantified Self, and Personal Genomics. In D. Nafus (Ed.), *Quantified: Biosensing Technologies in Everyday Life* (pp.

210–226). MIT Press.

Jacobs, G. E. (2013). Multi, Digital or Technology? Seeking Clarity of Teaching Through a Clarity of Terms. *Journal of Adolescent & Adult Literacy*, *57227*(2), 99–103.

Jacobs, G. E. (2014). Reimagining Multiliteracies: A Response to Leander and Boldt. *Journal of Adolescent & Adult Literacy*, *57*(4), 270–273.

Khaustovich, V. (2022). *Wearable Device Manufacturing in the US*. IBISWorld. https://my-ibisworld-com.ezproxy3.library.arizona.edu/us/en/industry-specialized/od6198/industry-at-a-glance#key-trends

Kragh-Furbo, M., Mackenzie, A., Mort, M., & Roberts, C. (2016). Do Biosensors Biomedicalize? Sites of Negotiation in DNA-Based Biosensing Data Practices. In D. Nafus (Ed.), *Quantified: Biosensing Technologies in Everyday Life* (pp. 5–25). MIT Press.

Nafus, D. (2016). *Quantified: Biosensing Technologies in Everyday Life* (D. Nafus (ed.)). MIT Press.

Rosenblatt, L. M. (1978). *The Reader, The Text, The Poem: The Transactional Theory of the Literary Work*. Southern Illinois University Press.

Rosenblatt, L. M. (1989). Writing and Reading : The Transactional Theory. In J. Mason (Ed.), *Reading and Writing Connections* (1st ed., pp. 153–176). Allyn and Bacon.

Rosenblatt, L. M. (2005a). The Transactional Theory of Reading and Writing. In *Making Meaning With Texts: Selected Essays* (pp. 1–37). Heinemann.

Rosenblatt, L. M. (2005b). Viewpoints: Transaction Versus Interaction -A Terminological Rescue Operation. In *Making Meaning With Texts* (pp. 38–49). Heinemann.

Said, Z. K. (2017). A transactional theory of the reader in copyright law. *Iowa Law Review*, *102*(2), 605–650.

Sherman, J. (2016). Data in the Age of Digital Reproduction: Reading the Quantified Self through Walter Benjamin. In D. Nafus (Ed.), *Quantified: Biosensing Technologies in Everyday Life* (pp. 27–42). MIT Press.

Street, B. V. (1984). *Literacy in Theory and Practice*. Cambridge University Press.

Taylor, A. (2016). Data, (Bio)Sensing, and (Other-)Worldly Stories from the Cycle Routes of London. In D. Nafus (Ed.), *Quantified: Biosensing Technologies in Everyday Life* (pp. 190–209). MIT Press.