

Chapter 9

Quantifying the Body: Body Image, Body Awareness and Self-Tracking Technologies



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Introduction

Among the plethora of terms used to refer to self-tracking, “Quantified Self” (QS) is commonly employed to describe a community of people that attempt to gain “self-knowledge through numbers”, believing that tracking is an essential starting point to make a change in the direction of an “optimal self”. In Quantified Selfers’ perspective, precise measurements and accurate data interpretation should lead to better awareness and improved knowledge, informing their everyday decisions, shaping their future, and, eventually, their identity [1].

In QS rhetoric, technological devices can overcome the natural limits that people encounter when they seek to gain self-knowledge, like a poor sense of time, a limited, fallible memory, and cognitive biases that negatively affect the opportunities for collecting relevant information to make decisions. Exact numbers collected by technology, instead, are powerful as they are not subject to memory distortion and, most importantly, “*they hold secrets they can’t afford to ignore, including answers to questions they (people) have not yet thought to ask*” [2]. This belief is entangled with the empiricist idea that “observation” can convey a neutral, objective and clear comprehension of phenomena: unlike language, which is ambiguous and multivalent, data speak for themselves [3].

The availability of wearable devices and ubiquitous technologies recently boosted the popularity of self-tracking technologies even outside the strict circle of Quantified Selfers, reaching the broader population [4–6]. QS rhetoric then seeped

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into the everyday use of these technologies, which are now integrated into a variety of practices in domains as diverse as health, sport, wellness, and safeness.

Achieving “self”-knowledge is strongly emphasized within the QS discourse, but do these technologies really support the development of an integrated knowledge about the self [7]? Or do they fragment the image that we have of ourselves into a variety of unrelated patterns of data? In this perspective, the body and the representation that self-tracking technologies convey of it gain a central importance.

Self-trackers are involved in a complex process of knowledge development, but this cannot be achieved without knowing the body, as knowledge is always situated and embodied [8]. However, self-tracking devices seem to embrace an abstract and scattered conception of the body, based on unrelated numbers, graphs, and depictions. This representation appears to not integrate into a coherent image that takes into account the body complex nature made up of perceptions, proprioceptive sensations, and self-representations. This may turn into biases and distortions of how we look at our bodies, worsening, rather than improving, our self-knowledge [9].

In order to understand the ways through which the progressive “quantification” introduced by self-tracking technologies is affecting the body, we need to preliminary explore a series of theoretical constructs concerning the body, which appear to be addressed differently by literature pertaining to different disciplines (e.g., Human-Computer Interaction, psychology, sociology, neurology). This diversity may entail unclear definitions and theoretical overlaps that may cloud our understanding of the current changes produced by technology on our bodies. *How are the concepts of the body and the self conceived? What are their relations? What kind of relationship is there among body schema, body image, and body awareness?* These are some of the questions we address in the first part of the chapter. The second part, instead, illustrates how individuals’ body image and awareness are affected by the usage of self-tracking technologies in the sports domain. It clarifies the concepts introduced above, by surfacing how athletes use wearable data to inform their sports practices and eventually develop an understanding of their body. It shows both the opportunities and the risks introduced by the quantification of the body, by highlighting that self-tracking technologies may either increase the understanding of the athlete’s body, or turn it into a series of aseptic information, which may distance the athlete from her body sensations and excessively “rationalize” her sports activity. This part builds on the empirical data collected through 20 interviews conducted with amateur and elite athletes, which have been previously published in a TOCHI article [9].

The Self and the Body

Self-trackers are interested in achieving a better knowledge on themselves, which can be useful to enrich or change several aspects of their lives. At least in principle, this goal should be achieved by placing the body at the center of the knowledge development process. However, it appears that the body, in its materiality and multifaceted nature, is clouded in self-tracking practices.

A core concept in critical investigations upon self-tracking is that of “digital double”, also known as “data twin”, “data double” or “datafied self”, which results from data assemblages [3, 10]. These investigations emphasize that, albeit we naturally have a body made up of sensations, contemporary technologies feed back a “screen body”, an abstract object dematerialized in a variety of data points. The body becomes something to be observed from a distance, controlled and managed with the help of technology.

Contemporary medicine is certainly the field in which technology has produced the most visible shift in the way bodies are treated: in the clinical practice, the symptoms recounted by the patients are losing their relevance, in favor of the visual examination mediated by technology (X-ray, RM, TAC), which is in charge of finding the “truth” about the body [11]. Likewise, self-tracking devices collect data that are not immediately visible and display them to the user, generating a “virtual” version of the body, a repository of storable and processable data [12, 13]. As an emerging effect of the quantification of human body through biometric practices, bodies are turned into numbers [14]. Nonetheless, numbers are not the natural way through which we represent our bodies.

People have different ways to relate to their body and, through them, they interact with the world and build their own sense of the self. Body schemata, body image and body awareness are theoretical constructs that point to particular ways of representing the body. These body representations are built upon a set of sensations, which are the object of perception. Human beings, however, are not purely reactive agents and perception is not something that “simply happens to us” [15, 16] nor senses are passive receptors. Rather, cognitive, emotional and even cultural factors influence the perceptive process, even when we consider the most primary aspects of the body, such as the heartbeat, which are tracked and measured by self-tracking devices.

This entails that sensations and body processes cannot simply translated into objective numbers aimed at capturing the “immediate” nature of our body. Actually, our relationship with our body is mediate by our representations, and there is a considerable gap between body sensations and their subjective appraisal. The goal of the next paragraphs is to provide a greater understanding of the ways we have to mediate the relationship between the body and our selves.

Body Constructs

The scientific literature about body representations points out six main theoretical constructs that operationalize the way we relate to our bodies: “body schema”, “body image”, “body awareness”, “interoception”, “exteroception”, and “proprioception”. The first three constructs concern the representations people have of their own body, resulting from the integration of various signals (e.g., touch, hearing, sight) and their processing at different levels (e.g., cognitive, sociocultural). Instead, the latter refer to the perceptive processes concerning the state of the body in

relation to endogenous and exogenous stimuli. More specifically, proprioception is defined as the awareness of the body position and of the movements of the body; exteroception refers to the perception of the body arising from exogenous stimuli; interoception is a multidimensional construct that concerns the perception of sensations connected with body internal processes, like organ functioning [17–19].

Even though all these constructs are equally important to understand body-self relation, in the following we focus on the constructs concerning body representations, as they are more tightly related with the issues arising from the use of self-tracking devices to monitor body parameters.

Body Schema, Body Image, and Self-Tracking

There is large consensus in psychological and philosophical literature over the existence of two distinct types of body representation: body schema and body image [20, 21].

The concept of “body schema” has been first introduced by Bonnier [22] and further defined, by Head and Holmes [23], as a representation, mostly unconscious, of the body’s position in space. By contrast, body image is depicted as a more conscious and intentional representation of the body, or a set of beliefs about the body.

These ways of representing the body are essential for building the self: the internal stream of sensations, which makes a person feel the body as her own, has been recognized as central for developing a stable sense of identity. Contemporary neuropsychological research showed that both deficits and distortions of body schema and body image lead not only to a variety of deficits in bodily experiences, such as personal neglect, apraxia or autotopagnosia [21, 24], but also to more complex disorders, such as anorexia and bulimia nervosa [25]. Sometimes, distortions in body schema and body image may be intertwined in the same syndrome, without a clear separation between them [26]. Nevertheless, body schema and body image should be treated separately since they refer to different ways of representing the body, as we will see in the next paragraphs.

Body Schema

Body schema is a representation of the body’s spatial properties, a constantly updated postural model, mainly unconscious. The first investigations on body schema were focused on the somatosensory capacities of our bodies and their relation with the self [22, 23]. Later authors confirmed that the sensorimotor capacities of our bodies are fundamental for the construction of the self, as they shape our pragmatic possibilities to interact with the environment [21]. The fact that we have a body that moves in certain ways drives the way we perceive and act and this, in turn, contributes to shape our self in relation to the world.

The relation among sensoriality, movement, the body and, ultimately, the self has been further addressed by both ecological [among others, 27] and enactive or sensorimotor theories [e.g., 28]. According to the latter, sensory systems are active systems that function as simulators of action. Then, perception is connected with the ability of the brain to anticipate action by using internal models, which simulate and somehow predict the interaction among the body, the environment and other entities [15]. In other words, to perceive is, essentially, to simulate through internal models [29]. In this line, recent works enriched the concept of body schema by conceptualizing it as an integrated internal model of the body, which represents and simulates the spatial properties of the body and its surroundings.

To summarize, body schema is important for the interaction of the person with the environment, and having a coherent and stable body schema is essential for developing an integrated sense of the self situated in the world. The construct of body schema, however interesting, allows us to see only one side of the problem, as it focuses on the spatial aspects of perceiving and representing the body. It leaves apart representations that involve more complex factors, such as beliefs, emotions, and values, also including socio-cultural norms. To account for all these elements, it is needed to introduce a more complex construct, namely, the concept of body image.

Body Image

Body image points to a more conceptual representation of the body, even though a univocal definition of its characteristics is difficult to achieve. It appears to be connected with body schema, as the experiment of the rubber hand shows [30]. In this experiment, the body image acts in a top-down manner upon the body schema [20], making the individual believe that she feels sensations on a rubber hand. Body image also seems to be entangled with the evaluations people make of various characteristics of their own bodies (like shape and size), as well as the emotions associated to those evaluations [31].

Body image, therefore, is a cognitive representation of the body, but is not an exact copy of the body as it appears from the outside (as the image that the body reflects in a mirror), nor of the functioning of the internal organs or the autonomous nervous system [32]. Rather, body image appears to be related to the narrative aspect of the self, which concerns the stories that we tell about ourselves [21].

The close relationship between body image and the self is particularly evident in people with a distorted body image. Dissatisfaction with weight and body shape has been associated with several psychological problems: in particular, it is considered a predictive factor for eating disorders [31]. Moreover, researchers found correlation between Identity Problems, according to DSM IV, and body image: for example, Vartanian [33] emphasizes that the body defines the self and having a problematic body image may lead to an equally disturbed sense of the self. As there may be multiple representations of the body [29], individuals may have multi-faceted

self-definitions [34]. However, it is important that these facets are stable, coherent, and clear, since coherence is considered a protective factor with respect to bodily and identity disorders [33].

The complexity of body image construct is apparent if we examine how it is operationalized in questionnaires aimed at analyzing the body image. To assess body image more than 150 measures have been used [35]. Kling et al. [35] synthesized the psychometric properties of several self-report measures about body image: the revised Body Appreciation Scale (BAS) [36], the Body Esteem Scale for Adolescent and Adults (BEESA) [37], the Body Shape Questionnaire (BSQ) [38], the Centre for Appearance Research Valence Scale (CAR-VAL) [39], the Drive for Muscularity Scale (DMS) [40], the Weight and Shape Concerns Subscales of the Eating Disorders Examination Questionnaire (EDE-Q) [41], the Body Dissatisfaction subscale of the Eating Disorder Inventory-3 (EDI-3) [42] and, finally, the Appearance Evaluation subscale and the Body Areas Satisfaction Scale of the Multidimensional Body Relations Questionnaire (MBSRQ) [43].

This variety may depend on the multidimensionality of the construct, which led researches to develop different body image measures. Here, therefore, we can define body image as a multidimensional construct, which encompasses thoughts, attitudes, beliefs, emotions, and cultural values related to the body [44]. Body image, in fact, is also affected by cultural stereotypes associated e.g., to gender [45].

Self-Tracking

If we consider body schema and body image as representations that mediate our relation with the body, we can affirm that self-tracking technologies should account for this mediation. By collecting and feeding back data about our bodies, they do not simply transform our body processes into numbers, but also affect the ways we represent our bodies. Likewise, the ways we look at our bodies may impact on how we use self-tracking technologies. What role does body image play in self-tracking practices? What happens when people have the availability of a large amount of body data, which integrate (or do not integrate) into the images they have of their own bodies?

On the one hand, Edwards [45] showed that activity tracker use (i.e., Fitbit) may be affected by the image that users have of their bodies: dissatisfaction with body image does provide motivation for using a Fitbit and dissatisfied users look to improve their bodies in some way ($N = 9$; age range = 16–64; females = 5). On the other hand, the “schizophrenic phenomenon” can shed light on the issues that people are encountering when using self-tracking devices. For example, Hortensius et al. [46] pointed out the frustration and sense of fragility that trackers feel when they cannot link a measure (e.g., of their food intakes, or blood glucose levels) to their personal experience, or when the device prompts undesirable data ($N = 28$; age range = 40–76; females = 15). Numbers that are not coherent with the user’s body images seem no to give her any cues for improving her self-understanding: rather, they can lead to a sensation of despair [47].

People use narratives to constitute the self [48]. Such narratives are commonly built in retrospection, upon reminiscences: however, current perceptions and mental events play an important role in this process. The self is not something that merely lives in the past, through its memories, or in the future, through mental simulations: it exists here and now, in the *hic and nunc*, and it constantly changes along with our internal perceptions, experiences, and actions [7]. The “self”, therefore, is made up of a multitude and mutable representations, elicited by a flow of sensations and bodily actions that occur in the moment. The sense of coherence we experience about our self is due to more stable configurations that sediment over time, like body image, and to the narratives we tell us about ourselves.

Self-tracking technologies, to be effective, should then integrate into these aspects of the self, encouraging, rather than disrupting, a coherent image about the body and, consequently, a coherent narration about the self. In other words, people can effectively use self-tracking devices to build their identity provided that the “digital self” emerging from the data becomes integrated into the body representations and self-narratives they have constructed over time. More precisely, self-tracking technologies can develop self-knowledge, if they are able to support people in generating coherent images and stories about their body and their self [3, 48]. The integration of the data in a coherent self guarantees a stable sense of identity and serves as a protective factor for mental health.

In so doing, they should take into account the flux of mental and bodily events continuously affecting the “present self”, especially those of which the person is aware. This leads to consider the notion of body awareness, which differs from both the concept of body schema and that of body image, albeit is strongly connected with both of them.

Body Awareness and Self-Tracking

The “body awareness” construct emerged across a wide range of health topics and has been described as “an innate tendency of our organism to self-organize and to feel the unity with oneself” [49]. It stems from the concepts of proprioception and interoception, but has a more nuanced meaning.

Body Awareness

Interoception, as we have seen, refers to the perception of sensations concerning the internal parts of the body, like heartbeat and respiration. Nevertheless, there is a distinction among the actual body-related events, their subjective perception [50] and the way each person evaluates her ability to accurately identify internal body states, which is a metacognitive skill [51]. In this perspective, body awareness is more than the simple focus on one’s own body, as it requires recognizing the interplay between body states and the cognitive appraisal of those body states [52].

Therefore, body awareness may be considered as an interface between top-down and bottom-up information: on the one hand, there are visual, tactile, olfactory, gustative and proprioceptive stimuli; on the other hand, there is the cognitive-affective processing of those physiological perceptions [53].

Body awareness is a key element for affect regulation and for the sense of self [18, 54] and it strictly depends on mental processes, included attitudes, affects, beliefs, memories, and cultural imprints [54]. It seems, in fact, that those mental processes can modify the subjective experience of body parts and of the body in general.

Pylvänäinen and Lappalainen [55] highlight that body awareness and body image are strictly tied together. This is evident, for example, among depressed patients: it has been observed that depressed individuals having dissatisfaction with body image also lack mindful body awareness [55]. Likewise, patients with fibromyalgia overestimate their body size due to the experience of pain in certain body areas: “*as pain increased, the patients described changes in the perception of their body size and its relationship with space: they felt their body becoming larger and as though space was shrinking*” [56, p. 2]. We may say that body image refers to a more stable representation of the body, which has been developed over time, whereas body awareness accounts for the momentary conscious stimuli that continuously affect our bodies. Both the representations involve cognitive, emotional and cultural aspects.

Self-Tracking

Considering body awareness when we investigate self-tracking practices may allow better understanding the impact of self-tracking devices on the body, as well as their potential positive and harmful consequences.

Sharon and Zandbergen [57] argued that self-trackers use their devices to have a more “active and watchful mind”, helping them be aware of body sensations, actions, and habits that are commonly unperceivable. Self-tracking allows people to sense elements concerning their internal perception, like the time of the day, or to acquire new capabilities, like identifying the calories and the weight of a portion of food just by looking at it. “*In such examples, numerical data are not all the end-goal of tracking; they are more like an unsophisticated, intermediate stage towards more augmented senses.*” [57, p. 1700]. Here, self-tracking serves to raise bodily awareness, to learn to better feel the body through the data [3] and to improve the users’ confidence in perceiving their own body. Research confirmed that augmenting perception of body stimuli through data could improve body awareness [49, 58], and this could have positive impacts on people’s health [59].

However, paying more attention to body states by using self-tracking technologies may not be beneficial for all the individuals and, in certain cases, it may elicit discomforting sensations [4, 27]. People are different, are situated in diverse contexts, and have different reasons to collect data about their bodies: they may need to monitor very specific body aspects that may be crucial for their health, or to gain

another perspective on their bodily sensations. However, they can use self-tracking technologies also to reinforce some maladaptive behaviors.

An excessive focus on the self and on the body can be linked to emotional distress, anxiety and depression disorders, as well as eating disorders and sexual dysfunctions in certain individuals [60]. For instance, continuous health feedback, prompted by tracking technology, may worsen anxiety and stress symptoms leading to preoccupation with one's health, especially in people with certain personality traits, such as neuroticism and anxiety sensitivity [4]. This entails that self-tracking technologies should account for the different predispositions that different individuals may have, depending on their personality traits, and even on previous psychological disorders.

Moreover, body quantification may give an excessive emphasis to numbers and data to the detriment of feelings and sensations, yielding a sense of disembodiment [11, 61]. A virtual self, made up of disembodied data, could alienate the individual from herself and from the others. Berardi [62] stressed that alienation describes the contemporary age characterized by the impossibility of enjoying the presence of the other, in the form of physical presence. With the word "derealization", he refers to the difficulty of the "animated body" in accessing the "animated body" of the others. Technologies have made remote interaction possible, that is interaction in the absence of the bodies [63]. Nevertheless, "in presence" social interaction is considered fundamental for the building of the self [64]. We need others' corporality to grasp the nonverbal cues that tell us their attitude toward us and, finally, to understand who we are: when the bodies are substituted with data, and communication is replaced by sharing information, the risk is that we form a more opaque image of ourselves. Users, especially adolescents, who compare their "virtual body" with that of other users on social media platforms are more exposed to several health-related psychological outcomes, like anxiety, depression or sleep problems [65]. Technology may further worsen symptoms of people who already have trouble with their body image, as in the case of patients suffering from bulimia and anorexia nervosa using weight-loss app [66].

In sum, the quantification of the body operated by technology and its subsequent dematerialization open both opportunities for and threats to the ways we relate to our bodies and our selves. The double-edged consequences of self-tracking on body representations will be further exemplified in the next paragraphs, where we report on the findings collected during a qualitative study conducted with amateur and elite athletes about the use of self-tracking in sport. The next Section summarizes parts of the findings reported in Rapp and Tirabeni [9], focusing on how personal data are affecting the way athletes relate to their bodies.

Self-Tracking and Sport

We interviewed 20 athletes to investigate the impact of self-tracking technologies on physical activity.

Method

We recruited 8 amateur athletes (A1-A8) and 12 elite athletes (E1-E12) (mean age = 31,7; SD = 6,5; females = 8) who have been using a self-tracking device for more than three months, asking them to recount their experience with it. All the recruited participants owned a smartphone and a wearable device aimed at capturing sports-related data. While elite athletes competed at least nationally during their career, amateur athletes exercised at least three times per week, spending five hours or more practicing. We included in our sample different sports, involving both endurance and non-endurance athletes. The sports addressed were cycling, swimming, triathlon, cross-country skiing, ski mountaineering, trekking, alpinism, free climbing, soccer, and sprint running. Almost all the athletes were educated and numerate. We aligned the size of the sample to other Human-Computer Interaction (HCI) studies with similar purposes and design, also following a data saturation criterion.

The interviews were semi-structured and lasted an average of 58 minutes (min = 40 min.; max = 70 min). Questions were addressed to explore athlete's attitude towards their discipline, use of personal data, and effects of use of technology on their sports experience. We allowed participants to explore topics not listed in the interview guide, and we prompted new questions when we needed to better understand their recounts. Interviews were audio recorded and transcribed. The analysis of the collected data followed standard open and axial coding techniques. Data were coded independently by two researchers who generated initial codes. Then, they reviewed the codes to assess their consistency. All the discrepancies were discussed and resolved.

In the following we outline how self-tracking technologies affect the ways the athletes represent their own body. Most of the reported quotes are extracted from Rapp & Tirabeni [9].

Findings

Self-tracking devices, at first glance, appear to have a positive impact on body awareness, especially for amateur athletes. A1, for instance, reports that such devices provide him with "*an awareness that you couldn't have before*". Amateurs agree that trackers can support the athlete in developing a greater awareness of her body, by prompting fixed measures to which compare those signals that are tied to a specific level of heart rate. Being in a certain heart rate zone, in fact, is a primary goal for athletes who want to achieve a certain standard of performance: "*if you're within the zone and you know how you feel, then you try to memorize it, and then when you do a race or a workout, and you're without the heartbeat [tracker], you try to understand in which zone you are, if you're in a medium that you can manage for the whole race*", says E4 [9].

The device not only can make the athlete directly aware of internal body processes that she is not able to identify by herself (i.e., the heart rate); but also can support the athlete in learning how to “read” her body, in order to detect such hidden processes. When the athlete feels certain body signals, she may not be able to retrace them to a specific heart rate zone. This is due to their high variance: they may differ depending on contextual factors, like the weather or the athlete’s physical condition. The device allows the athlete to progressively bring those signals that are meaningful for her sports performance back to certain heart rate zones, thus “teaching” her how to become more aware of the internal processes of her own body.

The increased body awareness that self-tracking technologies may produce, however, is not exempt from side effects. In fact, the device, rather than being used as a tool for learning how to listen to the body, may become essential for the athlete’s sports practice. The elite athletes emphasize that self-tracking devices may undermine the athlete’s confidence in what they call “sensations”, in favor of a complete reliance on the data provided by the device. Such sensations refer to the body and go beyond the signals of being in a certain heart rate zone. Actually, they point to fine-grained information about the body that allows the elite to tune her performance on the basis of the continuous changing context. It is a superior form of body awareness that elite athletes develop over the years, by carefully listening to their bodies: *“To use sensation means that I search some reference points in my body, the rhythm of the hair on the shoulders, how the foot hits the ground, if it’s heavy, or more round... [...] It’s even the sensation that I have at that moment. Some days when I don’t want to push forward at all... and then I precisely hear the exertion of the legs, the sensation of being more or less light”* [9]. These body sensations are used to tune their sports performance, regulate their rhythms, understand their level of fatigue, and recognize when they are reaching their body limits.

Awareness of sensations, however, can be jeopardized by an excessive use of self-tracking devices, which, in turn, can worsen the sports performance. E11 highlights that *“it happens to see athletes, non-professional athletes, athletes of the next generation... you tell them ‘run slow for an hour’ and they’re not capable of running slow because they don’t have a reference, they don’t have the watch [the tracker] that can tell them that they’re running slow, they can’t manage themselves”* [9]. Elite athletes use their device simply as a commodity, rather relying on their “superior form” of body awareness during races, when the technology is actually left apart.

The tracker, in fact, may also give information contrasting their current body representation, and this may produce anxiety and worries during important events. E10 says that *“So many times you feel good and you push forward, and maybe the heartbeat goes beyond the rate that you think you should keep, and maybe by looking at the watch you get frightened thinking that the rhythm that you’re keeping is wrong, when maybe your body is actually adapting itself [...], you’re managing everything all right, even if it’s a little harder than what you had set in advance”* [9]. The discrepancy between the representation of the body prompted by the device and the representation owned by the athlete may thus be perceived as disturbing and counterproductive for the athlete’s goals.

This situation, however, is slowly changing due to technological advancements. More fine-grained instruments are progressively allowing the measurement of “sensations” that were previously identifiable only by the athlete. In cycling, for instance, the power meter allows to capture the cyclist’s legwork. *“It has been the real revolution of both workouts and competitions, for now only available for bikes [...] If you keep 395 you’ll blow away at the last kilometer. If you see others that maybe begin the rise stronger than you, you don’t care, you look at your instrument, you keep that power, because you know that you can keep it”*, says E8 [9]. Nonetheless, in the elites’ eyes, “these advancements” are seen as a worsening of the overall sports experience. Despite the undeniable positive impacts of devices such as the power meter on the sports performance, such devices are slowly affecting the athlete’s body image, shifting it from a “living body” to a “mechanical body”. E7, for instance, emphasizes that *“the watch is a machine and measures your activity as if you were a machine, but the human body... there is a mental part and other mechanisms that the watch can’t compute”* [9]. This points out that the complex nature of the body can hardly be turned into numbers without producing impacts on the body image.

Discussion

Findings of this study highlight that the body is so variable in its reactions to both endogenous (e.g. stress, fatigue) and exogenous (environmental) factors, that parameters, like the heart rate, which technology aims to capture and turn into univocal numbers, can hardly account for it. The body is made up of meaningful “sensations”, and the body awareness that elite athletes develop is addressed to detect the richness of such sensations. The increased awareness about the heart rate (and other “objective parameters” pertaining to the body) produced by self-tracking technologies, therefore, may cloud the athlete’s opportunities for recognizing body sensations. Actually, it may decrease the awareness of the whole body in its multifaceted variability. In other words, the greater awareness of body parameters induced by the data may mislead the athlete’s “superior” body awareness, which is considered by the elites more reliable and fruitful when there is a lot at stake. Furthermore, it may prevent the development of such ability in the amateur athletes. A subsequent study substantially confirmed the insights coming from this research [67].

However, the development of more “precise” devices, capable of directly tying the body measures to the sports outcomes, seems to be progressively changing this landscape. The power meter, widely employed in professional cycling, anticipates a future when self-tracking devices could provide an efficient substitute, in terms of their instrumental value, of the sensations that are currently leading the elite’s conduct in a large variety of sports. This, however, is seen as an impoverishment of the sports experience also by those who are using this kind of device. Moreover, elite athletes emphasize that these instruments might change their body image, transforming it in something that is shaped by the data collected by the device, to which the real body would need to adapt. This sort of “mechanical body” would regulate

the rhythms and dynamics of the real body, constraining it to respond to the incoming data in a continuous and unavoidable feedback loop.

The concerns about the body arisen by our participants parallel those emphasized by authors who are starting to outline a critical discourse towards the assumptions embedded in QS culture. Lupton [11], for instance, highlights that trackers appear to extend the capacities of the body by supplying data that can then be used to display the body's limits and capabilities and allow users to employ these data to work on themselves. However, these technologies conceptualize the body not as a sensing body through which one can gain self-knowledge, but as a data generating device that has to be coupled with technology in order to be known [13]. In this perspective, the repository of the body knowledge shifts from the individual to the device. This also entails the individual's subservience to technology, since these "data-doubles" feed back information to the user in ways that are intended to encourage the user's body to act in certain ways.

What seems relevant, therefore, is that the benefits on body awareness that self-tracking instruments are bringing in the sports domain may be blurred not only by the reduction of the athlete's ability in becoming aware of her body sensations, but also by the athlete's loss of control over her own body, induced by an externalized body image that is imposed by the device.

Beyond the Athletes

As we have already noticed, the availability of a variety of commercial wearable devices that automatically collect personal body data has boosted the popularity of self-tracking outside the circle of specific populations, like quantified selfers, athletes, and people with a health condition, reaching the general public [68]. A variety of smartwatches, activity trackers, and smart clothes [69–71] are now available on the market, promising to collect data on body aspects as diverse as blood pressure, body movements, and respiration.

Nonetheless, we are currently far away from the possibility of providing such "general users" with complete and reliable representations of their body, which could be used to increase their body awareness and feed back an insightful image of their body. Trackers still exclusively focus on "objective" parameters and the representations that they give of the body is rarely meaningful for people that are not used to manage a large amount of quantitative data [72].

What kind of data and/or design techniques do we need for supporting users in increasing their body awareness and developing their body image, even helping them improve the perception they have of themselves? If we look at, for instance, Body Appreciation Scale 2 [36], which is a positive body image measure assessing individuals' acceptance of, favorable opinions toward, and respect for their bodies, we see the multidimensionality of body image construct and, consequently, the complexity of capturing and feeding back an image of the user's body that could really help her ameliorate the image of her body.

Scale items span from body acceptance and love (e.g., “I feel love for my body”, “I feel good about my body”), inner positivity influencing outer demeanor (e.g., “My behavior reveals my positive attitude toward my body; for example, I walk holding my head high and smiling”), to appreciating the functionality of the body (e.g., “I feel that my body has at least some good qualities”), taking care of the body via healthy behaviors (e.g., “I respect my body,” “I am attentive to my body’s needs”), and internalization of media appearance ideals (“I feel like I am beautiful even if I am different from media images of attractive people (e.g., models, actresses/actors”). In order to take into account all these aspects of the body image construct, it is not possible to simply rely on the functionalities of current trackers, but we need to envision novel ways of collecting and visualizing data.

For instance, self-reporting appears essential to grasp the subjective meanings that people ascribe to their body, and thus capture body acceptance and love, as well as appreciation and taking care of the body. Future research, therefore, needs to explore novel ways for eliciting the self-reporting of body data, which may be burdensome by requiring a high degree of compliance [73]. Self-reporting may be complemented by content analysis of social media, especially with reference to the goal of understanding how media appearance ideals may affect the user’s body image; or automated tracking focusing on “specific aspects” of body data, like those related to “body-harm” (e.g., lack of sleep, bad food, and lack of exercise), which could help to infer how people take care of their own body; or those connected with posture and face expressions/emotions (maybe collected when the user is looking at herself in front of a mirror), which may work toward a better understanding of the inner positivity toward the body.

Furthermore, finding novel ways for representing body data becomes essential if we want to give a meaningful body image of the user, also pushing her toward a more positive representation of her body. Adopting concrete representations of the body data collected by a wearable may support the projection into and the development of an emotional connection with them [74], possibly promoting the development of a more positive body image. Rapp et al. [6], for instance, proposed a visualization of the user’s body merged with the personal data collected by a variety of self-tracking devices, as if the user were looking into a mirror. The visualization does not allow for a precise quantification of the user’s data, but conveys a general impression about the user’s body, engaging her, at the same time, in an immersive interaction.

All these lines of research, which could work toward making self-tracking data closer to people’s needs, by providing them with more meaningful body representations also pushing them toward more positivity, are still in their infancy. Their exploration would lead to design novel Quality of Life Technologies (QoLT), which have been defined as any technologies for assessment or improvement of the individual’s QoL [75]. In fact, allowing people to construct a more positive image of their own body, as well as to develop a greater body awareness, could ultimately increase their overall self-knowledge providing benefits to many different aspects of their everyday life. However, much more research is needed to find insightful depictions of body data and novel ways to unobtrusively collect them.

Conclusion

In this chapter we have highlighted the potential impacts of self-tracking technologies on the body. In order to assess such impacts, we stressed that we need to consider the ways we naturally relate to our bodies, namely through different body representations. On the basis of the examination of three theoretical constructs that refer to the different ways through which we represent our own body, we outlined how technology is affecting our body conceptions, particularly highlighting the potential negative outcomes that may stem from the usage of body data. In this line, examples coming from a study in the sports domain pointed out the main risks for the athlete's body opened up by tracking technology.

However, all the issues we pointed out may be counterbalanced by the great opportunities that self-tracking instruments seem to open. Esmonde [68] highlights that the boundaries of the body are not defined by the skin, as they extend to the outside world, the environment and technology. In this perspective, self-tracking devices could have the potentialities to expand the limits of our body and, eventually, of our self. To achieve this goal, however, researchers and practitioners should start rethinking not only the way technology is designed, but also the theoretical frame in which it is inserted, in order to account for the complex modalities through which we relate to our bodies and our selves.

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