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# Digital behavioral technology, vulnerability and justice: towards an integrated approach

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**ABSTRACT**

The paper introduces the notion of 'digital behavioral technologies' and discusses them from the perspectives of vulnerability and justice, thereby integrating perspectives from bioethics or public health ethics and political philosophy. Digital behavioral technologies have seen a massive uptake in recent years, but the market for them is hardly regulated. We argue that understanding the impact of digital behavioral technologies requires understanding individuals not as abstract, atomized agents, but rather to take their embeddedness into social structures into account. This also allows extending the focus to groups, relationships and whole societies, which are often structurally unjust. This perspective provides a corrective to an overly individualistic consideration of digital behavioral technologies, which may suggest itself because of their focus on individual bodies. We point out some implications of this integrated approach with regard to the regulation of digital behavioral technologies. We conclude by describing some implications both for those who work on digital behavioral technologies and for those who work on questions of vulnerability and justice.

## Introduction

Mobile health technologies, such as fitness apps or wearables, can have a major impact on the lives of individuals.[1] Take the case of Alex: He is a well-paid consultant in a multinational company specializing in digitalization and biotech. As part of the company's health strategy, all employees receive an email containing motivating ideas for a healthier lifestyle. The email promotes an 'app of the

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[1] The following two cases are abbreviated and adjusted versions from the project website of the BMBF-project META mHealth: Ethics, Law and Society: https://about-mhealth.net.

month' that measures physical activity and with which one can set up competitions with others. Points can be gained by simple activities, such as walking and cycling (calibrated to body weight, gender, age and other variables), and bonus points are awarded for 'high intensity workouts.' In order to prevent cheating, the app recognizes individual patterns of movement, heartbeat and perspiration. Alex and his colleagues decide to do a four-week challenge. Alex is a highly competitive character. He changes the structures of his days, to collect as many points as possible, and starts neglecting other activities, such as reading books or meeting friends.

A similar app is used by Nadine, a single mother of three with an insecure and underpaid job. She sometimes has to work during evenings, which raises problems of childcare. She also has parents in need of care whom she tries to see regularly. Nadine is obese and her physician tells her she needs to lose weight. He recommends a sports group and healthier food, but Nadine knows that she lacks the time and money to afford either. Her friend Alia tells her about a new app with exercises and a calorie-counting function. Alia connects with other women on the app and thinks it's 'great fun' and it 'is for free.' Nadine downloads it right away and likes the cheerful design. She switches on the step count and starts the first workout with the help of the app. She also writes her first comment for which she gets some likes. However, over the next weeks Nadine notices that she feels rather burdened because she never seems to find the time to do exercises. She tries to count her calories, following the discussions about it in the comment section. But sweet snacks are one of the things that keep her going, and she suppresses the thought that she constantly skips typing in these calories into the app interface. Nonetheless, she gets more and more upset with the app and with herself. She feels embarrassed to meet Alia who texts her how much weight she lost.

Is there anything that could be problematic, from a normative perspective, about Alex's or Nadine's use of such an app? How do the differences in their social situations matter for the evaluation? And what does it mean for society if more and more individuals use such apps? According to a recent survey, 42% of US Americans use 'tools to measure fitness and track health-improvement goals' (Deloitte, 2020). Of these, 77% said it led to behavioral change that was at least 'moderate,' with much higher numbers for young users (Deloitte, 2020). While social desirability bias may play a role in these figures, it seems clear that the use of such apps, and their impact on people's lives, deserve scholarly attention.

This paper has three aims. First, we introduce the notion of 'digital behavioral technologies' for capturing the specific phenomenon under consideration. Fitness apps and other wearables are key examples, but meditation apps, period tracking apps, or dieting apps also belong into this category. Second, we connect this new phenomenon with the discourse on 'vulnerability,' from a bioethics or public health ethics perspective (Chung & Hunt, 2012; Luna, 2009;

Mackenzie et al., 2013), and the discourse on 'structural injustice' from political philosophy, which is also increasingly used in bioethics or public health ethics (Eckenwiler & Wild, 2020; Powers & Faden, 2019; Young, 2011). Third, we suggest an integrated approach for understanding digital behavioral technologies in which both individual vulnerabilities and structural societal factors are taken into account, thereby adding a normative macro focus to the existing micro perspective. In doing so, the paper suggests zooming out from the individual user of digital behavioral technologies and takes a wider perspective, which also accounts for broader social and economic dimensions. In a world marred by structural injustices, we show how new vulnerabilities in individuals and groups can be created, which may not meet the eye when one considers only individual cases. The market for digital behavioral technologies requires regulation, but there is also a need for a broader academic and public debate about what the arrival of these technologies means for individuals and societies.

## Digital behavioral technologies

The convergence of several key digital technologies allows for an unprecedented range of applications and devices for monitoring personal data, behavior, as well as affective and mental states. The ubiquity of portable end-user devices with web access ('smartphones') has effectively put a powerful multisensory mini-computer into the hands, pockets and bags of billions of people worldwide (3.8 billion smartphone users by the latest estimates) (Statista, 2021).

The combination of sophisticated miniaturized sensor technology,[2] the high-volume data streaming capabilities of smartphones, and wireless interaction with other devices (such as wearables, e.g. for optical heartbeat sensing), powers a quickly expanding set of applications that rely on tapping into highly personal data streams. Combining a variety of data from different sources (both sensors and active user inputs) enables the diagnostic and predictive modelling of behavioral states and dispositions of individual users with high precision. Coupled with communication channels for feedback by the program itself or a community of fellow users – such as 'likes,' encouraging messages or statistics detailing personal milestones – these apps effectively create a techno-social closed-loop system to influence and 'guide' the user's behavior, often by means of gamification, nudging, and related methods from behavioral psychology and user-experience design.

In the context of health and well-being, these portable health-related digital technologies are also referred to as 'mobile health technologies' or mHealth (Messner et al., 2019; WHO, 2011). This set of technologies can be considered

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[2] These include gyroscopes, GPS, temperature sensors, pressure sensors, fingerprint sensors, accelerometers, microphones, touch sensors and others.

a part of the wider ecosystem of 'electronic health technologies' or eHealth which also encompasses non-portable systems, such as telemedicine technology for remote health servicing, electronic patient records and other systems (Marzano et al., 2015). As the focus of our analysis is on e-health/mHealth apps and devices that are designed to influence user behavior regarding their health and well-being, we call these 'digital behavioral technologies' (DBT).

While there are certain challenges for a clear demarcation, on which we comment below, our operational description of DBTs comprises apps and devices that (1) collect and analyze digital data (from sensors, user input and other sources) about a person's behavior and/or physiology; (2) interact with the user by means of a user interface that provides feedback, e.g. statistics, figures, encouraging messages and other interactions; with (3) the goal to modify the user's behavior regarding their health, fitness and other aspects of their lifestyle that affects their well-being and/or bodily functions. Typical examples are wearable fitness trackers, period tracking apps, or mindfulness apps. Importantly, many DBTs are not classified as medical devices and treated as such by law; individuals can access them simply by downloading them from app stores.

DBTs are of course embedded into a wider ecosystem of digital technologies, as well as the global 'datasphere' (Burk, 2008), the realm of collected and curated data, and the 'infosphere' (Floridi, 2017), the entire global informational environment. The digital technologies on which DBTs are based allow for a precise recording and analysis of personal data, over an extended period of time, from devices which can be used to make inferences on a person's (in this context often referred to as 'data subject') behavioral patterns as well as for predicting future behavior. In the cases of Alex and Nadine, the DBT measures and collects behavioral patterns, and enables them to get detailed and granular feedback on their physical and nutritional activities. The data (and statistics based on these data) can then be shared within their communities of fellow app users for social engagement. However, there are specific features that demarcate DBT within this wider digital ecosystem: the close relationship to the user's body and physiology (e.g. through sensors that measure activities); the circular interaction between a user's behavior, the app's measurements, data, statistics and recommendations (e.g. in the form of rewards or encouragements); and the focus on well-being and health-related activities. What makes the conceptual demarcation between DBTs and other forms of ubiquitous digital technologies (such as 'social' media, messaging services, etc.) difficult is the close alignment of DBTs with other digital services: users may post their individual workout statistics on 'social' media, share images of their latest run on a photo sharing site, or start an online discussion group on optimal dieting on a messaging service.

Furthermore, it is often difficult to draw a clear line between health-related, medical applications and apps that promise to improve well-being, using

paramedical notions such as 'relaxation' or 'stress relief.' In other words, the way that these apps and devices are framed and marketed is (intentionally) cloudy, most likely to avoid the need to certify the app or device to conform with medical device regulation. Another problem in demarcating an app that is clearly health-related from one that is clearly non-health-related (e.g. for gaming or other forms of entertainment) is the classification of the types of data that are used to make health-related predictions. While it might be obvious to most users that measuring their heart rate, skin conductance and other biological signals can be used to estimate bodily health or find signs of disease, it is perhaps less obvious that machine learning analytics can use almost any type of personal data to make health-related inferences: the data from the smartphone's many sensors (and other so-called 'passive data' that is collected without the user's awareness), the data trails that users actively leave in the web and on their devices ('active data'); basically any kind of digital data that can be associated with a particular user. For medicine and clinical research, this approach to 'deep digital phenotyping' (Onnela & Rauch, 2016) creates promising opportunities for a better understanding of behavioral patterns that are associated with mental health disorders, such as depression and anxiety, and for building better diagnostic tools, e.g. for the early detection of depressive episodes. For the DBT industry in the consumer space, however, the same tools for digital phenotyping create new opportunities for building apps and devices that can analyze and predict – and therefore also shape – human behavior with unprecedented degrees of precision.

In fact, DBT use also has potential impact on the mental health of users, as seen in the hypothetical cases discussed earlier. Alex seems 'hooked' to the fitness app, and a detailed examination of his behavior might reveal signs of addictive behavior. The case of Nadine, too, illustrates ways in which using DBTs can harm mental health. The constant solicitation of feedback and interaction by the app reinforces feelings of shame regarding her body image, which could ultimately create spirals of negative thoughts and trigger depressive moods.

DBTs are based on permanent surveillance of the user's behavior and performance, which creates substantial mental health risks for users. If the data are shared on online platforms, a significant amount of peer pressure can result. Scholars emphasize that constant information updates can hinder productivity and have an addictive potential (Kreitmair et al., 2017) – which seems to be a risk for Alex. Sociologists have also argued that through such quantification of one's own performance and the comparison with other users, essential aspects of human life, such as nutrition, sexuality and (un-)healthy behavior, can become associated with feelings of bad conscience, guilt and shame (Lupton, 2015; Lupton, 2018) – as was the case for Nadine. Ultimately self-optimization through DBT could potentially even cause depression in users, doing more harm than good (Fangerau et al., 2016; Hussain et al., 2015). Even

though terms and conditions of use may explain certain data- and technology-related risks, such mental health risks are usually not disclosed to the user.

In the wider social sciences literature, we also find substantive sociological analysis and empirical scholarship on the 'quantified self' in the context of work (e.g. Moore & Robinson, 2016) or in relation to 'self-care' (if not self-optimization) practices (Cederström & Spicer, 2015; Ehrenreich, 2018; see generally also Mau, 2019). Many of these works provide a granular analysis of the systemic conditions that fuel the drive towards biometric and sociometric quantification and also give an account of how this impacts the lives of individuals and their well-being and flourishing.

Many popular apps, whether health-related or for pure entertainment purposes, are explicitly designed to occupy the user's attention and to maximize engagement (Wu, 2017). Scholars argue that by tapping into reward networks in the human brain, these design features can make vulnerable individuals prone to becoming addicted to games (Dong et al., 2015) and, thus, potentially, also to apps that use similar mechanisms of user engagement. The combination of personalization with frequent interactions based on behavioral incentives in DBTs could, therefore, carry substantial risks for global mental health. This development is also reflected by the fact that both the World Health Organization (WHO) and the Diagnostic and Statistical Manual of Mental Disorders in its fifth edition (DSM-5) of the American Psychiatric Association (APA) have introduced Gaming Disorder (ICD)/Internet Gaming Disorder (DSM) as a novel mental health disorder.

In recent years, there has been a growing debate about the ethical dimensions of apps, digital phenotyping and related topics, in addition to the ongoing discussion about privacy and data protection (Kellmeyer, 2018; Wild, 2019; Wild et al., 2019). Yet, in biomedical ethics, neuroethics and related fields, the discussions tend to center on the effects on individual users, for example on issues of autonomy, informed consent, and enhancement. What has received less attention in the debate are: (1) the notion of vulnerability, especially which dimensions of vulnerability are particularly relevant for DBT users; (2) the wider social and societal effects of the now widespread use of health-related DBTs, especially through the lens of structural injustice. We now turn to these.

## Vulnerability

The potential harms of DBTs can be a source of 'vulnerability' for the users (Kellmeyer, 2019b; Jacobs, 2019). In this section we briefly describe how this concept has evolved in bioethics and how we suggest using it as a heuristic to better understand normative dimensions of DBTs on a micro- and macrolevel.

In bioethics 'vulnerability' is a widely established normative concept and subject to extensive debate (Biller-Andorno et al., 2015; Ganguli-Mitra & Biller-Andorno, 2011; Hurst, 2008; Mackenzie et al., 2013; Wild, 2012). Although

vulnerability is relevant in all sub-areas of bioethics, the term has first been applied and discussed in research ethics. Traditionally, ethical guidelines in the area of clinical research have defined certain groups of people as vulnerable who are not in a position to make their own decisions freely (such as prisoners), and who cannot formulate them adequately (such as people with severe dementia). In order to protect individuals from harm (i.e. to reduce vulnerability), each person must provide *informed consent* before participating in clinical research or before a physician can perform a medical procedure on them. There are special safeguards for individuals who cannot provide informed consent, such as minimal risk requirements or consent by a proxy.[3]

In the context of DBTs, such an understanding of vulnerability, focusing on individual autonomy and consent, might be understood along the following lines: individuals give their consent to the use of their data and to all other functionalities of a DBT through their agreement with the terms and conditions. As in the case of clinical trials, only users above a certain age and with certain mental capacities can and should sign these terms and conditions. This rather legalistic procedure of 'informed consent,' in turn, protects companies from liability for certain harms, e.g. an infringement of privacy, misuse of data, or harms resulting from inaccuracies of the DBT. In this context, it is often emphasized that 'digital literacy' or 'digital competence' and 'data literacy' require key skills for individuals to be able to navigate this consent process in a self-determined and informed way. These skills comprise, inter alia: the practical and cognitive ability to use apps and devices as intended; understanding the flow of personal data streams from apps and devices to service providers; or understanding the difference between opt-out and opt-in when determining the use of one's data (Buckingham, 2010; Olson & Torrance, 2014; Pangrazio et al., 2020; Prado & Marzal, 2013). To support the acquisition of such skills, users need to be educated about the functionalities of apps and devices, about the importance of understanding how their data is being used, how this could potentially harm them and what safeguards could be taken. To achieve this, authors have suggested – in addition to education within schools – establishing educational spaces, for example in community libraries or community colleges, or 'real-world laboratories' (Singer-Brodowski et al., 2018).

In the following we argue that this 'traditional' understanding of vulnerability is shallow in two ways. Based on some well-established criticism of this understanding, but also adding new elements, we suggest more complex

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[3] An important part of the ongoing critical discussion of the term vulnerability is directed against the blanket assessment of individuals or groups as vulnerable. Such 'labelling' of individuals or groups is accompanied by paternalistic attitudes that can lead to stereotyping and discrimination (Luna, 2009; Mackenzie et al., 2013). Moreover, an imprecise, too inclusive and over-protectionist use of the term unjustifiably excludes entire groups of people from research and its potential benefits. Some argue that the term has been applied to so many groups that it is losing its normative force (Levine et al., 2004). More recent approaches to dealing with vulnerability thus often attempt to avoid the general labelling of entire groups, but speak, for example, of layers of vulnerability (Luna, 2009).

dimensions of vulnerability: On the level of the user, and also in relation to the understanding of vulnerability on a societal level.

First, on the level of individual users we suggest looking back to Alex and Nadine in order to unpack vulnerabilities which are not solved by signing the terms and conditions of use. We have mentioned that signing terms and conditions could be seen as a form of 'informed consent.' But signing terms and conditions of apps does not mean that the potential risks described in them have been well understood by the user. The language of data protection and safety, as well as detailed technological features of hard- or software are presented in a highly specialized language which is difficult to understand for lay persons. Studies show that even individuals with higher education have difficulties understanding these terms and conditions and that many simply do not read the terms and conditions in any detail (Bakos et al., 2014; Plaut & Bartlett, 2011). Moreover, as we have argued above, DBTs can carry mental risks that are simply not mentioned in the terms and conditions. An example of disempowerment and loss of autonomy are DBTs that operate via highly gamified app mechanics that might give users the illusion of consent and control, while at the same time exploiting their propensity for incentive-driven engagement of their attention (Cheng et al., 2019).

The ensuing vulnerabilities, which are potentially leading to a *loss* of autonomy, self-determination and empowerment (instead of an increase, which is the marketing message of many DBTs), are not covered by existing informed consent procedures. New ways of explaining potential harms to users would be needed, which manage to explain data- and technology-inherent potential risks in an intelligible way, and help to convey more complex risks, such as potential loss of autonomy and *dis*-empowerment.

The second point is connected to a criticism of the term 'vulnerability' as such and addresses the societal level. In bioethics, alternative concepts to the traditional understanding of vulnerability are being discussed to identify the constitutive sources of potential vulnerabilities and to determine appropriate corresponding responsibilities and duties (Hurst, 2008; Levine et al., 2004; Luna, 2009; Mackenzie et al., 2013; Wild, 2012). On the one hand, there are inherent, universal vulnerabilities based on the human biological make-up (Mackenzie et al., 2013). On the other hand, one must consider situational, relational and dynamic vulnerabilities, the causes of which do not lie in the individual, but rather in social and political circumstances. They must therefore also be evaluated in a different manner (Kellmeyer, 2019b; Luna, 2009; Mackenzie et al., 2013; Wild, 2012). This is an interesting lead for considering DBTs: vulnerabilities cannot be understood exclusively from the perspective of the individual user. 'Vulnerabilizing' factors can also be located in more complex societal structures and developments, e.g. unequal socioeconomic positions, or a trend towards over-emphasizing individual (in contrast to public) responsibility for health. One specific example of how societal developments can add

dimensions of vulnerability with respect to DBTs is the more or less unstructured way in which digital mental health apps were rapidly deployed during the SARS-CoV-2 pandemic, often without adequate regulatory and health policy oversight (Martinez-Martin et al., 2020), thereby shifting responsibility for health care decisions onto potentially vulnerable individuals.

We suggest using such an enhanced concept of vulnerability as a conceptual lens for the assessment of DBTs. It can help us to identify new vulnerabilities for individual users that go beyond a narrow, legalistic understanding of autonomy and 'informed consent' and include richer anthropological and psychosocial dimensions such as guilt or addictive potential. And it allows for understanding the introduction of DBTs as disruptive and potentially 'vulnerabilizing' phenomenon on a societal level, with implications for social justice. In the next section, we argue that combining this concept with the perspective of structural injustice adds a crucial additional layer to understanding possible effects of DBTs.

## Structural injustice

To integrate the conception of vulnerability into a broader social and political perspective, we suggest drawing on the concept of structural injustice, as developed by Iris Marion Young (2011). Young develops her account of structural injustice by evoking the example of Sandy, a single mother threatened by homelessness in a city with a difficult housing market (2011, pp. 43–45). Such a situation can come about without any specific acts of wrongdoing, either on the parts of individuals or on the parts of institutions (2011, p. 45). Rather, it can result as a confluence of various causes, including the unintended consequences of the actions of many individuals (2011, pp. 62–64), which, for example, pushes up housing prices in certain areas in processes of 'gentrification.' They lead to a situation in which Sandy is 'vulnerable to homelessness' (2011, p. 45). Young draws on social theorists such as Anthony Giddens and Pierre Bourdieu in order to emphasize the formal *and informal* dimensions of institutions, which create situations that individuals experience as 'objectively constraining' their options (2011, p. 53). The results of structural injustices are positions of privilege and disadvantage, along different dimensions.

The concept of structural injustice throws light on the fact that most societies that DBTs arrive in are marred by massive inequalities, many of which can be characterized as unjust. These inequalities are multidimensional, and often such that individuals cannot be held meaningfully responsible for their own position of privilege or disadvantage. While some of these inequalities are obvious (such as gender-based income inequality), others (such as inequalities in educational attainment, social partaking or care labor), and the

points of intersection between them, can be more hidden.[4] Depending on the position of an individual or a group within these intersecting structures, different vulnerabilities and vulnerabilizing factors can arise, along multiple dimensions.

If one applies the intersecting perspectives of vulnerability and structural injustice to the DBT use by Alex and Nadine, a number of dimensions become visible. Take, first, the fact that Alex has grown up, perceives himself, and is perceived by others, as a man, and Nadine as a woman. This means that Alex is, on average, more likely to have been brought up on a narrative that emphasizes the importance of competitiveness and 'being a winner.' On that point, he might be more psychologically vulnerable than Nadine. She, in contrast, is likely to earn less than she would as a man, which could make offers that come at no monetary cost, but for which she pays by providing her data, more attractive to her (whereas Alex has sufficient income, or his employer may even pay for the app). Moreover, Nadine is likely to be affected by social and cultural norms concerning female bodies, which are often perceived as stricter than those concerning male bodies. These require her to put time and energy in keeping her weight under control. But again, as a woman, she is statistically more likely to have less time and energy available to herself because she has more responsibilities in unpaid household and care labor, in what Hochschild has famously called the 'second shift' (Hochschild & Machung, 1989).

Other dimensions of Alex's and Nadine's positions in society may also have an impact on what the use of the app means for their lives. For example, the app may be available only in certain languages, which means that if they are members of a linguistic minority, they might have problems understanding the instructions, let alone the details of the terms and conditions. Or the app may suggest healthy recipes; but in order to follow this advice, users have to buy certain raw ingredients. Alex is likely to have enough money and to live in an area where this is no problem, while Nadine may have difficulties finding those, not only because of her financial constraints but also because she might live in a place in which shops offer less fresh food (see e.g. Krukowski et al., 2010). If she lives in a place without broadband internet access, this may also lead to problems in the transmission of data that may, for example, only show some part of her bodily activities, thus classifying her in a lower category.

This fitness app, like many other DBTs, implicitly presupposes a certain type of individual: one that has sufficient control over his or her time and the mental, physical, logistical and organizational possibilities to follow the advice given by the app. The implied user is someone who is seduced by the narrative of

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[4] In this respect, the concept also captures what has been described as 'intersectionality,' see Crenshaw (1991); for recent reflections see e.g. Collins (2017), who emphasizes the connection to social justice.

self-optimization and willpower (and just needs a bit of support from the app). But depending on the social position of users, these presuppositions hold to different degrees, and some may not hold at all for certain users. Because DBTs are scaled up for large sets of users, they typically include certain standardizing assumptions. These are likely to be oriented towards the positions of the most typical users (or those most lucrative as targets of advertisement), without taking the social positions and potential vulnerabilities of other users into account.

By drawing on the conception of structural injustice, we can see the individuals who use DBTs as socially embedded agents, whose options and choices are constrained by their positions of relative privilege or disadvantage along different dimensions, which create different kinds of vulnerabilities and vulnerabilizing factors. These different social positions need to be taken into account when DBTs are introduced and adopted. DBTs are often accompanied by a narrative of an autonomous and self-determined subject who can and wants to 'optimize' his or her lifestyle by help of some digital nudges. The responsibility for an individual's health is thereby implicitly shifted to this individual, away from questions about structures and opportunities, such as the availability of healthy food or public spaces for recreation and exercise in all neighborhoods. At the same time, more privileged members of society, with higher purchasing power, might afford to choose premium models of DBTs in which their data are not monetized – or they can afford to go to fitness studios or to use private coaches, forgoing questions of datafication and exposure to advertisements altogether.

Rejecting a picture of abstract, atomized individuals, and understanding them, instead, as socially embedded agents, thereby extending the focus also to groups, relationships and whole (structurally unjust) societies makes visible what the impact of DBTs at the societal level might be if they are widely adopted. This perspective provides a corrective to an overly individualistic consideration of DBTs, which may suggest itself because DBTs' focus on the body of the individual and the aim of changing his or her behavior.

This broader societal perspective is needed not least because it is likely, given the current trends, that the use of DBTs will be suggested (and incentivized) by health policies, either by insurance companies or by public policy makers. But this can put highly unequal burdens on differentially situated individuals. It might even direct attention away from reforms that would address these broader structures, offering what may seem to be an 'easy way out' for policy makers that allows them to brush harder questions about structural reforms aside. In a worst-case-scenario, DBT-based policies *add* vulnerabilities to the vulnerabilities with which disadvantaged individuals are already burdened (Nadine), or they create vulnerabilities for people who – as independent, healthy and wealthy individuals – would not traditionally fall under the category of 'vulnerable' at all (Alex).

## Towards an integrated approach for assessing the impact of DBTs

We do not take these arguments to mean that DBTs should be rejected altogether. Rather, we suggest evaluating them from an integrated perspective that pays attention to the differentiated embeddedness of individuals within social structures. This requires looking not only at the situation of individuals, but also that of groups; not in order to label or stigmatize their members, but in order to identify potential vulnerabilities including injustices and their underlying vulnerabilizing dynamics. And it requires taking into account the effects of DBTs on societies as a whole, with their multidimensional landscapes of privileges, psychosocial dynamics and disadvantages.

Currently, the incipient normative discourse on DBTs mostly focuses on specific technical issues such as accuracy (e.g. in measuring biosignals) or cybersecurity and privacy (i.e. securing apps and devices from unwarranted access and data leaks) (Galvin & DeMuro, 2020; Luh & Yen, 2020). Important as these are, they leave out broader normative questions at the social level as well as anthropological and psychological aspects of human-technology relations and interactions (Liggieri & Müller, 2019; Wild, 2019; Wild et al., 2019). The prevailing design logic of DBTs conforms to and perpetuates a performance-oriented configuration of human-technology interaction in which the apps and devices 'help' us in becoming our best possible selves: fitter, happier, more productive. There are specific risks and harms that this focus on (self)-optimization can create for users, for example in terms of mental health. When scaled up to the societal level, the aggregated effects of this optimization imperative may further entrench, if not escalate, existing structural injustices and may even create new categories and dimensions of injustice (e.g. for people who prefer a less digitally based lifestyle). Sociological studies already explore these broader effects at the societal level (Lupton, 2016, 2020). In these studies normative issues are being flagged and discussed, but not from an explicit normative standpoint or in connection with normative theories and with the aim of an ethical assessment. This is a gap that needs to be filled, given the increasing impact of DBTs on the lives of individuals and societies. To do so, the subdisciplines of bioethics, public health ethics, political philosophy and philosophy of technology need to be brought together, in conjunction with the relevant empirical disciplines.

Based on the perspectives of vulnerability and structural injustice, we suggest asking a set of questions about the use of digital behavioral technologies that bring these dimensions into view:

- Are individuals, for whom technology is being designed, understood as socially embedded, socially situated members of communities?
- What impact would the use of the DBT have for individuals from (variously) disadvantaged backgrounds and vulnerabilizing contexts?

- Which vulnerabilities of individuals or groups from disadvantaged or even privileged backgrounds might be compounded by the use of the DBT?
- Could certain structural injustices stay unaddressed, or even be reinforced, if the DBT were widely adopted? Is there a way DBTs might be able to reduce structural injustices?
- What happens if large groups of individuals use this DBT, possibly in a competitive 'race' that leads them to exaggerate behavioral changes? How could technology be designed to prevent such potential harms?
- Which accompanying measures would be needed in order to make the use of the DBT safe, just and beneficial for individuals and groups from all kinds of backgrounds?
- How would a society have to be structured so that certain – otherwise beneficial – digital technologies could be used in fair and equitable ways?

We do not take this to be a complete list of questions, nor do we think that it is possible to come up with one definitive list.[5] The reason for this is that the impact of DBTs – which are themselves quite a diverse set of technologies, as discussed earlier – varies depending on the context. Sensitivity to blind spots that the producers of DBTs might have, but also to possible unintended consequences when DBTs arrive in highly unequal societies with their specific histories of privilege and disadvantage for different groups, are needed.

The producers of DBTs often provide a narrative of self-determination and of endless fun and gamified possibilities for improving one's health and well-being. But our examples of Alex and Nadine show two things: first, this very narrative can create risks of addiction-like tendencies, even for very privileged individuals, and second, for less privileged individuals it may simply be unfeasible to accomplish, and thereby reinforce psychological problems. Moreover, for both of them, it may come at the price of giving up highly personal data and thus adding vulnerabilities with regard to the potential abuse of these data. It is by situating Alex and Nadine in their broader social structures that the full impact of DBTs become visible – and certain vulnerabilities, such as the lack of healthy food options, come under a glaring spotlight. To truly address them would require structural changes on a large scale.[6] They require action by politicians, lawmakers and public interest advocates in areas that go far beyond the use of DBTs, and which also include cultural and social norms, such as the imperative of self-optimization. Nonetheless, in what follows, we focus on some possibilities of law and regulation that are addressed directly at DBTs,

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[5] This is also why we have refrained from trying to come up with a simple schema or heuristic – the list is meant as an invitation for individuals to use their judgment when thinking about specific cases and also to come up with more and other question.

[6] This point can be seen in analogy to the discussion about the 'social determinants of health' (Deaton, 2013; Marmot & Wilkinson, 2005; Pickett & Wilkinson, 2015; Wilkinson, 1997).

while gesturing to the broader political, societal and cultural questions that are connected to them.

## Possibilities of laws and regulation

If one considers the different vulnerabilities and vulnerabilizing factors individuals are exposed to, and the structures of privilege and disadvantage they inhabit, it becomes clear that the steps that might be taken by private app developers are likely to be insufficient for preventing harms and enabling a self-determined life and human flourishing for all members of society. To truly address them would require structural changes on a large scale. Nonetheless, in what follows, we focus on some possibilities of law and regulation that are addressed directly at DBTs, while gesturing to the broader political, societal, and cultural questions that are connected to them.

Like in other markets where products are potentially useful but also carry risks, the market for DBTs requires critical public scrutiny, societal deliberation and regulation by law. Ideally, regulatory and governance measures need to be sufficiently granular and context-specific, to take all potential problems into account.

At the moment, the legal framework for such apps is rather patchy, with the exception of technologies that fall explicitly under the regulations for medicinal products, e.g. via the EU's Medical Device Regulation. There is a large grey market in which commercial providers offer DBTs without much attention to possible vulnerabilities, let alone structural injustice, and potentially with an intention of gathering user data for other purposes. This market requires regulation, just as markets for addictive substances or drugs. While questions of privacy and the regulation of data markets have received some attention in public discourse and have led to influential legal frameworks such as the European General Data Protection Regulation, DBTs need to be addressed from a broader range of perspectives and governance approaches in order to address issues such as those we outline in this paper.

A useful lens for thinking about possible regulation is consumer protection law, which can cover DBTs beyond the scope of medical device regulation. It can prescribe mechanisms that draw on the idea of 'cooling off' periods (e.g. a reminder after a certain period of usage of whether one wants to continue it), allowing consumers to revert decisions made in the heat of the moment. It can also require the provision of certain kinds of information to users, or forbid market claims that lack a scientific basis. For users such as Alex, with high levels of education and sufficient amounts of free time, it may be possible to access such information even if it is hidden in small print and expressed in technical jargon. In contrast, users like Nadine, who might lack the educational background and the temporal resources to study pages of small print, might benefit if certain pieces of information were made available in a standardized, easy to grasp

way, comparable to the 'traffic light' schemes that some countries mandate for nutritional information (and of course, there are also deeper questions about how social structures could be changed in order to decrease the pressures that make Nadine so vulnerable in the first place).

For types of data that are particularly sensitive, regulation might prescribe standards of software- and hardware-based encryption for the transmission of data, based for example on methods such as differential privacy (Winograd-Cort et al., 2017) or homomorphic encryption (Khedr & Gulak, 2018) and other approaches (Kellmeyer, 2019a). It might also ban the use of commercial models, or of models of 'data against usage' when particularly sensitive data are at stake. This might be justified as protecting vulnerable groups against offers that would add new vulnerabilizing factors to already existing ones.

A somewhat 'softer' governance approach is the use of certification systems, either on a mandatory or on a voluntary basis. An obvious step would be a certification system for data and device security, which would be beneficial for all users – vulnerability to data abuse is, after all, a vulnerability shared widely across demographics. Companies who integrate DBTs into their occupational health policies might then recommend only DBTs that are certified as fulfilling certain standards with regard to data security and use. As some technology companies are already implementing such privacy certification in their online stores (Statt, 2020), it remains crucial that policymakers do not leave the protection of privacy to the very companies that created (or substantially contributed to) the problem in the first place. Instead, they should provide a set of mandatory criteria, or even binding, internationally harmonized laws and regulations, that ensures democratically legitimized governance and oversight of DBTs.

Moreover, DBTs could be certified with regard to specific health issues. For users such as Nadine, who look for a solution to a specific issue (obesity, in her case), this would be useful to help them understand what kinds of behavioral changes are actually useful, evidence-based strategies. Another, more complex, question could be: how could the technology be designed so that it acknowledges and improves structural injustices? And of course, the bigger issue here is how the social structures would have to be changed such that the *social* determinants of obesity are addressed.

Another possible form of regulation is that DBTs could be certified according to their suitability for certain age groups. Children and teenagers are, arguably, particularly vulnerable to certain forms of digital marketing and digital manipulation that play on their need for belonging, social standing and their neurobiological vulnerability of a not yet fully developed capacity for controlling reward-seeking behavior (such as games or gamified apps). Moreover, children and teenagers who lack psychological support from parents might be particularly vulnerable to promises of fitness or other ways of 'managing' one's well-being. Just as movies and TV series are indexed to certain age thresholds in many countries, the same might be appropriate for certain DBTs.

Moreover, educational strategies should go beyond unspecified calls for 'digital literacy' and provide a detailed roadmap for how children and teenagers can be enabled to understand how DBTs work, what typical pitfalls are, and how their own vulnerabilities might be exploited, for example in apps that use methods of 'gamification' (Livingstone & Third, 2017; Livingstone et al., 2017).

To summarize, DBT regulation requires an integrated approach to informational privacy and security that takes vulnerabilities (at the individual and societal level) as well as the underlying social structural factors into account. To this end, regulators and policy makers need to develop a context-sensitive understanding of how structural injustices may increase existing or add new vulnerabilities for users of DBTs to protect individuals, as well as vulnerable groups, from undue harm while at the same time enabling the potentially positive impact of DBTs on well-being and human flourishing. In addition to regulatory policies and consumer protection laws, a multi-level governance approach to DBTs also encompasses the level of professional and industrial standards. In the context of certification systems for DBTs, developing clear professional norms at the level of coding and other aspects of software engineering (e.g. user interface design) could become an important mechanism for ensuring quality standards in DBT development.

Finally, to enhance the *emancipatory* potential of DBTs, attention should be paid to ways in which they could be used by individuals or groups in order to improve their situation. For example, communities of patients that are brought together as users of a certain app might be given a voice in its creation and further development. A decision in favor of open programming interfaces can enable tech-savvy users to modify and improve apps. In such ways, DBTs can become part of the toolbox that disadvantaged groups can draw upon – not in the sense of technological 'solutionism' that could replace other types of activism and reform, but as one possible tool for connecting with each other and for articulating and addressing specific problems.

The suggested steps are reformist, in the sense that they do not assume a complete overhaul of the current socioeconomic order, but instead aim at improvements over the status quo. As mentioned earlier, they should go hand in hand with reforms that address the underlying vulnerabilities, vulnerabilizing factors and structural injustices, which the arrival of DBTs makes all the more visible. A remaining challenge is that if certain countries were to take such regulatory steps, companies and users might still be able to sidestep them in the global infosphere (Floridi, 2014). But the suggested steps would nonetheless provide a certain degree of orientation and help users better understand the evolving ecosystem of DBTs within the larger data economy. To be able to give granular and actionable recommendations for policies and regulatory reforms, given their potentially far-reaching implications, in our view, should be based on systematic ethical reasoning and evidence from, inter

alia, quantitative and qualitative social science, psychology and economics research.

## Conclusion

In this paper we have introduced the concept of digital behavioral technologies to describe the emerging market of health and fitness apps and wearables that collect user data and entice them with a promise of improved self-control and behavioral changes. We have drawn on two discourses for understanding potential risks and harms connected to DBTs: the discourse of vulnerability and the discourse of structural injustice. We have argued that the introduction of DBTs needs to be considered not only from an individual, but also from a societal perspective, considering their potential impact on different groups. We have also briefly discussed possible steps for legal and regulatory responses that could make sure that DBTs can unlock their positive potential without harming individuals in disadvantaged positions.

These arguments have implications both for those interested in social justice (whether researchers or practitioners/politicians) and for those working on DBTs (again both researchers and practitioners, including creators). For the first group, attention to the uptake and development of DBTs can be an important building block in understanding current technological developments and their impact on social justice. While problems of discrimination in algorithmic decision-making systems have already been discussed by social justice theorists (for an overview see Herzog, 2021), the potential impact of DBTs on individuals' lives and society has hardly been taken into consideration. Especially when it comes to proposals to integrate DBTs in programs offered by employers, health insurers or public institutions, attention to their potential downsides, in particular for individuals who are already disadvantaged, is needed.

On the other hand, those who create DBTs or promote their usage (and also those who do research about them from other perspectives) need to be aware of the potential impact on vulnerable and socially disadvantaged users. DBTs are introduced into multi-dimensionally unjust societies, and while some potential risks and harms can be anticipated from the armchair of the philosopher or the committee meeting of a group of developers, it may not always be clear what unintended consequences the introduction of DBTs may have. One strategy for understanding risks and preventing harms is to involve potential users from various socioeconomic backgrounds from the very start, and to integrate their perspectives into the development of DBTs in the spirit of participatory design and innovation (Kellmeyer et al., 2019). This could happen, for example, by involving potential users in the design and co-creation of DBTs for example in 'living labs' (Bergvall-Kareborn & Stahlbrost, 2009) or 'real-world laboratories.' Its members could interact both with technical experts

and with experts on the social determinants of health or other socioeconomic issues, but they could also bring their own situated knowledge and lived experience to the table. Such proactive measures by companies and communities could go hand in hand with regulatory approaches. In this way, the chance that DBTs can unfold their positive potentials without doing harm or adding to the vulnerabilities of already disadvantaged users would be increased.

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## Data availability statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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