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Narratives in numbers: Sociotechnical storytelling with self-tracking

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Abstract

This paper explores self-tracking as a social practice with significant relationships to human memory. The history of data and memory is fraught with a concern that specifics of qualia are subjugated to datafication. Yet, historical perspectives linking paper diaries and digital tracking show that rich accounts can be preserved in media. Cognisant of both perspectives, this paper argues that rather than delegating reflection to algorithms, users engage critically. Using original research data, this paper demonstrates how users unite the sociotechnical affordances of devices, data visualisations, and personal narratives to communicate memory in mediated forms. In doing so, they bridge semantic and autobiographic memory, combining subjectivity and objectivity. A *datafied narration of everyday life* emerges, affirming unique and vital stories. Often directed toward future goals, the mnemonic value of self-tracking in the present is overlooked. Yet whether recalling unfortunate accidents, sporting success, work, holidays, or illness experiences, participants use data as a scaffold to build stories and affirm identity. This paper asserts that memory and storytelling is an essential anchor for practices of digital self-tracking.

Keywords: biography; data; memory; quantified self; visualisation

Introduction

Over the last two decades, digital self-tracking has shifted from an emergent technological phenomenon with significant participation barriers (Pantzar and Ruckenstein 2017), to a 'mundane' practice (Pink *et al.* 2017). It is possible to engage in self-tracking with active and passive sensor technologies, including small wearable sensors and in-built affordances of devices like smartphones. While intensive projects of 'lifelogging' (Bell and Gemmell 2009) have waned under the omnipresence of proprietary 'big data' – activity monitoring platforms offered by technology companies are rarely cross-compatible – self-tracking can still embed deeply in daily life. This paper explores how present forms of self-tracking data engage biography and memory, intertwined with practice: for some users of these platforms and services, self-tracking is an essential element of the work of remembering. Users engage critically with their devices and data to form digitally 'mediated memories' (van Dijck 2007): bringing together the processes of quantification, visualisation, and narrativisation. Self-trackers use data as a structure for qualia, recounting stories about their bodily capacities, health history, and personal identity, while also engaging in a co-presence and co-production with known others (Algera 2023). They are

also entangled with *unknown* others as part of global patterns of digital intermediation (Hoskins 2018), inextricably interwoven with the ills of capitalism (Reading 2014). While tracking is marketed as being context 'sensitive' – across multiple sub-types: see Apple's 'emotional design' in smartwatches (Till 2019) or the mood tracking app genre (Stark 2020) – memory-related affordances are not often a primary design goal. Often, a consideration of memory emerges after-the-fact as an outcome of user engagement with self-tracking technologies and practices (Kristensen and Ruckenstein 2018; Lomborg *et al.* 2018; Lupton 2020). However, research from various fields invested in self-tracking (and some pre-dating the mainstreaming digital self-tracking practices) point in the same direction: towards the need for more explicit exploration of how self-tracking engages human memory. This paper presents research on self-tracking practices that fore-ground mnemonic qualities and argues that memory interactions – between both semantic (data logs) and autobiographic (lived experience) – should be seen as an essential part of users' relationships with self-tracking data and practice and moreover, that memory is essential to how and why self-tracking embeds in daily life.

Background: designers, datasets, and diaries

The relationship between self-tracking and memory can be considered in manifest and latent forms. Early digital forms of self-tracking were born of a blue-sky, *manifest* conceptualisation of self-tracking as 'lifelogging', able to achieve a complete 'e-memory' with wearable sensors and digital archives (Bell and Gemmell 2009, pp. 21). While the terminology remains synonymous in some scholarship (Selke 2016), the 'total capture' and analytically intensive goals tied to the terms are generally unwieldy and impractical for everyday consumers. But memory remains essential in a *latent* sense, as the design intentions of self-tracking technology target human memory and draws on it as a logic with which to mediate embodied performance (Jethani 2021, pp. 114). Unsurprisingly then, a staple finding of research with self-trackers, is that – despite the introspective prefix – the practice is fundamentally communicative (Lomborg and Frandsen 2016). Evidence and recollection is central in practices of self-tracking: like social media profiles or any other curated series of digital artefacts, users want to record and curate the circulation of moments (Wang 2022). The everyday use of tracking technologies has become tied to selective engagements, with one or a few metrics related to specific activities being logged. These might include routine daily steps, regular workouts, sleep, diet, and for some, logs of biomedical interventions. Users are invited to reflect on change and continuity in their data and are offered a window into the performance of bodies related to wider domains of emotion, location, fitness, time-use, and health (just to name a few). There is a concern in extant literature that this segmentation is fragmentation, by which self-tracking creates partial 'data doubles' (Ruckenstein 2014), 'dividuals' (Cheney-Lippold 2011, pp.169; Reigeluth 2014, pp. 248), and 'doppelgängers' (Bode and Kristensen 2016) that – as disembodied aggregates of behavioural data – better serve the device/software providers than users. However, the domain specificity of most self-tracking practices can also enhance the agential capacities by allowing users to fill in the gaps: many ethnographic research project findings identify reflexivity (including remembering and reflection) as essential to their sustained tracking (Bode and Kristensen 2016; Lomborg *et al.* 2018; Lomborg and Frandsen 2016; Lupton 2019; 2020; Pink and Fors 2017).

This kind of data use is, however, largely intentional, and the delegation of 'remembering' (as counting and logging) is distinct from deeper memory engagements. While certainly agential, these user practices are in-step with human–computer interaction (HCI) research and the contemporary design logics of many self-tracking applications.

Applications (apps) intend to create gamified loop-like interactions with self-tracking, and rely on the inclusion of reflective processes enhanced by data visualisation (Li *et al.* 2010). Memory has long been a site of research within HCI: for example, the personal data exploration experiments at Intel in 2004 – autoethnographic data mining ('ethno-mining') – described by Anderson and colleagues (2009). Though the extractive tenets implicated when gamification principles are rolled out – across the millions of apps and devices now sold – raise questions of data ownership and power relations, and of whether users might be pushed towards damaging forms of self-surveillance (Cardell 2020; Esmonde and Jette 2020). However, design intentions can be further contextualised and historicised. Broader considerations of digital media objects, online environments, and memory from disciplines of psychology, literature, sociology, and human geography, combine to provide a wider sociotechnical account. Here, self-tracking devices, among other digital media, meet with human practice and engage with memory in ways that better account for agency.

Gilmore (2016) conceptualises wearable tracking technologies as 'everywear', in the sense of omnipresent monitoring and their literal being worn on the body. In this conceptualisation, users' personal routines are a mundane but very deliberate engagement with datafication and gamification, one that comes to produce everyday experiences. 'Everywear' also acknowledges how logics of self-tracking allow moments to be re-experienced as either (or both) labour and pleasure: mundane recollections may fade, but when recorded as self-tracking data, can later stimulate recollection of the past and provide an escape from the present. While there is a sense that mediatisation and sharing are quite literally better remembered (Wang 2022, pp. 4), others are more pessimistic about lock-in (Brown and Reavey 2014, pp. 331–332). Memories anchored in flows of data are less practically forgotten by humans (Dodge and Kitchin 2007) even if they can be drowned out with a mnemotechnic approach to digital obfuscation (Esposito 2017) (i.e., data erasure rather than human forgetting). van Dijck's (2007) concept of 'mediated memories' remains prescient in describing this back-and-forth relationship with digitalised forms of recollection in the twenty-first century. In short (2007, pp. 21):

> *... mediated memories are the activities and objects we produce and appropriate by means of media technologies, for creating and re-creating a sense of our past, present, and future of ourselves in relation to others.*

More recent approaches affirm this by turning to the personal: such in Wang's (2022) 'triangular self' which points to a three-way relationship between subjective self-representation, deliberate registrations of self online, and the self-as-inferred by virtual audiences, similar to the Bergsonian accounts of identity work through images shared to social media (Goodings and Tucker 2014). These explanations reflect more specific self-tracking research findings across the humanities and social sciences as well as in health. The interactions between self-tracking apps and humans generate different narrative forms and have a kind of 'shared agency' (Rettberg 2018, pp. 39). Smith and Vonthethoff see self-tracking within a risk-based modernity – following scholars like Giddens (1991) – where self-tracking data are a 'companion medium' (2017, pp. 12) that aid identity formation and ontological security in the face of perceived risk. Pink and Fors (2017) found evidence of memory work when their participants reflected on self-tracking practices. In their research however, reflective practices were aided by self-tracking data to respond not to risk, but to fast-paced lives, where there were otherwise few opportunities to pause and reflect (2017, pp. 381). Harris and colleagues offer similar ideas in 'autobiology' (2016, pp. 36), but flip reflection to performance: beyond the

portmanteau, the 'autobiology' term encompasses elements of illness narrative as a kind of self-encounter (through technology) that is also shared with an audience. As such, events labelled important as well as those seen as quotidian can be traced through seemingly innocuous metrics like the number of steps taken each day.

But an express connection back to personal forms of memory-making, where devices and their agendas are decentred – by both the research orientation and by the user practices they describe – has been provided by feminist research perspectives. These collectively emphasise a connection, often discounted in the highly gendered technology sector, between self-tracking and personal diaries and similar forms of life-writing (Cardell 2018; Humphreys 2018; Lupton 2019; Rettberg 2014). Courtesy of this work, there is a greater recognition of how self-tracking technologies capture otherwise undervalued moments in everyday life, while also highlighting the circularity of gendered design/usage in self-tracking, particularly in domains of health and care. In this less techno-centric view of self-tracking, the digital incarnation is only one among many other methods by which humans track, capture, and express their recollections (Lupton 2019; Wernimont 2018). Connections between 'diaries' and the notion of 'data doubles' is made explicit by Vermeer (2022), who finds datafication present within historical diaries, and argues that digital and analogue examples share both reflect the cultural concerns of their times. Taking forward these trajectories, this paper explores self-tracking as a datafied narration of everyday life, in which data and memory continue to affirm each other. Surfacing stories in a manner cognisant of academic perspectives on life-writing, this article explores ongoing issues about personal autonomy: while the institutional actors change in the digitalised space of contemporary self-tracking, complex relationships between the individual, and the power of 'the archive' itself (Beer 2020; Ernst and Parikka 2013; Reading 2014) remain.

Research methods: self-tracking show-and-tell

This article draws on data collected across various research projects related to the self-tracking practices. It attests to the use of wearable technologies (including wrist-worn activity trackers and smartwatches) paired with smartphone/tablet/computer apps or programs. The dataset for this work comprises thirty-eight interviews, conducted as a show-and-tell format, drawing on conversational interviewing and leveraging the co-presence of digital devices and personal data traces. The interview approach comes from the standpoint that data always require narration (Dourish and Gómez Cruz 2018) and is influenced by a range of existing approaches to digital media studies and self-tracking, including critical software-studies (Dieter et al. 2019), 'walkthroughs' (Light et al. 2018), image elicitation (Gorm and Shklovski 2019), and digital ethnographic co-analysis approaches (Møller and Robards 2019). Given the habitually on-body nature of wearable technologies, this approach is also set within a wider orientation towards social practice: the research was interested in how self-tracking – as a sociotechnical practice that intertwines the recording and presenting of self and time between macro-level measures and micro-level experiences – became embedded in mundane habitual action, or the 'circuits of reproduction' in everyday life (Shove et al. 2012, pp. 73–86). 'Circuits' here are both metaphorical and literal, given the interest in digital technology against a backdrop of practices that are not exclusively tied to such technology. In focusing on this embeddedness, the approach is interested in both the literal talk about 'your everyday' of the participants in an interactionist sociological sense (Lyman and Scott 1989), as well as the more theoretical valuing (and critiquing) of the 'the' everyday (Lefebvre 2014), as elevated by Pink's (2012) in illustration of the interrelationships between digitalised spaces, senses, and practices. However, this work is not taking a 'rhythmanalysis' approach to the study of self-tracking, as has

emerged in recent years (Jethani 2021; Pitts *et al.* 2020; Vigren and Bergroth 2021). There is difficulty reconciling such an approach – given the connection to data, commoditisation, and capital – with the overall Marxist tenets of Lefebvre's work, within the scope of this research paper.

This paper uses interview excerpts and screenshots taken by participants during interviews ('texts' that were both thematically analysed using NVIVO) to better contextualise their perspectives. This reflects understandings from prior research, which asserts that visualisations are useful for 'co-constructing and negotiating meaning' (Ruckenstein 2014, pp. 77), as well as the wider communicative practices surrounding screenshots as digital media objects (Jaynes 2020). Indeed, many participants already exchange screenshots (beyond the interview context) among their social networks: capturing events and collectively making meaning through what Hjorth describes as the 'emplaced visuality' (2016) of digital/mobile image capture. Taken by participants as part of their ongoing narrativisation of self-tracking practices, screenshots are evidence of data 'put to work' (Beer 2018, pp. 2; Dourish and Gómez Cruz 2018, pp. 8), and are indicative of a range of mnemonic and remembrance practices across digital media, social networking, and self-tracking.

It is necessary to acknowledge that the discussions of self-tracking and memory in interviews are purposive. The device-as-mediator approach to the interview recognises that the habits of technology use are already a form of memory (Chun 2016, pp. 80) and with the mnemonic value of self-tracking being one of the research project's key interests, questions about moments in data were asked directly. This built on the precedence of other research done with media-at-hand: memory work has already been associated with methodologies like 'media go-along' approaches (Jørgensen 2016, pp. 44), and is of course, already wrapped up in the reflective and sharing-intensive orientation of digital media platforms (Humphreys 2018; Rettberg 2014; Wang 2022). Moreover, there is the additional inescapability of time: it is obviously essential for tracking experience and memory, but and has evolved to become a key variable in digital life, including self-tracking statistics and visualisations (Wajcman 2019). The research process then cannot be seen as neutral regarding how it approaches memory, as participants are primed for a conversation that calls on their perspectives on technology and memory.

But following Jethani's concern that assuming design norms apply consistently as simple variables 'downplays the complex relationships that users develop with the devices and the data they produce' (2021, pp. 125), the interview approach intends to hold a space for participant recollections: they authorise deeply personal reflections, and give narratives room to flourish in conjunction with, but beyond, the technological shaping of recordkeeping and logging time (Wajcman 2019). Much like the authorial tactics of working around the predefined pages of a paper calendar or diary (Cardell 2018; 2020), participants enact authorial ownership in the spaces between data points and make personally coherent stories within the structured presentations of their activities.

Research participants

Participants in the research project were recruited via social media advertising and snowball sampling. Coming from an interactionist sociological base, interested in talk and practices, the sample is not at all representative and does not trouble the existing critiques of the kinds of capital required to engage with this form of technology by choice (Lupton 2016): unless otherwise stated, participants made voluntary engagements in self-monitoring as a leisure-based add-on to everyday activity. The research also follows extant work in being conducted in Australia, which shares much in common with the Global North insofar as it imports self-tracking technologies in a culturally wholesale

fashion from the United States and Europe (with many connections to the many qualitative Europe-based projects cited in this paper). As a bridge between the wider dataset and this article's specific focus on memory-in-data (rather than full autobiography), participant stories are presented in thematic vignettes. Following arguments made by Dourish and Gómez Cruz (2018, pp. 5), the understanding of narrative here is the act of performing narrativisation with and through data, and with data becoming a symbolic object.

In the scope of the wider project, participant data (which include interview audio, transcripts, follow-up emails, and a curated set of screenshots for each) were characterised in one of four user 'categories'. The typology itself should not be read as complete – the typologising approach is better attested to by the 'valences' of Fiore-Gartland and Neff (2015), or the 'modes' described in Rooksby *et al.* (2014), Ruckenstein (2014), and Lupton (2016) – and should be seen as a means of providing more context for data intra-actions (cf. Barad in Lupton 2020, pp. 3) surrounding the seven participants selectively foregrounded here to discuss memory.

- **Ideal** users (from the perspective of the device manufacturer or app vendor) make the utmost of the affordances available to them. They may use basic sensor technologies (entry-level devices or default/free apps) but are extremely disciplined. **Bradley** and **Daphne** are deeply focused on collecting data over time (body weight and steps, respectively) and per their narratives below, periods of crisis demonstrate both the extent of their longitudinal record keeping and their undampened zeal for tracking.
- **Typical** users tend to underutilise their devices, relative to their affordances, and/or engage in patterns of 'episodic use' (Gorm and Shklovski 2019). This might also be worded as: users who engage in *practices* of self-tracking without embodying self-tracking as *a practice*. For example, **Harry** owns a high-end Garmin sports watch but only engages sporadically with its offerings and may not wear it based on some seasonal and/or social valences (i.e., avoiding logging and sharing athletic performances that reveal waning fitness levels during winter).
- **Data enthusiast** users make their own tracking affordances by stepping outside of the platforms that typically synchronise and share data. For example, both **Adam** and **Mel** download and reupload their data in new formats to enrich their engagement with their specific sports-centric tracking communities (cycling and orienteering, respectively), while **Jess** imbricates tracking with an ongoing health project.
- **Experimental** users attempt purposive engagements, often mixing self-tracking (and other) datasets, extending the scope of their practice beyond the original remit of consumer technology. In extant research, this would describe the quantified self-movement (QS) but given an overabundance of related research, the movement is decentred here. **Pat** represents this group with a utilisation of tracking technologies that combines hardware adjustments (to suit their physical capabilities), and logs of medication intake for long-term health-monitoring.

Findings and discussion

The following sections present interview data (as verbatim snippets), generalised information from interviews, and specific screenshots related to data-informed recollections. Presenting textual and visual elements together is a literal way to illuminate where and how subjective meanings and records intermingle, capturing the essence of the method described above. To focus on different forms of mnemonic connection to self-tracking data, not all participants in the study are featured. There is a focus on storytelling by seven specific participants: one agender participant who uses feminine pronouns, three men, and three women. These participants were all keen self-trackers over thirty

years of age, and – distinct from younger participants in the study – drew on a personal autobiographies that predate their uptake of digital self-tracking. This becomes progressively more relevant in the sections below, in the types of stories shared and the way biographic details from pre-digital eras are imported into contemporary digital environments. Findings are organised in four sub-sections. In the first and second, participants narrate their individual *metric moments* as well as the collective making of *meaning in maps* based on geolocation data. Deeper connections with biography are engaged in the third section *spectres of self,* while the final section critiques the proposition that self-tracking data are always an *ersatz form of evidence.*

Metric moments

A pervasive finding from the research was participants' ability to harness their quantified records of activity to augment and corroborate their memories, with certain data series, trends, or outlying data points holding interest to participants because they captured extremes. Important moments were readily identified, as seen in two examples: Bradley, a man aged 53 who self-tracks across a Fitbit wearable/app and Withings smart-scale, and Daphne a woman of 47 who uses Samsung wearable and companion mobile app.

For Bradley, a longitudinal record of his bodyweight holds an important moment. In the excerpt below, Bradley initially considers the differences between his at-home tracking assemblage – consisting of a Wi-Fi enabled smart-scale that uploads data automatically to his Fitbit account – and a two-week period of weight readings from a rotary scale which was added manually while he was away from home. Bradley notes this inconsistency to preface what he found: that a structured and enforced diet meant that he lost around five kilograms. But the narrative embedded in this data is one of family bereavement. During the interview, he recollects this period (scrolling back to 2016), and then deliberately chooses to screenshot a year-long display of his weight to demonstrate both the trajectory of his weight graph, but to also show the significance of the two-week disruption to this pattern (see Figure 1). He then unfolds the narrative of this discrepancy with much longer reflection on his bodyweight:

> *Here's something interesting here, look at that [pointing to the chart]. The light blue spikes are the daily logs. Look how it spiked there and crashed. That was interesting because what happened there, is that I went to [another city] for two-and-a-half weeks. [...] I was staying with my Dad for two weeks and there was a whole thing going on – my Mum died at that time actually – so I was over there for that. Staying with Dad to keep him company. And uh, more often than not, hoeing into his meals-on-wheels with him. Which as you would know, is a balanced meal. It still allowed for a little cake or chocolate here or there, but the meals are a given size and given portion, of intakes. And look what happened, its interesting isn't it? Over one year you can see the pattern there. I'm just racing away, back to a weight that I was probably um, four years ago.*

Like Bradley, Daphne corroborates her memories in data anomalies. Daphne explains how one specific week of step-count data represents an extremely difficult time. She had travelled overseas intending to have an active and exciting holiday but injured her leg at the very beginning of her journey. This event is then captured and reflected in her step data (see Figure 2). The injury, as well as how it is recreated in data, also establishes quantified patterns of her slow recovery: a battle against the injury for the remainder of the journey, evidenced constantly by what she saw as a significantly reduced

Figure 1. A line chart of Bradley's body weight over one year (Fitbit app).

number of daily steps. Further adding to this, she noted that her recovery continued through to the time of the interview:

> *I had knee reconstruction, and ten finally started running again, and then fell down some stairs [while] I was overseas [...] So, the last month has been terrible [...] It was my first night there. New country, five weeks planning, lots and lots of touring, and I fell down the stairs [wry laugh]. You'll see that that first week – [pointing to the chart] we got there Boxing Day – it just dropped off that first week [...] So it took about two weeks for the swelling to go down, so it was a bit scary [...] The irony was, when I was coming down the stairs, I was holding both rails, um, because it was dark. So I did stop myself from breaking my neck [laugh].*

The memories elucidated here are not the forms of memory usually attached to logs of tracking data. They are not the highly rational 'reflections' (Li *et al.* 2010) poised for behaviour-change, nor are they as simple as a milestone (like a 'personal best' physical performance). They are memories of specific events that are only visible to the user. They are within a dataset, but are not about data in itself. The line-graph represented by the Fitbit weight log, or the steps recorded by Samsung – and the kinds of priorities
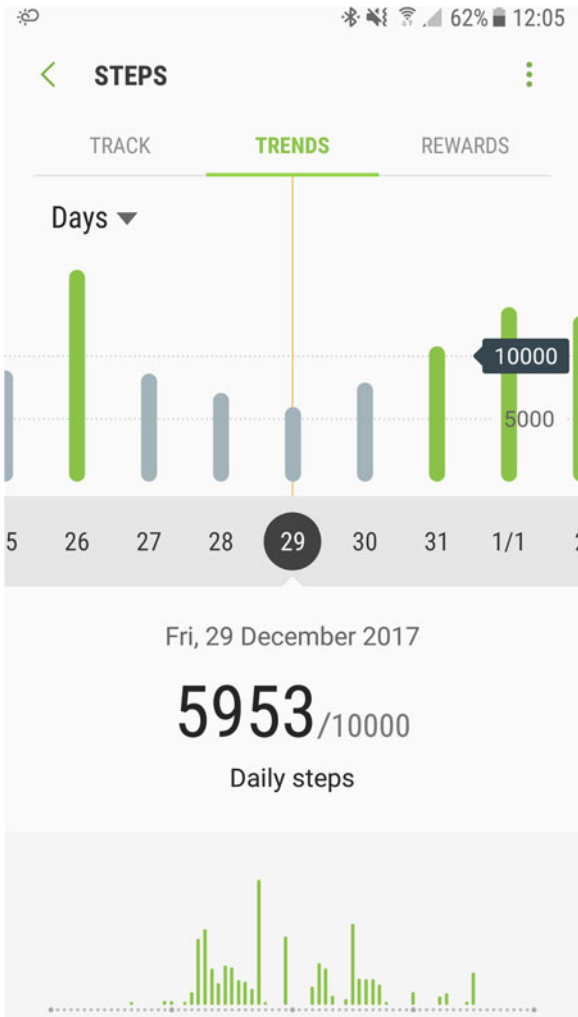
Figure 2. A bar chart of Daphne's daily steps over one week (Samsung Health app).

that these data might have – do not replace or override the emotionally significant periods Bradley and Daphne remember. It comes to corroborate their experience and act as a testament to emotion and feeling. To use the language of Dodge and Kitchin (2007, pp. 438), the 'thin' memories of formalised numerical data, act as a prompt for 'thick' memory, which draws on the richness of personal emotive context. The use of 'look' and 'see', and the first-person recounting of self-talk in the interview vignettes above, show how this unearthing of 'thick' memory unfolds in a to-and-fro relationship with data traces. Scholars of big data have been concerned that the connection between self, events, and quantified traces of activity may impede human memory on several levels (Schacter 2022) and create a reliance on 'institutionalized forms of memory' (Whitson 2013, pp. 167). However, there is clear agency present in the way participants like Bradley and Daphne, can harness self-tracking data to augment memory: metrics *are* affects of memory (Jacobsen and Beer 2021). These examples enliven Ernst's 'micro-temporality', where *telling* and *counting* combine: in digital mediation, memory is engineered in a sociotechnical dialogical manner (Ernst and Parikka 2013).

Meaning in maps

The statistics seen thus far are common presentations for digital self-tracking. Beyond numeric tallies, geolocation data are another form highly valued by some cohorts of self-trackers. Maps in self-tracking are particularly apt for satisfying 'aesthetic curiosity' (Neff and Nafus 2016, 80) and are popular with cyclists and runners. Harry (aged 32) uses his Garmin sports watch in conjunction with the popular cycling and running application Strava, in both the contexts of commuting to work and for leisure activities. Mel (aged 39) also uses a Garmin device and Strava but engages in a sport (orienteering) that sees her internationally seek more varied and complex forms of information presentation as part of her self-tracking practice. On Strava – 'Facebook for cyclists' according to Harry – the already generative digital storytelling affordances of social media, such as text and audio-visual content (Murphy-Hollies and Bortolotti 2022, pp. 4), combine with temporal and spatial data presented in maps.

For Harry, these data result in memories having their significance constantly reaffirmed. Harry uses Strava for diverse purposes, including commuting and holidaying. He outlines how frequent commutes appear alongside one-off recreational activities: bold bright paths on a map represent great frequency, while dull thin paths are rarer examples. On Strava, he describes 'a bright line between my house and work and then little faint paths around Asia'. Here, the relative scarcity of some types of data serves to evoke the past: a digital 'memento' of Harry's travel experiences:

> Like, I cycled through Cambodia and that so, I like to go back and look at those ones [...] So, like, when we went to Bali, we took a hike up the volcano or whatever. Like, it's a pretty common touristy thing, but like yeah, you get like the little heat map that shows where you walked up and where you took photos and its pretty cool [...] Like a memento, like a photo. Bit like a photo album, you get a collection.

Dually representing personal memories of a holiday and forming part of the public 'heatmap', Harry's movements and memories have their mundane or exceptional meanings reaffirmed as his records continue to accumulate alongside other users' shared data. The self/other contributions are also cyclical for Harry, who concedes that he is often 'bored' on runs, and looks to the public heatmaps for new 'scenery' that can alleviate this feeling: '[if] it's really hot, a lot of people ride that way. You can sort of tell where good paths are to go for a ride or a run'. Harry's case offers a physical activity-based demonstration of what Jacobsen and Beer (2021) describe as 'quantified nostalgia' in social media applications, used to enliven the present: the temperature conveyed by Strava's *heat*maps harmonises biography with the *warming* qualities of nostalgic records (May 2017, pp. 403, 411). Figure 3 captures a presentation of Strava's 'global heatmap', zoomed in on the centre of Melbourne, Australia, and serves as a reference point for the maps Harry (and later Mel) describe. Interviews surfaced sensitive geolocation data, which for privacy reasons, are not recreated here.

For Mel, meaning making is an active process, often done in negotiation with teammates. Through eager participation in the sport of orienteering, she self-identifies as a 'creative' and 'subversive' self-tracker, and says:

> I just love to pour over the data afterwards. I kind of read through it like a story I think. The data holds the story of that moment and also like, the story that I can recall when looking back on it. So I kind of want to draw a beautiful picture on the map.
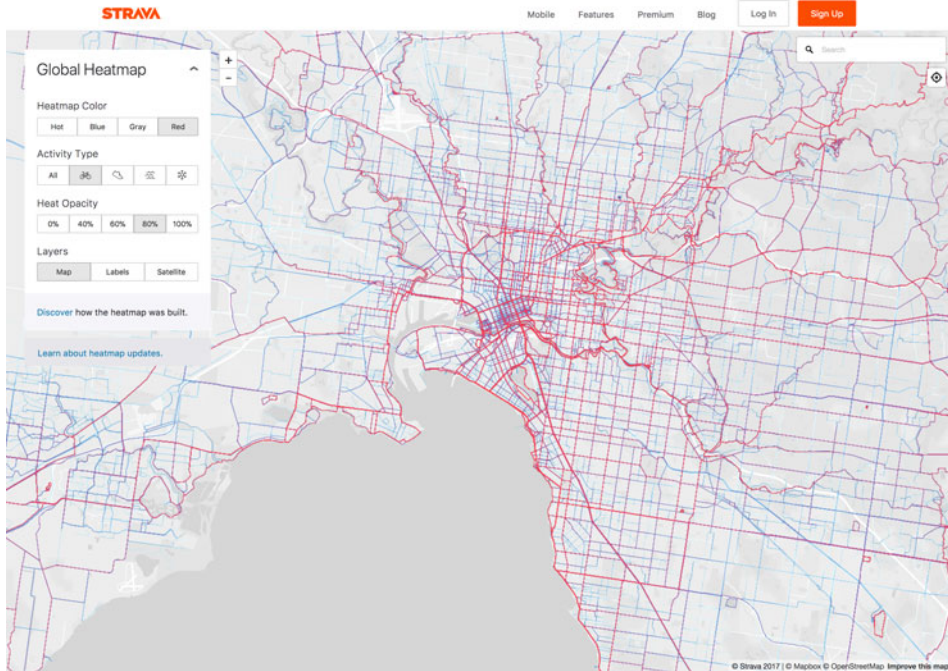
Figure 3. An indicative heatmap of exercise routes in Melbourne, Australia, as referenced by Harry and Mel (Strava platform).

To further unlock 'the story of that moment', Mel often goes beyond her Garmin's typical outputs and the mainstream cartography of Strava. She engages in extensive preparation – she presents rough scans of paper maps on her tablet device during the interview – and reflection, seeking to relive races in dimensions of 'contour', 'terrain', and 'scale':

Orienteering – being the data-nerd sport – there's heaps of developers who have created their own little apps or websites [because] *the downside of Strava is that it overlays your route onto either a satellite map or a street map and for bush orienteering you want the contours, you want a bushwalking map. So you can scan-in your bushwalking map and then you can overlay your data onto that, and then you can stretch it so that it fits perfectly and is scaled right. And then there'll be like, colour schemes [...] your line will be green where you were moving fast, and yellow where you were moving medium, and red where you were standing still. So you can look at it and kind of see where, how you were moving over the terrain, and what your route choices were. And so one of us will upload onto that and then share that with the others and then we'll be able to kind of talk about it. So last time he printed it out, and we just sat at the pub and were like, 'what did we do there; do you remember what that bit was?' And kind of put our narrative back together again. Over a six-hour race, there's so much that we've forgotten. And also as a team, we want to work out 'how can we improve; where did our communication breakdown that meant that we made a bad decision; was that my bad decision?*

Mel uses the multimodality of maps to move beyond numbers, to consider in more detail her efforts, her decisions, and her ability to work within a team. In combination with her memory, she puts data to work (Beer 2018), allowing for stories to be negotiated

between herself and co-present orienteers. Mel is confident in her own creative data-practices: telling stories in ways she wants to, evidencing 'media multiplicity' (Bown and Ferguson 2018) and leveraging a collapse of the spatial and the literary (Ernst and Parikka 2013, pp. 157) in her specific micro-temporal contexts. Though here, a recognition of plural meanings extends beyond just her orienteering teammates. She is acutely aware of how her personal data are inculcated in big data's more general multiplicities (Sadowski 2019): knowing full well that there are other autonomies at play, and institutional or individual actors might choose to use data otherwise. Mel herself, refers to a public canon of cartographic events – viral Strava art (Aalgaard 2016) and the public leaking of US army base locations (Hearn 2018) – during the interview, clearly realising that the tools of tracking work concurrently for both self-expression and surveillance. Mel's self-awareness and industriousness aside, it is worth considering what it means for users to look inward – beyond the self-aware meme of Strava users 'if its not on Strava it doesn't count' (Couture 2021; Pink *et al.* 2017) – and encounter platform-inscribed modes of remembrance. While this section imbues maps with curation and creativity, these memories are *branded* (the maps are marked in specific ways, and are also fundamentally commercial) by the platform's identity as much as they are by individual identity.

Spectres of self

Digital surveillance is its own topic, one not fully within the scope of this paper. However, a focus on memory cannot escape the possibilities the self-tracking creates for *self*-surveillance (Esmonde and Jette 2020). Data's multiplicity, at a personal level, was apparent in the pre-tracking memories that users brought forward into their contemporary self-tracking practice. In many cases, memories of turning points – coherent with what Brown and Reavey (2014) term 'vital memories' – seem to provide negative reinforcements for self-tracking in the present: for Garmin user Adam, and Garmin/MyFitnessPal user Jess (both aged 35), their practices are shapes by a kind of 'spectre' of their former selves.

Adam's self-tracking is tied to the maintenance of healthy leisure practices, which he sees as a necessary offset to his desk-based work life. He says he is 'conscious of the amount of time spen[t] at the desk', and bases this not just on public health discourse, but a 'twelve-month' period that 'was a real eye opener on the changes that happen when you go from being active [to] being tied down for five days a week, largely at a desk'. He elaborates further on these twelve months, recalling a moment that highlighted, first, how quickly his bodily capacities could change, and second, that his happiness and physical health were related:

> *I guess for me the turning point came, [...] I think in my first twelve months of work I put on fourteen kilos. I went skiing for five weeks, four-or-five weeks, in Canada. And the first week was not a lot of fun 'cos I wasn't particularly fit and strong. I was lucky that I had four-or-five weeks because it enabled me to get fit – and I wasn't that un-fit – I was just a lot more unfit that I'd ever been before. Um, but that was a real eye-opener about the challenges of, um, what it's like to be unfit and how much I didn't want to be unfit and have that impact on the recreational time I did get. And therefore, I needed to make sure that I came up with ways to keep myself fit and found things I wanted to do to keep myself fit whilst working. 'Cos I was no longer at uni where I had time to play golf three times a week; go for two bike rides; and then go skiing on weekends or whatever, we felt like. So, you know, for me it was an eye-opener [...] now I'm pretty conscious of trying to stay fit. And I know that I feel better; I'm happier and healthier when I am fit.*

Similarly, Jess describes a transformative moment, associated with what she saw as an unacceptable period in her embodied past, as well as her assessment of her own personality traits more generally. Importantly, she arrived at the scheduled interview *not* wearing her tracking device. This is because she had an on-again–off-again relationship with tracking practices: her enthusiasm for data was double-edged. She describes how this has played out since beginning self-tracking, and into the present:

> *I had a goal back then. So I wanted the watch, I wanted to try it and [see] how reliable it is, and if it could help me. But I also have a certain background concerning fitness, and healthy living, 'cos I used to be like eighty-five kilos. Its like, I don't want to go back there. So I want to track my progress [...] I used to connect it with My – do you know the app MyFitnessPal? It counts calories, but I'm overly obsessed really, about my eating and things. Just because I have a certain background as I've told you. That's the only reason why. And I still see myself at eighty-five kilos. It's also a mindset [...] I still have those apps. I actually stopped using the app before the Garmin – but [it is] still there. And it bothers me because every night it would send me – you know that they have notifications – and they will tell you 'remember to weight in'. What the heck, I don't want to weight in right now! [laughter] 'Don't forget to do that' and 'you haven't logged in for a while' blah blah blah. It's like, I'm a busy person [laughter] can't be bothered sometimes.*

While there are connections here to wider cultural trends at the intersection of tracking, diet, and bodies (Kent 2020), the refrain of not wanting to 'go back' that is common to both Adam and Jess, is significant for the current interest in memory. Disciplinary and 'confessional' features of self-tracking are not new to self-tracking research, consistent with Foucauldian research findings discussing the intersections of self-tracking and body weight self-tracking (Couch *et al.* 2019; Esmonde and Jette 2020; Robards *et al.* 2021), as well as mental health examples (Lomborg *et al.* 2018). Here, we see data holding power. Not only is there a tension between the present self and a so called 'objective' valuation of body, self, and practice lingering in something like a 'data double' (Ruckenstein 2014), but there is also a disciplinary 'allocution' (Lomborg *et al.* 2018) element that assists technologies in their prohibition of human forgetting (Dodge and Kitchin 2007; Esposito 2017). One-off interviews hit necessary limits when discussing some of the themes that are emerging here. But what is left unsaid in the interview context is coherent with the self-care applied to the self-tracking practices themselves – or what is left unrecorded by denying devices data at the frequencies they call for (Gorm and Shklovski 2019) – and ratifies agency in the present.

Ersatz evidence?

Beyond a relationship with personal evaluations of health, self-tracking can be extended: crossing over into a domain that is more medical. While a full assessment of the relationship between consumer-grade devices and biomedicine is beyond the scope of the present paper, it is necessary to consider how memory can be entwined with data about the body to generate both stories and medical evidence (Harris et al. 2016; Murphy-Hollies and Bortolotti 2022). In the context of chronic illness and disability, self-tracking data become a resource: internally, it is a means to affirm experience with additional external utility when drawn on as a communicative tool in encounters with medical professionals. Pat's (aged 44) tracking is multifaceted, with some data recorded passively from her Apple Watch and other data manually recorded in smartphone apps like PatientsLikeMe. These, in turn, may feature in manual data entries, forming presentations like those seen below (Figure 4): this example presents a log of various symptoms and

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medication over time, using the MacOS software Numbers and with a screenshot taken over Skype.

> *I'm mostly bedridden. Um, so if I can get like, one percent more functionality that's a really big deal. Um. That might mean the difference between – I can walk to the bathroom to use the toilet versus; I have to have a commode beside my bed. Which, like, psychologically, the difference is enormous. Or if kind of – on the higher end – if something's really useful, I can sit in my wheelchair and go outside, which I can't do at the moment. So I kind of want to wring every one-percent of functioning or medication-usefulness that I can. That's my excuse for getting a bit obsessed about it anyway [laughing].*

Pat's form of self-tracking creates stories that have power and meaning. In being told to others – but also to oneself – stories assert a self-concept around chronic illness. They are a resource for locating the self in one's abilities in the present moment (Charmaz 1991, pp. 228), and act as a logic of care (Mol 2008): 'every one percent' has value for Pat. Self-tracking data are simultaneously an interest and a resource, and by these means, a vessel of comfort and hope:

> *It's reassuring to have numbers, for me. For the first 20 years that I was disabled, that I was sick, I was fairly mildly impaired. And everyone around me, my parents, my teachers and all my doctors, all decided that I wasn't sick; that I was just making shit up and trying to get out of school. And so, for a really long time, I was taught not to believe myself; not to believe my own feelings; not to believe um, what my body was telling me. And so it's really easy for me to end up with the, kind of, little voice in my head that's like 'you're not trying hard enough'. [...] having the actual numbers kind of makes that shut up. 'Cos I believe in science [laughing] so if I can't believe in me, I can at least like, turn it into sort-of-science, and then it's something that my head accepts is more valid. Whereas, it's really hard for me to make my head*
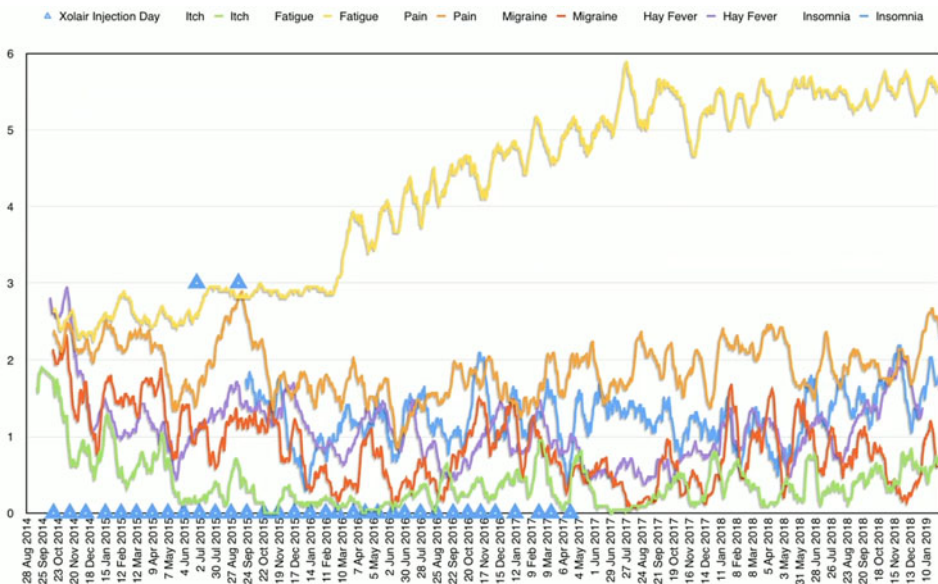

Figure 4. A line chart logging Pat's symptoms and medication over time (Numbers software).

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accept just a kind of feeling. If I turn the feeling into a number, I'll believe it much better. So I don't think that's a very standard reason for tracking [chuckle] things – but it's the only thing that I've ever found that really does kind of make me feel okay that way.

Pat's story also highlights, with stark clarity, that the subjective and the objective can ratify each other. This also sits in contrast to Pat's younger, past self, who was not able to draw on the same (external or objective) resources to explain the way she felt:

[Data] just sort of reminds me that my gut feeling is often right – and that it's okay to believe it. 'Cos, being trained – I think that's a really good way to screw up a kid for – really profoundly – is to train them to not believe in themselves. Like, it's a really awful thing to have had done – to have had done to you. Um, it kind of, screws up your head a lot. Um, it gets to the point where – [say] I started feeling like I had a headache: My first thought is not like, 'oh dear my head hurts'. My first thought is something more along the lines of 'does my head really hurt, or am I just imagining it?' And clearly that makes no sense ... If you feel pain then you feel pain. If you train someone not to believe their own interpretation of pain, that's just mean [wry laugh]. But I didn't know that when I was a kid. You know, you can't stand up to all the adults around you when you're a kid – unless you're massively exceptional ... I get to unscrew that.

In the present, Pat's data visualisations (Figure 4) are also 'evidence to show the efficacy of a treatment' to public health bodies, because in cases where 'there is no research, then you can use individual data'. Arguments that tracking outputs are an ersatz representation, in the vein of 'data double' critiques (Cheney-Lippold 2011; Reigeluth 2014; Ruckenstein 2014), is largely considered in terms of an able-bodied identity formation, where numeric representations are a quasi-violence that sees human life reduced to a 'digit' in a capitalist system (Milne 2015). However, examples of tracking like Pat's serve as a reminder of the human violences of disbelief and denial. In Pat's case, the very reductionism that might irk others (Goodings and Tucker 2014, pp. 48) makes invisible symptoms visible. Such a fight for visibility is a frustratingly necessary project for those living with invisible illnesses or conditions (Charmaz 1991, pp. 208). Here, objectivity is welcomed, and is bonded with the subjective to form 'markers' (pp. 201) of symptoms in/over time. Ableism is deeply inscribed in the tracking of life, particularly through long-established modes like diary keeping (Vermeer 2022), and the relative privileges of core communities in this space, like QS (Lupton 2016, pp. 31). Akin to the emerging accounts of long-COVID and chronic conditions in HCI (Homewood 2023), stories like Pat's expand the introverted 'n = 1' of the 'laboratory of the self' (Kristensen and Ruckenstein 2018, pp. 3625) seen in the QS. Biography and memory are essential vehicles that allow data from the present to speak back to past – but unforgotten – injustices.

Conclusion: self-tracking as a datafied narration of everyday life

The subject of 'control' (Cheney-Lippold 2011; Reigeluth 2014) is at the core of critical perspectives of self-tracking, along with a concern that datafication of the body/self may result in versions of events and renderings of the self that are 'decorporealised and decontextualized' (Rettberg, 2014, pp. 71). But for the self-trackers above, tracking is situated within a personal context and biography that is reaffirmed – for better or worse – through self-tracking practice as 'situated objectivity' (Pantzar and Ruckenstein 2017). For these participants, the linking of data from present-day to longer stories about the events in the past serves to strengthen their commitment to their self-tracking projects. They use data as a highly contextualised point of reflection. With the sociotechnical affordances

of self-tracking technology (Gilmore 2016), lived experiences are stretched, condensed, massaged, and layered to recapture experience, form coherent stories, and generate evidence. They are then told in multimodal forms – carrying across the verbal 'telling', as well as the visual 'showing' of self-tracked data. This is borne out by the research methods informing this paper but aligns with existing typologies of how device use is understood (Lupton 2016) and is consistent with lay practices: the talk, the messages, and the co-presence of small networks of self-trackers linked by their devices, apps, and memories.

While memory is a latent implication in design (Jethani 2021), often through the future orientation of metric goals (Li *et al.* 2010), participants are not just 'colonising the future' (Giddens 1991, pp. 114). The memory work of self-trackers is about navigating risk and insecurity in the present, by tracing back to key moments in the past (Hajek *et al.* 2016 pp. 1–3). In doing so personal histories become layered into trendlines of biometrics, records of activity, and come alive with narratives of mobility, family, life, and death. Stored in these visual forms, moments become mementos that are dispersed amidst the mundanity of daily routines. While the novel affordances of self-tracking can allow for new feelings and reflections to emerge, it is corroboration and communication that are most essential: self-trackers harmonise the accountability provided by the datafied structures of tracking, with their interpersonal accounts of everyday life. Clearly, numerical representations superimpose a linear temporal structure to the messy realities of memories, and this requires work to unpack. But the bridges made, between semantic memory and autobiographical memory – via self-tracking – blend objectivity and subjectivity is affirming and useful ways: the combinations communicate 'deeper truths' (Dourish and Gómez Cruz 2018, pp. 8). The notion of self-tracking as a diary-keeping practice so often arrives retrospectively to self-tracking practices and data, despite research pointing more and more earnestly to the primacy of memory and of diary-like engagements (Cardell 2020; Homewood 2023; Rettberg 2018; Vermeer 2022). Self-tracking would be better understood as a sociotechnical phenomenon, if mnemonic connections were seen as a prospective requirement: they are, in fact, implicitly encouraged as a means to anchor activities, keep records, participate in social elements – and if warranted – change over time, to the bedrock of the user's experience. Such elements are far more important than the explicit marketing around self-monitoring, which so often attempts to attest to analytic accuracy. As Gilmore (2016, pp. 2534) has already argued, tracking technology logics':

> *... ultimate value for everyday life may lie in its ability to generate moments that exist outside the quantified self and are resolutely part of qualitative experience. Although it is tempting to overstate the impact of quantification on transforming everyday practice, these technologies are largely predicated on traditional conceptions of socially constructing our relationships to our bodies, our spaces, and each other.*

This, however, should not be taken for granted a neutral proposition. Across this chapter, the consideration of memory, data, and *work* (Beer 2018; Jørgensen 2016; Pink and Fors 2017) raises questions of direction: where and for whom does effort produce *value*? In the fraught and contested space of self-tracking – sitting inescapably as it does within big data logics of accumulation and capital (Sadowski 2019) – users find personal value and maintain agency by asserting their own narrations of everyday life. Taking user experiences at face value, rather than suggesting that scholars know better where the balance rests, the creativity seen in everyday self-tracking, as social practice (Shove *et al.* 2012) provides a balance between what Beer sees as a 'triumvirate of archons – ordinary, commercial and algorithmic' (2020, pp. 109) – overseeing the archives of the self that riddle the

contemporary digital landscape. Self-tracking and datafied narrations are experiments with non-zero-sum versions of human agency (Brown and Reavey 2014, pp. 330–331). While self-tracking data alone compress nuance, a deeply personal datafied narration of everyday life seems possible for users willing to share stories with self-tracking metrics, personal biography, and an audience at hand. Evidencing the expanded consumer health 'autobiologies' Harris and colleagues imagine (2016, pp. 51), these narrations are performative works that take effort, but in this way, come to resist some flows of data capital, with qualitative memory acting alongside the extractive power of data aggregation: as Farman (2014) argues, conversation and storytelling are softly assertive tactics against these kinds of top-down processes. Such a focus on empowerment should inform research and design approaches going forward, particularly in a context where the COVID-19 pandemic has reignited consumer-side rights-based framings around personal data (Hummel et al. 2021) while seemingly reenergising (developer-side) datafication of biography through both absolute (location) and relative (the codification of emotional experience) means (Moshe et al. 2021).

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