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INTRODUCTION

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Over the last decade, we have witnessed rapid development and widespread of digital tracking devices, apps, and platforms, together with the emergence of global health movements, such as the Quantified Self. Millions of people around the world are now routinely using such technologies to track, document and analyse their physical activities, vital functions, and daily habits, all with the aim to assess and improve their health, productivity, and wellbeing. And with the current Covid-19 pandemic, the uptake of such technologies has accelerated, as tracing apps, biometric techniques (such as temperature monitoring, thermal imaging and facial recognition) and health data gathering and analysis have become important *dispositifs* for managing the pandemic at the governmental and personal level.

At the heart of such fast-growing trends lies the *quantification of the body* deemed as a key element in both medical practice and personal self-care. Although the latest developments in metric and tracking technologies have dramatically expanded the scope and reach of body quantification, quantification itself, as a process, is not unique to the current era and its technological prowess but is inherent in the history of modernity itself. As Noji, Kappler and Vormbusch (2021, p. 261) argue, 'the history of modernity is also the history of increasing instrumental knowledge about the human body and its "health status"'. And generally, people have long reflected on the state of their bodies and health for centuries using analogues devices and diaries (Sysling 2020, p. 108).

From a historical perspective, quantification became all the more important thanks to Galilei and particularly to Newton, the first to conjugate mathematical reasoning and strict observations based on measures of natural facts and phenomena. But such development could not have been conceived and introduced without a preliminary work of application of measurability on a key place of ancient natural philosophy, that is, the human body. A special kind of body among the bodies that constitute the physical world, the human body is such that – in the wake of the Vitruvian view of a *physis* structured by proportions – classic philosophy made of it the "natural parameter" for the measurement of nature. According to the Roman architect, Vitruvius, even human artefacts had to follow 'an exact system of correspondence to the likeness of a well-formed human being' (Vitruvius 1999, p. 42).

In no way both modern natural scientists and epistemologists could approach nature through abstract signs and measures without a preliminary reduction of the body to a quantitative model. It is no accident that they could find in medicine a rising tradition of natural philosophy that, since the early 17th century, started quantifying the human body by measuring the physiological processes which structure living organisms. Santorio's famous weighing chair is only one perspicuous example among the many

early modern attempts to convert the body into a quantifiable being, by measuring it through specific instruments. And while the body reflects a view of the natural world, it tests *in corpore* a new approach to observations and a new way of scientific reasoning, based on instruments and signs rather than on qualitative remarks.

By converting the body into the language of measurement and quantification, early modern medicine treats the body as the border territory where two contrasting conceptions of nature and natural science oppose one another: on the one hand, the ancient idea that nature is intrinsically qualitative and intelligent-like, so that it can be understood just within its inner logic, identifying hidden relationships, proportions, and connections in it. On the other hand, the new idea that nature must be examined and anatomised by placing it on the table of artificial ways of reasoning, as signs and numbers are.

Hence, early modern medical quantification of the body provides a pivotal condition for the new epistemological approach of modern science, and it constantly accompanies its evolution in parallel. No quantifiability of natural phenomena could be complete and plausible without the quantification of the body. By measuring the microcosmos of the body, early modern quantification of nature sought to make plausible that mathematics could be applied everywhere in the natural world. On this basis, in the modern age, the qualitative dimensions of natural phenomena are gradually supplanted by their measurable quantitative dimensions, so that, as Isaiah Berlin recalls, 'only the measurable aspects of reality were to be treated as real' (Berlin 1956, p. 17). As such, the concrete possibility, opened by medicine, of immediately converting the living body into numbers has also contributed to enhancing the idea of *Mathesis* as a metaphysical key for a comprehensive (and often deductive) understanding of the world. This is a pillar of the modern worldview from which even contemporary post-positivistic mathematisation of the world stems. But if it is true that a mathematised science, as well as an algorithmic society, cannot exist without measuring nor without the instruments that facilitate the conversion of the world into numbers, such an apparatus cannot be effective if our natural medium, the body, is not already (and problematically) made homogeneous to the quantification system. This is why early modern medicine, before philosophy or physics, has been responsible for making of such a convertibility of mathematics and reality something obvious.

As is known, over the history of modern philosophy one can find many important instances of such a modern tendency to see mathematics as a universal logic, able to embrace everything. Among the many well-studied cases, two examples would be adamantine. According to John Locke, for instance, the applicability of numbers to 'everything that either doth exist or can be imagined' (Locke 1979, p. 205) reveals its universal character, founded on its unwavering and unique unity to organise human mind and human thought. Thus, the number 'is that which the mind makes use of in measuring all things that by us are measurable' (Locke 1979, p. 209). Likewise, Locke's opponent, Gottfried Wilhelm Leibniz developed his infinitesimal calculus with the broad goal of mathematically standardising the mathematical understanding of the transformations that occur in the world. And with his *Machina Arithmetica* (1685), Leibniz intended to empirically materialise a universal method, liable to convert the

laws of reason into the laws of calculation. In addition to providing the detection of errors that could affect reason, Leibniz's arithmetic machine aimed to extend calculability beyond the natural limits of the human mind, making of reality something intrinsically predictable and deducible in terms of geometric-mathematical reasoning[1]. At the same time, the Leibnizian arithmetic machine aimed, according to a fully functionalist principle, to free human beings from the arduous task of performing the calculation for themselves. Although manipulated by human workers, the technological imperative was for the machine to free itself from the "hand" to nurture the "mind." Such imperative can be seen as a precursor to the need of designing automated technological means, as in today's digital culture and the burgeoning developments in Artificial Intelligence.

Despite such metaphysical and epistemological outcomes, the idea of nature as intrinsically quantitative and quantifiable remains inherently based on the pillar of the quantifiability of the living body and its processes. To the point that, in the late 18th century, one can find interesting cases of a recovery of the ancient idea of the body as a natural unit of measure, now conciliated with the modern conception of measure as intrinsically mathematical and algebraic. It is especially the case of Étienne Bonnot de Condillac, who, in his *La Langue des Calculus* (1798), undertakes a true philosophical panegyric about the scientific virtues of algebra as an exceptional and perfect non-arbitrary symbolic language. One of the uniqueness of his book lies in the relevance that the French author attributes to the relationship between calculation and bodily action. Right in the first chapter, entitled *Du calcul avec les doigts*, Condillac asserts that, originally, calculus refers to a human operation carried out with the fingers, just as language in general has action as its first reference (Condillac 1877, p. 7).

The ten fingers of human hands are, therefore, in Candillac's analogical reasoning, the starting point for imagining a series of numerical units and thanks to which it becomes possible to perform linear mathematical operations and represent them for ourselves. Going further in his kinesiological approach, the author states that all forms of calculation can be reduced and explained by means of two opposite movements performed by fingers: the successive opening of the fingers to count (add or multiply) is equivalent to "*numération*" [numbering] and, conversely, the successive closing of the fingers to subtract or divide is "*dénumération*" [de-numbering]. From this analogical point of view, to open the fingers then means to add, and to close them means to subtract – which is the same as to say that a sensory-motor act supports a mental operation that is specifically mathematical.

The analogue relationship of calculus with the body and the actions performed by it is particularly emphasised when Condillac, in another chapter of *La Langue des Calculus*, sustains that the measurement of space is one of the first tasks that human beings perform. In his words, nature itself has endowed us with an organic measurement faculty, which is why it is only necessary 'to count the steps, the feet, the inches, to

[1] Worth noting here, however, that Leibniz was a great defender of the irreducibility of the "essence of life" to the mechanical model. For him, quantification and mechanisation explain how life happens, but not why (see Leibniz's notion of *vis viva*).

be able to imagine several other forms of measurement' (Condillac 1877, p. 110)[2]. Before these formulations, in his famous *Traité des Sensations*, Condillac had already attributed a superlative cognitive function to touch, since, according to him, it is the haptic senses that truly give unity and objectivity to the phenomena apprehended by other sensory modalities. Condillac's sensualism is replete with a mathematical view of nature and beings; indeed, it highlights, above all, the *esprit systématique* that the Enlightenment philosophical thought inscribed both in natural sciences and in the humanities.

However, the core alliance between technology and science established in early modernity reaches a new level with the technological invention of artefacts with integrated mathematical measurement systems – as was the paradigmatic case, for instance, of the invention in the early eighteenth century of the mercury-in-glass thermometer. Soon these artefacts became impregnated with instrumentalist approaches to reality. Equating organisms and quantifiable beings greatly favours biological determinism and anthropological comparison methods anchored in measurement and quantification processes. In the nineteenth century, theories of biological determinism supported several forms of body quantification, such as those of anthropometry, a technical approach to human measurement and classification founded by the French police officer, Alphonse Bertillon, in the 1880s. While craniometry promised a cataloguing and ranking of human races, Cesare Lombroso's criminal anthropology of *l'uomo nato delinquente* tried to locate the genetic and hereditary background of delinquency. At the end of the century, and with Francis Galton's psychometry, further attempts were made to standardise the relationship between body and mental faculties, with the aim of quantifying the alleged intelligence level of each human being.

While scientific research continued to explore new possibilities of quantification and invest in new tools to achieve such goals, some of twentieth century philosophical thought attempted to break away from quantitative ideals and positivist heritage, showing how the body is irreducible to calculation and measurement techniques. 'Measurability belongs to the thing as *object*,' argues Martin Heidegger (2001, p. 98) who also adds that 'measurability means calculability, that is, a view of nature guaranteeing knowledge of how we can, and how we must, count on its processes' (2001, p. 104). For Heidegger, the body is unmeasurable to the extent that it cannot be perceived as a simple object, that is, as something that allows itself to be entirely represented, mediated, and quantified. On the contrary, what makes objects

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[2] What springs to mind here is ORLAN's *MesuRages* (1974–1983), a performative artwork in which the French artist uses her body as a unit of measure (ORLAN-corps) [ORLAN-body] to measure public spaces and cultural institutions, including Centre Pompidou in Paris, Saint-Pierre Museum in Lyon and the M KHA in Antwerp. MesuRages is not only about "*mesure*" [measure] but also "rage", the artist's anger at the dictum of 'man as the measure of all things, as found in the teachings of the ancient architect Vitruvius and illustrated by Leonardo da Vinci in his famous drawing of the Vitruvian man' (see, http://www.reactfeminism.org/nr1/artists/orlan_en.html). Through *MesuRages*, ORLAN ritualistically inscribes the female body onto public spaces and cultural institutions, occupying that which has been historically and exclusively dominated by male power.

measurable, according to Heidegger, is not only a technologically supported human capacity, but also the very "thing" dimension of objects.

Regarding the field of medical care, Hans-Georg Gadamer, in *Über die Verborgenheit der Gesundheit*, radicalises the Husserlian phenomenological distinction between the "living body" (*Leib*) and the "lifeless body" (*Körper*) – in the latter, the body is considered as merely a physical object –, and Heidegger's account of the body's immeasurability, arguing that health cannot be subjected to conventional technical measurement processes. If there is any form of measurement, according to Gadamer, this can only be an internal and subjective measurement, felt through the symbiotic relation of the body with the individual's own states of mind (Gadamer 1993). The reason is that, for Gadamer, quantitative conventions – like those of scientific measurement techniques – do not cover the true states of somatic equilibrium, which, according to him, obey a kind of natural measure inherent to the body itself and which is not, in turn, translatable by any numerical system. Being sick and feeling sick are, consequently, two different states. Likewise, George Canguilhem (1991) believes that it is the patient's perspective that defines the *experience* of being sick. He argues that 'medicine always exists *de jure*, if not *de facto*, because there are men who feel sick, not because there are doctors to tell men of their illnesses [...] Health is life lived in the silence of the organs' (Canguilhem in Diaz-Bone 2021, p. 295). This, in a way, gestures towards the importance of the individual/patient rather than only science and medical expertise in defining what health and sickness are in the first place, a standpoint that is a heart of contemporary movements such as the Quantified Self, biohacking and so-called "personal science" (Wolf and de Groot 2020) whose primary aim is to regain individual autonomy and reclaim agency from the clatch of medical expertise and its "one size fits all" approach.

Canguilhem, and later on Foucault, devoted much effort to scrutinising and unpacking the normativities and assumptions underpinning life sciences and medical understandings of what is healthy, what is normal and what is pathological. Their work, which resonates in recent literature on self-tracking and body quantification, has been instrumental in removing the veil of positivism to uncover the link between discourse and medicine, the effects of social and political forces on science, and the relationship between "power" and "knowledge" in the health system. One key lesson to be drawn from their analyses is that no science or technological process is neutral or value free. Every system and every practice, whether social, political, scientific or personal tends to be imbued with a set of norms and values that are derived from various sources and pre-existing rationalities. The quantification of the body is no exception. That is not to say that the individual has no agency in terms of negotiating and appropriating the values and norms of a given practice. But often, consciously or unconsciously, one tends to be "oriented" towards particular norms or conventions that are not wholly self-generated but originating from external sources and standardised measures – for instance, the recommendation to eat five vegetables or fruits a day and walk 10,000 steps per day which became the baseline for healthy active lifestyle. A similar argument could be made vis-à-vis the design of self-tracking devices and apps, which is mostly decided by technology companies themselves who

introduce and embed new standards and categories which determine what is measured and why (Cappel 2021, p. 240). As Diaz-Bone (2021, p. 305) postulates,

> The categories (and algorithms) have been implemented by technology companies and the resulting categories and data are in many cases neither controlled nor understood by users or adopted to their health practices and their health situation. The underlying measurement conventions are invisible for users and in case the data is transferred to the provider of the app, there is also an informational asymmetry in data analysis and its economical exploitation.

Herein lies one of the challenges and limits of contemporary forms of digital body quantification and self-tracking. Despite the promise of individual autonomy and agency, users are still bound by the design choices of product developers, by existing norms around health and by the market forces of data capitalism. Self-quantification and tracking practices thus sit at the 'fulcrum between self and external control, the objectification of the self, and regulation in accordance with social norms of "health"' (Hille 2016). This is why building one's quantification and tracking tools has become a major preoccupation for the techno-savvy members of the Quantified Self community who rely on their own technical skills to find ways to circumvent both the medical system as well as the tech industry. However, for the everyday general user, relying on commercial products is not so much a choice but an inevitability.

Moreover, body quantification and tracking technologies have become increasingly intersected with surveillance and control mechanisms, not only within governmental institutions and private organisations but also at the personal, intimate level. We now use biometric fingerprints and facial scans to unlock our smartphones or log into our bank accounts; we use MobilePay to purchase our groceries; fitness trackers, such as Fitbit, to log and analyse daily exercise; period trackers, such as Clue, to manage fertility and menstrual health; voice recognition to interact with virtual assistants such as Amazon's Alexa; contact tracing apps and thermal scanners to detect and contain the spread of coronavirus; and soon, Covid-19 vaccine passports and biometric immunity status apps to access pubs and restaurants, travel across borders, and return to work premises. A very recent survey by YouGov (2021)[3] in the UK revealed that most British people support Covid-19 vaccine passports despite privacy concerns and the potential of such systems to create and exacerbate forms of discrimination, exclusion and inequality. The Covid-19 pandemic has, indeed, normalised surveillance even further and made the quantification and tracking of the body all the more routine.

It is with this background and these issues in mind that this multidisciplinary volume proceeds to tackle the quantification of the body in its various contexts, shedding light on some of the key ontological, ethical, political, and aesthetic issues that arise out of the complex intertwining of bodies and measurements. By bringing together both established and emerging authors working at the intersection of philosophy,

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[3] See, https://yougov.co.uk/topics/politics/articles-reports/2021/04/12/covid-certificates-where-do-public-stand

sociology, history, psychology, and digital culture, this book provides multi-layered and nuanced analyses of the various facets of quantification and self-tracking practices, offering a critical engagement with the ways these practices are reshaping our relation to health and our bodies. The book is divided into four parts, each of which addresses specific angles and themes, including subjectivity and perception, Cartesian dualism and embodiment, gender and the quantification of the female body, wellbeing and mental health, as well as Artificial Intelligence and prosthetics. By addressing these overarching themes through a variety of theoretical lenses and empirical examples, the book makes a useful and unique contribution to existing literature, highlighting what is at stake in today's ever-growing culture of quantification and tracking.

PART I, *Body Quantification and Subjectivity: Philosophical Perspectives*, opens with Joaquim Braga's chapter which explores the imaginary of the body underpinning the self-tracking ideology, linking this to relevant philosophical debates. According to Braga, the classic way of understanding the body in Western thought comes from a combination of two complementary approaches: on the one hand, the body is taken as a subject of representation, and on the other, it is considered as an articulation metaphor. Both these notions contribute to seeing the body as an artifact, leading to a constant misunderstanding of it through a "paradigm of visibility" and through, what Braga calls, "metaphors of appearance" (the body as a natural semiotic being, a *vera icona*) or "disappearance" (the mediated body as disembodied and dematerialised). Contemporary body quantification lies, for Braga, in substantial continuity with such misconception of the body and its materiality, which was already preeminent before the rise of wearable technologies (for instance in pre-digital concepts of virtual reality or virtual space). In such a technological imaginary, quantification reinforces a Cartesian model which reduces the body to a mere object of information. In response, Braga exhorts to understand the body as an open and active intersection of possible mediations, and to consider it not just as a passive being or an inscription surface of events (as Foucault himself defined it) but as an autonomous meaning-maker that is irreducible to the mere status of an 'object.' Chapter 2 by Lorenzo De Stefano is dedicated to examining the interplay between self-tracking practices and subjectivity. It provides philosophical reflections on the cultural phenomenon of the Quantified Self and the extent to which this phenomenon contributes to the making of new subjectivities as well as forms of 'de-subjectivation.' Drawing on Material Engagement Theory, Heidegger's take on the 'question of technology' and Foucault's 'Technologies of the Self,' De Stefano highlights how recent techniques and practices of self-tracking have unlocked new ways of self-analysis and introspection which extend and remediate former practices, such as confession and journaling. While such developments are contributing to enhancing our understanding of the self and deepening awareness of the body and its vital functions, they are also encouraging a reductionist perspective that is driven by data and numbers. These developments are, as such, cultivating a 'quantitative aesthetics of individual existence' that is underlined by deeper biopolitical and technocratic phenomena, according to De Stefano. What is at stake, in this sense, is the way self-tracking practices can lead to a de-subjectivation of the user whereby data and apparatuses end up acquiring more power and agency over the life of the subject. Chapter 3 by Alessandro De Cesaris continues the

discussion on the forms of subjectivation involved in self-tracking practices, asking what kind of "self" is being produced through the subject's personal engagement with tracking activities. The focus of this chapter is placed on the extent to which self-tracking practices and quantification devices can be regarded as "care of the self," in the Foucauldian sense, and how "design" is the way of thinking that shapes the interaction between users and their devices. Self-tracking, as such, is seen as a product of design, understood as a specific way of conceiving, and organising the interaction between the subject and technical objects. This raises, again, questions around notions of autonomy and empowerment since users, according to De Cesaris' analysis, no longer track themselves per se, but instead, they are tracked by digital devices that act as prosthetic extensions of their bodies, enabling automated quantification. Ultimately, the question becomes whether self-tracking practices can be considered as a form of "delegated subjectivity" or whether such practices allow the subject to overcome automation and passivity.

PART II, Body Quantification: Historical and Empirical Perspectives, begins with Chapter 4 by Rachel Kent which provides a historical account of health tracking and body quantification in the UK. This chapter aims, in particular, at showing the impact of neoliberal policies on public health and its ideological residues in today's practices of self-management of health. According to Kent, the implementation of the neoliberal policies is responsible for reorganising the very notion of public health and the National Health System established after World War II. The core of such policies can be found in the relocation of responsibility for health from public institutions to individuals themselves, all under the narrative of "liberating" people from the alleged intrusion of the state. Some of the effects of neoliberalism have been the increasing privatisation of health institutions and the rise of "healthism," that is, the political discourse of lifestyle correction and health moralism. From this phase, which reached its apex with the Great Recession in 2008, the responsibilisation of individuals for their healthy or non-healthy behaviours comes together with a moralisation of health. The latter identifies a direct link between economic and social factors and self-discipline, dividing the population into healthy or unhealthy social groups. For Kent, this historical path is the premise and the ground for the contemporary techno-utopias of self-quantification and self-management of health, often presented as emancipatory strategies. Such ethos reinforces all the more the ideal of "private" health, often conflating better healthcare with "more" healthcare. The current COVID-19 pandemic has strengthened even further the hold of quantification on society, enabling digital surveillance practices and the infrastructure of digital capitalism to consolidate their invasion of people's everyday life, all in the name of health itself. To better understand and appreciate the impact of quantification and self-tracking, it is necessary to engage with the concrete aspects of such phenomena and their material dynamics. Chapter 5 by Btihaj Ajana does precisely that. It analyses body quantification and self-tracking from an often-neglected perspective, the user's direct experience. As Ajana remarks, self-management of wellness, and more broadly the emergence of a "self-wisdom through numbers," have been approached from many theoretical and academic perspectives in the last decade, most of which descend from well-established conceptual families in Western thought, such as positivism, biopolitics, post-phenomenology, actor-network theory, Marxism, and surveillance studies. Ajana's

chapter builds on and extends existing debates by drawing on an original empirical study comprising of an international survey with users of self-tracking technologies. This methodology lets users themselves report their own experiences, and then applies a theoretical analysis to the resulting data. What emerges from Ajana's investigation and analysis is a two-faced experience of digital self-management. On the one hand, especially through gamification, self-tracking displays positive motivational features, encouraging healthier and more active conducts that reflect directly on people's lives. On the other hand, the deployment of tracking technologies often leads to excessive self-monitoring and self-impositions, resulting in performance anxiety, particularly when the user shares her health data through social media and related platforms. Reflecting on the latter, Ajana points out the implicit political danger of today's alliance between capitalism and self-tracking, in particular the anatomo-political risks of current biosocialities, the colonisation of private life through data, and the many issues hidden behind data exchange/sharing or data philanthropy. Chapter 6 by Amanda Karlsson provides further empirical insights by looking at the monitoring of menstrual cycles through smartphone applications. One of the key arguments of the chapter is that self-tracking technologies, developed for "bodies who menstruate," can promote a uniformity of the female body, equating the control of menstruation with the supposed control of fertile cycles. Taking cue from feminist critique of biological reductionism, Karlsson suggests that gender stereotypes are intrinsic to technological design itself and reinforce normative and reductionist ideas about the female body. But this reductionism and stereotyping are primarily situated in the algorithmic quantification processes of the body. At the level of knowledge production and sharing, there is a greater interweaving of the various materialities that support the relationships of bodies with technology. This constitutes possibilities for expression and emancipation of the female body, no longer restricted to the stereotyped discourse of fertility or, in other words, of the woman's body as a reproductive body. Using several sources of empirical material (interviews and observations carried out between 2017 and 2019), the author raises the hypothesis that the exchange of information and knowledge between women about their bodies can generate a new social movement, a "techno-feminism", capable of shaking social stigmas and leading to significant cultural transformations. What underlies this change is, above all, the possibility for interaction that the new self-tracking technologies allow, since their users are not limited to keeping quantified information to themselves but share and discuss it among themselves.

PART III, Body Quantification and Mental Health, shifts the focus towards the relationship between quantification and mental health. It begins with Minozzo's chapter which provides useful reflections on the affective dimension of anxiety through a critical engagement with the recent history of its diagnosis and treatment in the context of psychological care. A key argument in Minozzo's contribution relates to the way mainstream psychiatry and the growing wellness industry reduce the subject to the status of the "dividual," that is to say, a form of alienated ontology that is based on consumption, identification, and endless quantification, through which individuals become data and numbers. "Dividuality," as Deleuze argues, is also characteristic of the 'society of control' in which we live, and whereby self-surveillance and algorithmic profiling have become a primary form of governance. What transpires

out of this dividuation process and in relation to diagnoses and treatments of anxiety and depression, is the loss of the possibility of experiencing a "subjective truth," according to Minozzo, since the constant pathologising and medicalising of anxiety and the desire to eliminate it, in today's culture, end up depriving the subject from the ability to delve deeper into the root causes of suffering and malaise and the opportunity to learn lessons from such experiences. The ethico-political question thus becomes: 'can the dividual speak?' And, if so, is the clinic ready to listen? The next chapter by Zeena Feldman also considers the issue of mental health but within the broader context of digital culture. Focusing on the increasing use of smartphones in the treatment of anxiety and depression, this chapter provides a very useful mapping of available apps in the UK that are dedicated to mental health and wellbeing, offering critical reflections on the ways these technologies reframe what mental health is in the first place and shift health responsibilities onto the individual. Feldman begins by tracing the key shifts in digital culture with regard to hardware, software, and content evolutions. She then proceeds to develop an analytical framework revolving around four key components, namely the intended audience of mental health apps, their communicative affordances, business model and, finally, therapeutic approach. From here the author develops the concept of *me apps* to account for the increasing individualisation, commercialisation and desocialisation aspects that are characteristic of the smartphone era. The chapter ends with some reflections on alternative ways of designing technologies of mental health that are oriented towards more collaborative understandings of digital culture and wellbeing.

PART IV, Body Quantification and Smart Machines, considers issues of embodiment, perception, Artificial Intelligence (AI) and smart technologies. Behind a "smart machine" there is always a "smart worker." This maxim is effectively developed by Phoebe V. Moore, who wants, above all, to show that the working world of "smart AI trainers" should not be equated with mere digital voyeurism which often implies negative and traumatic experiences, as reported by some of Facebook's moderators. Instead, Moore's chapter considers the wider ontological and ethical issues concerning smart workers in the AI field. It interrogates how intelligence, through textual and image recognition, is depicted and derived, and what kind of embodied labour goes into such AI processes. The main theoretical challenge arising from the consideration of the working world of smart AI trainers comes from the social invisibility to which their work is relegated, resembling, in this sense, the very invisible operations that machines allow and produce. Given this fact, it is necessary, according to Moore, to place the value of work not only in the production, organisation, and manipulation of data, but also in the projection, conscious and unconscious, of human skills onto the smart machines themselves. Many of these skills transcend the domain of the mere quantification of the mental performance of workers and are directly connected with the material conditions that support the cognitive processes of work and the somatic conditions inherent in the bodies and embodied performances of workers. Knowing, in advance, that Artificial Intelligence appropriates these two dimensions – cognitive (mental) and material (manual) –, it is therefore imperative to recognise and protect the rights of such invisible workers and to ensure that the information collected from them is not discriminatory, but can help improve their working conditions, in term of both their psychological welfare and their wage

conditions. The next and final chapter in this collection focuses on issues related to the sensory sphere of sensations, bringing together quantitative and qualitative aspects relating to robotic research on the human body. Here the author, Laura Corti, starts with the case of the "neuroprosthetic hand" to show the theoretical and practical insufficiencies of a purely quantitative approach to the somatic processes inherent to robotic research. If this research considers only the information given by neural signals thereby reducing the touch to the mere manipulation of objects, there is, in qualitative terms and according to Corti, an omission of the subjective dimensions that are present in all perceptual tactile activities. To overcome the gap between information and sensation – still anchored in the Cartesian soul-body dualism –, Corti advocates a broadly phenomenological approach, rooted in the Husserlian idea of *Leib* (the living and lived body), in order to respond to those practical concerns of neuro-robotics vis-à-vis the coupling of information with the sensations of objects. Only through such coupling, Corti argues, could a better analysis of the complex relationship between prosthetic technologies and the human body (lived body) be made.

References

Berlin, I. (1956) *The Age of Enlightenment: The Eighteenth Century Philosophers*, Boston: Houghton Mifflin.

Canguilhem, G. (1991). *The normal and the pathological*. New York: Zone Books.

Cappel, V. (2021). The Plurality of Daily Digital Health. The Emergence of a New Form of Health Coordination. Historical Social Research 46 (1): 230-260.

Condillac, E.B.D. (1877). *La Langue des Calculus,* Paris: Librairie Sandoz et Fischbacher.

Diaz-Bone, R. (2021). Economics of Convention Meets Canguilhem. *Historical Social Research*, 46 (1): 285-311.

Gadamer, H-G. (1993). *Über die Verborgenheit der Gesundheit: Aufsätze und Vorträge*, Frankfurt am Main: Suhrkamp.

Heidegger, M. (2001). *Zollikon Seminars. Protocols – Conversations – Letters*, Trans. by F.K. Mayr and R. Askay, Evanston, Illinois: Northwestern University Press.

Hille L. (2016). The Quantified Self – ubiquitous control, http://www.digital-development-debates.org/issue-16-food-farming–trend–the-quantified-self-ubiquitous-control.html.

Locke, J. (1979). *An Essay Concerning Human Understanding,* Edited with a Foreword by Peter H. Nidditch. Oxford: Clarendon Press.

Noji, E., Kappler, K., and Vormbusch, U. (2021). Situating Conventions of Health: Transformations, Inaccuracies, and the Limits of Measuring in the Field of Self-Tracking. *Historical Social Research*, 46 (1): 261-284.

Vitruvius. (1999). *Ten Books on Architecture.* Translation by Ingrid D. Rowland Commentary and Illustrations by Thomas Noble Howe with additional Commentary by Ingrid D. Rowland and Michael J. Dewar, Cambridge: Cambridge University Press.