‘You can’t really control life’: Dis/assembling self-knowledge with self-tracking technologies

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ABSTRACT

This article investigates everyday self-tracking as a practice of self-related knowledge production. Self-tracking activities are commonly narrated and imagined as productive of self-related knowledge and insight into one’s life and bodily functions. However, by drawing from qualitative interviews with Finnish self-trackers, the article argues that in practice self-tracking also appears as prescriptive of uncertainty. The article shows how everyday self-tracking systems actively produce their functionality as systems of knowledge production in practice, as selves are extended in time and potentialised via the measurement-related affordances of self-tracking technologies. Thus, self-tracking often prescribes and animates repetitive behaviour of keeping track; of attaining experiences of self-knowledge and control which nevertheless remain elusive and flow away. The paper engages with Bernard Stiegler’s discussions on temporal flux and cinematic time in order to theorise self-tracking as a practice in and through which the self is produced and lived as perpetually ‘unfolding’.

Keywords: self-tracking, technology, self, knowledge, time, temporality

INTRODUCTION

Self-tracking – referring to the use of digital devices and applications that gather real-time data on people’s bodily functions and rhythms – has become a popular everyday practice of proactive self-care in recent decades. In academic and common parlance self-tracking technologies, such as fitness tracking wristbands, sleep tracking applications and heart rate monitors, are most often conceived of as tools for producing self-knowledge through monitoring of selected functions of the body, recording the data and assembling the measurements into more or less coherent self-representations that are then subject to interpretation (Ruckenstein, 2014; Lupton, 2016). Some self-tracking devices and algorithms suggest self-knowledge through visual cues, virtual rewards for ‘achievements’ and haptic warning signs for ‘pathologies’ such as physical inactivity (Till, 2014; Schüll, 2016a, Marshall & Katz, 2016; Fotopoulou & O’Riordan, 2017). Some other devices merely enable the creation of data collections that provide individuals with possibilities for more reflexive self-exploration (Lupton, 2016; Pantzar et al., 2017: 25–26; Nafus & Sherman, 2014).

Nevertheless, while contemporary algorithm-driven self-tracking may well be thought of as productive of knowledge on individuals’ lives through the relatively easy generation of large databanks which can potentially benefit the individual, there is another side to the story. This paper springs from empirical observations on how in everyday lives of self-trackers themselves, narratives of living with self-tracking technology are often characterised by apparent and pervasive interplay between experiences of knowing oneself and of *not* knowing oneself. Following this dynamic, the paper sets out to explore *how self-tracking systems shape*

the experience of self-knowledge in practice? By 'self-tracking systems' I refer to assemblages of heterogenous human and non-human actants taking shape in and through self-tracking practices (Latour, 1992; Bennett, 2005; Lupton, 2016). For this paper this means that the focus is on how the human-technical co-operations and companionships shape and mediate the ever-present dynamic between self-related knowledge and uncertainty in everyday life.

Self-tracking has evolved into its current cultural significance in entanglement with neoliberal, individualised health markets that encourage people to gather health knowledge and take responsibility of their health (Lupton, 2013; Sharon, 2017). However, such regimes of personalised and proactive self-care seem effective not only in empowering people with knowledge but also in producing uncertainty. In relation to pharmaceutical health markets, anthropologist Joseph Dumit (2012: 1–2) suggests that people now live under the 'double insecurity' of not knowing whether one has in fact already fallen ill (despite a lack of obvious indications of illness) and not knowing *enough* about the possibilities of illness prevention. Dumit (2012) brings up what seems like a paradoxical development: that the more educated we become in caring for ourselves and combating risk, the more information we crave in order to keep illness at bay. This is relevant for proactive care in general, because the apparent paradox contains an important lesson: uncertainty – a doubtful mindset and a experience of 'not knowing' about the 'state' of the self – is not an essential condition but an *enacted* one. The notion of 'dis/assembling self-knowledge' here reflects the co-existent enactment of the self-as-known and the self-as-not-known within a specific regime of proactive self-care, namely self-tracking. In self-tracking, the self is made known through assembly work, i.e. through assembling individual data points and collections of data together. And yet, as an active practice, through human-technology co-operation self-tracking tends to steer away from temporally specific, lived self-knowledge as individual acts of measurement contribute to data-based, temporally extensive trajectories that motivate and prescribe further tracking and urges to know more. Disassembly, then, refers to how the self is *actively made incomplete* and not-known – i.e. unstable, potentially pathological, in need of securing control through *more data* – within self-tracking systems.

The ways in which systems of self-tracking enact not only modes of knowing the self but also modes and experiences of self-related uncertainty are still insufficiently mapped. This paper contributes to this gap and develops a novel theoretical account of self-tracking as a sociotechnical domain of temporal extension and reconfiguration of selves: it shows how selves become lived as temporal objects (Stiegler, 2011; Coleman, 2010). The notion of the temporal object in the context of self-tracking is important because as discussed widely in research on self-tracking-related early-adopter 'Quantified Self' communities, self-tracking is typically made sense of as a practice of employing databanks for assembling self-knowledge: for finding correlations between actions (e.g. exercise, behavioural changes, eating certain substances etc.) and consequences (e.g. increased/decreased wellbeing, lower heart rate, better blood pressure etc.) in order to enable self-control (Nafus & Sherman, 2014; Bode & Kristensen, 2016; Ajana, 2017; Kristensen & Ruckenstein, 2018). However, one of the main findings in this paper is that in everyday experience such correlations can prove very elusive.

The article will proceed as follows. First, I will discuss the idea of the production of self-knowledge in relation to existing self-tracking-related social scientific literature. I will then present the materials and methods of this research. This is followed by the analysis of the interview material. The first empirical section focuses on narratives of how people work with self-related databases. This shows how selves are extended in time in order to establish

'realities' about the self, yet how selves become established as unstable, constantly changing beings which then attracts acts of gathering more data. The second empirical section elaborates on the mundane craftwork of the self through showing how self-tracking devices and algorithms attract repetitive patterns of action. Lastly, I will provide brief conclusions.

SELF-TRACKING AND (THE WILL TO) SELF-KNOWLEDGE

Starting from the popular self-tracking discourses that promote 'self-knowledge through numbers', self-tracking is seemingly all about knowledge production and self-making through knowledge. This is not to say that self-trackers would always uncritically engage with the data they produce; on the contrary, in recent anthropological research it has been noted that self-tracking cannot be reduced to 'data fetishism' – i.e. to the idea that data and numbers reflects objective 'truths' about the self – as people often actively interpret and negotiate the meaning of the data and may thus be thought to tweak it into means of resistance against social discipline (Sharon & Zandbergen, 2016; see also Nafus & Sherman, 2014; Pantzar & Ruckenstein, 2017). Based on preceding empirical research, it seems that self-tracking can bring different modes, such as embodied and datafied modes of knowing together and thus enable new modes of knowing the self (Pink & Fors, 2017, Pantzar & Ruckenstein, 2017). And yet, while in general self-trackers may not blindly subscribe to 'data fetishism', everyday data gathering has also been connected with 'data valences' of truthiness and self-evidency, which point to different ways in which data still occupy a culturally superior position as a medium of 'truth', and how data – at least in everyday settings – are thus often experienced to be either indisputable, pure information or even knowledge *per se* (Fiore-Gartland & Neff, 2015: 1473–1478). Other identified valences – actionability, transparency, connection and discovery – while calling into question the value of data as self-evident truth and finding value e.g. in how the data can be *used*, also ultimately seem to focus on data as enhancing and supporting knowledge.

In any case, as these different insights into living with data build on the premise that self-tracking involves aspirations and strategies for management, control and steering of lives through data, the underlying presupposition seems often that through the practice of self-tracking humans *gain* insight. Hence, the focus is on the production of knowledge, be this knowledge of an oppressive or a subversive kind; of a truth-generating or a truth-challenging kind; sensitive or insensitive towards contexts and other modes of knowing; created in the here-and-now or created over time. Although it is at some level often recognized by researchers and research participants alike that the numerical and visual data may be close to unintelligible or meaningless for us, the practice of self-tracking is thought to feed insight: if we find subjective knowledge more intelligible than data, we are typically understood to simply override the software-generated data with our sensory data and thus perhaps become more sensitive to embodied ways of knowing the self. Or, if we work towards collecting a broad collection of data, we are understood to accumulate our knowledge of the self over a certain time scale and thus to form a gradually more coherent picture of the self over time.

However, it has also been noted that how data actually 'works' in establishing factualities about the self in self-tracking practices is through *relations to* similar data in different spatial or temporal locations (see Sherman, 2016: 33–34; Day & Lury, 2016: 57–58). This highlights the fact that data points – i.e. temporally local numerical or visual measurements, closed datasets, temporally local 'images' of oneself, etc. – provide insight into one's life in relation to

other data points, but also that every data point requires a connection to other data points to become a medium of self-related knowledge. For example, the number of steps taken on any individual day or a single heart rate reading in the morning does not necessarily add anything meaningful to one's self-knowledge, except in relation to similar measurements conducted at different points in time. These relations enable self-tracking as a linear practice, e.g. as 'progress'. This is how the self becomes known as an object of action and change, yet also only through *being extended over time and space*. Such an extended self is what Schüll (2016b) has referred to as the 'time-series self', as knowledge of the self is formed over time and via various series of data. In addition, Day and Lury (2016) refer to a process of 'stitching in time', as tracking practices create 'tracks' by tying together various data points.

What, in my view, is implied but not sufficiently explored in accounts of self-tracking as a correlative and relational practice, is the enactment of the self as inherently uncertain, unstable entity that is constantly subject for stabilisation through measurement. This resonates with Dumit's notions of double insecurity, especially in the sense that tracking, while perhaps contributing to the sense of knowing the self in order to act on the self in some way, also constantly lays out tracks for the further pursuit of self-knowledge. Tracking always enacts a person at risk; e.g. at risk of the next measurement(s) being indicative of something dramatic and pathological; or, perhaps at risk of insufficient knowledge, as the latest measurement might be found inaccurate, hard to interpret or invalid for technical reasons. Certainly, self-trackers usually acknowledge the need – and are encouraged through marketing – to 'keep track' and systems of proactive self-tracking have been perceived as having notable power in creating repetitive patterns of self-tracking behaviour (Fotopoulou & O'Riordan, 2017: 55; Ruckenstein, 2014; Lupton, 2016). While measurement-related biopolitical 'normalisation' in relation to health (Lupton, 2015; Fotopoulou & O'Riordan, 2017) no doubt explains many aspects of the interviewee's experiences with self-tracking, and provides motivation for self-tracking, this paper lays a sensitive eye on how one's normalising work on the self is conditioned and shaped by everyday systems of self-tracking.

Drawing from accounts in which foucauldian ideas of biopolitical normalisation and governance are set in dialogue with ideas on the performativity of technological and algorithmic systems (see e.g. Introna, 2016), as well as from Bernard Stiegler's (2011; 2012) philosophy of cinema, *I argue that self-tracking systems actively produce their own functionality and purpose as a practice of knowledge production in practice*, as they intensify the production of the self as a flux. The idea of the self as 'flux' here refers to how the self in self-tracking practice becomes lived as constant change through different yet entangled data points in time. Such a temporal extension of the self, it is further argued, can often attract will towards ongoing production of knowledge and repetitive behaviour. I conceptualise such persistent instability through a notion of the self as a 'temporal object'.

Importantly, a temporal object is not only trivially an object *in* time (as all objects in human perception are *in* time, i.e. affected by the flow of time) but rather something that *constitutes itself in duration*, as something that constantly unfolds and builds through repetition and rhythm. As Stiegler puts it, a temporal object 'weaves itself in the thread of time[…]as that, which manifests itself in disappearing, as a flux vanishing as it is produced' (Stiegler, 2011: 36–37, quoted in Roberts, 2006). A classic Husserlian example of a temporal object would be a melody: it consists of individual notes, which have a relation to other notes at different moments. But melodies become coherent through not only the appearance but also only through the disappearance of each note, and the entanglement of the note with the other

notes within the melody. For Stiegler, an example of the temporal object is a film that constitutes of series of images and becomes coherent through a process of 'flowing away' (Stiegler 2012: 446–447). According to him, the 'film's flow coincides with the spectator's consciousness' so that the spectator *lives* the unfolding. In self-tracking practice, the self is the spectator and assessor of itself as something that is woven in time. As such a time-series self, the self becomes lived as an entity that is always 'becoming' and in a persistent state of incompleteness.

In the following analysis I will show how the tracked selves are not only assembled into coherent self-representations but disassembled into trajectories in which futures (and pasts) are always both present and 'sufficiently remote' (cf. Coleman, 2010; Nowotny 1994). Thus, in a Stieglerian sense, despite self-tracking devices being commonly made sense of as tools for self-related knowledge production, in practice the tracked self becomes *lived in duration*, as a metastable entity, i.e. constantly subject to change.

MATERIALS AND METHODS

The materials for this paper consist of 14 interviews with Finnish self-trackers who have been employing tracking technologies in their everyday lives for at least 6 months. Typical technologies in question include fitness activity trackers, sleep tracking devices, and other common equipment for proactively measuring bodily processes such as heart rates, activity levels and blood pressure. In addition, the author has engaged in self-tracking practices, employing a FitBit Charge HR fitness tracker over a period of 8 months, enabling empathetic knowledge (Pink & Fors, 2017: 6) through which to relate to people's narratives on self-tracking.

Interviewees, all of whom were, at the time of the interviews, employed or studying and between 25 and 50 years of age, were interviewed in Finnish and asked about their motivations, experiences, thoughts and habits in relation to self-tracking. The interviews were conducted in face-to-face meetings, via Skype video calls and in one instance via e-mail. Some of the interviewees were recruited through a 'Quantified Self'-related Finnish Facebook group, while others were contacted through snowballing and had no known contact with such groups. The analysis does not focus on the Quantified Self community as such, but on everyday self-tracking among relatively well-off individuals more generally. Interviewees' self-tracking practices have not been directly observed, as they have mostly taken place outside of interview situations. However, Law (2004) remarks that practices such as speaking and 'knowing' also precede reality rather than simply follow from it. Interviews offer accounts in which it is known how selves have become (un)known. They are, then, 'doings' of ways of how self-tracking has become a practice of dis/assembling self-knowledge in everyday lives.

The transcribed interview materials have been analysed via thematic textual analysis, the main thematic elements of which have been self-related knowledge and non-knowledge as well as self-related stability and instability. Notably, the reading of the interview material has been informed by a sensitivity towards actor-network theoretical ideas of locating multiplicities and contradictions in the world, and 'staying with the trouble' (Law & Singleton, 2013: 487–488). In the case of self-tracking, a central contradiction – or a 'troubling' theme – has been that of people's narratives readily underlining self-knowledge and stability, yet also often legitimising expanding patterns of self-exploration in terms of that which is and remains

(even frighteningly) uncertain. While during the interviews people frequently and very relatably assured me that it is self-knowledge in the sense of actualisation of one's states that makes self-tracking rewarding, the ways that they describe manners in which these devices are appropriated and implemented into everyday contexts often tell a story of a self that once measured, always also slips from the grasp. This has given rise to conceptualisations of the self as a temporal object.

ANT accounts also highlight the role of non-human agency: a sensitivity towards how technical affordances at play in self-tracking condition human action. This article considers technical affordances of self-tracking mainly in relation to everyday user perspective. In tracing the everyday effects of self-tracking, I have focused not only on what people say that they gain out of self-tracking practices, but also on how they speak about 'co-operating' *with* self-tracking devices. This is to say that while the interviewees seemingly speak about appropriating and implementing these devices into their everyday lives, their narratives also reflect how the data-drivenness of self-tracking – evident e.g. in the visual presentation of the self as graphs, charts and visual data collections – prescribes and suggests (Latour, 1992) action and ways of relating to themselves.

CHASING THE ELUSIVE 'REAL' SELF

Sakari is a 50-year-old man who describes himself as perfectly healthy and who is very active in self-tracking. In fact he offers me an exact date – about six years before the interview – when he started, in his words, a 'fully systematic' exploration of himself; that is when he started tracking many of his bodily dimensions such as weight, heart rate and blood pressure and noting down these values in a consistent manner into applications and excel charts. Initially, Sakari seems very well educated about himself as he explicates a strong sense of having gained self-knowledge and knowing something 'real' about himself.

> **AUTHOR:** Can you tell me something about the motivations behind your desire to track yourself?
> **Sakari:** […] One [main] reason is a bit zen-like, direct experience of things… because through tracking, things become so terribly real. It's one thing to know how much you weigh but when you know your weight through like five thousand measurements, your weight becomes so… like… real [laughs]. And things like blood pressure and heart rate… So when I go to bed at night I always measure my resting heart rate. Even if I know that I am relaxed, when I see that resting heart rate value that I have… and when I have a massive amount of those measurements and I know my starting level, my relaxation becomes real in a whole different fashion! I really know on some deep level that I am relaxed, that I am not just imagining being relaxed. I see in the numbers that I have to be relaxed. And this is definitely one level, that self-tracking makes reality somehow deeper.

Such an act of establishing the objectivity of one's states represents quite a typical way of stating the functionality of self-tracking in everyday life. In a similar fashion, other interviewees often state that they use a self-tracking device such as a pedometer because it shows them how much they 'really' walk, or they employ a sleep tracker to establish the 'reality' of what actually happens (in terms of sleep) during the hours spent in bed. However,

instead of subscribing to data fetishist behaviour, what the interviewees most often seem to actually mean by 'reality' is – in line with Pantzar's and Ruckenstein's (2017) notion of 'situated objectivity' – that the technologies serve as means of continuous self-confirmation and actualisation of one's experienced state of being. For example, as Sakari explains above, one of his methods of self-actualisation is to confirm an *already existing sense of relaxation* in co-operation with a heart rate monitor and the data it has provided.

Sakari speaks about self-tracking providing 'direct experience' in relation to himself. However, in Sakari's account the experience of the actual state of the self is anything but direct, as it is assembled through other measurements: for Sakari the data become effective as self-confirmation especially *in relation to an ever-increasing bank of preceding data*, the preceding thousands of measurements that he mentions. What seems to happen, then, is that self-knowledge is assembled both from different ways of knowing and through wide sets of temporally and spatially separate yet entangled measurements.

Although Sakari initially seems quite well educated about himself, his account then also reflects the disassembly of self-knowledge, as knowledge of one's being must now be established at all times. Sakari describes self-trackers as scientists for whom the object of inquiry (i.e. the self) becomes something like a scientific fact*:* not a fact that is indisputable, or even objective, but rather something the viability of which must be tested and established on a regular basis – such as *daily* – because the tracked self only comes 'into effect' relationally. So, it is not only the preceding measurements but also future measurements, that matter. In other words, any individual tracking event provides a glimpse of the self but *also disappears* into an ever-expanding canvas of data because it gains its meaning only in relation to other measurements at other spatial and temporal points.

What this means is that the tracked self becomes ephemeral*.* The self, knowledge of which becomes assembled together from multiple data points, also becomes constructed temporally, as a flux*,* i.e. through constant change or becoming. Interestingly, because he is tracking a process of change, Sakari is also very explicit about the *limitations* to self-knowledge that he now lives with. He eventually says: 'you cannot really control life', and says that it is an 'experience of control' that self-tracking can offer. As it is indicative of constant change rather than stability, self-tracking for Sakari actually also gives birth to heavy distress, even what he quite strikingly calls 'terror':

> **Sakari:** [S]ometimes you get these weird occurrences when your weight goes up or down, and it is kind of unexplained, so you notice a kind of… maybe distress would be the right expression. So it's not the point that your weight goes up or down, but the loss of control… So when you can't explain [the change in data], it's kind of an anxious feeling… but as long as everything is under control, your values are understandable[…] at best this is a very therapeutic practice.
> […]
> I would say that the main feelings in relation to [self-tracking] are… Panic is maybe a strong word [laughs], but like… terror… something like that… especially when you get a longer period of time when you see changes in values, and you're unsure about why it's happening… Then again, when you suddenly realise why that is… and you go back to normal values, it makes you feel so self-confident. Like yeah, this [tracking] is such a peculiar business, because this is about such

> basic things [in life]… Some guy who just dabbles a bit with measuring his weight once a month, he doesn't get this at all…

As Sakari does not 'dabble' but has thousands of measurements on any specific dimension of his body, he quickly creates a web of data points that expands through time (days, months, years, past, future) and space (diaries, Excel charts, software databases). The more data he gathers, the more potential points there are to which any specific change relates, and thus the more potential points there are in relation to which any individual measurement or trend in results may seem 'unexplained'. While it is tempting to think that without such expanding datasets one would know even less, the other side of the coin is that as Sakari's body and self is now experienced and perceived increasingly through a constant flux, as a process that can (and should) be tracked very regularly (as for Sakari seems to be the case with weight and resting heart rate), maintaining self-knowledge now also constantly requires more data. He is, indeed, *living the unfolding* of the self. Sakari's self-tracking practices have also been steadily expanding: in fact, Sakari has moved on from 'basic' self-tracking technologies, such as weight and heart rate measurements, to include biomarkers drawn across regular intervals in laboratories and even a one-time MRI imaging of his head, because they 'provide [me] with more data' and contribute to his 'peace of mind' and the 'self-confidence' that he gains from self-tracking and the illusion of controlling the flux.

Sakari's drive towards an ever-expanding search for control via self-knowledge, in the form of incorporating ever-wider datasets into his practice of self-tracking, indicates that self-tracking systems also constantly open up the future and the past to scrutiny and as objects of stabilisation in and through the present. Any control, any 'reality' of the self that is reached, simultaneously slips away; the self as flux is constantly an object of stabilisation. In this way, systems of self-tracking actively suggest and 'prescribe' (Latour, 1992) acts of gathering more data, in the ongoing project of knowing enough, but whatever knowledge of the self in established in a single measurement event, the event also establishes a flux, by making apparent the need for relations and context.

Sakari's story obviously presents a quite extreme instantiation of self-tracking. However, very similar dynamic of knowledge and uncertainty is present in the narratives of other interviewees. Mikael, a 26-year-old university student and part-time worker, started self-tracking with a heart rate monitor at the age of 18 as an attempt to optimise his training for a specific marathon event. Now, after 8 years of tracking, he employs a variety of devices, such as an activity tracker watch, body mass scale and two separate sleep tracking applications to enable him to sketch a picture of the way in which his time spent sleeping is divided into phases of deep sleep and light sleep. He now also gets heart rate variance data during his sleep which suggests insights into his body's stress levels as well as physical and mental recovery. Mikael offers an account of how the act of measuring specific mass-related aspects of his body has 'sparked' an interest in gathering more accurate insights, as he obviously feels that self-tracking entrenches his self-knowledge.

> **Mikael:** [When] I first stepped on a body mass scale, it sparked my interest in knowing the fat mass and muscle mass in my body. A couple of years from that I acquired this body mass scale that uses weak electric currents through the soles of my feet to measure body mass. And then later I got a scale that also measures from your palms, so it's a bit more of an accurate version. I've used that for a year at least… So every day, in the morning, I check the measurements and record

> them in a notes application, so in that way I try to keep informed [literal translation: 'to stay on the map'] about what [my] relation is today to what went before[…]the way I use these devices is to confirm some sensations that my body tells me.

For Mikael, then, regular self-tracking and development of self-knowledge is explicitly about being aware of the actuality of his state of being in relation to the past and to his embodied sensations. Furthermore, this activity aims towards the future as he 'aims to change [his] everyday life'. As a result of self-tracking, he says he has adjusted the timings of his daily intakes of caffeine, as well as patterns of exercise, for example. However, after eight years of tracking, he also thinks that while he has been able to 'trace some effects' and thus modify his behaviour in a satisfying way, it is, according to him, very difficult to know and 'isolate' the factors that actually affect sleep and recovery, and to identify how they affect these things.

This dynamic between experiences of knowing and not knowing the self becomes more apparent as Mikael talks about how self-tracking has 'made visible' new opportunities:

> **Mikael:** I think that their [self-tracking devices'] ability to make visible and numerical various vital functions and things that were previously invisible can itself bring good or positive consequences, because you [begin to] pay attention to things, and you become informed about things over which you previously thought you could have no control.

What seems to have also been made visible in a new fashion, in addition to various vital functions under the skin, is the past and the future: self-tracking in the moment becomes, in fact, also *creative* of pasts and futures, as measurements contribute to the creation of states of the self that can be thought of as causes (i.e. current actions lead to future outcomes) and as effects (i.e. past actions have led to current outcomes and to possible futures). Mikael says that 'if you track long enough, you can maybe pinpoint some connections' between actions and their consequences, and he suggests that self-tracking promotes the constant act of 'paying attention'. Self-tracking prescribes attachments to data and datasets, as one becomes aware of oneself as a temporal flux and conscious that one *can* affect things. In other words, current vital functions unravel as functions that not only reflect but also *shape* possible futures and pasts.

This is living the 'extended present' (Coleman, 2010; Nowotny, 1994) through data: the act of 'tracing effects', as explicated by Mikael, works as a practice of bringing possible pasts and futures into the present and simultaneously extending the tracked present into the past/future. However, as Coleman (2010) notes, the future also always appears 'sufficiently remote' because self-tracking always also always enables other temporal points to pay attention to. As one indiction that futures remain remote, we may see that Mikael has become aware that he can and does affect things, yet he has also become increasingly unsure *how* he can affect things. It seems that eight years of tracking have established a sense of the self as flux; as that which is *in need* of active control through constant monitoring. However, he still seems to hope that there will come a day when he will become better equipped, knowledge-wise, to make interventions into his patterns of everyday being. As the newest addition to his means of data gathering, Mikael has acquired a blood pressure monitor, because he 'became interested to know how ice swimming affects [my] blood pressure'. This, again, requires the consistent creation of another dataset.

It is important to note that the future and the past need not be understood as wholly symmetrical; in fact, the experience of self-related uncertainty may acquire different practical manifestations or 'workings' in relation to the past and the future. For example, uncertainty in relation to already existing databanks (i.e. the past) may manifest in the person not being sure how to interpret the existing data 'correctly', which may drive for example further health literacy. Then again, uncertainty in relation to the future may more commonly be about the future being perceived as open, which drives more tracking in order to monitor further change. However, the notion of the self as a temporal object points to the enduring significance of the temporal extension in both ways. As Mikael said, he wants to constantly 'stay informed' and know himself 'in relation to what went before' and that 'isolating' important factors in whatever change he tries to achieve is very hard. This work on isolating factors requires continuous engagement with the past. Earlier, Sakari said that the data-based histories can produce uncertainty about what is causing weird data, until due to gathering more data 'you suddenly realise' some factor(s) that explains it; i.e. sheds new light on the datafied history. These narratives point not only to the importance of the past as 'fixed' repository of self-knowledge but also to how future data may unlock new ways of interpreting the past, and thus effectively change it. Much like a film, only the latter scenes of which may build a novel sense to what went before. In a mundane example, Mikael may someday – after gathering new data and relating it to the past – establish an understanding that caffeine intake after all has no meaningful effect on his sleep. In a sense then, the past also stays sufficiently remote; in a longitudinal self-tracking practice in which the self is lived in duration, the past is always emergent, as is the future.

ON THE (MULTIPLE) TEMPO(S) OF REPETITION

In Sakari's and Mikael's experiences we have seen how self-tracking systems open futures and pasts up to scrutiny in new ways. This is a logical consequence of the self becoming experienced as temporally extended as this extension prescribes the gathering of more data. While the previous subchapter elaborated on how the temporal trajectories of self-tracking produce a sense of the self as flux, this subchapter elaborates on the doing of the self as a temporal object with and through the technical affordances of self-tracking devices.

Let us consider the example of Sirkku, a 26-year-old female who works in a company that develops sleep tracking software. She uses mobile applications such as SportTracker to record her running exercises, Apple Health systems to record daily activity, such as the steps taken and distances travelled daily, and a sleep tracking device that is installed in her bed and provides insight into her sleep via measurements of heart rate patterns, movement and breathing rhythms during the night. In relation to sleep tracking, which currently seems to be the most important aspect of self-tracking for her, Sirkku repeats the usual story: she characterises herself as a 'bad sleeper'. The tracker functions to reveal how she 'really' sleeps. Sirkku, like several other interviewees, is very explicit about self-tracking always containing the risk of 'overdoing it', the risk of developing an intensive attachment to self-tracking technologies; she, for example, describes herself as having become 'obsessed' with calory consumption tracking in the past. When talking about her sleep tracking in the present, by her account the practice is highly repetitive, almost ritualistic:

> **AUTHOR:** Do you feel that the data is important to you…? What if you had to live without it?

> **Sirkku:** I could live without it but[…] I would not like to give [sleep tracking] up. I would really miss it. I remember to switch [the tracker device] on every evening… It has an automatic tracking function which means that it is not necessary [to remember to turn it on] but I like to use it manually, so that I get the hours slept as accurately as possible… Sometimes I am quite tired in the evening, and I forget a lot of things… things I would like to prepare for next morning, like choosing my clothes [for the next day] and pre-loading the coffee machine… Those I can live without, but I always remember to switch on the sleep tracker.

Such a tight attachment may seem surprising because as a person who works in close contact with self-tracking technology development, she is very aware of the inaccuracies of self-tracking systems: based on, among other things, movement in bed, the sleep sensor is definitely 'not perfect' in analysing sleep as it may for example register the movement of anyone who sleeps in the same bed. Sirkku also mentions that there have been occasions of dissonance in which she may feel poorly rested, yet the application indicates a relatively well rested night. Sirkku also says that while she has attempted to change some habits in order to sleep better, 'there will be bad scores, no matter what'. However, it then becomes clear that for her, the system becomes functional and therapeutic through long-term *averages*, which is another way of working with the affordance of the temporal extension of the self:

> **AUTHOR**: So…I get the feeling that...as the application gathers data on a longer time-scale, like monthly or weekly…so you rather analyse your data longitudinally [than daily]?
> **Sirkku:** Yes, that is much more interesting… averages and all that. I think its too cruel to punish myself for sleeping poorly one night, because you will get bad scores, no matter what, but if I check like weekly averages, I think that can be really comforting – – I think people should talk more about [and make sense of themselves in terms of] averages.

Remisniscent of what Deleuze (1995) termed 'dividualisation', the self in self-tracking software is often concretely dissolved into graphs and trajectories. This is to say that selves become assemblages – collages of data points – on specific functionalities that are, in a sense, detached from any specific temporality (See also Marcus & Saka, 2006). Individual measurements can be deemed relatively insignificant, yet each is important. A logic of averaging is present in many other interviews as well. With the logic of averaging it becomes evident in yet another fashion how futures and pasts are both brought into the present: Averaging becomes a 'process of composition' of the self (Day & Lury, 2016: 57) that is a way of extending the self in time, and presents an ongoing sequence – or 'tracks' – that by definition can never be complete. This is reminiscent of how the self can be thought of as an unfolding of a melody. A weekly or monthly graph of nightly measurements is, in a sense, a neat graphic symbol for the dis/assembly of self-knowledge: one assembles an average of one's sleep through individual measurements; however, it can also be argued that through temporal extension one disassembles a temporally specific understanding of the quality of one's sleep. The quality of sleep (and the evaluation of the self as 'sleeper') becomes an average that does not necessarily correspond with any specific acts of sleeping. Averaging, then, is an activity that can attract repetitive measurement (e.g. each day, each night) in order to contribute to bigger pictures (weekly stats, monthly stats etc.). Although days and weeks

pass and complete, as an average the self becomes lived through the continuous process of unfolding.

The logic of averaging and the detachment of the self from specific temporalities also directs to think about how the practice of self-tracking involves several overlapping time cycles; or, how devices can be implemented into one's life through different cycles. Marika is a 43-year-old mother of three who enjoys gardening and speding time with family, and works in a managerial position in health care. Unlike Sakari, Mikael, Sirkku and some other interviewees, Marika has never heard of groups or movements like the 'Quantified Self' that have promoted self-tracking to a wider public in Finland and elsewhere. However, at the time of the interview she had employed a fitness tracker wristband in her life for a little over six months.

Like others, Marika says that the main motivation for self-tracking springs from the will to establish a 'reality' of the number of steps and amount of movement performed during the day. However, she also talks about how her tracking practice has become functional through 'keeping track' in the sense of consistent monitoring. She thinks that self-tracking has become so popular because in general people are interested to know more about themselves. Yet during the interview she also experiences something like an epiphany on how much she has actually integrated the simple fitness tracker as part of her everyday habits of checking back on the self:

> **Marika:** I think it is interesting to see whether I'm active, because at work I feel that I must walk a lot... and so it's nice to know whether I really am very active, and to keep track of my *cough* bad shape. That has been interesting.[…]Maybe people are more interested in themselves and their wellbeing now than before. Like back in the day people just went and did stuff, and did not analyse it further. But now people want to know, and use technology for that…
> […]
> **AUTHOR:** So do you think it is important that you have some kind of a [data] record of your activity?
> **Marika:** Yeah. Like I said… I haven't really though about it but now that you ask all these questions, it is kind of… interesting actually how much I have checked it and implemented this [fitness tracker] device into my everyday life. Yeah… like generally you don't really think about how [often] you look at it.

Even though Marika has seemingly not been as active and rigorous with tracking as Sakari, Mikael or Sirkku, and has taken a break from tracking during summer holidays, she says she has 'implemented this device into [my] everyday life' (i.e. checking the readings systematically each evening when using the device) to a surprising degree. She also talks about those little glances to one's wrist during the day when the numbers are accumulating and the (daily) self is unfolding: 'you don't really think about how [often] you look at it'. In addition, even though she has missed some days in the sense of not gathering measurements at all, weekly and monthly measurements have helped her to establish a sense of self-knowledge. This also helped her to pick up the activity after a break: she has reference days, weeks, and months which serve as a basis for picking up the activity again.

> **Marika:** You really need to be active with [the device]. If you aren't… then you kind of have to start all over again. But [during the break] it had not deleted the existing information about myself, so that was positive… because if it had deleted everything

> from February, that would have pissed me off, because you can also monitor monthly… You can check how your months, or weeks, or days have been and compare them. So it's interesting to check monthly or weekly data.

This also shows how systems of self-tracking can produce repetition in different temporal cycles, that help to keep the self-tracking system intact and functional, even if actual connections between bodies and devices occasionally disappear. Devices break, they need to be charged, they suffer from glitches and sometimes people choose not to wear them: there will be gaps in the data. Overall, 'you have to be active' with the device, but self-tracking affords temporally inspecific ways to be active. A simple fitness wristband that encourages the monitoring of daily steps may more readily promote repetition on a daily scale, while some other technologies afford slower cycles (e.g. Sakari measures his resting heart rate every day and his blood pressure once a month). Yet the mindset of the self as something that is constantly unfolding is similar. Also, even a simple fitness tracking device typically assembles daily insights into weekly and monthly insights, thus affording overlapping cycles. As seen with Marika, these slower cycles offer a way back into the activity, should one quit tracking for a period of time for any reason.

The persistence of systems of self-tracking beyond apparent abandonment of devices is evident also in other interviewees' narratives. For example, when reflecting on the question of what life would be like without self-tracking, Sirkku says that she would 'really miss' sleep tracking and Mikael refers to 'feeling lost' [literal translation: 'feel like an orphan'] without constant heart rate monitoring, although both, in their own way, also readily acknowledge how one's relation to self-tracking in general may easily turn 'obsessive' (Sirkku) or 'neurotic' (Mikael). Another interviewee, 32-year-old office worker Jessica who answered my questions via e-mail says that she has quit step tracking and heart rate tracking mainly due to technical inaccuracies and due to having noticed how self-tracking may easily become just another stress factor in one's life. She says to have experienced many rewarding moments with self-tracking devices, for example as heart rate monitoring has helped her to monitor her physical condition getting better. On the other hand, she has now become to enjoy the 'sense of freedom' in going out for a jog without any tracking devices. However, she says that it is constantly 'in the back of [my] head' that one *could* track one's bodily functions longitudinally, and admits that she would happily employ heart rate tracking again in order to follow up on her progress in terms of physical condition, if employing it were only technically more effortless. The point here is that 'being active with it' – a mode of self-tracking action that often manifests as stress and (overly) repetitive behaviour in everyday life – is only a logical way of working with the affordances of self-tracking systems in one's life, and this mode of action often remains tempting and effective even after physical detachment of any specific device. Self-tracking changes society because, apart from the employment of specific, clear-cut gadgets, it seems to have profound effects on how we relate to ourselves as an inherently uncertain and always emergent temporal object[1]; as a turbulent unfolding of causes and effects and as something in need of constant monitoring and control.

CONCLUSION

In this article I have argued that although self-tracking is most often thought of as a practice related to the production of an experience of self-knowledge, we may also perceive it as production of uncertainty. Self-tracking reflects a classic dilemma of knowledge production

and work on the boundaries of knowledge: the more one comes to know, the greater the profundity of insights that become imaginable. In more concrete terms this means that while self-tracking is often narrated as the practice of exploring and establishing correlations between actions and their consequences, in practice such correlations, that may help one's self-making, often prove elusive. The argument builds on notions of how selves are temporally extended in self-tracking practices, as the future and past are brought into, shaped through, and potentialised in the present through the measurement affordances of relevant technologies. Moreover, the interviewees described how one needs to 'be active' *with* self-tracking: acts of averaging and the relational character of the data can promote repetitive patterns of behaviour as one tracks the unfolding of the self. In my view, a fruitful way to conceptualise this logic of the system and dis/assembly of knowledge in self-tracking practices, is to propose that in self-tracking the self is constructed as a temporal object and as an ephemeral flux (Stiegler 2011; 2012). As discussed in the analysis, any individual measurement is simultaneously connected to past(s) and future(s). In a sense, each measurement also becomes productive of what precedes it and what will follow. The tracked 'self' becomes not only connected to but enacted through other temporal data manifestations of itself, which is why self-tracking systems prescribe actions of gathering more data. As a temporal object that is *constituted in duration* the self is in a constant process of unfolding.

This is relevant because in contributing to the production of the self as a temporal object, the practice of intensive, algorithmic everyday self-tracking may be thought to entrench ontological uncertainty. In self-tracking, any established 'state' of self that is found through tracking, disappears. By producing the self as a temporal object, these self-tracking systems actually 'work' to serve a non-knowing subject that they also help to create. This is to say that *the functionality of self-tracking systems as systems of self-related knowledge production seem to, in part, stem from the production of the self as a temporal object that can never be known well enough, or that can never be 'completed' as an object of knowledge.* Self-tracking systems then easily lure the individual into a logic of constant monitoring and temporal extension. While in terms of self-tracking the pathology of 'compulsion' is often seen as a human attribute (i.e. it is the human being who is seen as 'compulsive' or 'obsessed'), it is important to note that self-tracking systems actively prescribe such behaviour.

While biopolitical, health-related normalisation is inseparably connected to the appeal of self-tracking, in this paper the point has been to avoid reducing the appeal of self-tracking to regimes of normalisation, but rather to show how self-tracking systems afford and animate aspirations for self-exploration on which processes of normalisation operate. The argument presented here may direct social scientists to look beyond self-tracking as production of knowledge – whether oppressive and/or subversive – and bring new layers to claims of digital and metric culture being productive of (ontological) uncertainty and even anxiety in contemporary societies (Beer, 2016: 212). To be clear, this is not to say that self-tracking technology – or any technology, for that matter – *in itself* is unequivocally negative or undesirable phenomenon. Indeed, as evident in the analysis, self-tracking provides avenues for a diversity of positive experiences and empowerment in individual lives (see also Sharon & Zandbergen, 2016; Ruckenstein, 2014), for example as it may enable shifting (if often elusive) understandings of the self and experiences of being in control of one's wellbeing. Perhaps an experience of life as temporal, inherently unstable flux might also work to challenge the cultural imperatives of self-control on which self-tracking builds. Traces of such possibilities may be found for example in Sakari's narrative in which long-term self-tracking seems to have concretised an understanding of life as inherently uncontrollable. However, for

him such understanding converts into feelings of terror and a mindset of gathering more data. Indeed, technologies are always both remedy and poison, as their effects and repercussions intertwine with the cultural and political contexts within which they become functional. Contemporary self-tracking technologies are typically imagined, promoted and appropriated through ideals of proactive self-care and health-related self-control through knowledge. It is then important to bear in mind that by rendering selves as always-emergent temporal objects, self-tracking technologies in practice often subtly yet actively enact the kind of self-interested subjectivities that they promise to serve. Furthermore, instead of simply enabling one to make 'right' health choices, these technologies often contribute in rendering everyday health management a complex practice of producing consistent data as well as tracing relations between causes and effects. We have seen how self-tracking thus easily develops into a highly systematic and repetitive practice of attaining an empowering experience of control that nevertheless always 'flows away'. This paradoxical dynamic between knowledge and uncertainty can and should still be analysed further in relation to different social and institutional contexts in which bodies and lives are tracked.

Acknowledgements

I wish to thank the Academy of Finland for supporting the research project 'Tracking the Therapeutic' (grant number 289004); this article is a part of the project. I also wish to thank the editors of *Distinktion* and the two anonymous reviewers whose comments and criticisms helped to improve and clarify the arguments presented here.

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Notes

[1] Reminiscent of what Adams et al. (2009) refer to as a 'anticipation'. For them, anticipation is a modality of being and an instantiation of modernity. '[P]redictable uncertainty leads to anticipation as an *affective state*, an excited forward looking subjective condition characterized as much by nervous anxiety as a continual refreshing of yearning, of 'needing to know' (ibid.: 247).

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