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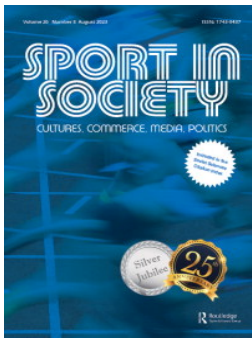
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Running free: recreational runners' reasons for non-use of digital sports technology

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ABSTRACT

The use of digital sports technology has become more the rule than the exception in digitalized societies. The normativity of technology use is also present in the research literature and there is only a little research on the non-use of technology. We see the non-use of technology as an active and conscious choice, reflecting people's relationship with digital society, with sport, and with themselves. We have limited the research context to recreational running, which, as a popular and highly technologized form of sport, offers a rich environment for research into the non-use of technology. Through an abductive analysis of the qualitative questionnaire data, we identified four partially overlapping themes: 1) Technology, and its use and non-use, are not categorical and binary things; 2) Non-use of technology as freedom; 3) The relationship between technology and the meanings attributed to running; and 4) The material reasons for non-use of technology.

Introduction: digital sport technologies in the post-digital era

> I am a significant minority. I am the only one in my circle of friends who exercises but does not own a watch. (Runner 17).

As the above quote illustrates, the use of digital sports technology has become more of a rule than an exception in digitally advanced societies such as Finland (Morozova and Gurova 2021), the empirical context of the present study.[1] Digital sports technology is a nearly $12 billion and growing market (Research and Markets 2022) consisting of thousands of different devices and applications (Aliverti, Evangelisti, and Angelucci 2022). In addition to specific devices such as sports watches, approximately 385 million people use various fitness mobile apps (Business of Apps 2022).

The societal and cultural phenomenon behind these numbers can be defined as the post-digital turn. Post-digital is an approach to digital media that considers digitalization as something that has already happened and thus might be further reconfigured (Cramer 2013). Put differently, since (almost) everything either is or is related to digital, we need

more elaborated concepts and frameworks for describing and understanding the world we are living in.

One useful concept for making sense of the post-digital age is datafication. Datafication refers to the latest phase of deep mediation (Couldry and Hepp 2017), in which massive amounts of digital data are produced from people's everyday activities (Southerton 2020) on a continuous and real-time basis. In the context of exercise and health, datafication culminates in the quantified self-movement, in which human performance optimization is sought through various self-measurement technologies (Lupton 2020). Furthermore, various sports technologies like sports watches and (outdoor) running/cycling applications use GPS to collect location data to track the speed and distance.

The idea of post-digital also requires a critical examination of the concepts of use and user (of digital technology). Put differently, if (almost) everything is digital (or related to it), it is worth asking how much intentional and agentic decision the use of digital technology actually involves? Indeed, we acknowledge that in a digitalized society and culture, non-use of technology may require more awareness, purposefulness, and effort than the use of technology itself would require (see also Tainio 2020). Therefore, non-use is not about the absence of something but about something that happens instead of the use of technology (see Baumer et al. 2015; Radtke et al. 2022; Takkinen and Heikkurinen 2022)—an active and conscious choice that reflects a person's relationship with the post-digital society and oneself (and sport in the context of the present study).

Concrete examples of conscious non-use are intentional periods of restricted use of digital technologies often referred to as digital detox or unplugging (Radtke et al. 2022). That said, while we see non-use as an intentional action, it is not something that determines the subject as a whole (and neither does use). Drawing on Bannon (1991), Satchell and Dourish (2009, n.p.) argue that the 'very idea of "the user" reconfigures a multifaceted human being as an adjunct to a piece of hardware or software; asked at a party what they do, no one has ever introduced themselves as a user of Microsoft Word'. Most likely, no one has ever introduced themselves as a non-user of MS Word either (or any other technology).

So far, non-use as a conscious and agentic choice has been on the margins of sports technology research (cf. Esmonde 2020; Kent 2020). Instead, the focus is often on those who use technology (e.g. Kuru 2016; Nuss and Li 2021), and non-users are typically framed as either previous (Attig and Franke 2020; Nuss and Li 2021) or future (Augustin et al. 2021; Chiu and Cho 2020) users. The knowledge interest is particularly technical (see Habermas, 1968) as one of the research tasks is to produce information on how non-users can be turned into users and/or how the use of technology can be increased (Chiu and Cho 2020, p. 820; Fronczek et al. 2022; Mathavan et al. 2022). Technical knowledge interest is also reflected in methodological choices. Research on the use and non-use of sports technology is often quantitative and aims to explain causal relationships (e.g. Adesida, Papi, and McGregor 2019; Attig and Franke 2020; Camomilla et al. 2018; Chiu and Cho 2020; Janssen et al. 2020; Mathavan et al. 2022; Åkerberg, Söderlund, and Lindén 2017; cf. Esmonde 2020). From a disciplinary perspective, research on the use and non-use of technology emphasizes cognitive and behavioral psychology, often leaving other views on technology (e.g. socio-cultural, feminist) unacknowledged (Lupton 2020; for concrete examples, see, e.g. Attig and Franke 2020; Nuss and Li 2021; cf. Esmonde 2020).

The structure of the article is as follows. Next, we will introduce the research question and justify our focus on recreational running. Then, the implementation of the study is explained. The findings are divided into four main sections that also include a discussion with relevant theoretical and empirical research (see Lindgren's et al. 2020 points about re-contextualization). We end the paper by synthesizing the main findings, pondering about their implications, and outlining the limitations of the study.

The current study

Research question and contextual focus

Our research question is: *what reasons do runners express for not using digital sports technology?* Running as a specific type of recreational sport offers a rich environment for studying non-use (and use) of technology for several reasons. First, internationally, running is one of the most popular forms of exercise (Scheerder and Breedveld 2015), which means that our target group of runners is not a marginal one. In addition, the range and variety of running-specific technology is significant: there are over 10,000 different wearable technologies designed for running alone (Aliverti, Evangelisti, and Angelucci 2022), and almost 90% of runners use a sports watch or smartphone app as part of their running hobby (Janssen et al. 2020; see also Pobiruchin et al. 2017). In view of these figures, non-use of technology in running appears as countercultural, even anarchistic action (Tainio 2020, p. 29; see also Takkinen and Heikkurinen 2022).

Furthermore, running is not a generic movement like 'everyday' physical activity (e.g. counting steps). While some people approach running from an instrumental point of view (e.g. a promoter of health; León-Guereño et al. 2021), many runners have a deeper relationship with the sport. For some, running is a 'serious leisure' (Stebbins 2007) that includes goal-oriented training and regular competition (Janssen et al. 2020). Others approach running from the perspective of post-sport (Pronger 1998) exercise culture, in which movement as a lifestyle and identity building or 'self-project' (Klemola 1998; see also Atkinson 2010; Tainio 2020) is emphasized. Indeed, running has been a repeated subject of scholarly philosophical analyses (e.g. Austin 2007; Biana and Sarza 2018; Koski 2015; Le Blanc 2018; Sheehan 2013: Tainio 2020, 28): 'a human can choose to be a running individual, and so choose one physical form of exercise in order to be in touch with the world' as Koski (2015, p. 68) elegantly summarizes the (subjective) nature of running.

Methodological underpinnings

In this article, we follow an interpretive approach to qualitative research. In accordance with Lindgren, Lundman, and Graneheim (2020, p. 2), we see interpretation as a process that involves explaining, reframing, making sense of, or otherwise showing an understanding of narratives about a person's lived experience. Interpretation is not a matter of following mechanical rules, but of performing a thorough and comprehensive analysis while having the courage to search for the underlying meaning of the verbatim text (Lindgren, Lundman, and Graneheim 2020).

In the present study, the demand for a thorough and comprehensive analysis was operationalized by using an abductive approach, which is one possible way to engage in the

hermeneutic circle of reading, reflective writing, and interpretation (Kafle 2013). The starting point of abductive reasoning is that observation is guided by a theoretical thread. However, unlike in deductive analysis, the data are not 'tested' by the theory, but rather the theory's role is to open up new perspectives (Grönfors 2011; Rennie 2012).

In this study, our guiding principle was that runners' reasons for technology non-use are drawn from multiple sources, such as the subjective meanings given to running (e.g. Koski 2015; Tainio 2020) and the respondents' relationship to a digitalized and data-driven society. In other words, we assumed that the reasons for not using technology form a complex whole that requires multi-faceted and in-depth interpretation. The actual analysis process will be discussed in later sections.

Data

The data were collected in the spring of 2021 through a qualitative online survey (see Table 1). An online survey allows researchers to reach a relatively large sample, which complements the qualitative research on runners' non-use of technology, which has used interviews with 10 to 12 participants (e.g. Esmonde 2020; Tainio 2020). Limitations of the data collection method are discussed later in the paper.

The survey was distributed in running and endurance sports-related social media groups and on the authors' own social media profiles. The survey was also sent to individual running/sports clubs. Background information was collected on the participants' age, gender, and running and exercise activity (number of running and exercise sessions per week). For the purposes of this article, the most crucial substantive questions are number 10 'Why do you not use technology in your running?' (to which the respondent was directed if they answered 'no' to question 6 'Do you use technology in your running?') and number 5 'What does running mean to you?'.

Following the guidelines of the Finnish National Board of Research Integrity (2019), no ethical review was required because: 1) participation does not deviate from the principle

Table 1. Questions on the survey form.

No	Question	Type
1	Age	Numeric
2	Gender: Female / male / other / I don't want to disclose	Closed
3	How many times a week do you run on average?	Numeric
4	How many times a week do you do other exercise?	Numeric
5	What does running mean to you? You can tell about your running history and/or those motives that get you out for a run	Open (text box)
6	Do you use technology* in your running? Running in this context includes the actual running performance, as well as the preceding (e.g. planning) and subsequent (e.g. analysis) use of technology. *devices (e.g. sports watch, heart rate monitor) applications and applications / services (e.g. Strava, virtual coaching)	Closed (yes/no)
7	What technologies do you use in your running? How do you use them and why? Running in this context includes the actual running performance, as well as the preceding (e.g. training planning) and subsequent (e.g. analysis) use of technology	Open (text box)
8	Are there features in the technologies you use that you don't use? What are they and why don't you use them?	Open (text box)
9	How accurate and reliable do you consider the measurements and analyses of the technologies you use (e.g. distance, speed, heart rate, fitness tests and evaluations, personalized training programs)? Justify your view.	Open (text box)
10	Why do you not use technology in your running	Open (text box)

of informed consent; 2) the research does not involve intervening in the physical integrity of participants; 3) the focus of the research is on adults[2]; 4) the research does not expose participants to exceptionally strong stimuli; 5) the research does not involve a risk of causing mental harm that exceeds the limits of normal daily life; and 6) conducting the research does not involve a threat to the safety of participants. Gender or age of the participants are not included within the data excerpts to secure their anonymity. Similarly, all references to indirect personal information (i.e. respondents' occupation, specific geographical locations mentioned by the respondent) were removed from the excerpts.

Altogether 1060 runners responded to the questionnaire. The age-range was 17–72, with an average age of 44.4 years (median 42 years). 64% were female, 35% were male, and 1% were of other genders or did not wish to provide information on their gender. All respondents ran at least weekly, and some more, up to seven times per week. Almost all also exercised in other ways from one to seven times per week. The data for this article consists of the responses of 47 runners who, according to their answers, do not use technology in their running. Of these respondents, 33 (70%) were women and 14 (30%) were men. Oldest runner was 72 years-old while the youngest one was 25 years-old. Average age of the runners was 44.9 years (Median 44 years). Every participating runner described to run at least once a week, some even 7 times a week (average 4.6 times per week). Most of the runners also did regularly some other form of sport or exercise (on average 3.1 times per week).

Analysis

In the first phase of the analysis, anonymized data excerpts were collected into one text document. The data excerpts were read several times, and inductive and deductive notes were written in the document. This so-called open coding (Williams and Moser 2019) produced 33 codes (e.g. lack of purpose of tech in running, emphasis on being in the moment). In the second phase of the analysis, we read the coded data excerpts thematically (a close reading of data excerpts dealing with a specific theme) and horizontally (a close reading of all the data produced by individual respondents) and recontextualized (and reconceptualized) our interpretations by making connections with previous theoretical and empirical literature (see Lindgren et al. 2020). We illustrate this phase, especially the horizontal reading, with the following data excerpt.

> I haven't found it necessary to use, for example, a smart/sports watch, because I don't train towards any specific goals […]. Maybe it would be nice to sometimes monitor heart rate, but I haven't familiarized myself with it enough to know what to watch out for with the heart rate. The body tells me if I'm going too hard or if I can increase the pace. If I had a watch on my hand, I'd be afraid of staring at the watch instead of listening to my body's sensations (Runner 17).

The excerpt 'the body tells me if I'm going too hard' indicates that the runner trusts their embodied knowledge (Hockey 2013). The mention that 'maybe it would be nice to sometimes monitor heart rate' was interpreted as an ambivalent relationship with technology: it is not a categorical rejection of technology and/or its use, but rather the runner does not see technology as necessary in their current goal-less running hobby. On the other hand, they also see risks in the use of technology, stating that using technology could direct their

attention to the watch – that is data and numbers – instead of bodily experience. This excerpt was interpreted as a reference to sports technologies as orientation devices (Ahmed 2006; Aho 2020) that modify the experience of activity. The statement that the respondent does not know what to monitor about heart rate was interpreted as indicating the 'recomplicating effect' brought about by technology (Sailors 2009, p. 210): knowing the heart rate alone is not enough, the runner would need to be able to relate it to their individual heart rate limits, which would require a threshold test using lactate measurement.

Through the so-called axial coding (Williams and Moser 2019) described above, we derived four themes from the data, around which the results are structured. The themes are: 1) Technology, and its use and non-use, are not categorical and binary things; 2) Non-use of technology as freedom; 3) The relationship between technology and the meanings attributed to running; and 4) Material reasons for non-use of technology. After creating the themes, we went through the data again to ensure the credibility of our interpretations (see, Kafle 2013). Various extracts from the data are presented in the findings sections to improve the reliability and transparency of the analysis process. Although for the sake of clarity we will discuss the themes in the results section one by one, they are more intertwined than separate by nature. We will discuss the relationships between the themes in the concluding section of the article.

Technology, and its use and non-use, are not categorical and binary things

> All running technology = computer. I hate computers in all their forms. (Runner 34).

The absoluteness against technology use shown in the quote above was an exception in our data, and for other runners, the use and non-use of technology was not binary or categorical. Some of them had used sports technology before, but later abandoned its use. As the following examples show, the use of technology (often a heart rate monitor) was typically linked to a certain goal, and after its achievement, the use of the monitor was discontinued as unnecessary.

> Before my first marathon, I bought a heart rate monitor and stared at it so that I could train at the right heart rate. Then I learned to know myself and my heart rate and don't need the meter anymore. 10 marathons have now gone by (Runner 37).

> I used a heart rate belt and a watch at first to divide my strength correctly, now I know how each pace feels (Runner 5).

In these examples, the use of sport technology, specifically heart rate monitor, has created a framework against which bodily experience is calibrated. Runner 37's comment that they 'stared at it [heart rate monitor] so that I could train at the right heart rate' reminds us of Aho's (2020, p. 5) argument that 'the body connected to the meters becomes an externally observed object'. However, according to our data, this objectified relationship with the body does not end with the removal or abandonment of the meter. Metaphorically, it can be said that the external monitor has been discarded because the meter information has become part of the runner's internalized bodily experience. For example, in the case of Runner 5, the heart rate that used to be associated with an unclear experience of the effort of running is now associated with belonging to certain pace ranges. In other words, the experience has been given a category based on numerical information on the relationship between speed and effort (heart rate).

Runners 37 and 5's data excerpts also reflect how runners typically perceive the use of technology in running as the use of specific sport technologies, such as wearable sensor devices. Using a 'general everyday device' like a smartphone and its applications was perceived as less sport technology than specific devices. This phenomenon is illustratively captured in Runner 32's response that they, 'measure the distance with the Sports Tracker, *if that counts as technology* [italics added]' Similarly, runner 24 explained that they use no technology because 'a smartphone's Sports Tracker is enough'.

In research literature, smart devices and sports apps are typically classified as one of many forms of sport technology (e.g. Eskola and Laine 2020). Our respondents, however, placed the smartphone as a generic everyday technology in a (partially) different category than specific (wearable) sport technology, such as a sports watch, heart rate monitor, or foot pod. Although we recognize that people's everyday categories and scientific taxonomies have different logics and needs, the perception of the smartphone and fitness applications as a gray area between use and non-use of digital technology is interesting in and of itself. In our interpretation, this distinction indicates that, although the use of specific sport technology is mainstream in highly digitized societies like Finland (Morozova and Gurova 2021), it has not yet become as intertwined with the fabric of everyday life as the smartphone to paraphrase Weiser's (1991) infamous description of the 'naturalness' of ubiquitous computing. The use of separate sports technology means adding a new technological element to both running and more broadly to one's life. We will delve further into this theme in the following section by considering the relationship between technology non-use and freedom.

Non-use of technology as freedom

For certain runners, not using technology was related to freedom. For some, it meant the freedom that is inherent in running. Others, however, considered freedom in relation to technology, as well as to the culture of performance measurement. According to the responses, the freedom of running was particularly evident in the ease of running, and the ability to enjoy nature, to be more closely connected to the environment, or to be part of nature. Running is 'resetting the head after work, getting oxygen, admiring nature and the sun', as Runner 37 expressed it. The response reminds us of Tainio's (2020) results, which showed that running was perceived as an opportunity to disconnect from obligations and to have enjoyable nature and environmental experiences.

According to the runners in our data, the use of technology can interfere with this freedom. One runner, for instance, wrote that 'in everyday life it feels liberating to 'let go' of the devices from time to time' (Runner 5). Although the quote is concise, it is rich in meaning. The expression 'from time to time' refers to the role of technology in other aspects of life, from which running offers the opportunity to disconnect. Letting go, in turn, has resemblance with the concept of a sticky media device (Raudaskoski, Mantere, and Valkonen 2019), from which it is difficult for the user to detach their attention. Another runner described a similar feeling when writing that after using a sports watch before, he felt that he 'got stuck in technology' (Runner 3), which practically meant that 'during the run, you are staring at the heart rate all the time' (Runner 3). Based on the description, when using technology, the runner's attention was focused on technology and the numerical information it produced, rather than on running, their own body, or the environment. The example

reminds us of Ahmed's (2006) idea of technologies (in a broad sense) as orientation devices that determine how a person approaches themselves and their surroundings.

According to Aho (2020, 5; see also Mueller et al. 2017) self-tracking technology as an orientation device has brought the culture of measurement, recording, and optimization (once specific to elite-level training) also into the realm of recreational exercise. A representative example of this is Runner 40's statement that he 'didn't like the heart rate range notifications' of his sports watch. Some technologies have coaching and planning support features (Aliverti, Evangelisti, and Angelucci 2022), and in this case, the notification means auditory and/or haptic feedback at moments when the runner exceeds or falls below the heart rate range set for the workout. The notification also concretizes the active role of the tracker as an orientation device: the device does not always 'just wait' for the runner to look at it but can guide their attention to itself using various stimuli (see Lomborg, Thylstrup, and Schwartz 2018).[3] However, orientation was not only about individual moments of individual runs. Rather, it seems that the sport technology as an orientation device reshapes the entire activity (Aho 2020; Mueller et al. 2017): 'if you use a sports watch, you use it every time you run', as Runner 40 summarizes the phenomenon.

While, on the surface, many of the reasons related to freedom and technology were concrete and mundane, they simultaneously reflected broader relationships between technology and humans. For example, Runner 6 wrote that 'on top of everything else, you have to keep charging and updating the smartwatch constantly'. Runner 34, in turn, commented that 'it's really nice to have one area of life where you don't have to worry about the battery running out or connecting different devices'. These excerpts are examples of the technological meta-work outside of the actual sport-related technology use that is required for the smooth operation of the devices. Updating the device and establishing connections are also examples of technological convergence, that is the integration of different devices. The deployment and update of many sports technologies require a smartphone or computer (Aliverti, Evangelisti, and Angelucci 2022). In addition, many sports technology products include not only the physical device but also a mobile application and/or website (e.g. Polar Flow, Garmin Connect) and a cloud service integrated into them, to which data are saved when the user synchronizes their device with the app (see Aliverti, Evangelisti, and Angelucci 2022; Moilanen 2017). The data are then available to the user in the app or on the website in a structured and visually appealing form, often as graphs and statistics. It is also possible to link data to a variety of services, such as social media platforms (Stragier, Abeele, and Marez 2018). The use of a single sport technology may therefore require the use of multiple technologies or an entire ecosystem. This did not appeal to all runners. Indeed, runner 42 stated that 'I don't own a smartphone and virtually all devices these days require one to work'.

In addition to individual devices, non-use of technology was about freedom from the broader culture of technology and measurement, which Couldry and Hepp (2017) call datafication, the dominant phase of deep mediation, in which technologies, media and data are interwoven into structures that affect society, communities and people's daily lives. In work life datafication is present in the use of self-tracking technologies in work well-being campaigns (Giddens, Gonzalez, and Leidner 2016) and in the monitoring of efficiency (McParland and Connolly 2020) to provide only a few examples. People are also under constant monitoring in their leisure time: smartphones continuously collect location data from their users and virtually all our online activities generate data (Pybus and Cote 2022). These themes were also familiar to the runners of our study. Runner 6 expressed a critical

stance towards the culture of measurement and surveillance by stating that he did not want 'such [a sports watch] to measure my heart rate or locate me'. Runner 21 shared their view and wrote that 'I don't want to measure myself in a context that I want to be outside of all performance'. The characterization of running as an area outside of performance reflects the subjective meanings given to running, which we will examine in the next section in relation to non-use of technology.

The relationship between technology and the meanings attributed to running

Why people run has an impact on what technology and its features they use (Clermont et al. 2020; Stragier, Abeele, and Marez 2018). Therefore, the subjectively attributed meanings of running provide a framework for a detailed examination of the reasons for not using technology. While from the outside all running may seem the same, running means different things to different people: although runners are united by the same sport and identification as runners, the ways and meanings of running are determined by individuals' preferences and needs (see, Tainio 2020).

Such diversity was also present in our data. Many of those who responded to the survey ran primarily for their own sake. For some, running is a way to build identity and lifestyle (Klemola 1998; Koski 2015). 'I run in the morning and I almost feel like I need to run: it keeps me in a good mood all day, and I feel like I can do anything', as Runner 6 summarized what running means to him. Others' motivation for running was primarily related to health (see also León-Guereño et al. 2021), and one runner 5 described that he is 'running away from hereditary diseases such as diabetes'. In addition, there were runners for whom running is serious leisure through competitiveness and goals (Stebbins 2007).

Runners who consider technology most necessary are typically those who are engaged in goal-oriented training (Tainio 2020). Competitive runners are interested in optimizing the efficiency of their running, while recreational runners use technology to increase motivation (Clermont et al. 2020). If someone does not run with measurable objectives, the features related to such goals may seem unnecessary: 'I don't train so goal-oriented that I would need running technology to fine-tune my fitness' (Runner 40). That being said, based on the data, the relationship between goal-orientedness and the use of technology is not necessarily that straightforward. Some runners reported training systematically and in a goal-oriented manner, and recognizing that technology could help with training. Runner 14 stated that 'a watch would definitely be helpful when running strides alone', but the implicit benefit of technology did not outweigh the required investment in its use.

Some respondents found appeal in the simplicity of running and believed that the use of technology would make running more complex. Runner 21, for example, wrote about how running is 'above all an easy way to move and combines many important elements: you can move when it suits you, time is not spent on transitions or tinkering with equipment and you can be outside'. For some respondents, using technology would be just a more complicated way to get the same information that their body would tell them anyway. Hockey (2013) argues that through bodily-experiential knowledge gained through various senses, a runner can strive to understand and evaluate their run and make decisions based on that. In other words, using technology is not seen as providing information that cannot

be otherwise obtained, and personal bodily awareness may be a more meaningful source of information for a runner:

> I have learned to recognize my heart rate/training zones from my body. Bodily experience is important to me. I believe that the knowledge of my own body gives more precise information about fitness, strain, and need for rest than a monitor (Runner 31).

The preference for embodied knowledge may be a matter of prioritizing informative content that helps clarify and keep the amount of information related to running manageable. Sailors (2009) has written about the 'recomplicating effect' of running technology: as the amount and diversity of information increases, its evaluation and contextualization in relation to running becomes more difficult. Complexity was also addressed in the data in terms of the time wasted learning how to use the devices and the suboptimal reliability of the devices. Runner 1, for example, wrote that 'it sounds like technology is constantly failing for many people and that would require me to learn about it, which I don't have time for'. This comment well illustrates how, in sports technology in particular, we are dealing and 'tinkering' (to use Runner 21's exact words) with concrete and material devices, a theme to be discussed in a more specific manner in the following section.

The material reasons for non-use of technology

From the perspective of materiality, we identified three themes in the justifications for not using technology: how wearable technologies (as material artifacts) feel on the body, environmental issues, and personal financial issues. The first theme, the feeling of the technology on the body, was the most straightforward, as respondents simply described that they do not like how wearable technologies feel on their skin: 'A thick wristband or heart rate monitor would feel unpleasant' (Runner 15); 'I don't like the feeling of a heart rate monitor on my skin' (Runner 39).

Although the importance of the comfort of use has been recognized in the development of wearable technology (see e.g. Koo and Fallon 2017), it is not easy to reconcile comfort and measurement accuracy. To produce accurate information, wearable technology must be in as direct contact as possible with the phenomenon being measured (or the bodily reaction indicating the phenomenon). For example, an optical heart rate sensor on the wrist must be tighter than a wristwatch to detect changes in heart rate based on the frequency of blood flow in the vessels, and the tightness may feel uncomfortable. Similarly, chest-straps need to be adjusted tight enough to prevent horizontal and vertical sliding. As put by Runner 23 'I have tried a couple of heart rate monitors. They mainly stress or squeeze'.

The above excerpt from Runner 23 does not tell whether the physical discomfort of the technology was noticed before or after the purchase decision. Nevertheless, technology is being bought more than ever today, and over 80% of recyclable electronic waste is stored in households after a short use cycle (Parikka 2020). Although digital technology is often associated with immateriality, digital technology always has a material existence as well, as the production, use, and maintenance of digital technologies and their software consume materials and require energy. The same principles apply to sports technology, and Runner 18 justified technology non-use specifically from the perspective of environmental impact:

> I don't understand how there would be enough minerals and other materials for technology devices. The use cycle of the devices is too short!! Recycling brings too many chemicals and toxins to the atmosphere. What are we giving to future generations?

The runner's observations about the short use cycle of the devices and the loss of raw materials are supported by research. The lifespan of various wearable technologies is often not very long: for example, the lifespan of smartwatches is estimated to be about three years (Vo et al. 2020). However, they require various components that burden the environment (Gurova et al. 2020), and the production process itself also burdens the environment, as it takes about 11,000 liters of water to manufacture one smartwatch (Vo et al. 2020). In addition, at the end of use, a lot of electronic waste is generated and the use of technology increases the need for electricity production (Gurova et al. 2020), but recycling materials only compensates for 15% of consumption (Vo et al. 2020).

Of course, digital devices are not the only technologies used in running. Butryn (2002) has divided exercise technologies into five different categories, one of which is sports equipment such as running shoes. In addition to shoes, a runner also needs (at least in the geographical context of Finland) sports clothing suitable for different weather conditions. Although the amount of equipment needed is moderate compared to many other sports, running is not a hobby with no financial costs. One runner said that she might use digital sports technology, but 'as a student, I can't afford it. I spend my money on good running shoes and clothes' (Runner 32). The choice of words suggests that the selection between digital technology and other equipment is not a pure either/or situation. Runner 32 is not choosing between running shoes and sports technology per se, but between good running shoes and sports technology. In other words, he values good quality shoes and has chosen to invest her limited financial resources specifically in them, rather than compromising on the quality (and price) of the shoes and also buying a heart rate monitor or similar.

Concluding remarks

In this article, we have examined the reasons Finnish recreational runners give for non-use of technology. Our aim has been to contribute to broadening the user-centered understanding of humanity in previous digital sports technology research (e.g. Augustin et al. 2021; Chiu and Cho 2020; Satchell and Dourish 2009), and our data from runners produced a multifaceted image of running in a post-digital and datafied world. Four core themes were derived from the data: 1) Technology, both its use and non-use, are not categorical and binary things; 2) The non-use of technology as freedom; 3) The unnecessary nature of technology in relation to the meanings given to running; and 4) The material basis of technology non-use are not precise and completely separate from each other but have numerous intersections.

The use and non-use technology were not binary and categorical things for runners. Some of them said they do not use specific sports technologies, but they may measure the length and speed of a run with a smartphone app like Sports Tracker. In other words, technology does not form a coherent whole but people give different meanings to different devices, software, and their functions. The perception of smartphones as 'less' technology than specific sports technologies partly reflect their different roles in people's lives. Although the use of sports technology has quickly become widespread and naturalized, it is still

considered an emergent technology compared to smartphones (Parikka 2020). This suggests that in the post-digital era, conceptions of digital technology are fluid and diverse.

Using a mobile app also implies that the runner may not find the additional information offered by specific sports technologies (e.g. heart rate, cadence, power) necessary in relation to what running means to them. In other words, the rudimentary information (distance, time, and pace) stored by the mobile app is sufficient for them. Many runners described the meaning of running from the perspective of post-sport culture, in which running is seen as an activity that offers aesthetic experiences rather than goal-oriented sports (Tainio 2020). They felt that sports technology disturbs being in the moment and enjoying the environment, as it directs their attention to running as a numerical and measurable performance. In summary, although wearable sports technology represents the technical peak of technology designed for consumer use, the programmed perception of running and the runner based on development and optimization (see Aho 2020, 5) is one-sided and in conflict with post-sport culture.

The use of sports technology as a performance-oriented and measurement-intensive orientation device (Ahmed 2006; Aho 2020) was something that runners explicitly sought to escape from. Some of them wrote about how they wanted to 'be free' (Runner 5) from sensor technology, which was described as akin to a 'straitjacket' (Runner 40). However, the use of smartphones and fitness apps on them was not viewed with the same affectivity, and we interpret this separation as being related to the active role (exercise) technology takes in running. Even if the runner does not use a training program that reacts to heart rate zones, the sports watch still automatically provides a haptic or auditory feedback when a kilometer is completed, directing the runner to focus on the running event as numerical performance: a tapestry of distance, time, and heart rate. And even if the watch does not provide feedback, as a wearable technology it is practically always visible on the wrist whereas checking speed or distance on a phone would require it to be pulled out of a pocket, waistband, or backpack.

According to Saariketo (2018), our experiential landscapes are 'rhythmed by code' because software 'modifies, often problematically, the spatial-temporal orders of everyday life and structures the rhythms of life' (2018, 47). Indeed, with a sport watch a one-hour run is not necessarily a continuous flow of time. Rather it is broken up into segments the length of time spent running each kilometer. Runners also noted how the 'needs' of technology, such as ensuring sufficient battery power, also determine the rhythm of the running event before setting out to run. Some runners mentioned that technology had a significant role in framing their everyday lives. Therefore, they did not just want freedom from the devices themselves, but from the larger technological environment characterized by measurement, continuous data collection, and a materialistic consumer culture that burdens the environment.

These reasons and explanations share commonalities with the concept of digital detox and unplugging, in which people often voluntarily reduce the role of digital technologies in their lives (Radtke et al. 2022). Given that a critical stance towards technology-driven ethos is an inherent part of post-sport culture (see Atkinson 2010), future research exploring the relationships between these phenomena would be important to better understand people's experiences and agency in the post-digital era. Additionally, we would like future research to pay close attention to the environmental dimensions of the use and non-use of digital sports technology. So far, humanistic research on ecological and sustainable sport equipment use has mainly focused on clothing (e.g. Brice and Thorpe 2021) or other non-digital equipment (e.g. Subie, Mouritz, and Troynikov 2009).

No study is without its limitations. It must be kept in mind that our participants were a self-selected group, not a sample justified by theoretical sampling. Using an online questionnaire may also have excluded runners who are most negative about technology from the respondent group: although Runner 34 stated that they 'hate[d] computers in all their forms', the hatred was not so strong that it would prevent them from responding to the questionnaire. Additionally, it is possible that our participants might have been relatively strict with regards to their views about the use and non-use of technology. There is evidence that move between technology use and non-use in quite flexible and situational manner (i.e. use self-trackers only in certain sessions; Esmonde 2020; see also Patel and O'Kane 2015), which is in contrast with Runner 40's argument that 'if you use a sports watch, you use it every time you run'.

Using a qualitative questionnaire as the data collection method has its own limitations. While it can allow researchers to reach a larger (and potentially more diverse) sample compared to qualitative research interviews, the data from individual participants may not be as rich. A questionnaire does not provide the opportunity to ask clarifying questions in the same way as interactive data collection methods. Interviews conducted while running together (see, Esmonde 2020; Tainio 2020) could potentially provide a fruitful method for studying the relationship between subjective meanings of running and technology, in particular. It is also reasonable to consider the guiding effect of the formulation of questions in the questionnaire. Although questions 6 and 7 (see Table 1) mention both specific exercise technologies (e.g. heart rate monitor) and apps that can be used on mobile devices and traditional computers (e.g. Strava), it is possible that some of the runners only considered specific exercise technologies in their responses. Last, it is important to remember that the research context was a highly digitalized Nordic welfare country and change in the context could have resulted in different kinds of responses (see Sikes and Jarvie's, 2014 study on Kenyan female runners and running as freedom, for example).

These limitations aside, we believe that our findings are able to provide recreational runners and professionals working with them, such as running school coaches and fitness instructors, with conceptual tools for grasping the range and interweaving of meanings related to running and digital technology: the use of technology is not a given for even the more goal-oriented runners for reasons such as financial constraint, environmental questions, and broader relationship with technology and measurement-culture. The diversity of meanings and the emphasis on post-sport fitness culture in the data are also a strong message to developers of sports technology to broaden the way how humans and sports are 'coded' in technology in order to move beyond the prevailing user-centered (Chiu and Cho 2020) and performance-orientated (Aho 2020) approach. For future research, our work offers a context-specific lens that, when combined with 'grand theories' such as actor-network theory (from the perspective of sport, see Kerr 2016), enables a sharp-sighted analysis of the relationship between different sports, humans, technology, and society.

Notes

1. In the Digital Economy and Society Index (DESI), a Europe-wide survey of the digital economy, Finland was at the top of the list in 2022 (European Commission 2022).
2. Finnish National Board of Research Integrity (2019) outlines that individual over 15 year-old can decide about their participation independently

3. Of course, the features of a sports watch can be customized to suit the user's needs and preferences. However, people often use devices and services without changing the default values (Thaler and Sunstein 2008).

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References

Adesida, Y., E. Papi, and A. H. McGregor. 2019. "Exploring the Role of Wearable Technology in Sport Kinematics and Kinetics: A Systematic Review." *Sensors* 19 (7): 1597. https://doi.org/10.3390/s19071597

Ahmed, S. 2006. *Queer Phenomenology*. Durham, NC: Duke University Press.

Aho, K.-R. 2020. "Itsensämittaamisteknologia osana ryhmäliikunnan ohjaamista sisäpyöräilytunneilla" [Self-Measuring Technology as Part of Group Exercise Instruction in Indoor Cycling Classes]. *Kulttuurintutkimus* 37 (3–4): 3–17.

Åkerberg, A., A. Söderlund, and M. Lindén. 2017. "Technologies for Physical Activity Self-Monitoring: A Study of Differences between Users and Non-Users." *Open Access Journal of Sports Medicine* 8: 17–26. https://doi.org/10.2147/OAJSM.S124542

Aliverti, A., M. Evangelisti, and A. Angelucci. 2022. "Wearable Tech for Long-Distance Runners." In *The Running Athlete*, edited by G. L. Canata, H. Jones, W. Krutsch, P. Thoreux, and A. Vascellari, 77–89. Berlin, Germany: Springer.

Atkinson, M. 2010. "Fell Running in Post-Sport Territories." *Qualitative Research in Sport and Exercise* 2 (2): 109–132. https://doi.org/10.1080/19398441.2010.488020

Attig, C., and T. Franke. 2020. "Abandonment of Personal Quantification: A Review and Empirical Study Investigating Reasons for Wearable Activity Tracking Attrition." *Computers in Human Behavior* 102: 223–237. https://doi.org/10.1016/j.chb.2019.08.025

Augustin, L., B. Kokoschko, A. Wolffram, and M. Schabacker. 2021. "Defining the Non-User: A Classification of Reasons for Non-Use." In *International Conference on Research into Design*, 339–349. Springer. Berlin Heidelberg.

Austin, M. W. 2007. *Running and Philosophy. A Marathon for the Mind*. Hoboken, NJ: Wiley.

Bannon, L. 1991. "From Human Factors to Human Actors: The Role of Psychology and Human-Computer Interaction Studies in System Design." In *Design at Work*, 25–44. Boca Raton, FL: LEA.

Baumer, E. P. S., J. Burrell, M. G. Ames, J. R. Brubaker, and P. Dourish. 2015. "On the Importance and Implications of Studying Technology Non-Use." *Interactions* 22 (2): 52–56. https://doi.org/10.1145/2723667

Biana, H., and B. Sarza. 2018. "Rundezvous: The Meeting Point of Running, Philosophy, and Meaning." *Suri* 7 (1): 78–93.

Brice, J. E., and H. Thorpe. 2021. "Toward More-than-Human Understandings of Sport and the Environment: A New Materialist Analysis of Everyday Fitness Practices." *Frontiers in Sports and Active Living* 3: 660935. https://doi.org/10.3389/fspor.2021.660935

Business of Apps. 2022. Fitness App Revenue and Usage Statistics https://www.businessofapps.com/data/fitness-app-market/

Butryn, T. 2002. "Cyborg Horizons: Sport and the Ethics of Self-Technologization." In *Sport Technology: History, Philosophy and Policy*, edited by A. Miah, and S. B. Eassom, 111–133. Boston, MA: JAI.

Camomilla, V., E. Bergamini, S. Fantozzi, and G. Vannozzi. 2018. "Trends Supporting the in-Field Use of Wearable Inertial Sensors for Sport Performance Evaluation: A Systematic Review." *Sensors* 18: 873–923. https://doi.org/10.3390/s18030873

Chiu, W., and H. Cho. 2020. "The Role of Technology Readiness in Individuals' Intention to Use Health and Fitness Applications: A Comparison between Users and Non-Users." *Asia Pacific Journal of Marketing and Logistics* 33 (3): 807–825. https://doi.org/10.1108/APJML-09-2019-0534

Clermont, C. A., L. Duffett-Leger, B. A. Hettinga, and R. Ferber. 2020. "Runners' Perspectives on 'Smart' Wearable Technology and Its Use for Preventing Injury." *International Journal of Human–Computer Interaction* 36 (1): 31–40. https://doi.org/10.1080/10447318.2019.1597575

Couldry, N., and A. Hepp. 2017. *The Mediated Construction of Reality*. Cambridge, UK: Polity Press.

Eskola, I., and A. Laine. 2020. "Suomen urheilu- ja hyvinvointiteknologia-ala urheilukulttuurin muutosten ilmentäjänä" [The Finnish Sports and Welness Technology Sector as a Manifestation of Changes in Sports Culture]. *Kulttuurintutkimus* 37 (3–4): 84–102.

Esmonde, K. 2020. "There's Only so Much Data You Can Handle in Your Life': Accommodating and Resisting Self-Surveillance in Women's Running and Fitness Tracking Practices." *Qualitative Research in Sport, Exercise and Health* 12 (1): 76–90. https://doi.org/10.1080/2159676X.2019.1617188

European Commission 2022. Digital Economy and Society Index (DESI). 2022. Finland.

Finnish National Board of Research Integrity. 2019. The ethical principles of research with human participants and ethical review in the human sciences in Finland. https://tenk.fi/sites/default/files/2021-01/Ethical_review_in_human_sciences_2020.pdf

Fronczek, L. P., M. Mende, M. L. Scott, G. Y. Nenkov, and A. Gustafsson. 2022. "Friend or Foe? Can Anthropomorphizing Self-Tracking Devices Backfire on Marketers and Consumers?" *Journal of the Academy of Marketing Science* https://doi.org/10.1007/s11747-022-00915-1

Giddens, L., E. Gonzalez, and D. Leidner. 2016. "I Track, Therefore I Am: Exploring the Impact of Wearable Fitness Devices on Employee Identity and Well-Being." In Americas Conference on Information Systems. San Diego, CA: Association for Information Systems.

Grönfors, M. 2011. *Laadullisen tutkimuksen kenttätyömenetelmät [Fieldwork Methods for Qualitative Research.]*. Hämeenlinna, Finland: SoFia-Sosiologi-Filosofiapu Vilkka.

Gurova, O., T. R. Merritt, E. Papachristos, and J. E. Vaajakari. 2020. "Sustainable Solutions for Wearable Technologies: Mapping the Product Development Life Cycle." *Sustainability* 12 (20): 8444. https://doi.org/10.3390/su12208444

Habermas, J. 1968 [1987]. *Knowledge & Human Interest*. Cambridge, UK: Polity Press.

Hockey, J. 2013. "Knowing the 'Going': The Sensory Evaluation of Distance Running." *Qualitative Research in Sport, Exercise and Health* 5 (1): 127–141. https://doi.org/10.1080/2159676X.2012.693531

Janssen, M., R. Walravens, E. Thibaut, J. Scheerder, A. Brombacher, and S. Vos. 2020. "Understanding Different Types of Recreational Runners and How They Use Running-Related Technology." *International Journal of Environmental Research and Public Health* 17 (7): 2276–2295. https://doi.org/10.3390/ijerph17072276

Kafle, N. P. 2013. "Hermeneutic Phenomenological Research Method Simplified." *Bodhi: An Interdisciplinary Journal* 5 (1): 181–200. https://doi.org/10.3126/bodhi.v5i1.8053

Kerr, R. 2016. *Sport and Technology: An Actor-Network Theory Perspective*. Manchester, UK: Manchester University Press.

Klemola, T. 1998. *Ruumis liikkuu-liikkuuko henki? Fenomenologinen tutkimus liikunnan projekteista [The Body Moves-is the Spirit Moving? A Phenomenological Study of Physical Activity Projects]*. Tampere, Finland: University of Tampere.

Koo, H. S., and K. Fallon. 2017. "Preferences in Tracking Dimensions for Wearable Technology." *International Journal of Clothing Science and Technology* 29 (2): 180–199. https://doi.org/10.1108/IJCST-03-2016-0021

Koski, T. 2015. *The Phenomenology and the Philosophy of Running*. Cham, Switzerland: Springer.

Kuru, A. 2016. "Exploring Experience of Runners with Sports Tracking Technology." *International Journal of Human–Computer Interaction* 32 (11): 847–860. https://doi.org/10.1080/10447318.2016.1202461

Le Blanc, G. 2018. *Juoksu: Fyysisiä mietiskelyjä [Running: Physical Considerations]*. Tampere, Finland: Eurooppalaisen filosofian seura ry.

León-Guereño, P., H. Galindo-Domínguez, E. Balerdi-Eizmendi, M. Rozmiarek, and E. Malchrowicz-Mośko. 2021. "Motivation behind Running among Older Adult Runners." *BMC Sports Science, Medicine & Rehabilitation* 13 (1): 138–148. https://doi.org/10.1186/s13102-021-00366-1

Lindgren, B. M., B. Lundman, and U. H. Graneheim. 2020. "Abstraction and Interpretation during the Qualitative Content Analysis Process." *International Journal of Nursing Studies* 108: 103632. https://doi.org/10.1016/j.ijnurstu.2020.103632

Lomborg, S., N. B. Thylstrup, and J. Schwartz. 2018. "The Temporal Flows of Self-Tracking: Checking in, Moving on, Staying Hooked." *New Media & Society*, 20 (12): 4590–4607. https://doi.org/10.1177/1461444818778542

Lupton, D. 2020. *Data Selves: More-than-Human Perspectives*. Cambridge, UK: Polity.

Mathavan, B., A. Vafaei-Zadeh, H. Hanifah, T. Ramayah, and S. Kurnia. 2022. "Understanding the Purchase Intention of Fitness Wearables: Using Value-Based Adoption Model." *Asia-Pacific Journal of Business Administration*. https://doi.org/10.1108/APJBA-04-2022-0166

McParland, C., and R. Connolly. 2020. "Dataveillance in the Workplace: Managing the Impact of Innovation." *Business Systems Research Journal* 11 (1): 106–124. https://doi.org/10.2478/bsrj-2020-0008

Moilanen, P. 2017. "*Kannustin, koriste ja liikkujan kaveri: tutkimus liikuntateknologian käyttä-jyydestä*" [Incentive, Decoration and Mobility Buddy: A Study on the Use of Sports Technology]. Jyväskylä studies in computing 267.

Morozova, D., and O. Gurova. 2021. "Being like Others Vs. being Different: Wearable Technology and Daily Practices of 50+ Consumers in Russia and Finland." *International Journal of Consumer Studies* 45 (6): 1335–1356. https://doi.org/10.1111/ijcs.12656

Mueller, F. F., C. T. Tan, R. Byrne, and M. Jones. 2017. "13 Game Lenses for Designing Diverse Interactive Jogging Systems." In Proceedings of the Annual Symposium on Computer-Human Interaction in Play, pp. 43–56. https://doi.org/10.1145/3116595.3116607

Nuss, K., and K. Li. 2021. "Motivation for Physical Activity and Physcial Activity Engagement in Current and Former Wearable Fitness Tracker Users: A Mixed-Methods Examination." *Computers in Human Behavior* 121: 106798. https://doi.org/10.1016/j.chb.2021.106798

Parikka, T. 2020. Yli 80 prosenttia kotitalouksista säilyttää kierrätyskelpoista elektroniikkajätettä [More than 80% of Households Retain Recyclable Electronic Waste]. https://www.stat.fi/tietotrendit/artikkelit/2020/yli-80-prosenttia-kotitalouksista-sailyttaa-kierratyskelpoista-elektroniikkajatetta/

Patel, M., and A. A. O'Kane. 2015. "Contextual Influences on the Use and Non-Use of Digital Technology While Exercising at the Gym." In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems, 2923–2932. https://doi.org/10.1145/2702123.2702384

Pobiruchin, M., J. Suleder, R. Zowalla, and M. Wiesner. 2017. "Accuracy and Adoption of Wearable Technology Used by Active Citizens: A Marathon Event Field Study." *JMIR mHealth and uHealth* 5 (2): e24. https://doi.org/10.2196/mhealth.6395

Pronger, B. 1998. "Post-Sport: Transgressing Culture in Physical Culture." In *Sport and Postmodern Times*, edited by G. Rail, 277–299. Albany, NY: Suny Press.

Pybus, J., and M. Coté. 2022. "Did You Give Permission? Datafication in the Mobile Ecosystem." *Information, Communication & Society* 25 (11): 1650–1668. https://doi.org/10.1080/1369118X.2021.1877771

Radtke, T., T. Apel, K. Schenkel, J. Keller, and E. von Lindern. 2022. "Digital Detox: An Effective Solution in the Smartphone Era? A Systematic Literature Review." *Mobile Media & Communication* 10 (2): 190–215. https://doi.org/10.1177/20501579211028

Raudaskoski, S., E. Mantere, and S. Valkonen. 2019. "Älypuhelin ja kasvokkaisen vuorovaikutuksen muuttuvat käytänteet [The Smartphone and Changing Practices in Face-to-Face Interaction]." *Sosiologia* 56 (3): 282–299.

Rennie, D. L. 2012. "Qualitative Research as Methodical Hermeneutics." *Psychological Methods* 17 (3): 385–398. https://doi.org/10.1037/a0029250

Research and Markets. 2022. Global Sports Technology Market (2022-2027) by Technology, Sports, End-user, Geography, Competitive Analysis, and the Impact of Covid-19 with Ansoff Analysis. https://www.researchandmarkets.com/reports/5601676/global-sports-technology-market-2022-2027-by

Saariketo, M. 2018. "Koodin rytmittämät kokemusmaisemat" [Experiential Landscapes Rhythmed by Code]. *Kulttuurintutkimus* 35 (1–2): 37–49.

Sailors, P. R. 2009. "More Than a Pair of Shoes: Running and Technology." *Journal of the Philosophy of Sport* 36 (2): 207–216. https://doi.org/10.1080/00948705.2009.9714757

Satchell, C., and P. Dourish. 2009. "Beyond the User: Use and Non-Use in HCI." In Proceedings of the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group: Design: Open 24/7, 9–16.

Scheerder, J., and K. Breedveld. 2015. *Running across Europe: The Rise and Size of One of the Largest Sport Markets*. London, UK: Palgrave Macmillan.

Sheehan, G. 2013. *Running & Being: The Total Experience*. Emmaus, PEN: Rodale.

Sikes, M., and G. Jarvie. 2014. "Women's Running as Freedom: Development and Choice." *Sport in Society* 17 (4): 507–522. https://doi.org/10.1080/17430437.2013.815519

Southerton, C. 2020. "Datafication." In *Encyclopedia of Big Data*, edited by L. Schintler and C. McNeely. Cham, Switzerland: Springer. https://doi.org/10.1007/978-3-319-32001-4

Stebbins, R. 2007. *Serious Leisure: A Perspective of Our Time*. London, UK: Routledge.

Stragier, J., M. Abeele, and L. Marez. 2018. "Recreational Athletes' Running Motivations as Predictors of Their Use of Online Fitness Community Features." *Behaviour & Information Technology* 37 (8): 815–827. https://doi.org/10.1080/0144929X.2018.1484516

Subie, A., A. Mouritz, and O. Troynikov. 2009. "Sustainable Design and Environmental Impact of Materials in Sports Products." *Sports Technology* 2 (3-4): 67–79. https://doi.org/10.1080/19346182.2009.9648504

Tainio, M. 2020. "Esteettisiä kokemuksia etsimässä: Kestävyysjuoksuharrastus ja liikuntakulttuurin muutos" [In Search of Aesthetic Experiences: Endurance Running and the Changing Culture of Sport]. *Kulttuurintutkimus* 37 (3–4): 18–32.

Takkinen, P., and P. Heikkurinen. 2022. "Harmaalla alueella: Autoetnografia kestävyysasiantuntijuuden teknologiasuhteesta" [In the Grey Area: An Autoethnography of the Technological Relationship of Sustainability Expertise]. *Niin & Näin* 4 (2022): 15–26.

Thaler, C., and R. Sunstein. 2008. *Nudge: Improving Decisions About Health, Wealth, and Happiness*. London, UK: Penguin Books.

Vo, H., J. Kattelus, S. Karki, and S. Shopneel. 2020. Life Cycle Assessment Summary Samsung Galaxy Watch. https://www.researchgate.net/publication/338801291_Life_Cycle_Assessment_Summary_Samsung_Galaxy_Watch

Weiser, M. 1991. "The Computer for the 21st Century." *Scientific American* 265 (3): 94–104. https://doi.org/10.1038/scientificamerican0991-94

Williams, M., and T. Moser. 2019. "The Art of Coding and Thematic Exploration in Qualitative Research." *International Management Review* 15 (1): 45–55.