



Would John Dewey Wear a Fitbit? A Pragmatist Analysis of Self-Tracking Technologies' Impact on Habit Formation

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Received: 30 June 2023 / Accepted: 3 January 2024 / Published online: 9 January 2024
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Abstract

In this paper, I discuss the formation of habits with the help of self-tracking technologies. Although devices like Fitbit smart bands come with promises of empowerment through the means of increased control over users' habits, existing literature does not provide conclusive findings about the validity of such claims. I contribute to the ongoing debate by relying on John Dewey's pragmatist philosophy and its notion of intelligent habit. I demonstrate that from a pragmatist standpoint, habits that are the most likely to accomplish users' goals contribute to their flourishing need to be reflective (accompanied by adequate deliberation) and flexible (adaptable to the changing circumstances). On this basis I highlight some ethical-epistemic issues surrounding self-tracking technologies that inhibit the formation of habits desirable from a Deweyan standpoint. These include a lack of reflection on the part of the developers, difficulties for users to deliberate and consciously shape the habits developed by their devices, and dependence upon self-tracking tools that makes it difficult to adapt habits to individual needs and circumstances. I conclude the paper by discussing self-tracking's general impact on flourishing, as well as placing my arguments in the context of the diversity of self-tracking practices and identifying how users attempt to alleviate the shortcomings of the technology and make it more suitable to their goals and needs.

Keywords Self-tracking · Habits · John Dewey · Pragmatism · Ethics · Empowerment

1 Introduction

Over the last decade, self-tracking technologies evolved from novelty gadgets adopted by a devoted but narrow group of enthusiasts, into mainstream apps and devices worn and used by millions of users every day. Wearable devices such as

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Fitbits and Apple Watches, as well as specialised smartphone apps (e.g., MyFitnessPal, Strava) collect and quantify information about users' activity and promise to provide valuable insights that allow people to shape their habits and thus achieve greater control over their behaviour.¹ However, such promises should not be taken at face value. There is relatively little evidence regarding the positive impact of self-tracking on users' habits and authors do not agree whether self-quantification has an empowering impact on the users (see Wieczorek et al., 2022 for a review). Moreover, the notion of empowerment is quite unclear and encompasses a variety of factors, sometimes only tangentially related. For example, while I follow a number of authors connecting empowerment to self-knowledge and users' increased control over behaviour (see, e.g., Duus et al., 2018; Sharon & Zandbergen, 2017; Owens & Cribb, 2019), many works focus predominantly on political aspects of this notion. This is especially evident in healthcare, where the use of mHealth tools is often discussed in connection with increased access and patient participation (see, e.g., Sharon, 2017; Wieczorek & Rossmair, 2023 for a more detailed analysis).

Consequently, this paper adopts a narrow focus on behavioural aspects of empowerment to examine a selection of ethical-epistemic issues that surround the formation of habits with the help of self-tracking technologies.² For this purpose, I adopt John Dewey's understanding of habit due to its descriptive and normative potential (Dewey, 1957; Fesmire, 2003; Sullivan, 2001). In Dewey's pragmatist philosophy, the notion of habit goes beyond the common understanding of this term as a repetitive, unreflective and often unwelcome behaviour (i.e., a smoking habit). For Dewey, habits are the most basic unit of behaviour and refer to a wide variety of dispositions that shape our behaviour and character (he goes as far as to discuss political habits as shaping the way we organise institutions, see Dewey, 2016, pp. 61–62). From a pragmatist standpoint, it would be possible to claim that all behaviour refers to our habits: it is a continuation or a modification of existing habits (including the habits of thought, political habits, etc.) and in circumstances where existing habits fail to be relevant or are deliberately abandoned, it can lead to the creation of new ones (i.e., even behaviour occurring "out of character" happens in the context of one's character and can result in its modification).

¹ Of course, it is possible to supplement self-quantification with other kinds of information, for example that collected from wearable cameras worn by lifeloggers or written down in journals. However, this paper deliberately adopts a narrower focus on quantified data as I take it to be a fundamental feature of self-tracking (see Wieczorek, et al., 2022 for a more detailed discussion). I deal with other data sources and multimodality in Sect. 4.2. to provide more context and nuance for my analysis.

² It is worth observing that the idea of self-directing one's behaviour through technology is closely connected to Foucault's (1988) idea of technologies of the self. However, since Foucault's context has already been extensively examined in the context of self-tracking, I wish to merely point out to an alternative reading of self-tracking and direct readers to existing work rather than exploring this avenue (see Fotopolou & O'Riordan, 2017; Gabriels & Coeckelbergh, 2019; Richardson & Mackinnon, 2018; and to some extent Bergen & Verbeek, 2021, who discuss a related gamified habit tracking app). However, it is worth noting that both Bergen & Verbeek (2021) and Gabriels & Coeckelbergh (2019) present self-tracking as eventually subjecting the users to the demands of power rather than empowering them. This provides an alternative explanation for the findings I present below, while also pointing to divergences between Foucauldian and Deweyan perspectives, as well as the peculiarities of each of these approaches.

Our persistent reliance on habits does not mean that all habits are equal. Dewey's philosophy praises habits that are intelligent, that is reflective (i.e., resulting from deliberation) and flexible (i.e., adaptable to new situations). Intelligent habits allow us to achieve a wide range of goods across different circumstances and, perhaps more importantly, arise from a genuine reflection on the kinds of goods that are worth pursuing and the kind of life that is worth living. Designation of some habit as intelligent is not merely a description of its utility or effectiveness but is a moral valuation – an intelligent habit is one that is likely to contribute to growing and flourishing.³

Consequently, when asking whether habits developed by self-tracking are intelligent, I am interested in more than some internal features of particular habits (e.g., their genealogy or persistence). I ultimately want to determine whether they help self-trackers pursue the good life and allow them to consciously shape the notion of the good life that is being pursued. At the same time, I do not wish to promote a certain vision of flourishing. The notion of intelligence in relation to habits leaves open the exact shape of the good life to be pursued and allows individuals to determine it themselves (see Boenink & Kudina, 2020 and van de Poel & Kudina, 2022 for a discussion of the pluralistic and flexible nature of values in pragmatism). Many of the issues discussed in this paper deal with the question of autonomy – I am concerned whether users are able to exert an adequate degree of control over the habits produced by contemporary technologies.

Over the course of this paper, I analyse self-tracking habits according to their three features subsumed under the more general notion of intelligence: reflectivity, flexibility, and overall contribution to users' growth. In Section 2, on reflectivity, I consider whether the habits arising through self-tracking recognise the variety of users' individual circumstances, build on existing habits, and allow users to deliberate upon the impact of their devices on their behaviour. In Section 3, on flexibility, I investigate whether the habits can be adapted by users to different situations and whether self-tracking devices help users develop the ability to respond to change, also without the active influence of a given tool. In Section 4, I present an overall conclusion about the impact of self-tracking on growing and flourishing. However, I also note that not all kinds of self-tracking practices are equally susceptible to the negative impact that self-tracking can have on the reflectivity and flexibility of users' habits. Consequently, I present some ways of using self-tracking technologies as potentially more conducive to the development of good habits, and, ultimately, flourishing.

³ Growing is a central ethical ideal in Dewey's philosophy and forms a fundamental part of the good life. It can be characterised as an intellectual and practical attitude aimed at the amelioration of experience and improvement of one's character. It is closely related to the notion of flourishing, which in pragmatist terms is defined as a state of happiness resulting from good experiences and the satisfaction of one's goals. Importantly, individuals can still grow in bad circumstances (i.e., by attempting to make them better), but it would be difficult to imagine they would flourish. It is worth noting that while Dewey typically translates the Aristotelian term *eudaimonia* as happiness (Dewey, 2008, p. 197-199), I decided to refer to flourishing as this translation is arguably more common in contemporary ethical literature.

Moreover, even though this paper focuses exclusively on self-tracking, I believe that many of its conclusions will be applicable to other contemporary technologies. Even though devices such as Fitbits are explicitly meant to shape our habits, all kinds of technologies exert some influence over our behaviour – that the use of a technology will result in the creation of new habits is one of the core assumptions of Dewey's philosophy of technology (Hickman, 2001). Consequently, in addition to conducting an ethical-epistemic analysis of a given case study (i.e., self-tracking), I hope to present Dewey's notion of intelligent habit as a descriptive and normative tool for the fruitful discussion of a wider range of contemporary technologies and their constitutive impacts. Despite recent reinvigorated interest in Dewey's philosophy of technology (Boenink & Kudina, 2020; van de Poel & Kudina, 2022), Dewey's discussion of habit has not yet been applied to normative debates surrounding contemporary technologies – this paper can thus contribute to recent developments in the application of pragmatism within technology ethics.

2 Reflectivity

Dewey argues that the formation of desirable habits needs to be accompanied by reflection. Whenever we find ourselves in problematic situations – circumstances in which we are unable to act automatically through dependence on our existing (good) habits – we should engage in the process of dramatic rehearsal (see Dewey, 1957, p. 190; Fesmire, 2003, pp. 69–91). This involves an active inquiry into the variety of available courses of action, as well as their competing valuations (for example, those coming from individuals approaching the problem from a different perspective and with a different worldview). According to Dewey, deliberation upon our habits that occurs during dramatic rehearsal is an attempt to consciously determine “what kind of person one is to become and the kind of world that will be made” (Dewey, 1957, p. 217). Imagination is the chief capacity employed for these purposes as it allows the deliberating individual to conceptualise what kinds of habits could be relevant in the given circumstances and consider their viability according to their consequences (including the long-term impact on the individual's character).

A successful inquiry should aim to consider the maximum possible extent of viable avenues for action in order to find one that brings the individual the closest to the desired result. In fact, Dewey argues that inquiry that is cut short and fixates on a single approach is likely to fail and confine the inquiring individual to a rigid habit that would not adequately respond to the situation at hand (Dewey, 1957, p. 211). Instead, inquiry should involve the imagination and pursuit of new avenues in order to maximise the potential for growth.

At the same time, dramatic rehearsal is not arbitrary as it builds on the existing habits of the individual and is rooted in actual circumstances. It should recognise the specificity of the situation with which it deals and propose solutions that are an extension of good tendencies already present in an individual's behaviour. In this vein, Dewey's educational philosophy encourages teachers to focus on what students already know and expand their existing capacities to ensure that knowledge and abilities would grow organically – they would thus be better rooted in the student's

character than disjointed pieces of information and skills not anchored in practice (see Fesmire, 2015, pp. 173–181 for an overview). I believe that this approach should also be extended to technologically-assisted habit formation – habit-oriented technologies should guide and inform users’ own character-building efforts and encourage good tendencies already present in them, rather than depend on universalistic proxies that do not recognise users’ character and life situations. In practice, building on a user’s existing habits should guarantee greater persistence of new dispositions and be more in line with their individual interests and goals. Simply put, habits guided by the process of dramatic rehearsal should prove more useful (i.e., more likely to bring the desired/projected outcomes). From the normative standpoint provided by Dewey’s ethics, such habits would respect users’ autonomy and individuality/identity, and thus positively contribute to their growth and flourishing.

The above description closely links ethical and epistemic considerations, and it has been argued that pragmatism is characterised by a rejection of “the false trichotomy among the epistemic, the ethical, and the political in discussions of normativity” (Medina, 2013, p. 81). In Dewey’s philosophy good habits and the good life are an extension of the quality and form of deliberation upon them. Consequently, for pragmatists the evaluation of our epistemic processes goes hand in hand with moral valuations and political analysis – in recent years many pragmatist scholars have been engaging in the debates about epistemic (in)justice (Dieleman, 2017; Medina, 2013; Sullivan, 2017). In particular, Medina (2013, p. 50) proposed two ethical-epistemic principles that should help improve the quality and inclusivity of our epistemic activities (as described in this paper, dramatic rehearsal can be seen as an embodiment of these principles). The principle of acknowledgment and engagement requires us to recognise competing worldviews and beliefs and factor them in our epistemic considerations (even if only to reject them as incompatible or epistemically harmful). The principle of epistemic equilibrium forces us to ensure that no single perspective fully dominates the epistemic practices and that competing knowledge claims can also be adequately judged. In the context of self-tracking these principles entail that habits promoted through self-tracking technologies should be based upon a consideration of a maximal feasible number of alternatives – as follows from the principle of epistemic equilibrium – and should recognise the unique life situations to which they are to be applied (i.e., the specificity of particular users and concrete circumstances) – as follows from the principle of engagement.⁴

Moreover, reflectivity cannot be achieved if individuals are unable to interpret and critically evaluate existing and prospective habits, including their content, purpose and motivations. This is especially important when habits arise because of some external influence (as is the case with habits developed with the help of self-tracking

⁴ My reliance on Medina’s principles does not signal the adoption of a principled approach. Dewey was sceptical of rooting discussions of morality in a single factor (see Dewey, 2018, p. 315–20) and my analysis could be based on a reference to Dewey’s virtue of open-mindedness (see Dewey, 1933, pp. 30–31; Zagzebski, 1996, p. 173), or Mark Tschaeppe’s (2018) virtue of humility that he builds on the basis of Dewey’s philosophy. I use Medina’s principles as they allow me to analyse two distinct, if related, features of reflectivity while still encompassing the core aspects of open-mindedness (i.e., openness to views of others, fallibilistic attitude to one’s beliefs, anti-universalism).

technologies). A habit developed without the knowledge, consent and understanding of the habituating person should not be considered reflective. Although in many circumstances individuals outsource some of their habit-making to a trusted third party (for example in education), this trust does not imply complete resignation to the will and influence of others. Steered or guided habit formation still requires deliberation on the part of the individual and proper guidance should provide us with enough background information to enable reflection about what is being taught.

In what follows, I analyse self-tracking technologies and the habits they promote in the context of reflectivity, and demonstrate their shortcomings. In the first subsection, I identify some common features of self-tracking that betray a lack of reflection on the part of developers. In the second subsection, I turn to the elements of self-quantification that make it more difficult for users to reflect upon their habits mediated through self-tracking technologies.

2.1 Reflection in Design

Self-tracking technologies play an active part in users' habit formation by providing easily digestible metrics, contextual cues and personalised recommendations aimed at the development or reinforcement of specific habits (i.e., good sleep, regular exercise, mindfulness). While potentially helpful, these techniques mean that many of the users' habits are to a large extent a product of specific self-tracking apps and devices. Users can actively reflect on the influence of the device (not without difficulties, as I demonstrate in the next subsection), but some decisions of technology developers largely determine the kinds of habits that are developed and their relevance to specific user groups. The idea of reflectivity makes it possible to identify several problems with the habits promoted through self-tracking technologies. As I argue in this section, some common features and design decisions behind self-tracking would lead to habits that are not motivated by adequate inquiry. Most importantly, the design of self-tracking technologies overly privileges certain perspectives – thus violating the principle of equilibrium – and fails to recognise and adapt to users' unique life situations – thus violating the principle of engagement.

The metrics and recommendations found in self-tracking technologies typically depend on a limited number of predefined standards relating to users' activity and bodily features. Developers might base the functioning of their apps and devices on a reference to baselines such as certain body fat percentages, a specific number of hours of sleep (potentially divided into different phases of sleep), distance travelled, and many others. Users are commonly evaluated according to their performance relative to these standards and the algorithms found in self-tracking technologies suggest actions that might help them achieve or maintain a desired outcome.

However, these standards are primarily informed by a limited number of dominant perspectives. It has been noted that self-tracking technologies often frame metrics in biomedical terms and link data to health even when this might not be warranted (Morgan, 2016; Owens & Cribb, 2019), that they promote neoliberal views surrounding productivity and individual responsibility (Ajana, 2017) and that they reflect the worldviews of the largely-male design teams, which leads to the exclusion

of the needs and perspectives of women (Waelen & Wieczorek, 2022). Consequently, the standards endorsed through self-tracking technologies are rarely representative of the diversity of users (Nissenbaum & Patterson, 2016; Sharon, 2017), are often improperly justified (Crawford et al., 2015), and sometimes reflect prejudices held by technology developers or the society at large (Sharon, 2017). In fact, self-tracking is often criticised for mirroring the point of view of its young, male and affluent users (Barassi, 2017; Sharon, 2017).

Some commonly referenced examples support this criticism. Standards related to activity levels are often unattainable for users with injury history, disabilities, or even care responsibilities (Neff & Nafus, 2016, pp. 38–44). Health-related features of self-tracking medicalise various aspects of everyday life and betray an obsession over fitness, for example by directly and narrowly linking weight and lack of health (Wieczorek et al., 2022). Many relevant women-oriented features (such as period tracking) are implemented only in later iterations of devices or not implemented at all (Duhaime-Ross, 2014), and they often replicate harmful stereotypes relating to gender roles, for example by assuming that all women want to get pregnant and that sex is primarily connected to reproduction (Kressbach, 2019). Moreover, female users commonly report inaccurate readings as developers do not anticipate that women are likely to use their self-tracking tools differently to men (for example, by carrying their devices in their handbags rather than their pockets, or using wrist-worn self-tracking devices while pushing prams, an activity still more likely to be undertaken by women, see Criado Perez, 2020). Finally, tools of self-quantification do not consider the material circumstances of users and fail to recognise that not all of them are able to bear the cost of tracking and implementing the recommendations, both in terms of time and resources (Neff & Nafus, 2016, p. 160; Owens & Cribb, 2019).

These shortcomings, whether arising from a lack of care or attention, point to the absence of epistemic equilibrium in the design, development and deployment of self-tracking technologies. The practices of self-quantification commonly promoted through self-tracking technologies, and consequently the kind of habits they produce, are not a result of a consideration of a maximum feasible number of alternatives. In fact, the narrow scope of many self-tracking practices suggests an inquiry cut short and fixated on a single perspective. As Gabriels and Coeckelbergh (2019, p. 126) point out, “the technologies encourage a particular perception and experience through the design” and they correspondingly “steer our thinking” in ways that are not necessarily in line with users’ values and desires. In pragmatist terms, this is problematic as self-tracking technologies direct users’ growth in a limited number of often arbitrarily selected avenues. They do not guide users following a careful consideration of their diverse needs and the best ways of fulfilling them in specific circumstances.

Moreover, self-tracking technologies do not meet the requirement of engagement as they do not recognise and adapt to their particular users. Standards endorsed through self-tracking are most often applied across a diverse range of users without a consideration of their unique life situations and individual character. It is the users who are expected by the developers (and other parties, such as insurers or employers using self-tracking technologies) to conform to the norms

and requirements reproduced through self-quantification, sometimes at the cost of their self-esteem, confidence and mental health. In fact, self-tracking technologies have been criticised for encouraging obsession over the results of tracking and instilling a sense of inadequacy as the scores reported on the screen always stand to be improved (Kristensen et al., 2021; Lomborg et al., 2020).

I argue that the most common implementations of self-tracking seem to be starting habit formation from square one. This approach insufficiently builds on users' existing habits and does not adequately adapt their functioning to the situation at hand. Although users might be commonly asked to input some minor details when they configure their apps and devices (such as gender, age, purpose of tracking, etc.), the personalisation techniques employed in self-tracking recognise only extremely general categories that fail to capture the specificity of actual people (and algorithms can mistakenly infer information, further contributing to misrecognition). Technologies are constitutive of users' identity and those that fail to recognise users' individual needs and capacities (as well as their autonomy and societal contributions), could have significant long-term negative effects on their confidence and sense of self-worth (see Waelen & Wiczorek, 2022).

Arguably, this problem could be attributed to technological limitations as it might not be feasible to quantify and account for *all* the features of individuals' lives that might be relevant to habit formation. Metrics and standards employed in self-tracking need to depend on generalisations and proxies, and their reductive nature is to some degree offset by the possibility for cross-comparisons and algorithmic analysis that could lead to otherwise unattainable insights. To propose that all users and all life circumstances are irreducibly unique, would be simply impractical. After all, we are commonly able to speak of "types" of habits and identify similarities between different circumstances.

However, the data-driven perspective endorsed through self-tracking goes a step too far by excessively favouring quantified information and ignoring its deficiencies, such as insensitivity to context and reliance on proxies. The universalisation of standards and the purported objectivity of quantification, often echoed in the marketing and popular discussion of self-tracking (Ruckenstein & Pantzar, 2017; Wolf, 2010), demonstrate a lack of genuine reflection upon (or, in some cases, wilful ignorance of) competing perspectives and other possible ways to conceptualise self-tracking practices. Ultimately, the design of self-tracking technologies is a balancing act between an emphasis on the generalisable yet reductive quantified data, and a recognition of the actual multiplicity of phenomena that cannot be fully represented and analysed through numbers – at least at the current stage of the technology. Arguably, it might be possible that developments in algorithms and data science eventually enable the developers to quantify an even more diverse range of metrics. However, by their very nature when proxies and categories model some information, they do so by overlooking and generalising other relevant phenomena, especially the phenomena that are better captured by qualitative ways of knowing. It is likely that regardless of technological advances, large parts of our experience will never be properly expressed in terms of numbers (even if the numbers do bring additional knowledge about that experience).

By tipping the scale in the direction of data, self-tracking technologies offer their users some potential benefits. Data and associated recommendations can serve as a genuine source of information and guidance. However, the design of many popular self-tracking tools goes a step too far and neglects the actual diversity of users and their life situations. As a result, those belonging to groups underrepresented in the technology (e.g., women, the disabled, the less affluent, and many others) are not adequately engaged and are less likely to reap the benefits of self-tracking. Moreover, as follows from the assumptions of pragmatist epistemology, the lack of consideration for a broad range of perspectives is likely to reduce the desirability and efficiency of produced habits (as the lack of reflection reduces the number of situations and consequences of habits that can be anticipated, thus reducing their potential for leading to desired outcomes).

2.2 Reflection by Users

While my concerns outlined in the previous subsection deal primarily with how the design of self-tracking technologies limits the reflectiveness of the habits produced through the practice, this subsection outlines the obstacles users themselves face when attempting to deliberate upon the impact of self-tracking on their behaviour. As I argued above, users may be trained into unreflective habits that do not arise out of a consideration of viable alternatives, or out of engagement with the self-tracking individuals and their unique life situations. However, in practice users are not completely passive recipients of wisdom generated through self-tracking and they should have some opportunity to evaluate and adapt the habits promoted by their apps and devices. While this can certainly happen, users' ability to integrate self-tracking technologies into their daily life depends on a wide range of factors. These include personal ones such as age or technological affinity but also quality and appeal of the self-tracking device as well as reliability of collected data (Jin et al., 2022). Already in the early days of research on self-quantification, Li et al. (2010) established that the use of self-tracking is multi-stage process and identified numerous obstacles that users need to overcome in order to translate insights from their tools into desirable action. Although it is important to consider the personal and environmental factors that prohibit the users' from fully benefitting from self-tracking (see Jin et al., 2022; and Yfantidou et al., 2023 for a deeper analysis of these factors), these vary from person to person and from demographic to demographic. However, I argue that there are some inherent features of self-tracking technologies that affect users of varied backgrounds and limit their ability to reflect upon their habits and consciously shape their behaviour.

Users are not presented with the full extent of information collected by their self-tracking apps and devices. Although self-tracking technologies collect a significant amount of data, often without our knowledge, users can typically access only a portion of it and only in a processed form, for example as graphs (Crawford et al., 2015). Their insight into a given activity is not as deep as that available to those managing the data collected by the device (at least in terms of metrics – they of course have access to information not available to the developers, e.g., on how they

felt during the tracked activity). The results displayed to them (e.g., the number of steps taken or heart rate) are often calculated on the basis of a number of different undisclosed variables (e.g., location data). Moreover, the algorithms processing data and their exact functioning are commonly kept hidden from them (in addition to being too complex for most people to understand). They are often only hinted at in general descriptions of a given product or mentioned in convoluted and sometimes purposefully obfuscated privacy policies and terms of service documents (Danaher, et al., 2018). At the same time, the devices often do not collect enough relevant data points to enable reflection and help users arrive at meaningful conclusions (Li et al., 2010).

From the perspective of users, self-tracking devices function as a black box – some unknown amount and type of information is put inside, and a series of metrics and suggestions come out. Users are given little insight into the entire process and this serves as an obstacle for genuine reflection upon the habits that would arise if these recommendations and behavioural cues were followed. Moreover, users are likely to develop some habits merely through exposure to self-tracking technologies and not as a result of deliberate conformity with specific recommendations. Many self-tracking apps and devices have been demonstrated to engage in behavioural nudging (see for example Toner, 2018 who analyses this phenomenon by drawing on some elements of Dewey's philosophy, as well as Lanzing, 2019), but even the repeated act of wearing a self-tracking device and regularly checking the scores and metrics displayed on the screen is bound to produce some new habits of thought and behaviour among self-trackers (e.g., a habit of evaluating one's everyday activity according to some pre-defined standards).

At the same time, even if some features of specific self-tracking practices are made explicit, this does not necessarily enable reflection on the part of the users. Specific standards and target metrics are often at the forefront of what is presented to self-trackers, but the reasons for their adoption might be arbitrary or complex enough as to escape users' understanding. Standards such as 10,000 steps per day, recommended activity levels, target body fat percentage often lack scientific, or even well-reasoned, foundations and might not correspond to the needs as well as life situations of users (Crawford et al., 2015). Self-trackers might not always be able to determine the validity of specific standards or recommendations and participate in how they are formed and implemented. While it is possible to approach these features with attitudes ranging from scepticism to wholehearted endorsement, in many instances users might be kept in the dark as to their actual content, justification and motivations behind them. This seriously inhibits users' ability to form a deliberate and successful response to their influence.

The reductive nature of quantification can also be an obstacle to genuine reflection. Self-tracking technologies collect only information that is easily quantifiable or construct quantified proxies of qualitative phenomena and this is likely to leave out some valuable and relevant information. Moreover, due to the perceived objectivity of data, users might be more inclined to trust it over other forms of information or consider non-quantified information much less important (Gabriels & Coeckelbergh, 2019; Juchniewicz & Wiczorek, 2022; Ruckenstein & Schüll, 2017). This could lead them to overlooking contextually relevant but

not quantified factors in their deliberation upon the habits developed through self-tracking and thus serve as an obstacle to genuine reflection. For example, when the activity of walking is framed exclusively in relation to the distance travelled or the number of steps made on a given day, users might fail to consider the influence of the background infrastructure on their walking habits (e.g., the availability of accessible walking paths) or the inherent value of their activity. Even if self-tracking does encourage and enable reflection upon one's habits, it may be a one-sided, numbers-driven form of reflection that resembles an inquiry cut short and fixated on a single aspect instead of a full-fledged dramatic rehearsal.

Moreover, there is a gap between users' lived experiences and the kinds of insights provided by self-tracking. Li et al. (2010) quote people who encounter difficulties while integrating data into their reflective practices because they fail to understand how additional information can be used to shape their future actions. Notably, one respondent to their survey observed that data is "really not very useful and it's kind of annoying. I mean, I walk a lot. What else do I really want to know?" (Li et al., 2010, p. 562). Fairclough (2023) addresses this issue by pointing out that users face difficulties when asked to confront their first-person experiences of a phenomenon, with a third-person account provided through the means of data. And although his work deals with neuroadaptive technology, it shows that if users are to incorporate data in their reflective practices, this data needs to be presented in an approachable and understandable way. Fairclough's (2023) analysis suggests that the nature of supplied data as well as the interface through which it is presented strongly determines whether technologies promote or inhibit reflection (e.g., through the dismissal of data as irrelevant as in the example provided by Li et al., 2010). I return to this point in Section 4.2.

All these issues (limited access to information, technological opacity, vagueness of standards, reductive nature of data, and difficulty with integrating third-person data and first-person experiences) impede users' ability to reflect upon the influence of self-tracking and assess the habits developed as part of the practice. The design of self-tracking technologies does not provide users with enough hermeneutic resources for successful deliberation upon "what kind of person one is to become and the kind of world that will be made" (Dewey, 1957, p. 217) with the help of self-quantification, and it may even negatively impact existing hermeneutic resources (as in the case of datafication). Moreover, inequalities in the distribution of means of understanding may further complicate this problem as users with lower digital literacy might find it even more difficult to reflect on their self-tracking practices. This could be understood in terms of hermeneutical injustice proposed by Fricker (2007), as users are deprived of means for making sense of their lived experience. However, I believe that Sullivan's (2017, p. 210) pragmatist reformulation of epistemic injustice as situations in which "the speaker isn't allowed to epistemologically transact with the world in ways that enable her own as well as others' flourishing" is even more apt here, as the limited epistemic access to the operations conducted by self-tracking technologies prohibit self-trackers from fully transacting with an important element of their daily experience and deprive them of opportunities to reflect upon it and shape it in line with their needs.

Arguably, users cannot fully negotiate what factors will be tracked, how it will be done and for what purposes.⁵ Although most common self-tracking apps and devices make it possible for users to choose which data will be highlighted and what will be the scope of recommendations, the actual data collection and the hidden work of algorithms remains out of users' reach, often by design. Admittedly, by outsourcing some of their reflective work users might reduce the risk of cognitive overload and receive curated information that sometimes might even be sufficient for their purposes. However, this requires them to become epistemically dependent on self-tracking and accept that some of their habits will be steered by factors beyond their control and beyond the scope of their reflection. It is questionable whether this trade-off is justified, especially since users have to accept its terms as designated by technology developers. Moreover, as Kristensen et al. (2021) show, steering often still leads to adverse effects, such as lower self-esteem and satisfaction, while nevertheless requiring users to perform cognitive work in order to incorporate new habits into their patterns of behaviour.

3 Flexibility

Flexibility is another feature of intelligent habits and it plays a significant role in Dewey's philosophy. His pragmatism recognises the unique nature of different life situations, but stipulates that habits are *general* dispositions for specific *kinds* of action (see Dewey, 1957, p. 42). Consequently, useful habits need to be applicable across a wide range of circumstances – malleable enough as to adapt to new challenges, but still adequately defined so that otherwise irrelevant changes do not require renewed deliberation. By contrast, rigid habits lose their relevance as soon as any variation is introduced. Instead of allowing the acting individual to recognise patterns and skilfully adapt to their minor modifications, they depend upon rote repetition of specific steps and break down the moment something unexpected is encountered. Such inflexibility has a significant impact on the efficacy of habits, as even small changes to the circumstances can reduce an individual's ability to secure desired results and force them to reevaluate their dispositions.

Flexibility can be distinguished as a separate feature of habits, but it does not arise on its own. I take it to be a byproduct of genuine reflection that considers viable alternatives and anticipates a wide range of outcomes that can be associated with a given habit. On this note, Shannon Sullivan observes that "the habits that are more likely to be capable of change are those that are formed with an eye for further

⁵ This is even more problematic when users do not engage in self-tracking practices out of their own initiative, but are forced or pressured to do it by some external factors (i.e., as a condition of access to health insurance and public services, or as part of workplace wellness schemes, see Ajana, 2017; Moore & Robinson, 2016). This further reduces the insight into the habits that are formed as a higher number of elusive factors needs to be considered, such as the interests of a private insurer, or the data practices and objectives of an employer. Moreover, such involuntary uptake of self-tracking might leave users unprepared (in terms of time, ability and opportunity) to reflect on their self-tracking habits, while also limiting their ability to freely shape the tracking practices.

transformation, rather than those that are formed as fixed grooves into which one settles.” (Sullivan, 2001, p. 33).

Consequently, many of the issues discussed in this section arise directly from a lack of deliberation outlined in Section 2 and the analysis presented here could be interpreted as an extension of that related to reflectivity. However, since flexibility is a central aspect of intelligent habits, it is worth highlighting specific features of self-tracking technologies that serve as an obstacle for the development of dispositions that are malleable and responsive to change. Of course, this is not to say that users have no say in how they use their self-tracking tools and to which purposes. It is ultimately them who decide which tools will be used as well as how and why it will be done (unless they are pushed to track by various institutional actors such as employers or healthcare providers, see Lupton, 2016). However, the ability of the users to integrate self-tracking into their individual circumstances and to adapt resulting habits to their needs is directly connected to some features embedded within the available tools.

I already argued that the rigidity and limited variety of standards endorsed through self-tracking is an obstacle for the formation of reflective habits. A similar problem can be noted in the context of flexibility. Self-tracking technologies operate with a narrow vision of what is normal or desirable and routinely prove to be unreliable for “atypical” users (e.g., women or people with disabilities) or fail to reflect a wide range of commonplace phenomena in their metrics. Consequently, habits generated through self-tracking are likely to be relevant only in situations that neatly correspond to those imagined by the developers. The rigidity of metrics and standards found in self-tracking technologies means that any unanticipated change is bound to destabilise users’ habits (and as Section 2.1 demonstrates, the developers fail to anticipate quite a lot). This could turn commonplace occurrences into what Dewey calls problematic situations that require further reflection rather than reliance on familiar ways of acting.

Moreover, existing research shows that habits developed through self-tracking often lack persistence (Moore, 2017, pp. 172–173) and that users may encounter difficulties with integrating self-tracking in their lives due to a variety of personal and wider factors (Jin et al., 2022). Users typically begin their tracking practices with much enthusiasm and note significant benefits, but many of them stop tracking after several months. Most importantly, these benefits are usually lost when self-tracking technologies are no longer in use. For example, users who manage to increase their level of daily activity with the help of smart wristbands or smart watches, quickly revert to their baseline levels once the device is no longer worn regularly. This suggests that habits aided through self-tracking are too rigid and too dependent on self-tracking technologies to be adapted to changing circumstances that involve the discontinuation of a given self-tracking practice.

This could be blamed on commercial interests of the developers of self-tracking technologies as their revenue is tied to continued data collection and is thus reliant on users’ uninterrupted use of a given tool. It is arguably not in their interests to guide users towards beneficial habits that can remain actionable without a given app or device. Developing users’ dependence on technology seems like a quite successful, if ethically suspect, business model.

However, this inflexibility does not have to result from developers' ill will. Even if self-tracking apps and devices are designed with users' best interests in mind, the current state of the technology does not encourage user independence and reflection. The possibility of delegating at least part of the burden of evaluating one's life is arguably one of the most appealing elements of self-tracking. As Bergen and Verbeek (2021) point out, these technologies are meant to make users do things they usually would not do out of their own initiative. As such they seem to be designed and are often approached as a behavioural and deliberative shortcut. The apps and devices currently on the market promise their users valuable insights and actionable lifestyle recommendations delivered in a seamless manner and without users' intimate involvement in the calculations and decision-making. The users are expected merely to wear or carry their device and promptly react to recommendations supplied by the algorithms. The calculations taking place in the background happen without the users' active involvement and, as already discussed, often without their knowledge.

Consequently, the habits that can be produced with the help of self-tracking typically involve rote repetition and are dependent on the active influence of a given technology. Users are not encouraged to develop practical wisdom and are rarely informed about the motivations and purposes behind specific recommendations. The application of an intelligent habit requires an individual to evaluate a given situation and pass judgment upon the relevance of existing dispositions, as well as the need for their updating. In self-tracking, evaluation and judgment are delegated to technology. Self-tracking tools often serve as a replacement, rather than extension, of users' deliberative capacities and there is little reason to believe that exposure to such techniques could improve users' ability to adapt to change. Although the habits operationalised *while tracking* may possess a degree of flexibility, depending on the design and efficacy of a specific tool, all this flexibility is likely to be lost once tracking stops. Without general skills and repeated inquiry into the relevance of established modes of actions, users will not be able to gain the capacity for adapting their habits to change. While this is certainly true of all habits, self-tracking technologies often deprive users of the opportunity for developing these skills⁶ and take away the necessity for engaging in inquiry – in this sense they certainly succeed in producing habits in the common understanding of the term, but this does not amount to *intelligent* habits. Even if self-tracking technologies produce a habit that is desirable on its surface (e.g., a habit of daily exercise or meditation), they are still lacking in Deweyan terms, as the process of habit formation that they facilitate does not involve meta-reflection on the habit itself and on the means of acquiring it. This ultimately reduces users' influence over that habit and their ability to adapt it according to their needs.

Moreover, the issues of limited access to information, technological opacity, vagueness of standards and reductive nature of data that I discussed in Section 2.2 limit users' ability to counterbalance the inflexibility of habits produced through self-tracking. Even those that possess practical wisdom and a desire to adapt their

⁶ Insofar as they are related to tracking practices and associated habits.

habits to change are not provided enough hermeneutic resources to do so. Due to the black box design of self-tracking, dependence and delegation are not only the default way of engaging in self-tracking, but the dominant one. Users approaching their self-tracking apps and devices with flexibility in mind, are likely to face significant obstacles.

4 Discussion

Admittedly, my overall judgment on self-tracking habits does not account for the multiplicity of ways in which users engage with self-quantification. The analysis presented in this paper outlines situations in which self-trackers blindly accept the data presented to them by their apps and devices, and eagerly follow the recommendations supplied by the algorithms. Although such an attitude is certainly possible, many approach their self-tracking technologies with a dose of scepticism and engage in significant amount of work to make self-quantification fit their needs and reflect their circumstances. And while these attempts are certainly commendable and successful to some degree, they do not change the fact that *as designed*, self-tracking is woefully inadequate as a tool for the formation of intelligent habits. The arguments I put forward do not mean that I believe no reflection or flexibility are possible in the context of self-tracking. After all, self-trackers pick up their tools with the intention to reflect upon and change their behaviour. However, I want to stress that due to inherent limitations of the technology, the amount and nature of these processes do not meet the, admittedly very high, standard implied by Dewey's notion of intelligent habit. In fact, the necessity for users to modify the basic functions of self-tracking tools in order to promote greater reflectivity could be taken as further justification of my arguments.

However, to nuance the discussion and provide a way forward, I describe some common strategies for embedding self-tracking into one's life and demonstrate what impact this may have on the reflectivity and flexibility of the developed habits. Some of the approaches adopted by self-trackers can positively impact the kinds of habits they are able to operationalise through their practices, and thus make self-tracking more in line with the objective of growth. Since these strategies can increase users' ability to choose and achieve a form of good life while engaging in self-quantification, they can serve as guidelines for users on how to increase their agency in the context of self-tracking and how to make the habits produced by self-tracking more intelligent. Moreover, in addition to this user-centric analysis, I look at the design of self-tracking tools and note some changes that the developers could implement to better recognise the diversity of users' needs and circumstances, as well as to promote reflectivity and flexibility.

4.1 Approaches to Self-tracking and their Impact on Habits

As already noted, some users might opt to use their self-tracking technologies uncritically and blindly follow the supplied recommendations. While this limits the risk of

information overload by outsourcing evaluation of collected data to the device and offers easy to follow guidance, it is unlikely that a majority of users stand to significantly benefit from this approach. Those that do not fit the image of a typical user or who find themselves in circumstances seen by developers as unusual would likely end up in one of the two following scenarios: 1) they would either see recommendations that do not correspond to their individually held goals and do not recognise their existing habits; or 2) they would have to adapt their behaviour, lifestyle and beliefs in order to fit the norms endorsed through self-tracking and thus pursue the goals determined for them externally. While the latter option could certainly enable the users to pursue some form of a good life, neither of the discussed possibilities can be seen as genuinely contributing to growth. Users would develop their character in a predetermined direction, but this would hardly ameliorate the depth and variety of their experience. Arguably, this form of self-tracking is most likely to result in frustration or conformity.

Users could also opt to merely collect their data and track metrics that they could independently put to a good use. For example, long-term self-trackers might wish to consult their historical data and reflect on how it compares to their current activity patterns. While this would certainly protect them from direct negative influence of personalised recommendations, it is possible to develop habits through self-tracking also unconsciously, especially when developers engage in nudging or manipulative practices. Moreover, it is questionable whether such an approach would open users to the diversity of experience and expand their horizons to alternative forms of behaviour and thinking or merely reinforce existing patterns. Unguided habit formation on the basis of the often rich and detailed self-tracking data could lead to information overload or require a degree of hermeneutic capacities that is not universally possessed. While some digitally literate and reflective users could benefit from this approach, it is possible that for many it would bring no observable benefit or even entrench existing habits.⁷ At the same time, the difficulties with integrating insights from one's data into one's life I discuss in Section 2.2, such as low relevance, accuracy and availability of data, would still serve as obstacles to reflection.

Arguably, most users may recognise their tracking practices as falling somewhere on the spectrum between the first and second options described above. They use their self-tracking technologies, including the associated personalised recommendations, as a handy reference point, but approach them with a dose of scepticism. As noted by existing research, users are generally aware that self-quantification requires a lot of interpretative work and are suspicious of universalising and objectivist claims behind popular self-tracking tools (Kristensen et al., 2021; Sharon, 2017). They also form communities in which they exchange insights about their individual practices, compare their achievements and guide each other to achieve the best results (Barta & Neff, 2016; Kristensen et al., 2021; Sharon & Zandbergen, 2017). Some even go as far as “hacking” their devices and their practices by inventing ways

⁷ This entrenchment could take form of a feedback loop whereas a motivated user interprets their data as supportive of a specific goal, commits more intensely to a specific behaviour, and ends up with even more data corresponding with the initial assumption.

for capturing new metrics, developing competing standards, and finding other means of making self-tracking technologies suit their individual needs (Ruckenstein & Pantzar, 2017; Sharon & Zandbergen, 2017).

Although some have criticised the dataistic and individualistic aspects of the Quantified Self movement, there are tendencies among its members that closely correspond to the attitude described in the previous paragraph (Ruckenstein & Pantzar, 2017). QS members often draw attention to the uniqueness of different users and their life situations, the incomparability of different users' metrics, and the necessity to make hermeneutic work a part of any practice of self-quantification. There are also similar, less organised and smaller scale groups that demonstrate considerable success in resisting the dominant schemes of self-tracking, while also emphasising user choice and influence over mere reliance on externally determined metrics and norms (Kristensen et al., 2021). This attitude is characterised by a critical view towards quantified data and a willingness to examine information together with others, but also an incorporation of alternate sources of information that challenge the one-sided perspective offered by quantified data (e.g., diaries, notes and photographs). This approach may be most beneficial to users and provides them with the greatest degree of flexibility, while also requiring some reflection on their part. Such decentralised, epistemically-varied, community-oriented and often unorthodox self-tracking practices should be conducive to the development of intelligent habits and offer the users ample opportunities for determining and pursuing their chosen vision of the good life. However, mainstream self-tracking technologies have not been designed to accommodate this way of tracking and users may only accomplish their own objectives as a result of considerable struggles against competing intentions and interests embedded in their tools or through an incorporation of alternative sources/kinds of data.

Consequently, a vocal minority of self-trackers is determined to design their own alternatives to the most common apps and devices. They tinker with and construct tools uniquely cut out for the fulfilment of their particular goals and they report considerable successes.⁸ Such an approach requires individuals to become intimately involved with their habits and strive to shape them in ways that promote flexibility and respond to their individual needs. However, it also involves a significant amount of engineering knowledge, time and resources, not to mention general hermeneutic capacities. Simply put, such completely independent ways of tracking may only be available to a narrow group of individuals. While certainly commendable and a source of inspiration for others, a wider audience cannot be expected to go through

⁸ For example, a 2009 post on the Quantified Self movement website teaches members how to make their own mobile self-tracking app (Betts-LaCroix, 2009). QS website is full of recorded presentations about people building their own devices (e.g., <https://quantifiedself.com/show-and-tell/?project=603>), and forum posts with discussions and schematics on DIY sensors (<https://forum.quantifiedself.com/t/im-building-a-meditation-biofeedback-device/478>; <https://forum.quantifiedself.com/t/portable-environmental-sensors-on-arduino/7157>).

such extensive efforts if they want their self-tracking technologies to play a more beneficial role in their pursuit of the good life.⁹

4.2 Design Recommendations

The third and the fourth approaches to self-tracking identified in the previous subsections are comparable in terms of the amount of reflectivity and flexibility with which they can imbue the habits they produce. However, as most users are more likely to depend on mainstream self-tracking technologies rather than develop their own, the extension of user choice and influence embedded within the existing self-tracking tools might be the most practical way forward.

There are of course, some generic recommendations applicable to a range of consumer technologies that developers could rely on to improve the reflectivity and flexibility associated with self-tracking. For example, greater representation within data, and design and testing teams would go a long way in ensuring that a greater variety of perspectives is recognised by self-tracking devices. Similarly, participatory design practices would help incorporate new types of metrics and recommendations that would make self-tracking more relevant for a wider range of users. After all, had Apple genuinely consulted its actual user base during the development of Health app, it would have taken them less than eight years to incorporate period tracking (Duhaime-Ross, 2014).

Change could also come at the regulatory level. For example, the European Commission's new and proposed legislation such as the Digital Services Act, and the AI act contain rules that would be beneficial also in the context of self-tracking technologies. Ideas such as bans on dark patterns and manipulative nudging and transparency mandates, not to mention improved (and actually enforced) data protection rules would have a great impact on the autonomy and wellbeing of self-trackers. However, at the time of writing neither of these acts are in effect (with companies only having to comply with DSA from 1 January 2024) and their provisions do not extend to self-tracking technologies.

It is also worth mentioning some recent developments in the design of self-tracking apps and devices. Apple's Fitness app allows users to pick their desired level of activity and be evaluated on this basis. In turn, Fitbit users are now able to determine how prepared they are to exercise on any given day and change the thresholds

⁹ I am aware that some liberal or libertarian readers might take issue with the discussion presented in this paper and refer to the values of personal responsibility and autonomy. After all, even if some users are pressured by insurance companies or employers to pick up self-tracking, most engage in the practice out of their own volition and they should be able to make that choice even if it is ultimately less than beneficial. However, I see my arguments as largely compatible with such liberal sentiments as the issues I discuss through the lens of reflectivity and flexibility can be seen as infringing upon autonomy and run contrary to the ideal of personal responsibility. Users' difficulties in reflecting upon their self-tracking tools limit their ability to make informed choices about self-quantification and their behaviour as a whole, whereas the inflexible nature of the produced dispositions may reduce users' control over their habitual actions (partially delegating it to a device). In this sense, even if users are not coerced to self-track, it is not certain that they are able to fully exercise their freedom while engaging in the practice.

and recommendations depending on their “Daily Readiness Score” (however, this feature is unfortunately locked behind Fitbit’s premium subscription). Such features might encourage some self-trackers to pay more attention to the goals and motivations behind their self-tracking practices and reflect on their compatibility with the standards and motivations endorsed by the technologies. Promising changes have also been made at the material level of self-tracking devices. Whoop is a tracking device designed to be worn not only on a user’s wrist. It is possible to fit the device within a sports bra and other pieces of clothing and a proprietary algorithm adapts the results based on the location of the tracker on the user’s body. In turn, the Oura Ring resembles traditional jewellery, which might make the device more appealing and comfortable or less intrusive for some users. Similar design interventions into the physical form of self-tracking devices could promote the diversity of self-tracking practices and thus enable the production of a greater range of habits.

Finally, I want to return to the multimodality of data and alternate sources of information I mentioned earlier. Many of the issues discussed in this paper are directly connected to the reductive nature of quantified data and the limited perspective offered by self-tracking tools. However, I already observed that many users, for example those belonging to the Quantified Self movement, incorporate other ways of monitoring the self in their tracking practices, such as journals or handwritten notes. Moreover, lifelogging technologies (see this recent paper by Ksibi et al., 2021, for an overview) serve a relatively similar function, but depend to a much greater extent on qualitative data, such as photographs or video recordings. Although early research on lifelogging pointed to ethical worries similar to the ones discussed here (e.g., limitations of the data, inconsistency of devices, see Jacquemard et al., 2014), recent work suggests that lifelogging and self-tracking data can complement each other and offer users much greater insight into their behaviour (Fairclough & Dobbins, 2020). Similarly, I already noted that appropriate visualisation and explanation of data through the user interface can make it much more intelligible (see Fairclough, 2023). As such, comparisons between different sources and types of data, as well as the introduction of interfaces better adapted to users’ needs are of fundamental importance for the ease of reflection associated with self-tracking technologies.

5 Conclusion – Self-tracking and Growth

Dewey’s view that the deployment of technologies first and foremost results in the production of new habits (see Hickman, 2001) makes it easy to assume that self-tracking technologies will result in the development of some habits among their users, and that these habits will have a degree of influence on users’ ability to grow and live a good life. Admittedly, many of the habits encouraged through self-quantification are predominantly corporeal and physical in nature. Even if some users may use their apps and devices to quantify their attention or time spent with friends and family (see Nafus & Sherman, 2014), most self-tracking practices are concerned with the tracking of exercise, body weight, sleep and other such factors, and they focus on the development of habits related to these phenomena.

At the same time, pragmatism provides good foundations for discussing such ostensibly corporeal elements of our daily life in an ethical manner. For Dewey, normative judgments surrounding physical activity colour our moral imagination (Dewey, 1957, p. 32), and our bodies are irreducibly connected to how we discuss morality (Dewey, 2008, p. 282). Moreover, as demonstrated especially in Section 2 of this paper, self-tracking habits extend far beyond the body. By relying upon and expressing specific norms, they significantly affect users' identity, self-esteem, attention and many other factors. Overall, I argue that they have an impact on users' character and thus co-determine their avenues for growth, as well as the kinds of the good life chosen by them (in addition to impacting the chances for achieving a particular vision of the good life).

Are self-tracking practices conducive to growth and the living of the good life? In Sections 2 and 3, I presented some deficiencies of self-quantification in regards to reflectivity and flexibility. My argument is that in their arguably most common form, self-tracking technologies do not promote intelligent habits. Instead, they confine users to a narrow understanding of what is normal and desirable, fail to recognise the diversity of the users, and instil rigid habits that are unlikely to withstand change. On the pragmatist view, habits arising from self-tracking are unlikely to bring users their desired ends, or bring them only when users adapt their goals and motivations to fit those endorsed by their apps and devices. Consequently, they should be predominantly seen as an obstacle to growing and flourishing and cannot be endorsed from a Deweyan point of view.

This is not to say that *only* intelligent habits are beneficial in terms of outcome – unreflective, rote behaviour often also leads us to desired goals and many unreflective habits produced by self-tracking could help users achieve their objectives. However, reflectivity and flexibility are inherently valuable in Dewey's philosophy as they are characteristic of a life guided by deliberation – one that is clearly endorsed in pragmatist terms – and they produce good outcomes by design and not mere coincidence. Even if unintelligent and intelligent habits lead to functionally similar results, the latter are more highly esteemed from a Deweyan standpoint as they are motivated by different decision-making procedures.

For these reasons, John Dewey would probably not wear a Fitbit. While self-tracking tools can have an overall beneficial effect on behaviour, the pragmatist view allows to assess a technology's impact on behaviour in a way that goes deeper than a mere judgment on its beneficence. Intelligent habits do not merely lead to good outcomes. They are deeply integrated with one's character and promote growth in line with consciously established goals. As I discuss in Section 4, developers of self-tracking tools could do more to encourage reflectivity and flexibility and accommodate a greater variety of approaches to technologically-mediated character development.

Finally, beyond offering an analysis of a particular behaviour-centric technology, I hope that a Deweyan perspective could encourage a broader discussion of technology's role in character-formation. Although the promise of automating certain burdensome or unappealing aspects of one's life and self-development is appealing, a pragmatist approach asks us not to sacrifice deliberation for the sake of delegation. The development of one's character is a complicated, demanding and

time-consuming effort and this should be recognised by behaviour-centric technologies. To really assist users and facilitate their character-building endeavours, self-tracking and other technologies should rely less on nudging and reductive proxies but instead encourage greater reflection by offering comparisons to alternative perspectives and sources of data and challenging the established ways of acting and thinking.

Acknowledgements I would like to thank Bert Gordijn, Fiachra O’Brolchain, Mark Coeckelbergh and Gabriel Flynn for the comments and suggestions they made at different stages of my work on this article. Their feedback greatly improved my manuscript.

Authors’ Contributions MW is the only author of this article.

Funding Open Access funding provided by the IReL Consortium The author received funding from the European Union’s Horizon 2020 research and innovation program under the Marie Skłodowska-Curie grant agreement no. 813497.

Data Availability Not applicable.

Declarations

Ethics Approval and Consent to Participate Not applicable.

Consent for Publication Not applicable.

Competing Interests The author declares no competing interests.

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