Rhetorical Implications of Contact Tracing Mobile Applications:

An Examination of Big Data's Work on the Body

Candice L. Lanius

University of Alabama in Huntsville
Huntsville, AL

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Abstract: For nearly a decade, big data has been hyped as an amazing new technology that will benefit corporations and consumers alike. By promising customized knowledge at an accelerated pace, big data technologies have slowly saturated the digital systems American consumers use to live, work, and play. Yet have the promised benefits materialized? An examination of the proposed contact tracing applications in response to the novel coronavirus alongside existing wearable technologies reveal that our trust and vulnerability, opening our bodies to be sensed by these networked systems, is a fraught rhetorical activity, but not because an omniscient system now sees us and cares for us in our time of grave need. Rather, the opaque system misunderstands our embodied rhetorical actions, is incapable of moving the American polis, and cannot generate the promised collective action.

Keywords: Big Data, Contact Tracing, Control, Kairos, Embodiment, Procedural Rhetoric

Introduction

"Big data" first appeared on the Gartner hype cycle in 2011. The hype cycle captures emerging technologies as they move from "inflated expectations," through the "trough of disillusionment," to the "plateau of productivity" (Gartner, 2020). While Gartner focuses on the business potential of big data, this hype cycle mirrors the way that big data has been discussed and idealized by the public over the last decade. Big data, named for the quantity, variety, and speed of the data being collected, disappeared from the Gartner hype cycle in 2015 while still in the "trough of disillusionment" (Woodie, 2015). The author of that year's cycle, Betsy Burton, explained that big data "has become prevalent in our lives,"

meaning it no longer deserved a place as a hyped technology (in Woodie, 2015). For something that is 'prevalent,' big data remains an opaque technology for most people. If asked to define or provide an example of big data technologies in their daily life, most would be unable to answer. The lack of common knowledge is not an accident: yes, the technology is complicated, but there are other issues as well. The early rhetoric about the potential of big data often made the case that big data would be to the benefit of everyone (boyd and Crawford, 2012), but have those benefits materialized?

The most prolific and successful use of big data is arguably customized media recommendations, with services such as Netflix capturing viewer behaviors to recommend new shows and green light the production of new series and movies they believe their viewers will appreciate (Havens, 2014). In the arena of social media, the benefits and consequences of big data technologies were manifest after the 2016 presidential election in the U.S. (Bossetta, 2018). Social media platforms promise free social connections to their users as advertisers and political action committees target messages using algorithmic filtering and mixed modeling approaches. Another class of big data technologies promises to know your own body better than you know it yourself: fitness trackers are marketed as motivators to live a better, healthier, and more active life (Parviainen, 2016). As Jaana Parviainen (2016) observed, these fitness trackers "can distance people from their lived bodies" while delivering on the promised tracking of bodily functions (p. 56). Benefits, then, might be an unfair description of the complicated consequences of prevalent big data technologies. Despite consumers being the life force upon which these technologies rely for their data collection, consumers are not treated as equal partners.

Many scholars have looked closely at the political economy of big data technologies. Writing in 2007 and 2014, Mark Andrejevic has explored how private corporations have taken up where government power ends, offering goods and services that steadily and insidiously shape the conditions we live within. Big data is one small part of the overarching trend toward the domestication of all life through asymmetrical power relationships embedded in information communication technologies. The collection of data from users is never equal. User data is immediately the property of the corporate entity collecting the data to use for their own enrichment, whether that use includes targeting ads to the individual or selling that information to third parties. Additionally,

José van Dijck (2014) warned that big data projects are readily supported by the state who "leeches" information from social media platforms, while academics validate the enterprise by creating a veneer of trust in the organization through co-development of research projects (p. 205). Numerous scholars have called for an increased study of big data collection and analysis as "vital to appreciate the growing power imbalance between powerful and virtually omniscient companies and governments, and an individual" (Van Otterlo, 2014, p. 257). The owners of big data technologies control the data they collect and the information they share, yet it is possible the asymmetrical relationship is benevolent for the people embedded in the technology networks upon which big data technologies run.

As the coronavirus pandemic reshaped our world, a big data solution was quickly proposed to help address the crisis: contact tracing using smartphone applications. On April 10, 2020, Google and Apple announced their joint partnership to create an "exposure notification" system using Bluetooth (Apple & Google, 2020a). The framework they proposed informs someone who comes into close proximity with an individual who later tests positive for coronavirus that they too have been exposed. By notifying exposed parties as soon as possible, the user can quarantine and prevent asymptomatic transmission of the virus. Apple and Google have promised to protect individuals' privacy, but their new COVID-19 contact tracing application has been met with skepticism by privacy-concerned activists and journalists. Many fear the Orwellian specter of an overreaching mass surveillance system, but many of the dangers arising from big data technologies are not due to the system's infallibility; rather, these technologies have limitations that are often shrouded in scientific expertise. The aspiration to measure and control on a large scale has occurred before. Johanna Hartelius (2018) described the public discourse surrounding the United Nation's "Global Pulse" big data initiative as "[eliding] difference between data, information, and judgement" that "obfuscates its own constructedness as a human measure, animating epistemic technologies" (p. 67). When addressing big data technologies, including contact tracing, it is important to understand what is *not* measured and how public health, economic, social, and political agendas are reinforced by the manifestation of contact tracing applications.

Using a series of existing big data technologies as motifs, this article utilizes rhetorical tools to address the implications of contact tracing for the average person. Specifically, it focuses on existing

wearable technologies. These technologies have a variety of sensors that allow them to capture data about the user wearing the device, data which is then transmitted to a smartphone for processing into information: more explicitly, digestible dashboards and user-friendly descriptions. Pervasive examples include Fitbit, smart watches, and even ankle straps for monitoring infants, supplying data from users of all ages. The digital data collection tools govern the bodies of those who cede their data to the system. Contact tracing applications maneuver in similar ways to the childhood development, social life, and workplace data collection systems, but some aspects of contact tracing make it unique from existing big data technologies. We now face potential threats to the American *polis*. It is a prime moment for rhetoric of science, technology, and medicine scholars to study and communicate the risks of trusting big data technology to shield us from danger in our shared moment of global crisis.

Big Data and the Body

There are numerous approaches that one can take to understanding big data. The technical aspects are important, but for the sake of understanding the role of big data technologies as rhetorical machines, it is important to start with sensations, sensing, and quantification. James Brown (2014) described a rhetorical machine that "takes input, applies procedures, and generates output" (p. 497). While Brown was interrogating the rhetorical performance of a writing bot, his perspective is equally valuable for reminding us "that the boundaries between human and nonhuman continue to proliferate" (2014, p. 511), especially in the realm of big data technologies where networked arguments are formed. Big data technologies collect data inputs using various sensors, whether that be the keyboard used to collect textual thoughts on a social media platform or the flow of blood under the users' skin. The input is then manipulated by algorithms, authored by engineers, to "generate and interpret" what they have found as an argument (Brown, 2014, p. 496). 'Your followers have not heard from you lately' or 'make sure to get your daily steps in' are arguments based on the networked technologies gathering input from the individual before purportedly comparing it to standards based on the larger community. But what does it mean for your friends to "hear" from you, for your physical health to "step" a few hundred more times, or, in our current moment, to be notified of your "exposure" to someone who has tested positive for coronavirus? The foundations of these arguments require examination to understand their basis

in our rhetorical activities and the implications for how they are received.

Wearables and mobile contact tracing applications are an important subset of big data technologies that rely on a variety of sensors to extrapolate data about the user as an embodied actor. For example, the latest generation of wearable trackers regularly have heart rate monitoring capacity. The tracker manages this by directing light down into the wearer's blood vessels located at the wrist, and the sensor picks up differences in volume as the heart beats (Rettner, 2016). Marc Gillinov, a cardiac surgeon, tested the accuracy of consumer wrist-based heart rate monitors and discovered that they can be very inaccurate, partly due to the "noise" generated by the wearer's movement, ambient light, and muscle contractions (in Rettner, 2016). The four products that Gillinov tested had an average range of 33.5 beats per minute above or below the wearer's true heart rate. Despite the known limitations with measurement, most consumers using wearables trust the metrics that are based on their captured heartbeat, including reported "stress" and "energy" levels. Heart rate is one example of a larger issue: sensing people in motion is very difficult, but despite a lack of data quality, the aggregated and compared metrics are eventually the basis for the arguments made by fitness tracking systems.

Another underlying issue with what the wearable trackers are "sensing" lies in translation from what is captured to what is claimed. Many smartphones and wearables use three axis accelerometers, the electromechanical sensors that identify when the device is accelerating in a particular direction. Similar to the arguments based on heart rate, the accelerometer is equally prolific in its promised findings, converting the user's motion into step counting and sleep quality. As Julie Elman (2018) points out in her article "Find Your Fit," Fitbit uses diverse bodies in their marketing materials, but the actual device is incapable of measuring and translating accelerometer inputs in a meaningful way for wheelchair users (p. 3771). Even for the idealized user of wearable technology, the underlying assumptions whereby acceleration becomes a step or a marked disruption to the user's life involve layers of translation and manipulation.

Even when the technology used to sense and quantify behavior does not reflect the user's innate sense of themselves, people trust data deeply and will reject their own intuition in the face of data. Theodore Porter (1996) traced the historical roots of quantification

to understand social life; while many assume the Western fetishization of data is driven by the success of quantity in scientific disciplines, Porter showed that quantification was created to allow trust across communities. Creating categories and then counting those categories allowed for the creation of trustworthy knowledge and facilitated public management and shared political aspirations. Moving forward to our current moment, quantification has become monolithic. Consumers are told to trust the numbers provided by wearable technologies before trusting themselves. Ian Bogost (2007) directs attention to another reason why wearable tracking technologies create trust in the resulting data. The procedure of daily wearing and consulting the fitness tracking application can "mount arguments" that have a cumulative effect on the user's belief in the value and veracity of the resulting data regardless of the actual message.

In the context of contact tracing applications, the questions of what is being sensed and how we are told to understand our bodies are further complicated. While a person knows when they "step," can feel their racing heartbeat, and therefore levy their own sensation to question the sensors of wearable technologies, contact tracing applications are wholly opaque. For the contact tracing system to work, each person must be carrying a Bluetooth enabled smartphone (Nield, 2020). Bluetooth 2 signals have a minimum viable range of 10 meters/33 feet. In the American version of contact tracing applications, each device generates a token that becomes an identifier for that person: these tokens change frequently and are deleted after fourteen days (the assumed incubation period for coronavirus). When the individual comes within range of another person using an enabled contact tracing application, both phones record the other device's token, the amount of time they were within range, and the distance between the two phones based on the signal strength (Nield, 2020). As Google and Apple have described their new contact tracing application programming interface (API), the architecture upon which community/regional contact tracing applications are built, the "app can notify you if you've been near someone who has reported a positive COVID-19 test result" using an "exposure notification" (Nield, 2020). The person who tests positive informs the application, their log of token identifiers is sent to a server, and then those who were exposed are notified so that they can choose to self-isolate and get tested.

The arguments formed by digital contact tracing applications are first and foremost based on mapping device proximity to the way

that coronavirus is transmitted from person to person. The phone is sensing another device from the smartphone user's pocket or bag, and the underlying assumption is that a strong Bluetooth signal means that the two people are close together and therefore vulnerable to virus transmission. There are several concerns with using Bluetooth as a sensor for virus transmission. First, Bluetooth signals are "greatly affected by the placement of furniture, movement of people, walls, *etc*. Signal strength alone cannot be used for estimating distance" (Patil *et al.*, 2006, p. 635). A second problem is that virus transmission is dependent on factors beyond proximity, such as respiratory symptoms of the infected party and exposure through the mouth, nose, or eyes to respiratory droplets, aerosols, or direct contact and whether or not both parties are wearing a mask (WHO, 2020). Finally, there are social principles in place that prohibit users from keeping a smartphone on their person at all times: for example, the waitress who must store her cellphone in a locker while at work or the student whose phone must be kept off during school hours. Yet, in a moment where there is no vaccine, digital contact tracing is being pushed as one of only a few mechanisms to "fight" COVID-19 by providing a trace of when the user is exposed. These applications seem to argue that by tracing the disease, we can control and purge the sickness from our networked social environments.

The fight to cleanse our network is articulated in the August 2020 marketing for the first coronavirus contact tracing application in the United States. The digital advertisements for COVIDWISE, shown in Figure 1, ask for citizens of Virginia to "add your phone to the COVID fight" (VDH, 2020).

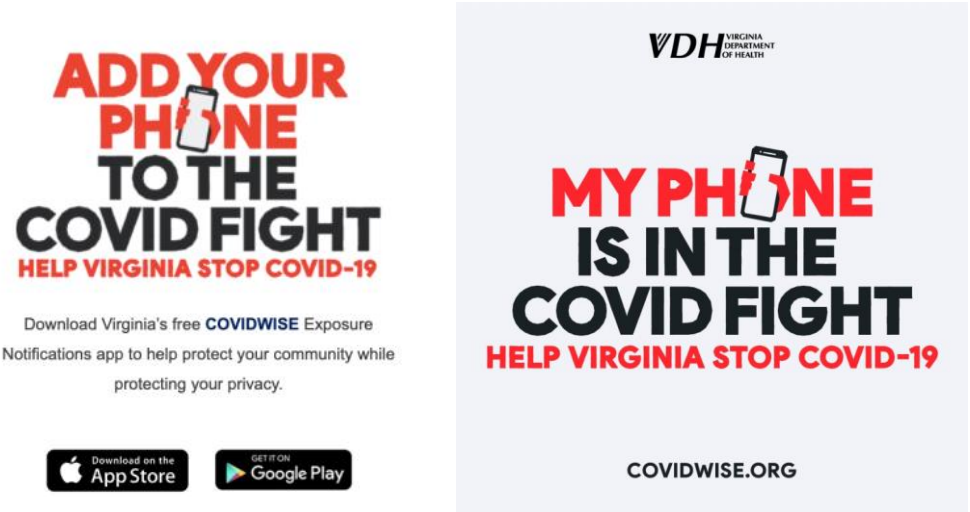


Figure 1: Digital Advertisements for COVIDWISE Application, Virginia Department of Health (2020).

The focus on the technology in these marketing materials rather than the person suppresses the disconnect between Bluetooth sensing and viral transmission and is an example of what Evgeny Morozov calls "the folly of technological solutionism" (Morozov, 2013). The modern faith that a technology solution can save us from any ill is threaded throughout the calls to download and use contact tracing applications. The hand griping the phone, raising it high, mimics the "beacon" of Bluetooth technology, but the human body is otherwise removed from these calls to action. The individual, as an embodied actor, is not part of this "procedural rhetoric" (Bogost, 2007). Contact tracing applications and other big data technologies require access to the user to "sense" and provide "sensations" that support the larger goal of control, but the calls to use the application do not articulate the messy relationship between tracking, tracing, and the user's body. Beyond problems with the sensing technique, there are Americans who lack access to expensive smartphones. Pew Research Center reported in 2019 that 81% of American adults owned smartphones, but fewer chose to enable Bluetooth on their devices. The individual who cannot afford a smartphone is not seen and therefore not valued by contact tracing applications.

Locus of Control

Moving beyond the direct connection between sensation and the sensor is the larger purpose of wearable trackers and contact tracing applications: control of people within the network. While wearables appear to have a unit of focus on the individual, they are an example of "social engineering." Hamid Ekbia and a team of computer scientists wrote that the "development of computing seems to have followed a recurring pattern wherein an emerging technology is promoted by loosely organized coalitions that mobilize groups and organizations around a utopian vision of a preferred social order" (Ekbia *et al.*, 2015, p. 1527). In the case of fitness trackers, the aspirations may seem personal, but the technology exists as a result of pushes for fitness, health, and efficiency in the workplace, education, and healthcare. These goals need not be malicious or conspiratorial to have a power and control element: many workplace wellness programs encourage their workforce to wear fitness trackers and compete in step counting contests. Often described as "accountability" to the self or from others (Chung *et al.*, 2017, p. 4881), networked tracking technologies reveal the larger system where user behavior is tracked, measured, and then used to make arguments to the

individual about their place in the network (Lanius & Hubbell, 2017). For workplace wellness programs and contests, the argument is not kept private, but rather broadcast to other people within the "assemblage" (Hess, 2015): the individual, organization, and co-workers are the various layers that constitute the worker's identity and encourage particular behaviors and beliefs.

Despite the presence of control mechanisms within networked technology, part of the rhetorical appeals used to encourage the adoption of networked technology is to disguise that relationship under the guise of "individual agency," "empowerment," and a "culture of health" (Teston, 2016). In human-computer interaction research, the arguments for behavioral change embedded in persuasive technology are described benignly as "nudges" (Fogg, 2002; Shin & Kim, 2018). These framings of the relationship of the individual to the larger network locate the locus of control, with attending agency and responsibility for one's behavior, internally. If the user does not like the experience or the "nudges," those arguments can be ignored. With contact tracing applications, however, the veneer of control, the stated ability to "turn off" the device, is uncomfortable.

When the fitness tracker is no longer used by the individual, they are delaying progress on their personal fitness goals; it remains a rhetorically self-centered activity. With contact tracing applications, the network is clearly articulated and the relationship with others in the network exposed. Google's "Android Help" center highlights this tension between the role of the individual and others networked by the contact tracing system. When Google writes, "to help understand whether you've been exposed to someone who reports having COVID-19, you can turn on Exposure Notifications" (Google, 2020), they concede that exposure happens regardless of the use of the contact tracing application. Google turns back to the individual control myth further down on the same webpage: "this system only works if you decide to use it. You control whether you receive exposure notifications, and you decide if and when to share your data" (Google, 2020). This is an uncomfortable claim due to its inherent contradictions: if each individual decides whether or not to share their COVID-19 diagnosis, then the safety of one individual's health is controlled by the dyad they form with the strangers, acquaintances, and friends they interact with in the grocery store, on a street corner, and in their workplace. Contact tracing is an important control measure that is "fundamentally linked to the [...] network of potential transmission routes" (Eames & Keeling, 2003, p. 2565), and with airborne infections, "contact

tracing has to be far more efficient and generally far more rapid" (p. 2570). Individual choice, in this case, undermines the contact tracing systems' ability to function, and that reality is not reconciled or addressed in Google or Apple's marketing and informational materials.

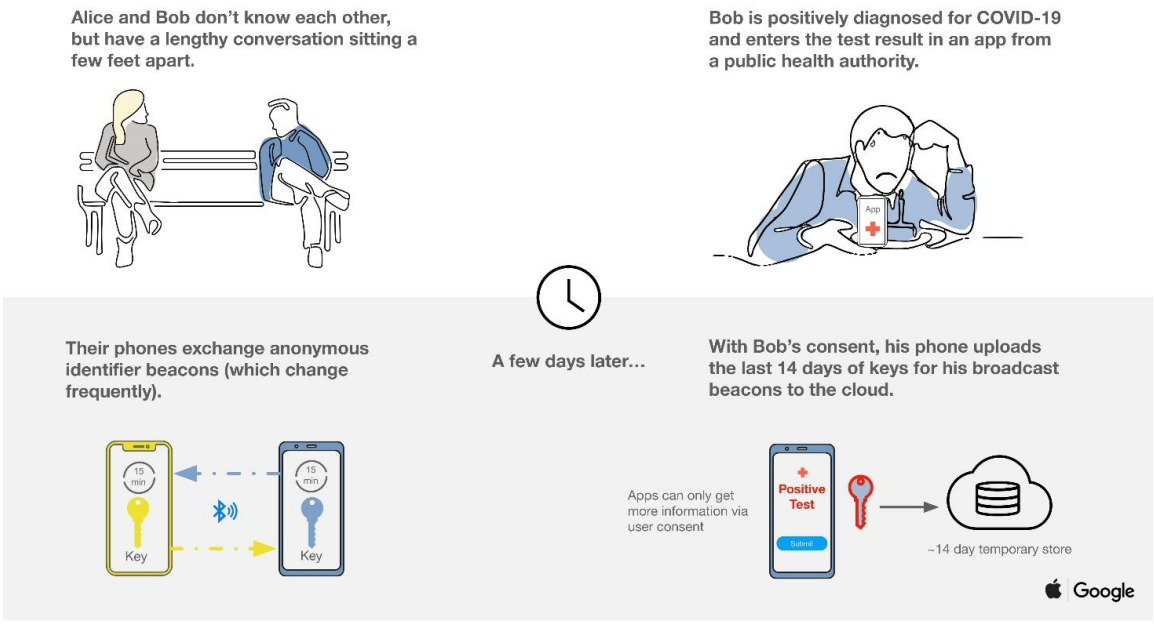
The state level implementations of the contact tracing framework, on the other hand, rely heavily on the empowerment myth. The North Dakota version of contact tracing, known as "Care19 Alert," is built upon the Apple and Google exposure notification system and duplicates much of these companies' rhetoric, but they also claim that "Care19 Alert quickly notifies you if you've likely been exposed to COVID-19, empowering you to make decisions that are best for you and your loved ones: like seeking medical advice or staying home" (NDResponse, 2020). "GuideSafe," the Alabama version of the application, uses "power" in its appeal, coaxing Alabamians to help test the pilot version of the application: "The app protects your privacy while giving you the power to protect the health of yourself, your family, and your community" (GuideSafe, 2020). While there are only a handful of states with public messages about their contact tracing applications, an additional eight are considering adopting the Apple/Google API (Hall, 2020), and each state will make rhetorical decisions about how they contextualize and promote their version of a contact tracing application.

A final blow to the individual empowerment narrative emerges with Google's renunciation of authorial control: "Government public health authorities determine which factors might indicate exposure" (Google, 2020). The contact tracing application in Virginia may give different exposure notifications than the version used by the Public Health Departments of North and South Dakota based on identical underlying Bluetooth signals. Nitya Verma (2016) observed this general issue with "the big data mythologies—specifically that data can offer more accurate, objective and truthful forms of intelligence and knowledge" (p. 505); the system creates "space for action influenced by what is measured" (p. 508). No matter what the individual does with their own device, the notification of exposure is bound to the testing and reporting of others in the network and the geographically redefined meaning of exposure itself. Rather than accomplishing "empowerment" and "emancipatory self-expression," the "average person" is left with a sense of "anxiety and confusion" (Ekbia *et al.*, 2015, p. 1538).

Kairos in Times of Crisis

When they are most effective, fitness trackers come with online communities where "fear of shame fuels [a] performative regime" (Hoggett, 2017, p. 365). The rhetorical potential of fitness trackers is not contained in the sensor and immediate display of information to the user. Rather, the display of "health" and "progress" are timely and social performances shared on dashboards where friends and acquaintances can follow along. These two hallmarks of fitness trackers are captured by the term "social tracking" (Becker *et al.*, 2017). The rhetorical concept of *kairos* explains the first part of this equation: the opportune time and network occasion to perform a rhetorical act (Trapani & Maldonado, 2018). Rather than focusing on chronological time or the static architecture of the network, *kairos* helps explain why people share their data. In the case of fitness trackers, it can become a habitual action or a promise to hold each other "accountable" (Chung *et al.*, 2017). In these cases, a lack of data becomes a noticeable absence or gap where the performance of 'active' and 'healthy' should be.

Turning to contact tracing applications, the moment and demand for action is clear. In May 2020, the CDC described the potential advantages and disadvantages of "proximity tracking tools" being used in the United States and around the world, specifically noting the "little published empirical data showing the capabilities" of these technologies (CDC, 2020). Within their list of five advantages, the CDC mentions timelier identification and rapid isolation of contacts. Yet with delays in testing and slow adoption of contact tracing, the applications are not poised to answer the demands of this moment. The slide deck created by Apple and Google (See Figure 2) exposes this gap in timeliness. In the liminal moments where "Bob" begins to feel the symptoms of COVID-19, the top slide shows a clock and the phrase "a few days later…" before Bob has received his diagnosis and shares his results with the application. "Alice," the stranger who Bob spoke to on a park bench, has her own story pane in slide 2 with a clock underlined with "Sometime later….". Eventually Alice sees the notification "ALERT: You have recently been exposed" (Apple & Google, 2020b). The focus is almost exclusively on the privacy protecting technical aspects of the API and not on when Alice and Bob, as rhetor and audience, need to hear from the contact tracing application.



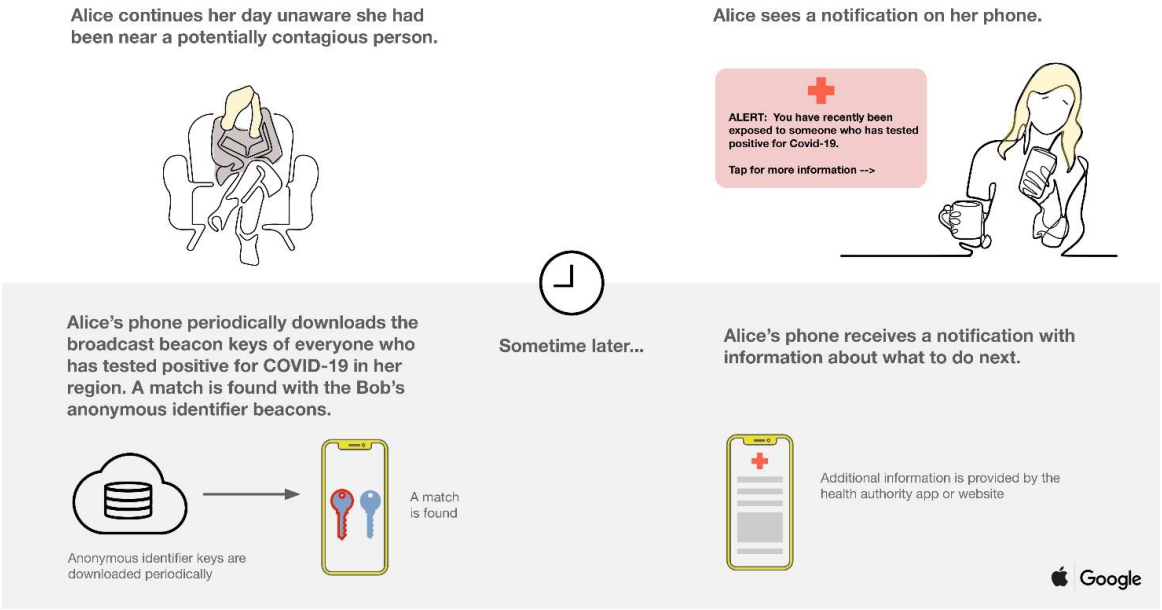


Figure 2: Apple and Google's Overview of COVID-19 Exposure Notifications (2020b).

Guilt, Responsibility, and Human Motivation

The "social tracking" of each other also leads to an emotional response if expectations are not met. Rather than ignoring the tension between different user's expectations and resulting guilt, Kenneth Burke's (1966) definition of humankind as "separated by instruments of his own making" helps to explore and understand the motives and motivations of humanity's reliance on technology (qtd. in Hill, 2009). The use of fitness trackers elevates the routine motion of running, sleeping, and eating to a symbolic action that can be articulated and shared with others. Sandra French and Sonya Brown (2011) extend Burke to address the different ways we discuss control over bodies, noting the tension between symbolic action and motion. If our narrative does not capture and balance the pentadic elements of act, agent, and agency, then we end with "debates… about bodies, and what or who controls them, and what or who should bear responsibility for what happens to them" (French & Brown, 2011, p. 3). Fitness trackers move human behavior into the realm of symbolic action and allow us to create explanatory narratives for what and how we behave.

A cross-cultural comparison between the South Korean version of contact tracing and the American version illustrates the need for narratives to manage guilt, assign responsibility, and motivate participation in contact tracing. Anthony Kuhn, an NPR reporter, shared his experience living in South Korea during the coronavirus pandemic (in Warner, 2020). The South Korean version of contact tracing is not application based. Instead, the government sends out alerts to people who are known to live within a particular radius of someone who tests positive. This system is similar to how the Amber Alerts work in the United States. Unlike in the American version, positive case notifications also come with "data trails" that show where and when the person who tested positive came into contact with others. When combined with the demographic characteristics, "people storify this information, and they make a narrative out of it" (Warner, 2020). The ability to understand and narrativize the agent and act can lead to shame and guilt but can also contribute to a sense of responsibility among South Koreans. This sort of transparency has also improved the public's trust in their government. Mark Zastrow (2020) rationalized this trend based on South Korea's experience with the 2015 Middle East Respiratory Syndrome outbreak; the South Korean government had to provide the information to gain the public's trust.

The American contact tracing applications, however, do not inform the exposed person "when or where it happened" to prevent "personally identifiable information" from being accessed by Apple or Google (Nield, 2020). While the privacy concerns are valid and protecting biomedical big data is important for shielding those who are vulnerable and require treatment (Mittelstadt & Floridi, 2016, p. 307), it is unlikely the American contract tracing applications will work rhetorically without a narrative to anchor understanding and motivate action.

Conclusion

When the CDC (2020) wrote out a list of "potential disadvantages" of digital contact tracing tools, they mentioned important issues such as data security and confidentiality, technical challenges with device interoperability, and access to devices (some people do not have a smartphone or may not keep it with them at all times). The last trial mentioned by the CDC was the need for a "critical mass" of people within a community to use the application. At no point do they consider or interrogate the system as a rhetoric: even if the contact tracing mobile applications have no data privacy issues and manage widespread adoption, will the digital tools do the desired rhetorical work? Sadly, despite the desire for a technology solution to an unprecedented and devastating viral pandemic, contact tracing applications as implemented in the United States will not have the promised effect. First, the Bluetooth sensors do not neatly map onto viral transmission or how people live as embodied actors. Second, the locus of social control is too explicitly privacy focused and granular to create the necessary social trust in the application. Finally, the contact tracing applications have failed to use guilt or shame as social motivators: merely telling someone that they have been exposed is not enough to motivate action. The comparison of Apple and Google's contact tracing application (API) to existing and commonplace wearable fitness trackers reveals the uncomfortable truth about many big data technologies: the promised benefits and myth of a data-driven, technologically empowered utopian society are not here and may never arrive.

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