Quantifiable Me: Fitness and Health Trackers and the Trope of Holisticism

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ABSTRACT
As fitness trackers have proliferated, many now collect information about both physical and mental health indicators. Arguably, such capabilities promote the notion that achieving and maintaining health is holistic, pushing back against the mind/body divide that has long characterized how we tend to perceive health and disease in Western cultures (see Segal, 2005). In this article, the author argues that the visual (photographs and data visualizations) and language-based communication strategies used on Bellabeat Leaf's website, a smart jewelry device for women, employ a narrative of holisticism. Further, this narrative functions as a rhetorical trope that reinforces power relationships that align with a dominant underlying ideology of Western medicine—the notion that disease and illness can be controlled. The author proposes that future designs of the Leaf's smartphone application might allow users to visualize quantitative and select user-contributed qualitative, sensorial-based feedback to potentially provide a more balanced perspective of health.

Categories and Subject Descriptors
H5.3.Group and organization interfaces: Computer-supported cooperative workl

General Terms
Human Factors; Design

Keywords
visual communication; data visualizations; biomedicine; smartphone app; smart jewelry

PRACTITIONER TAKE AWAYS
- Many health and fitness trackers such as Bellabeat's Leaf, a smart jewelry device for women, promote their capabilities using a narrative of holisticism that promises users an integrated mind/body experience while also pushing back against the mind/body divide that has long characterized how we tend to perceive health and disease in Western cultures (see Segal, 2005).
- The visual (photographs and data visualizations) and language-based communication strategies that Bellabeat uses to promote the Leaf work as a rhetorical trope that reinforces a dominant ideology of Western medicine—the notion that disease and illness can be controlled.
- Rather than focusing exclusively on visual quantitative information, future designs of the Leaf's smartphone app might allow users to also visualize select user-contributed qualitative, sensorial-based feedback in order to provide a more balanced and potentially comprehensive perspective of users' health.
- Modifying and/or appending the interface for the Leaf's stress predictor (as shown in Figure 5) to include feedback from users about how they are experiencing and attempting to manage their stress provides one redesign option.

INTRODUCTION
As fitness and health-trackers have proliferated over the past decade, many have evolved to collect information not only about variables that influence physical health like diet and exercise but those that influence mental health as well. Fitbit, for instance, now tracks both sleep quantity and quality. "Smart jewelry" like Bellabeat's Leaf, which looks like a pendant, claims to predict users' stress level and provides strategies for managing it. iPhone's Health app includes a mindfulness category, which tracks meditation activity, and LVL is "the first ever hydration monitor," which purports to use sleep, activity, heart rate, and hydration information (collected using "infrared light to measure water in your blood") to predict

mood (2017a). These devices are linked to digital visualization programs (apps and websites) that allow users to compile data about select health indicators, which they can then use to determine trends and patterns in their health-related behaviors and practices and subsequently use to make health-related decisions.

Arguably the emergence of such tracking capabilities promotes the notion that achieving and maintaining health involves attending to both the body and the mind, pushing back against the divide between the two that has long characterized how we tend to perceive health and disease in Western cultures (see Segal, 2005). For instance, according to Fitbit's website, the program's app "has a purpose for every part of your day" (2017). The Leaf is described as "a health tracker for your body and mind" that "focuses on your overall well-being" (Bellabeat Homepage, 2017; Bellabeat About, 2017). Further, the overview video for iPhone's health app states: "Everything's connected," (Apple, 2017), and the Kickstarter page for LVL proclaims that the product "gives you the complete picture of your health" (2017b).

This health is holistic narrative used to promote the capabilities of many of these devices as demonstrated in the above examples illustrates the growing emphasis in medicine on health promotion and disease prevention that has emerged over the past few decades (see Office of Disease Prevention and Health Promotion, 2017), as well as the increasing recognition that physical and mental health are integrally connected. Yet, as I argue in this article, this narrative also functions as a rhetorical trope that continues to reinforce one of Western medicine's dominant underlying ideologies—the notion that disease and illness can be controlled—and accomplished, in part, by invoking a mind/body split. To make this argument, I conduct a detailed analysis of the visual and language-based communication strategies used on the website of one device, the Leaf, which is a relative newcomer to the wearables market. It débuted in 2015 in response, at the time, to the paucity of tracking tools specific to women's needs (Gokey, 2015). I propose that the Leaf specifically invokes an overall narrative of holisticism through the visual (photographs and data visualizations) and language-based strategies used on its website to sell the device to potential users. Further, the act of monitoring, measuring, and assessing that users of the Leaf (and other health and fitness trackers) engage in constitutes a form of self-surveillance that invokes power relationships that align with Western medicine's ideologies. In closing, I propose that future designs of the Leaf's smartphone app might also allow users to contribute select qualitative, sensorial-based feedback, which could potentially convey a more comprehensive perspective of health. I then illustrate this idea by proposing several adaptations to the Leaf's stress-sensitivity predictor.

WESTERN MEDICINE'S NARRATIVE OF CONTROL

For the past couple of centuries what is commonly referred to as bio- or Western medicine has tended to provide the dominant framework for how health, disease, and illness are perceived in Western cultures. Often characterized by four key principles as described by social psychologist Elliott Mishler (1981), health is defined as not being ill, the exact causes of disease and illness can be identified, illness affects people in consistent ways, and a belief in "the scientific neutrality of medicine" (p. 3). Accordingly, Western medicine tends to endeavor to create health by controlling disease and illness, and disease and illness are often described as external threats to the body that should be acted upon. This perspective facilitates a separation between the body and the mind in terms of how disease and illness are treated wherein the mind assumes the role of "the executive," as Segal puts it (2005, p. 122), over the body in order to assert this control. Further, gaining this control is often framed as "progress," which Segal (2005) characterizes as the "most salient narrative of medical history" (p. 21).

Overall, this perspective tends to define and shape many aspects of health and medicine in cultures that subscribe to a Western model of medicine: research approaches and priorities; diagnosis, treatment, and prevention strategies; even the ways that we tend to perceive our own state of health or illness as well as the state of health or illnesses of others. Indeed, the deeply ingrained ideologies that frame the biomedical model often tend to go unquestioned, in part, because in many cases we can determine the exact causes of illnesses and diseases. More specifically, the viruses and bacteria responsible for many infectious and communicable diseases have been identified, and some lifestyle choices related to diet and exercise have been linked to developing specific chronic conditions like diabetes and high blood pressure.

Further, achieving and/or maintaining health is exceedingly complex, involving the interplay of multiple variables that we now recognize includes both physical and mental health indicators as well as genetic factors (that may be known or unknown). The health-related practices and behaviors that lead to the absence of illness or disease in one person may not have the same effect in a different person. Consequently, attempting to define health in terms of its characteristics often proves far more difficult than defining health in terms of what it is not, as Western medicine has tended to do.

The ideologies that underlie Western medicine, as Segal (2005) points out, are often embedded in commonly-used metaphors that reveal its values such as "medicine is war" and "the body is a machine," (p. 120), as well as "diagnosis is health" (p. 125) (italics in originals). For instance, medicine is war is still often invoked in language about treatment (Segal, 2005), particularly for severe illnesses (see Sontag, 1978), reinforcing disease and illness as external and mind/body dualism as a mechanism for gaining some control. More specifically, this metaphor often manifests in language that characterizes disease as invading the body with the mind overseeing the fight between disease and the body's defenses.

Body is a machine, too, reinforces the notion that the body is controlled by the mind because it conveys that there is an optimal way that the body, like all machines, should perform and this performance should be monitored. This metaphor is often overt, but it can also often be seen in expressions that refer to one's own or someone else's physical state (e.g., "I need to reset my metabolism," or "She seems to be functioning well"). In such constructions, the operator (the mind) oversees the machine (the body) and makes health-related decisions, as needed, to help ensure the body gives its best performance.

Like medicine is war and body is a machine, diagnosis is health reinforces mind/body division by normalizing the notion that the body (or parts of the body) need to be evaluated, usually by healthcare providers, in order to establish the presence or absence of disease. Indeed, as Segal (2005) points out, diagnostic procedures are usually performed before patients receive treatment. For instance, screening mammography is effective in detecting breast cancer before women develop symptoms because the visual information

that might indicate that this disease is present is presumed to be similar in all women. If no visual information is found indicating cancer, then the breast tissue is believed to be healthy.

Diagnosis is health is usually not articulated as overtly as medicine is war and body is a machine in discussions surrounding health, illness, and disease but rather is often embedded within a broader, overall narrative of prevention. For instance, patient education materials that describe cancer screening procedures like mammography, for example, often tout the life-saving benefits of early detection while also addressing the potential risks of screening (see American Cancer Society, 2017a). These materials also encourage readers to engage in other behaviors that can reduce their risk of developing the disease like eating a healthy diet, exercising regularly, limiting alcohol consumption, and performing monthly breast self-exams (see American Cancer Society, 2017b).

The language choices in many of these materials also reflect an overall shift over the past few decades toward a widespread and growing emphasis on engaging in health-related behaviors and practices that have been shown to help prevent chronic conditions. Indeed, prevention has increasingly been recognized as far more effective for reducing disease and illness than treatment (e.g., see Office of Disease Prevention and Health Promotion, 2017). This emphasis on prevention, too, aligns with the more recent move in the twenty-first century toward patient-centered care (Institute of Medicine, 2001), a model that encourages collaboration between providers and patients while also downplaying the often-assumed authority of the physician. Engaging in preventative practices has potentially reframed not only how patients perceive their involvement in making decisions about their healthcare [1] but also their role in achieving and maintaining their own health.

Such trends also push back against the way that Western medicine has tended to define health—that is, in terms of what it is not rather than what it is—as well as Western medicine's focus on controlling disease and illness. More specifically, emphasizing prevention requires identifying and promoting the behaviors and practices that tend to characterize health, which ideally reduces the need to focus on treatment. Further, the advent of preventative medicine has led to increased research on health-related choices and behaviors—diet, physical activity, sleep, and stress management, for instance—that have been shown to reduce the incidence of many chronic conditions. In sum, such efforts reveal the emergence of a broader culture of wellness that seemingly rejects Western medicine's traditional mind/body divide because health promotion habits and behaviors synergistically shape one's health status. In other words, eating a nutritious diet, exercising regularly, getting sufficient sleep, and managing stress can positively affect the whole body simultaneously.

Indeed, many patient education materials, particularly those targeted toward preventing and managing chronic conditions, tend to advocate a holistic perspective by advising patients of multiple, integrated strategies for reducing risk. For instance, the Mayo Clinic (2015) explains that some patients with high blood pressure—a major risk factor for developing cardiovascular disease—may be able to control the condition through lifestyle choices that include not just attending to diet and exercise but also by taking steps to reduce stress such as "Change your expectations" and "Know your stress triggers" (section 8). This transition to a culture of wellness and its attendant emphasis on promoting a holistic perspective toward health—in addition to technological advances and the widespread use of social media (Wolf, 2010)—has also driven the emergence and proliferation of wearable health and fitness trackers, which allow users to monitor many of these behaviors.

THE LEAF: "A HEALTH TRACKER FOR YOUR BODY AND YOUR MIND"

mHealth (mobile health) technologies enable users to 'quantify the self' (see Nafus & Sherman, 2014; Smarr, 2012; Swan, 2013; Wiederhold, 2012; Wolf, 2010) by providing quantitative information about a wide range of health-related behaviors and practices—diet, exercise, sleep, stress—that can, in theory, impart increased agency in allowing them to make particular kinds of health-related decisions. As a writer for Technori, a company that promotes starts-ups, put it in a blog post: "People, like you, are taking control of something conventional wisdom has told us is not ours to understand: our health. … Today, we ask our doctors. Tomorrow, we will ask our data" (Moschel, 2013, para. 1). Indeed,

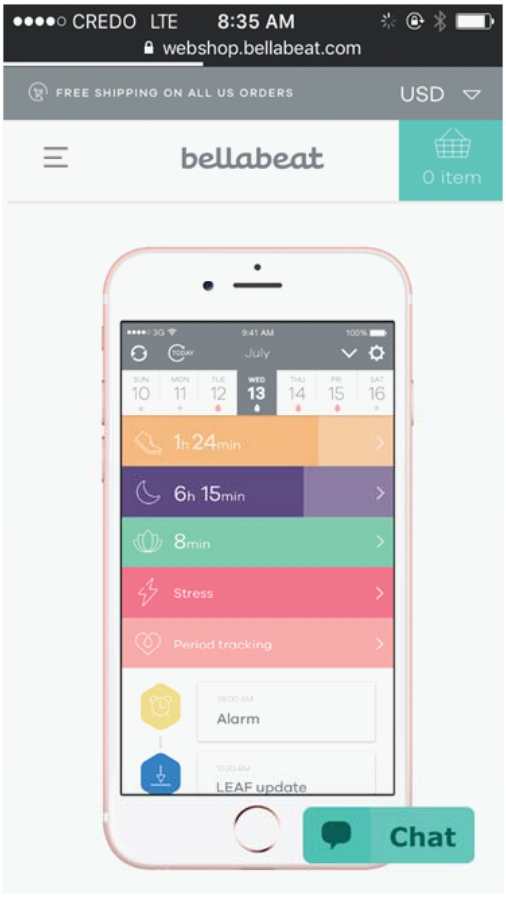

Figure 1. This screenshot of the dashboard for the Leaf's smartphone app shows a consolidated report of all five variables that the device tracks. For instance, the orange bar with the shoe icon indicates that the user engaged in an hour and 24 minutes of activity that day. The purple bar with the moon icon underneath the orange bar indicates that she slept 6 hours and 15 minutes. Users can touch the arrow to the right end of each bar to access more specific details about each metric displayed. Touching the arrow on the sleep bar, for instance, will lead users to the interface shown in the middle panel of Figure 2. Image used with permission.

one of the main benefits touted by the creators of many health and fitness trackers, as discussed at the beginning of this article, is the interconnectedness of these devices' tracking capabilities, which their creators propose can give users a holistic perspective of their health. One of the screens of the Leaf's smartphone app (Figure 1), for instance, displays multiple variables that the device tracks conveying "a simple visual snapshot of [users'] daily activity, sleep, meditation, stress prediction and periods" (Bellabeat, Leaf Nature, 2017).

Through this interface, users can see how they performed in each category simultaneously. The Leaf's developers explain that these data are constructed using algorithms developed by the company and health-related research, which they state provide "a holistic approach to self-tracking" (Gokey, 2015, para. 12). In other words, for Leaf users, health is more than exercise, sleep, meditation, stress monitoring, and/or regular periods. Health is tracking, monitoring, understanding, and then acting upon all of these variables. This message is then reinforced both visually and verbally across the product's website in promoting the device's functionalities and benefits to users.

Beginning on the homepage, the product is described as a "health tracker for your body and mind" (2017), and is accompanied by a montage of physically fit, able-bodied young women performing different activities while wearing the device: running on the beach, enjoying an ice cream cone, lounging on a step. Viewers are invited to click on the images to "see how Leaf fits your lifestyle" (Bellabeat, Homepage, 2017). The webpages that describe the Leaf's two models—the Leaf Nature and the Leaf Urban, respectively—use a linear structure in that viewers can scroll down the page to learn about each of the five variables that the Leaf tracks: activity, sleep, meditation, menstrual cycle, and stress. The top of the page includes a short description of that particular Leaf model. More specifically, the Leaf Nature is "well-being reimagined" (2017) and the Leaf Urban is "the evolution of well-being" (2017). These pages are divided into full-screen images of individual women performing each activity (as applicable) that the device tracks. These images are then paired with text explaining each specific health indicator—physical activity, mindfulness, sleep, for instance—and a short description of its importance as well as how the Leaf's tracking capabilities enable users to better understand this aspect of their health. A screenshot of the interface of the Leaf's smartphone app showing visualized data (where applicable) [2] for that particular health metric is also displayed so that users can see the kinds of visual quantitative information that they will be able to view (see Figure 2).

While a holistic narrative toward health is communicated visually through the data visualizations shown in Figures 1 and 2, this perspective is also repeated textually on individual pages dedicated to explaining the variables the device tracks in more detail. For instance, the page about menstrual health states, "Keep track of your monthly cycles so that you understand your body better and take care of your overall well-being"; "Cycles: the center of your health"; and "The Leaf identifies the pattern of your cycles, which affect your sleep and activity, as well as your focus and stress levels." These descriptions also align with Lupton's (2015)

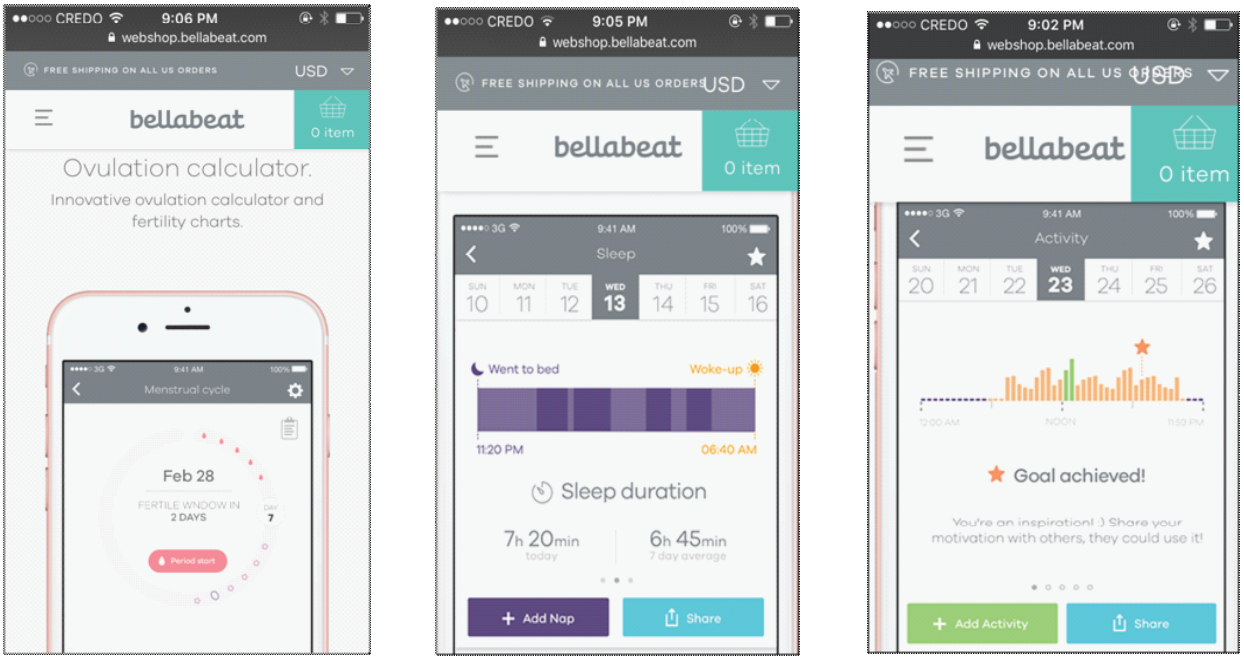

Figure 2. These screen shots show the kinds of data that users can visualize on the Leaf's smartphone app. For instance, the left panel shows the Ovulation Calculator interface, which tracks each stage of the user's monthly menstrual cycle. The user can see the stage(s) she has experienced that month thus far (if any) and the stage that she is currently experiencing. The middle panel shows how long the user slept each day over the past week and includes the time she went to bed and woke up, respectively. The right panel shows the user's activity level by hour throughout the day. The device tracks steps (not shown). Taller bars on this visual indicate more steps taken during the hour, while green bars show user-contributed activity. The star indicates when the user reached her step goal. Images used with permission.

observation in her analysis of apps that track sexual activity and reproduction that such interfaces often "seek to impose order on otherwise disorderly or chaotic female bodies, using data to do so" (p. 447). The assumption is that women, more so than men, need the knowledge that tracking their reproductive functions can impart.

The Leaf's visual message conveyed both through the photographs described earlier and the data visualization capabilities shown in Figures 1 and 2 seems clear: health is balance. Further, this balance can be achieved and/or maintained by routinely engaging in as well as tracking the kinds of health-related practices and behaviors that the Leaf tracks. Indeed, both of these webpages on Bellabeat's website conclude with a screenshot of the dashboard of Leaf's smartphone app (Figure 1), giving users a complete visual, numeric representation of many of their health stats as collected by the Leaf.

The visual and language-based strategies used on the Leaf's website promote the notion that health is holistic. However, embedded within these messages is also a clear and familiar counter narrative of control and progress grounded in mind/body dualism, communicated using two of the metaphors commonly used in Western medicine to frame health, illness, and disease discussed previously: body is a machine and diagnosis is health. For instance, the "Activity" page directly states, "Your body is an amazing machine" (Bellabeat, Activity, 2017). The body-is-machine metaphor is also a pervasive undercurrent directly linked to diagnosis is health as demonstrated both visually by Figure 1 as well as the text accompanying this visual that states users "can compare activities and learn what you need to improve in your life" (Bellabeat, Leaf Nature, 2017). At some point in their lifespans, machines usually need some kind of intervention to ensure that they continue to run efficiently—assessment, maintenance, and/or modification, for instance. Trackers, like the Leaf, can continually perform this diagnostic function by monitoring select bodily functions and behaviors so that the mind can more effectively enact control over behaviors. Indeed, it is probably no coincidence that the image in Figure 1 is referred to on Bellabeat's website as the 'dashboard'—the metaphor that we use to describe the interface we use when driving a car that allows us to monitor that machine's performance and more importantly, control it. The data visualizations generated by the Leaf's smartphone app shown in Figures 1 and 2 act as similar diagnostic and operational tools that allow users to better understand their body's performance by reporting a range of metrics that users can then assess to determine what behaviors and practices they may want to change (if any) in order to ensure their body "runs" as it should.

This same combined body is a machine and diagnosis is health message can also be seen textually in statements on the Activity (2017) page, such as "Get a real-time overview of how being active every day affects your health, and where you need to improve"; "Record your workouts and reach your goal with Leaf's custom activities"; and "…it all counts and everything you do empowers you." When the body is a machine, diagnosis is health, and progress provide the guiding framework for how one acquires or maintains health, one's state of health (and body) becomes a "thing" that users need to control and manipulate.

Western medicine positions the mind as assuming this control over the body, in part, because health is also notoriously unstable. We can go to bed one night feeling fine only to wake up the next morning with a sore throat, aches, and a cough, for instance—indicating that we may have contracted a virus. Further, health constantly fluctuates because one's state of health is influenced both by changing factors that can be known (and measured)—diet, exercise, sleep, and stress—as well as those that are often unknown, such as exposure to viruses and bacteria and/or a genetic predisposition for developing a chronic condition. Indeed, the relationships among the factors (both known and unknown) that influence health are not always well understood. Wearable fitness trackers, as Swan (2012) proposes, enable a user "to understand his or her own patterns and baseline measures, and obtain early warnings as to when there is variance and what to do about this" (p. 95)—also, in theory, encouraging users to engage in healthy behaviors and habits (Ananthanarayan & Siek, 2012). Consequently, the tracking features of the Leaf (and other devices like it) can reinforce the notion that monitoring health-related choices—like what foods we eat or how long we exercise, for instance—give users numeric information that allow them to exert more control over their overall health and prompt them to engage in behaviors and practices that might reduce the risk of developing some chronic illnesses.

The Leaf's smartphone app attempts to address the challenges of providing information that can potentially better enable users to acquire and/or maintain health by imparting specific, quantifiable knowledge unique to each user through data visualizations, like the dashboard shown in Figure 1. Such information is also presumed to be accurate because, after all, the data were collected by the

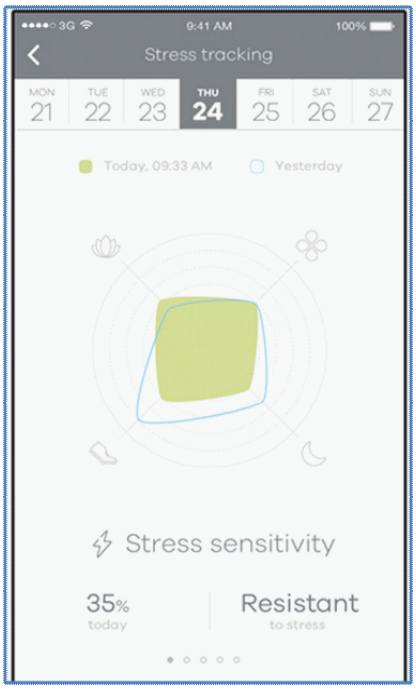

Figure 3. The above screen shot shows the Leaf's "stress sensitivity" assessment. The Leaf smartphone app creates this map by considering trends in the user's performance for the other variables the device tracks. The flower icon (upper left) symbolizes meditation, the shoe icon (lower left) symbolizes activity, the moon icon (lower right) symbolizes sleep, and the small circles (upper right) symbolize the menstrual cycle. In this image the green shading is equally distributed among these four variables, indicating the user is not experiencing stress. Image used with permission.

device and transferred to the app, tools that are often seen as neutral and objective. Consequently, these data visualizations might be interpreted as encouraging users to act on what has been objectively collected rather than relying on their own imperfect and subjective experiences or memories. Indeed, Tom Wolf (2010), one of the creators of the Quantified Self movement and website, comments, "If you want to replace the vagaries of intuition with something more reliable, you first need to gather data. Once you know the facts, you can live by them" (para. 5). In other words, rather than a user trusting her own embodied experiences—that is, how she actually feels—users of health and fitness trackers may come to rely primarily on the app's numeric report to assess their health status (Lupton, 2013; Lupton, 2015). As Schüll (2016) observes, "the wearable tech industry banks on this double insecurity: the customers they imagine, unsure whether to trust their own senses, desires and intuitions as they make mundane yet vital choices…" (p. 9).

The Leaf's stress-monitoring function, for instance, purports to know when users' stress levels are increasing even before the user herself knows by evaluating the other four variables the device tracks (see Bellabeat, Leaf Features, 2017; Bellabeat Blog, 2017). More specifically, the device evaluates users' stress by weighing the information it has collected about sleep, activity, mediation, and menstrual cycle over the past seven days. The device's stress tracker then provides a visual assessment of the user's stress level as shown in Figure 3. The interface also recommends strategies for reducing stress, such as increasing sleep, and/or minutes of activity, and/or meditation (see Figure 4).

Overall, the numeric information collected by devices like the Leaf not only becomes privileged, overriding users' intuitive senses about their health and/or particular aspects of their health, but purely sensorial information also is figured as unreliable. As the company's mission page states, the Leaf "help[s] us learn the science behind our bodies and give[s] us the power that comes from knowing the truth about our body and mind" (Bellabeat, Our Mission, 2017)—again, reinforcing mind/body separation as well as Western medicine's overall narrative of control.

Data visualizations like Figures 1 and 2 do let us see patterns and trends in behaviors and practices that we otherwise would not by consolidating abstract, quantifiable information into concrete visual representations. Indeed, determining how many steps we took or how many hours we slept by relying on memory alone is often largely inaccurate. However, assuming that data always represent objective, factual information is a tremendous leap, glossing over and leaving uninterrogated the key role that methodology plays in determining how data are collected. And this, in turn, establishes the validity and accuracy of quantifiable information.

The quantitative information collected by devices like the Leaf reflects the decisions that users have made about what to track and how, when, and under what circumstances to track it. For example, some users may only wear the Leaf when they engage in rigorous

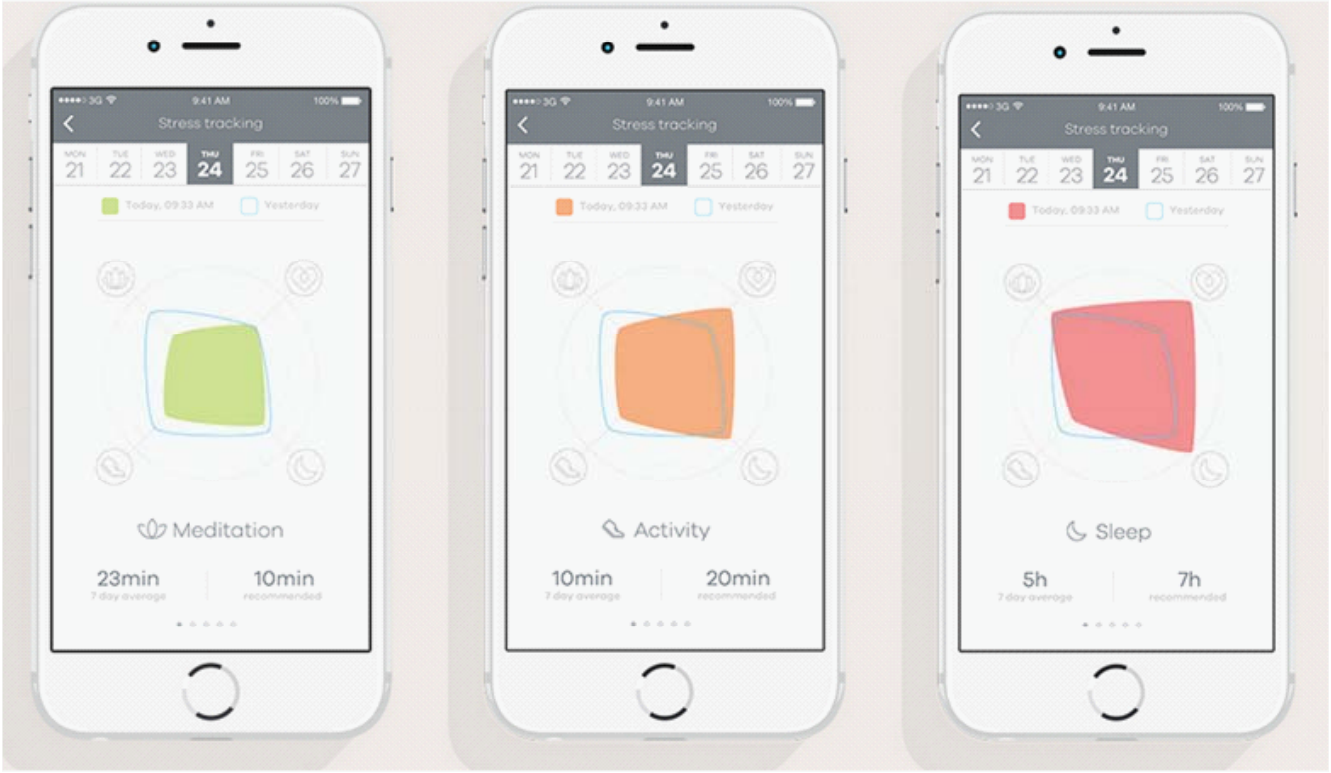

Figure 4. The above screen shots show the Leaf's stress predictor feature. The blue shape in the middle of each visualization superimposed on the shaded area indicates the user's stress sensitivity in each area (mediation, activity, and sleep, respectively) the day before. The color of the shading indicates the level of sensitivity where "Green (0-35) indicates that you've got everything under control; Orange (35-70%) means you might experience some stress; [and] Red (70% - >) means high stress sensitivity" (Bellabeat Blog, 2017). In the above image, the app recommends that the user practice 10 minutes of meditation (left panel), get 20 minutes of exercise (middle panel), and increase her sleep to 7 hours a night (right panel) to reduce stress. Images used with permission.

physical activity, like going for a run or on the days that they believe might be more stressful. Consequently, the Leaf will only collect this select information, meaning that any data visualizations that the smartphone app creates will also be selective.

Any decision the user makes about what, when, and how to track information as well as how to view this information (hourly, daily, weekly) has also already been filtered through the choices that the designers of the Leaf (and other health and fitness trackers) have already made. For example, the Leaf does not track any information about diet, which is as important as regularly engaging in physical activity and managing stress in promoting health. The Leaf also does not allow users to record potentially relevant qualitative information, like their mood and/or perceived energy level before and after a workout or meditation session, respectively. Some users have pointed out design limitations specifically related to the stress tracker, calling into question its accuracy. On the company's blog post announcing the release of this feature, for instance, one user reported that she had had a particularly stressful day, but the stress she experienced was not reflected in her smartphone app's sensitivity report. She stated, "My stress level indicator says low but today was a very stressful day- blown tire, fever while out running eeriness and more personal stuff I'm just not getting into & yet I'm in the green and only 13% [sic]" (Bellabeat Blog, 2017). Another asked when users would be able to input minutes spent meditating (rather than relying only on the device to track this information) (Bellabeat Blog, 2017). She noted that not being able to report this information may be affecting her stress sensitivity percentage. Such comments suggest that some users need to adapt to the tracking features and capabilities that the designers of the Leaf value, which may not align with the features and capabilities that the user values.

Data visualizations generated by smartphone apps like the Leaf also reflect the values of Western medicine by visually situating quantitative health information through specific genres like line graphs and bar charts (as shown in Figures 1 and 2). These genres are established, commonly used forms for communicating temporal, spatial, and comparative information. Yet such representations also reinforce Western medicine's narrative of progress through continual diagnosis; users can view their stats hourly, daily, weekly, monthly, and/or over specific time periods of their choice. This visual information urges users toward continual improvement, promoting what Lupton (2013) has characterized as "the discourse of 'healthism'" with its promise of individual "empowerment" (p. 397) that is enacted through routine self-surveillance wherein the mind monitors the body, adjusting its performance as needed. From Lupton's (2013) perspective (also citing Bell, 2001; Davis, 2012; Lupton, 1995), the Leaf's overall visual and language-based messages might also be interpreted as a "techno-utopian discourse," which, rather than creating distance from the body, "direct[s] the gaze directly at the body" (p. 396), reinforcing Western medicine's mind/body separation and overarching narrative of control.

Further, with increased empowerment and self-responsibility for one's health-related behaviors also comes increased culpability, particularly when users may not be assured that their data is private and/or they voluntarily share information with healthcare providers that could then be accessed by third parties like insurance companies. In their discussion of the ethical implications of such devices, Ferenbok, Mann, and Michael (2016) caution, "The human-machine unit creates semiotic meaning about the world around us, yet simultaneously presents a dreamy technological utopia that may be hiding dystopian undercurrents" (p. 94). Such potential "undercurrents" include insurance companies increasing premiums for patients whose exercise and diet choices do not align with recommended healthy parameters. It is also not difficult to envision a future scenario in which patients who are identified through genetic testing as being predisposed to developing a chronic condition, like high blood pressure or diabetes (or who already have these conditions), are denied coverage, charged more, or otherwise penalized if they do not self-track metrics like diet and exercise that might help reduce their risks of developing the illness.

QUANTIFIABLE ME: SELF-SURVEILLANCE AND THE TROPE OF HOLISTICISM

The act of tracking our health-related behaviors and practices—whether recorded digitally or the old-fashioned way using pen and paper—can change not only what health-related behaviors and practices we engage in but how we engage in those behaviors and practices. Indeed, critical scholarship on wearables has theorized the ways that the surveillance capabilities of such devices enable and complicate differing subject positions, invoking power relationships that simultaneously both diminish and create distance between users and their bodily experiences (e.g., Ferenbok et al., 2016; Lupton, 2012; Lupton, 2015). As Lupton (2015) states, these practices "involve the voluntary turn of the gaze upon oneself for one's own purposes" (p. 446) with these technologies also driving "the importance of 'taking responsibility' for one's health" (2013, p. 397). Personal responsibility is, in fact, central to preventative medicine and an emergent culture of wellness because chronic diseases are often thought to be preventable (or at least managed more effectively) by consistently engaging in health-related practices and behaviors, like eating a healthy diet and engaging in regular physical activity.

The Leaf's website reinforces this ethic of personal responsibility by both showing and describing the device's tracking capabilities, which promise users self-fulfillment by engaging in self-diagnosis through self-tracking. As the company proclaims on their mission page, "We want you to be the most powerful, capable, confident woman that you can be" (2017). This message is then rhetorically constructed using a visual and language-based narrative of holisticism throughout their website, as I describe in the previous section, promoting the potential to acquire whole body knowledge in ways that are both unattainable and unknowable through lived embodied experience alone. Their "About" page articulates this overall position by stating, "We want you to know what it feels like to have a relationship with your body & mind and achieve the quality of life you deserve" (2017).

However, biomedicine's ideologies remain deeply entrenched within this narrative. The above statement still positions the mind and body as two separate entities, assuming that users do not already have a mind/body relationship and that the Leaf can create this connection. In actuality, the integrated whole body experience the Leaf promises is delivered through the increased tracking capabilities the device offers including menstrual cycle, stress, and mediation, which were previously unavailable in other devices. More to the point, the holistic perspective that the Leaf promotes serves as a rhetorical trope employed thematically throughout the product's website, endeavoring to persuade women that the device meets their unique needs and but also aligning with the biomedical model by reinforcing control over disease and illness, which is thought to subsequently create health.

In this scenario, such control is achieved through the act of tracking, measuring, visualizing, and evaluating quantifiable health-related information, which users can then use to make particular kinds of decisions and take particular kinds of actions. For instance, health.gov advises adults to engage in 150 minutes of "moderate-intensity aerobic physical activity" every week (U.S. Department of Health and Human Services, 2017, para. 3). By tracking minutes spent exercising, Leaf users can enact control over this health-related variable by engaging in exercise habits that align with this recommendation (and/or that meets other fitness goals), while also making changes, if needed.

Somewhat similarly, Leaf users can also enact control over stress by programming the device to alert them when stress sensitivity is increasing and prompt them to engage in meditation (or to increase their physical activity or sleep) as well as guide them in establishing meditation as a habit, which can help them more effectively manage and control stress overall. In sum, by giving users quantitative information about select physical and mental health metrics that they can use to make decisions about select health-related behaviors, the Leaf seemingly gives users a holistic perspective of their health.

But health is not reducible to a series of quantitative assessments (considered individually or together) even if such assessments attempt to account for both physical and mental health variables. Rather, health is influenced by a wide range of factors that overlap and fluctuate in messy ways and which cannot always easily be identified or quantified, like a genetic predisposition that can increase a person's risk of developing a particular chronic condition despite her diet and exercise habits as well as exposure to environmental factors like viruses and/or pollutants.

With fifteen percent of the United States population using some kind of wearable device (Piwek, Ellis, Andrews & Joinson, 2016), these technologies have often been touted as offering an unprecedented opportunity to transform preventative medicine (see Kratzke & Cox, 2012; Kaplan & Stone, 2013; Swan, 2012; Wiederhold, 2012). Yet the epideictic rhetorics often used to characterize the functionality of these devices, as Teston (2016) has characterized the discussion surrounding wearables, also tends to assume a particular type of privileged user who is already healthy and has the resources and capabilities to maintain her health, frequently overlooking the opportunity to potentially address health disparities, as she argues. Indeed, poorer people may have more to gain from these technologies, but they also face significant limitations in terms of access (Maitland, Chalmers, & Siek, 2009).

The visual and language-based communication strategies used to promote the Leaf on Bellabeat's website also suggest that the device is designed to resonate with a very particular target audience: economically stable, able-bodied, and already physically fit young women. In other words, the photographs do not represent users who may not be in good health, face limitations in achieving or maintaining health, may be managing chronic conditions, or who may be post-menopausal (and thus have no need or interest in the menstrual cycle tracking component). Rather, the device appeals to users who seek self-actualization—those who are ready to "bring out [their] greatness" and "let [their] inner beauty shine" (Bellabeat, Our Mission, 2017).

Ultimately, like any company, Bellabeat wants to sell their products, and the narrative of holisticism that the website uses is likely effective in targeting such users (as well as potentially those striving for this privileged, idealistic bodily state). As of March 2017, over 700,000 devices had been sold (Cuen, 2017), and in June of this same year, Business Insider featured the Leaf Urban in an article touting, "The best pieces of smart jewelry you can buy" (Gokey, 2017). However, people who are engaged in the potentially fraught process of managing a chronic health condition, for instance, and/

Figure 5. The above screen shots show mock-up adaptations of the Leaf's stress tracking feature to incorporate user-contributed, qualitative feedback. All modifications created by Ian Weaver.

or treating a particular illness may have neither the interest nor the "luxury" of "bring[ing] out [their] greatness" by focusing only on the health metrics the Leaf tracks as well as the tracking options the device makes available. Patients managing high blood pressure or diabetes, for instance, may need to prioritize other metrics. A diabetic patient, for example, may choose to pay close attention to diet (which the Leaf does not track). She may also not be as interested in health-related variables prioritized by the Leaf that she perceives as less or not important for her immediate health-related needs. Further, some potential users may choose a different device that does also track diet (or decide not to use a tracking device).

While the visual and language-based communication strategies used to sell the Leaf on its website continue to invoke biomedicine's narrative of control, as I have argued, this approach may also illustrate the shift in Western medicine toward a culture of wellness. Preventative health-related practices, like eating a healthy diet and exercising, still endeavor to control illness and disease by reducing their likelihood of occurrence. However, such behaviors are not tied to counteracting any one disease or chronic condition because they can often help prevent a wide range of adverse health outcomes. In this way, such preventative behaviors are also health promotion behaviors, which emphasize the move toward efforts to define health in its own right and not only as the absence of disease or illness, as Western medicine has traditionally done.

Further, the narrative surrounding preventative medicine increasingly positions health as holistic by linking (and sometimes downplaying the division between) physical and mental health. For instance, the Mayo Clinic's (2015) online educational materials on managing high blood pressure connect mental patterns that can induce stress to the physical manifestation of hypertension. The organization also emphasizes the combined mental/physical benefits of exercise in its educational materials on this topic (Mayo Clinic, 2016).

While the main purpose of the Leaf and other health and fitness trackers is usually specifically to record select quantitative health-related information, future design iterations of these devices might offer potential users (including those who are ill and/or managing chronic conditions) the ability to track a wider range of quantitative measures as well as select those that specifically interest them. For instance, in addition to recording commonly-tracked metrics like activity, diet, and sleep, the iPhone's health app also has a "Vitals" category, which includes blood pressure and allows users to record or import information from apps specific to this variable. Blood sugar could also be included along with categories for numeric information related to other chronic conditions like asthma. In order to keep the interface manageable, however, and not overwhelm users, these applications might also include a preferences panel that allows them to select (and curate) the variables and features that they wish to track and hide those that they do not. As Ananthanarayan and Siek (2012) observe in their paper exploring strategies for encouraging users of wearable devices to engage in healthy behaviors, "The user has had little, if any, input into constructing the device or controlling how it responds. Why not allow for this possibility?" (p. 240).

Additionally, future design iterations might also connect physical and mental health metrics more concretely by including the option to input and visualize some quantitative measures, like user-contributed, sensorial-based feedback. Modifying the interface for the Leaf's stress sensitivity predictor (shown in Figures 3 and 4) offers one possibility. More specifically, this interface gives users numeric values (i.e., a percentage for stress sensitivity and recommendations on how much additional time to spend, if needed, on mediation, sleep, and/or activity to reduce one's sensitivity percentage). It visually conveys this information by showing a part-to-whole relationship among these other variables (the shaded information between the four icons—see Figure 3), indicating the device's assessment of the influence of each on the user's stress and visually potentially providing a more holistic perspective toward stress. In other words, this graphic conveys to viewers that stress is integrally connected to the user's activity, mediation, sleep, and menstrual cycle.

Consequently, the design of this interface might be modified to include user-contributed qualitative information that reflects how the user is actually experiencing and attempting to manage her perceived stress. For instance, Figure 5 shows several sample design mock-ups illustrating this idea. More specifically, under the wording "stress sensitivity," users might select an emoji that rates their overall stress for the day (e.g., a smiley face or a frowning face). The emoji that users select might also be taken into account in the app's algorithm in determining the user's overall sensitivity rating. The Couch to 5K running app, for instance, includes a similar feature that allows users to record their post-workout mood after completing each training session, which is collected in addition to quantitative information like distance and time. Users can access this info in their running log, share their results with other users (if they choose), and add comments about each other's performance.

Somewhat similarly, in the proposed modified stress sensitivity interface (Figure 5), the emoji the user selects each day might be included on the bar at the top of the screen that shows the dates for that week. Users might also have the option of adding a note that briefly explains their assessment for that day, such as a short description of a specific stressful event and/or stress reduction strategies the user may have engaged in like journaling, talking to a friend, and/or watching a movie (Figure 5, middle panel) as well as looking at notes for previous days (Figure 5, right panel).

In June 2017, the Leaf had been available for two years, meaning the device is still somewhat new compared to products like the Fitbit, which premiered in 2007. As the technological capabilities of these trackers continue to evolve, new prototypes have also begun to emerge like smart fabrics, implants, and temporary smart tattoos or stickers with sensors. Further, tech developers have proposed that rather than providing detailed statistical info, new technologies will focus on giving users more tailored feedback about their progress (Schüll, 2016, p. 8). Additionally, Maitland et al. (2009) have argued that "technology designed to promote health-related behavioural change," as they describe it, should "be designed for action, not persuasion" (p. 1; italics in original) in order to better meet the needs of lower income populations. In other words, as they suggest, based on the results of a small study they conducted, some lower income people do not need to be convinced to make dietary changes. Rather, they need tools that will help them make the changes they already want to make.

As wearables continue to proliferate, certainly their designs and tracking capabilities will become increasingly nuanced, sophisticated, and user-centric, ideally better reflecting the needs, interests, and desires of a more diverse and wider range of users. Perhaps new iterations of the smartphone apps that visualize user-generated data should also attempt to include feedback from users themselves in order to provide a more balanced and potentially comprehensive perspective toward health.

ENDNOTES

[1] Some scholars have disputed the notion of patient choice in the provision of healthcare (see Mol, 2002; Keränen, 2007).

[2] The meditation and stress categories use different visual representations.

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