Delft University of Technology

Digital Phenotyping as Felt Informatics
Designing AI-Based Mental Health Diagnostic Tools Through Aesthetics

Bogdanova, K.; Cila, N.; Kudina, O.; Bozzon, A.

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Digital Phenotyping as Felt Informatics: Designing AI-Based Mental Health Diagnostic Tools Through Aesthetics

Karin Bogdanova
AI DeMoS Lab; Faculty of Industrial Design Engineering
TU Delft
Delft, Netherlands
e.bogdanova@tudelft.nl

Nazli Cila
AI DeMoS Lab; Faculty of Industrial Design Engineering
TU Delft
Delft, Netherlands
n.cila@tudelft.nl

Olya Kudina
AI DeMoS Lab; Faculty of Technology, Policy and Management
TU Delft
Delft, Netherlands
o.kudina@tudelft.nl

Alessandro Bozzon
Faculty of Industrial Design Engineering
TU Delft
Delft, Netherlands
a.bozzon@tudelft.nl

Abstract

With psychiatry lagging behind other medical fields in terms of innovation in instruments and methods, AI provides it an opportunity to catch up. Advocates of digital phenotyping promise to provide an objective tool that detects symptoms by analysing data from personal devices. We argue that digital phenotyping requires a more reflexive and critical approach to its design and an alignment of the clinicians' interests in generating relevant evidence with the needs of service users who seek tools to manage their condition. We propose a felt informatics approach, situating digital phenotyping design within the problem space of pragmatist aesthetics. Within this perspective, felt life becomes a central object and a site for digital phenotyping design. This paper reveals the ways diagnostic data mediates mental ill health experience, emphasises the cultivation of aesthetic sensibility as a fundamental element of digital phenotyping and includes design considerations for practitioners and researchers.

CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)**.

Keywords

Digital mental health, Digital phenotyping, Pragmatist aesthetics, Felt informatics

1 Introduction

Among all medical disciplines, psychiatry has long been denied significant innovation in its instruments and methods—with the exception of diagnostic manuals and standardised questionnaires improving reliability [12, 115]. Expansive AI implementation into healthcare thus seemed to provide a site for reinventing psychiatric practice. *Digital phenotyping* (DP), or personal sensing, has been brought to the attention of clinical researchers, practitioners, and investors in 2015 [95]. DP's proponents argue that psychiatry suffers from overly subjective processes that obstruct gauging accurate and relevant diagnostic information from the patients. In fact, DP's pioneer, Insel [91] asserts that current clinical practice does not respond to the needs of patients anymore, as the latter increasingly "realise… they cannot trust their subjective experience". What clinicians lacked, it is argued, is unbiased, untampered information about how patients "live out" their distress and disorders outside the walls of the clinic [133].

Working towards set objectives, DP's advocates turned to the digital footprint produced by smartphones and wearables, claiming that it can reveal behaviour indicative of the symptomatics of mental distress or such psychiatric conditions as generalised anxiety disorder, major depressive disorder, social anxiety disorder, bipolar disorder, schizophrenia, and suicidal ideation [34, 108]. The data that can be used for diagnostic purposes is all-encompassing: time spent outside the home, locations visited, gait, time spent in darkness, charge initiations, responsiveness to calls and texts, internet and app usage, keystroke logging and related psychomotor operations, website search, social media posts, vocal prosody, facial expressivity, and others. These types of data are referred to as *digital biomarkers*, although there is no consensus on the term's exact definition [7, 131]. DP can involve solely passive sensing, with data collected from the sensors and other available sources without the user's involvement, or its combination with active data input, i.e., filling out questionnaires, mood logging, etc. For example, a British start-up thymia collects data on microexpressions, head position and eye gaze, while users play an in-app game designed to detect behavioural patterns associated with depression [193]. Moreover,

vocal biomarkers become increasingly popular within both clinical research and industry. Apps such as Canary Speech, Sonde, Kintsugi, and Ellipsis Health invite the user to record a voice note that would be further analysed for semantic (words used) and/or acoustic qualities (intonation, rhythm of speech, length of vowels, etc.) to assess "risk".

No comprehensive software yet exists, and the only glimpses of this idea can be seen in commercial apps that align themselves with the digital well-being field, like aforementioned voice biomarker apps, or in university-based research projects (e.g. BEHAPP, Beiwe). Some clinical applications emerge but remain available exclusively to healthcare providers (e.g. Click Therapeutics, Winterlight Labs). The first DP application is yet to receive medical certification. Therefore, DP could be seen as a "partially existing object" [96] that is unstable, inconsistent, and non-homogenous as it is yet to be realised fully. Nonetheless, we believe that it is in this state of interpretive flexibility that it is more receptive to redirection. We share DP advocates' ambition to engage lived experience in the diagnostics, monitoring, and management of distress and mental disorders, yet in this paper we aim to propose an alternative path towards that goal.

We identify foundational concerns of DP as follows. Firstly, DP imagines psychiatric diagnosis as an issue of information: accuracy could be achieved if only there was enough standardised, legible data to analyse. In creating correlations between behavioural data and mental illness symptoms, DP reifies diagnosis as a stable, determinable entity. DP imagines the psychiatric diagnosis akin to that of physical illnesses: that is, based on quantified markers, which clinical instruments can reveal to be higher or lower than the baseline. Consequently, blinking as an indicator of autism is given the same significance as a number of leukocytes as one of infection [9].

Secondly, DP puts too much value on the diagnosis itself, despite a long critical tradition arguing against the practicality and relevance of diagnostic categories altogether [73, 148, 168, 194]. As opposed to physical illnesses, treatments for mental disorders are not as reliant on accurate diagnosis. Many treatments are fit for multiple conditions with diagnosis sometimes being confirmed based on the effectiveness of the prescribed treatment [12, 115]. Comorbidity often obstructs provision of a clear diagnostic label, while the diagnoses of many patients with complex cases change through the course of life. For some, diagnostic labelling brings social and self-stigma, rather than a path to treatment and healing [19, 170].

Lastly, benefits from the DP implementation are overwhelmingly presented from the perspectives of clinical and computational psychiatry researchers and technology developers. As such, there is a noticeable lack of inquiry into the patients' needs and experience, data practices, patient-doctor-AI collaboration strategies that would inevitably emerge out of introduction of DP into mental healthcare. Service users' needs lie in the personalised approach that is attuned to their situation and that can at the very least alleviate their burden and help manage the condition. Quantified health and the Western biomedical model of disorders, while able to provide standardised measures, are reducing and homogenising experiences and expressions of mental health. More than that, the recent WHO-UN guidance [144] called for a shift toward holistic, community- and justice-based approaches to mental healthcare.

Further deprioritisation and disenfranchisement of patients' lived experience and subjective qualitative accounts cannot contribute to more productive and person-oriented clinical encounters for the patients.

In addressing this gap, we thus propose future designers to place DP within the problem space of *pragmatist aesthetics* [152, 212]. This shift, we argue, allow to identify deeper concerns and generate novel design solutions through/with the notions of experience, perception, relationality, action, and interpretation. Additionally, we expect the aesthetic approach to be more familiar to designers, with Holt [83] arguing that within design practice, the language of aesthetics might be the most conducive to conceptualisation and experimentation.

As we further configure this new problem space, we integrate parallel concerns of pragmatist aesthetics, design, and mental health into a lens that we called *felt informatics* (see Section 4 for further elaboration of the concept). Being situated within critical HCI, this work equally borrows from medical anthropology and philosophy of psychiatry, while rooted in the phenomenological tradition. Analytically, this perspective assumes that aesthetic sensibility towards one's mental state is developed and transformed in relation to the data that DP (or any other personal health technologies) makes visible. Meanwhile, the experience and expression of mental health can be affected by this data, especially if it is presented as objective and clinically authoritative. These processes often take a form that cannot be easily labelled, put to words, if at all grasped. As such, data is *felt* in/through/with the body. Generatively, that means DP design can create conditions for particular experiences (see Section 4.1) and develop aesthetic sensibilities towards them (see Section 4.3). Within this perspective, *felt life* is thus both a central object and a site of DP design. The goal of felt informatics is less in creating AI that makes one feel understood, and more in creating AI that makes one feel felt.

In order to elaborate our proposition, we will discuss four elements of design that need to be considered: how those health and behavioural metrics are perceived, represented, integrated into the situated everyday experience, and located within a larger network of care relations. Our intended contribution is, firstly, to draw attention to DP as a design inquiry and, secondly, provide a lens enabling to view felt life as a fundamental element of the experience of mental (ill) health and aesthetic engagement—as a focal process in the use of DP apps [127]. Furthermore, with this work, we aim to contribute to the ongoing discussion in the HCI community about the body and senses as a site and material for design and thus propose DP as a case for somaesthetic experiments and provocations. In this paper, we describe the theoretical foundation of felt informatics lens, outline its main elements, and finally provide recommendations for design and further research.

2 Related Literature

2.1 Critique of Digital Phenotyping

A couple of years following DP's inaugural papers, critique regarding the method ensued—mostly from philosophy and ethics scholars. Barron [12], a practising psychiatrist who supports the introduction of DP, disclosed that the main ethical bottlenecks regarding the development of psychiatric AI lie in data ecosystem

governance and data ownership. These concerns encompass questions regarding the kind of data to be used (summary statistic or raw), whether proprietary software should be used (evoking the questions of transparency, explainability, and black-boxing), and who should be in the front row of creating such an ecosystem. At the same time, Barron ([12], emphasis added) writes: "The question really isn't so much how to produce data… but rather how to *overcome* concerns about ownership and security to gather enough data in one place to make sense of and incorporate useful measures into the clinical ecosystem". Such a matter-of-fact attitude is held up throughout medical literature, where ethical considerations on DP are brought up briefly—if mentioned at all. They are mostly placed in limitations sections at the end of papers or incorporated in the reflection on data collection protocols and seem to refer rather to legal and regulatory concerns, e.g. ethics committee approval, receiving participants' consent etc., e.g. [11, 44, 100, 163, 164]. At times, ethics are viewed as hindering the delivery of more innovative and efficient healthcare [44, 198]. That said, these authors demonstrate their awareness of ethical challenges and acknowledge the necessity to address these concerns but rarely engage with them in their own research. A deeper evaluative work is usually taken up by bioethics, philosophy, and social science scholars.

One strand of critical scholarship on AI in psychiatry and DP relates their concerns to broader ethical issues, primarily in the domains of data and AI ethics. The scholarship of such researchers as [105, 123, 124, 151, 178, 208] encompasses privacy, transparency, consent, accountability, and fairness. It highlights the issues of proprietary algorithms and their consequent black-boxing, the potential use of mental health data outside clinical settings (e.g. criminal system, insurance, and worker surveillance), and the reproduction of inequities related to race, class, and sex inherent in the mental health research data. Other researchers, such as [13, 43, 59] argue that DP would negatively affect the patient-doctor relationships and inquire into the conditions for appropriate DP intervention in clinical processes. Overall, these works make a call for addressing the collection, analysis and use of mental health data and shaping policies and governance models around the responsible development and use of DP.

Another strand of critique, leveraging the contributions from philosophy, sociology, and STS, positions their concerns at a larger scale and level of severity. Here, the most salient critique challenges methodological and epistemological claims of DP, namely: the oversimplification of mental and social processes, the questionable relation between digital and "biological", and the search for causality among correlates, inferences, and covariants [18, 29, 41, 51, 134, 187]. Furthermore, such authors caution that DP can devalue non-quantifiable elements of clinical decision-making, such as a diagnostic intuition of experienced mental health professionals and expressions of mental conditions not included into the machine learning (ML) model [14]. Researchers such as [28, 31, 146, 185] also argue that DP might become considered as a required "data witness" in mental health diagnosis, thus further deprivileging lived experience and first-person narrative accounts of people experiencing mental distress, as that evidence is further deemed unreliable and incomplete. Most scholars of that category attempt to "de-hype" and critically analyse discourses around DP, as well as its consequences to mental healthcare. Pickgersgill [154] and Engelmann

[53] argue that the lack of definitive evidence for DP methods and the lack of standardised conceptual definitions and practices make DP more of a buzzword-filled rhetoric and a promissory discourse, rather than a settled sociotechnical practice. In other words, the field is sceptical if DP, as its pioneers [92, 93, 143] claim, can truly cause a revolutionary shift in psychiatry as did pharmacology and genomics.

Therefore, while those strands of critique surface pressing and consequential issues of DP, the ethical standpoint's focus on data omits a larger set of concerns on human and clinical levels, while social science and humanities concentrate on the harmful consequence of the system as is. The lack of design-oriented critique thus results in the lack of alternatives and transformational implications.

2.2 New Aesthetics

The "aesthetic turn" [203], which happened almost two decades ago in design and HCI, largely remained focused on appearance, form, and pleasure as key parameters [61, 70, 79] with some extension towards better usability and communication [72, 74, 87]. In philosophy, however, the term aesthetics has long been decoupled from its historical association with the philosophy of art and beauty. Dewey [49] redirected the attention of aesthetics from the object towards *an experience*. In other words, he refuted that objects inherently possess fixed aesthetic qualities. Instead, a particular attention to recognise objects as they are and in the relation to their surroundings, which then creates certain meaning and feeling of unity, rhythm, intensity, and fulfilment, produce an *aesthetic* experience [112]. In the opposite situation, *anaesthetic* experience is constituted through (perceived) meaninglessness, fragmentation and lack of coherence. That way, an experience could be equally engendered by mundane events and objects. As Wakkary pointedly summarises, the pragmatist interest lies in the actions of knowing and *how* things are known, rather than objects of knowing and *what* is known [207].

In the mid-2000s, driven by the discontent with a rationalist and goal-oriented cognitive approach and traditional view of aesthetics, HCI scholars [56, 128, 152] found an alternative in pragmatist aesthetics, engendering fields like aesthetics of interaction and experience-based design. These frameworks focused on the theory of and design with experience as it "emerges in the interplay between user, context, culture, and history, in the construction of relations between artefact and viewer, subject and object, user and tool" [212]. Following Dewey, an aesthetic experience was now seen as situated, embodied, enactive, and contextual, as well as dependent on the socio-historical and material conditions that the person, artefact, and their surroundings find themselves in.

The significant aspect of pragmatism was the assertion that the intellectual, cognitive, somatic, and affective should be seen as equal *modes of experience*, mostly inseparable from each other. Understanding of the body as an indispensable site of sense-making (see also *affective cognition* [181] and *embodied theory of meaning* [99]) led to the establishment of the field of *somaesthetics*, where it was recentred and understood as "a locus of sensory-aesthetic appreciation and creative self-fashioning" [179]. In particular, aesthetic perception at the core of the Deweyean notion of experience was presented as a *skill* that could be trained and perfected [183, 188].

The translation of somaesthetic theory into design practice has been marked by the scholarship of Kristina Höök [90] and her programme of *soma design*, which placed *felt bodily experience* in a centre of human-technology interactions.

Within aesthetic theory, pragmatism informed a philosophical inquiry into *everyday aesthetics* that further ruptured the "West"-based association of aesthetics with philosophy of art [113, 121, 172]. Saito, a pioneer of the field, then transformed the theory into *aesthetics of care*, underlining that aesthetic sensibility always requires an aesthetic expression and a skill of discernment of articulations of others [173]. She puts forward conventional medical practice as a potential example of poor expression of care. Saito describes this type of medicine as seeing a patient as a "molecular host" and "bundle of symptoms", excluding them from medical processes, while performing tasks by the numbers, led solely by goals of correct diagnosis and finding cures. The patient thus becomes an "an object of detached perception and experience" [173].

To bring together these strands of aesthetic scholarship, key points should become relevant to our proposition. Firstly, aesthetics is essentially implicated in the production of meaning (through the processes of sensing and sense-making). Secondly, aesthetic experience is necessarily a relational achievement that is generated through cognitive, affective, and somatic capacities equally. Thirdly, aesthetic sensibility can be attuned and cultivated. Lastly, as aesthetic experience is deeply ingrained in the everyday and felt life, aesthetic judgments and behaviours are infused with ethical and moral positionings. In other words, aesthetic experience can both be informed by and inform values. In the following section, we will further elaborate on the relevance of aesthetic framing for DP design, redefine current issues of DP as an aesthetic concern and argue how the perspective of felt informatics could be used in addressing them.

3 Digital Phenotyping as an Aesthetic Concern

We pose that mental distress and disorders in both its everyday and clinical contexts are at their core an aesthetic experience, as they necessarily engage aesthetic sensibilities, which we will elaborate on further. If we are to create a rough causal outline of the DP app user journey in relation to an aesthetic aspect that gets enrolled, four processes resurface:

(1) *perception*, i.e. algorithms sense the movements of the body and behavioural patterns;

(2) *representation*, i.e. a DP system translates the data into health knowledge by displaying it to the user in visually organised and abstracted way;

(3) *experience*, i.e. the user then engages with the new knowledge and internalises it, integrating it within their existing model of mental health;

(4) *relationality*, i.e. repeated interaction with an app (and with one's data), in one way or another, affects one's sensibility towards experience and expression of mental health, as well as intervenes into a larger ecology of care.

3.1 Perception

A key promise of DP is the introduction of *objective* diagnostic and monitoring practices that would supplement or even replace self-evaluation and interactional narrative-based methods in mental health care [81]. Some of the reasoning behind insisting on this innovation is the claim that patients are incapable of properly assessing and reporting their inner state for various reasons: due to shortcomings of memory (i.e., recall bias), reporting only "socially desirable" symptoms and behaviours, or cognitive impairments caused by mental conditions [133, 159, 174]. While clinicians' diagnostic perception and reasoning are treated with less distrust, their bias is said to interfere with making suitable clinical decisions as well [132]. Meanwhile, Roy Cohen, the founder of Behavidence, proudly announces in the company's video pitch that their app "diagnoses mental health disorders with three times the accuracy of a psychiatrist" [65].

While those claims, when problematised, are often framed under epistemic or hermeneutical injustice [31, 166, 185], we argue that these issues could be deconstructed at a more foundational level—that of *sensing*. In aesthetics terms, such distrust and condemnation of "subjectivity" hinges upon the patients' assumed lack of skills or disruption in the capacity to sense and make sense of their internal processes, as well as meaningfully express them. In other words, a failure of *aesthetisation*. As mental health professionals construct evidence from the discrete elements of experience performed by their clients/patients during a intake session, the gathered clinical data is thus almost always incomplete. Attempts at stimulating aesthetisation through diagnostic interviews and intensive expert noticing require in this case significant effort from the clinician. However, eventually this process can result in an aesthetically unsuccessful interaction, where diagnosis could not be reached, reached incorrectly, or treatment and management cannot be defined with a good level of certainty.

In this context, DP emerges as a tool of *hyperaesthetisation*: intensification of the capacity of sensing and making senseable, leading to an intensified process of sense-making [64]. The design of algorithms does not just create a system of enhanced perception, but also "determines what presents itself to sense experience" [160]. Furthermore, hyperaesthetics are enabled by literally *making* senses, that is, creating a new *sensory apparatus*, construed by the development of digital biomarkers, use of sensors, and training of ML models. Many of the digital biomarkers that DP algorithms sense and try to make sense of are at their core aesthetic. Sensors take vigilant notice of movements of the body both in space and time (as small as taps on the screen and posture sway, and as big as a daily commute), time that is contributed to an action, reactions to surroundings and events, and quality of interactions with other people. In this sense, algorithms make aesthetic judgements.

It can be argued that DP, rather than to discern discrete "objects" (here—symptoms and signs), is intended to create and foreground relations (here—correlation between behaviours and clinical constructs). The relations that the algorithms produce have a forensic quality to them, as they are related to possibilities, risks, and traces of "deviation" left behind. DP as such is designed to generate evidence, or rather an *"objective" proof of illness*. However, rules on what can be perceived as evidence remain flexible. Most of the

indication towards what needs to be sensed comes from experimental clinical research on biomarkers and behaviours associated with psychiatric conditions as described in the diagnostic manuals. The translation of those findings to the correlations made by digital biomarkers is practically teleological, thus allowing some malleability in terms of how they can be elicited, organised, and connected—i.e., the actions comprising aesthetic behaviours and sensibility of DP systems. Thus, while still requiring clinical validation before being implemented, digital biomarkers entail more conceptual work.

We propose that, instead of framing DP in terms of the development of objective methods, it might be more suitable to define it in terms of creating an *aesthetic agent*, in the sense that it engages in the acts of aesthetic evaluation or makes judgements in attributing properties to the relations between the objects [129, 137]. The objects of aesthetic agency, i.e., particular behaviours, are, however, predetermined clinically and technologically. DP's ML model is trained on human labelling and available population data [70, 177] to have a selective sensibility towards perceiving particular expressions and capacities and make aesthetic judgements.

In reframing DP's "objectivity" as an aesthetic agency we do not seek to take away the possibilities of DP being clinically useful, generative, and even ameliorative. We instead argue that developing, implementing and suggesting these tools to the mental health providers and patients require a more critical, rather than "hype-driven" approach to what they can actually do. Instead of juxtaposing "objective" quantified evidence to expert subjective judgement, the notion of agency opens a conversation on how it intersects and contests ours (whether "we" are the clinicians or patients) and how we make space (if at all) for that type of agency.

3.2 Representation

DP "externalises" and represents the user's inner mental state through data visualisation. While previously the user possessed the role of an aesthetic *agent* (alongside DP's AI), this process now enables the agents to become the objects of experience and aesthetic perception more explicitly (see Section 3.3). The framing of the data in DP's interfaces attempts to convince the user of its credibility—that they are displaying the truth, bare facts, and "the things as they are". As current preoccupations of DP developers lie elsewhere, interface design receives a generic approach, mostly preoccupied with data visualisation design, the attractiveness of an app altogether (aesthetics in its traditional sense), and the immediate user experience. However, with the promises and consequences to psychiatry and (digital) mental health services as declared by DP's advocates, such a casual approach could be detrimental. In this section, we seek to expand the areas of concern for the future design of DP systems by repurposing Beaudouin-Lafon's maxim to call for "designing interaction, not interfaces" [15].

In the context of interaction design and HCI, representation can be broken down into three aspects: communication, politics, and interaction itself. All of them are interrelated, yet practical implications and suggestions will slightly change. Communication aspects fall into the category most familiar to designers: interface design that includes visualisation, as well as semiotic, metaphorical, and cognitive considerations—in short, design best practices

[58, 98, 213]. Politics of representation, in turn, foregrounds the way an object (in this case, the dynamic state of mental health) appears, being defined by the language (including visual language), frames and narratives the data is enveloped into, as well as the choices of what should be displayed or hidden [160]. In the case of DP, these choices are informed by a combination of scientific paradigms, psychiatric, somatic and entrepreneurial cultures, as well as normative views on health, minds, bodies, and their interrelationship. Interaction, in turn, is informed by those two previous aspects: what kind of interactions DP interfaces afford are determined both by design choices and politics (including politics of those same design choices). Taking as an example interfaces of some of the apps existing today—Behavidence [153], Sonde[1] [77], and Kintsugi [75]—we would like to exemplify some of the current concerns regarding representation.

The first concern is the conflation of clinical constructs and everyday, "normal" affective states [55, 62, 80, 84, 85]. At first glance, Behavidence app seems to focus on conventional well-being categories like mood, worry and focus [17]. As described on the company's website, the app combines both digital biomarkers (here—interactions with the phone) and active input (here—self-reporting through a survey). Yet, these categories turn out to be intended as digital questionnaires on depression severity (PHQ-9), generalised anxiety disorder (GAD-7), and ADHD (ASRS). Accordingly, the "score" that the person sees on the screen is "based on a digital behaviour comparison to *other* people diagnosed with ADHD, Depression or Anxiety" ([16], emphasis added). Somewhat concerning is Behavidence's demo interface images that appear on the landing page of the app's website and Google Play Store page [16, 153]. It differs from the app itself and shows that perhaps the initial intention was to track diagnostic data for mental health conditions like ADHD and PTSD, visualising it in percentages. Similarly, while Kintsugi's presents itself as a wellness app, its interface suggests that the user can see the manifestation of symptoms of depression and anxiety *every single day*. Such a case could be accurate for people experiencing severe episodes or have clinical cases of depression and/or anxiety. Yet, if that is the case, the content of the app like mindfulness exercises and gratitude journal seems to be inappropriate for that level of severity.

Related to that, the second concern pertains to the creation of new epistemic concepts and metaphors, or translation between medical constructs, data, and lived experience. Sonde offers an example of this by using measures such as levels of "crispness" or "sluggishness" of a voice as indicators of mental "fitness". The explanation reveals that this quality of voice is measured by the "average duration of vowel sounds in speech" (see also [76]). While clinical research [2] indeed shows a statistically significant correlation between psychological distress and especially depression and vowel length, there is a significant jump in abstraction from vowel length to sluggishness to then crispness. In this sense, producing new concepts in an attempt to translate the relation between the data and mental health experience that are inconsistent or obscure might be as unsuccessful as labelling every negative emotion under "depression".

---

[1]At the time of writing, the app version enabled access to a functional demo. In the following update, however, it became inaccessible without a "group code" provided by the administrators.

The third concern is the interactions with the data available to the user. Among the three, Kintsugi is the only one that suggests some basic self-help modules and gives an option of contacting a mental health professional if the measurements get too high. The presented data overall appears to be simply indicative, displaying "facts", providing neither insight into the data nor suggesting "acting on the data". On the other hand, despite the design not making it into the final iteration, Behavidence's attribution of similarity score with such conditions as ADHD and PTSD is particularly troubling. Without any access to data and transparency of algorithms, the result of 64% similarity to people with ADHD diagnosis (as the is difficult to make sense of (considering that, in the app, it is replaced with "Focus", levels of which fluctuate every day) and can result in (self-)misdiagnosis, cyberchondria, or, at the very least, leaving the person in a state of confusion, vulnerability and self-stigma [2]. As discussion in hermeneutics elucidated, "understanding and meaning do not arise automatically from demonstrating correlation or causal relations" [211]. In other words, at this development stage of DP, the ability to simply externalise, quantify, and represent mental health makes it an attractive enough tool, yet it is lacking in practical usefulness and further reflection and action.

Representation thus is a mediating link between perception and experience. It determines the form and boundaries of the object of experience and knowledge (in this case, mental state and somatics), defines which of its elements are elicited to the senses and as such "formats the cognition" [196]. The way interfaces are currently designed, both processes of sensing and representing are intended for the recognition of abnormalities and susceptibilities, thus rendering the user's state as always being "at-risk", "presymptomatically ill" and as "patients-in-waiting"—as a daily occurrence of depressive and anxiety episodes demonstrated [54, 195]. As much as the apps currently renounce their connection to medical diagnostics for legal and ethical reasons, they continue to borrow authority and credibility by using clinical constructs [117].

Meanwhile, in addition to "relationships among elements of an interface and the meanings, affects, moods, and intuitions they produce in the people that interact with them" [10], the pragmatist approach calls for foregrounding of what people can *do with* the knowledge about themselves that get represented for them and about them. Empirical literature on personal technologies for *physical* health, whose data arguably has more clearer causal relation with the biomarkers, demonstrates that neither casual users nor people managing chronic conditions nor clinicians expect accuracy and reliability from self-tracking technologies [5, 57, 147, 169]. Instead, the main value of personal health technologies (PHT) lies in the sense-making and narrative emplotment of data (that is, data occupying a significant role in health and illness narratives)—both in everyday and healthcare contexts [42, 118, 158, 169, 175]. In other words, these data allow users to contextualise their sensed health and find a place within their personal health or illness narrative. Consequently, users are quick to abandon PHT, when "epistemological tensions" arise, e.g. if data contradicts their self-perception and are ill-fitting to the narratives and existing sociocultural models of health [82, 175]. The aforementioned observations suggest that

data are therefore encountered as an evocative object in need of contextualisation [78], while the digital interfaces of PHT function as tools of organising information and creating categories and relations.

DP apps, on the other hand, provide no opportunity for meaningful data work for the user (and it is unclear whether clinician-facing systems are any different). Placing the interaction within the contexts of "objectivity" and health data, interfaces evoke a sense of moral obligation to respond to the data displayed. Yet, instead of representing health in meaningful, actionable ways, they produce data doubt and data anxiety [114, 156]. Of course, how mental health is visualised through the data and interface is dependent on how mental health is sensed in the first place (that is, what kind of data is collected) and how evidence is constructed. A pragmatist aesthetics approach would emphasise the incomplete, dynamic nature of the data that allows for meaningful engagement and a sense of care [109, 196].

3.3 Experience

On par with objectivity, another promise that DP advocates make is that passive sensing can provide access to the "lived experience" of (prospective) patients by virtue of personal mobile devices being innocuous and ubiquitous [45, 93, 95]. Yet, instead of adding generative complexity to the diagnostic and monitoring methods—for instance, larger contextual awareness of the system and giving an equal epistemic value to the life-world narrated by the patients—the claim is that DP simply leaps over the representation of the experience (i.e., the narrative) to the "reality" itself, as it unfolds. Burkhout and Zaheer note that it is curious that the DP proponents employ the vocabulary of "lived experience" at all, as the discourse around it is deeply entwined in "scientistic language, reflective of normative models and curative practices implicated in ableism and sanism" [22]. As such, an approach assumes a "view from nowhere" that is decontextualised and generalising, where the diversity of expressions and experiences of health get flattened and homogenised, with normative ideas of what health and illness *should feel like* being fostered.

As an aesthetic proposition, we call for a closer examination of contexts of use, consequences of implementing and domesticating such technologies, and revealing obfuscated affective and cognitive layers of interaction with technologies such as DP. In particular, we argue that what gets omitted from the development and design of DP is recognition and alignment with mental health models and related somatic and behavioural expressions. Within the aesthetics perspective, we emphasise three elements of experience that we will elaborate on below, namely: embodiment, sensibility, and performance.

3.3.1 Embodiment. (Ill) mental health is grounded in the body. Episodes of depression and anxiety are *felt* in the body the same way as they are recognised in the change of thought patterns and cognition. Similarly, symptoms of conditions that DP argues to be able to identify (like bipolar disorder, schizophrenia, and psychosis) are connected to the transformation in embodied sensation, perception and interactions with the world and others [63, 66, 199]. As people make sense of their experiences of mental health, they engage not just in analytical reflection but attempt to attune and, if

---

[2]At the time of writing, Behavidence's website [17] presented the app as an aid to clinicians, but the version with the same metrics (stress, mood, focus, and worry) remained accessible on Google Play Store.

possible, evaluate their perception of the lived world, somatic experience, and affective states. Moreover, experience and articulation of mental disorders are predicated by culture [106, 107], as somatic cultures and media representations, practices, discourses, and behaviours in one's social circles help to shape mental health experiences. Design for DP thus should not limit itself to the biomedical model of mental health as the transformations and disruptions of those mind-body connections are not solely engendered by biology.

Whether provided by a clinician or a DP app (treated as a medical authority), knowledge about mental health can be internalised and integrated as an objective-self-fashioning [50], potentially leading to a post-diagnosis identity [209]. This transmission of mental health knowledge, then, is not neutral as it gets translated back to people's experiences and their identity expression. Crucially, it does not happen in a straightforward way, where information simply gets absorbed. Sensing and sense-making are selective and constructive behaviours that are anchored in cultural representations of mental health, which influence not just cognition but health-related behaviours, treatment acceptance and even outcomes [8, 139, 184]. Furthermore, naming a particular state also produces an interpretive frame to one's behaviours and experiences, overall influencing people's lives [142]. The framings of mental health are then reflected in the perception of the body(mind) and the interactions with the environment.

In the case of DP apps, which provide limited tools for reflection and insight, we may expect that the users will more actively employ lay models of mental illness and folk theories of mental health, even if they contradict the clinical ones. Often, they involve intensified somatisation and narratives around it, as well as an interweaving of illness or distress into one's life narrative [21, 30, 149]. Designers of DP should engage with the vernacular models of mental health (i.e. the subjective, "irrational" accounts of one's experience, expression and explanations of mental (ill) health) alongside the clinical ones (i.e. accurate, objective, and analytical), without propagating potentially harmful practices.

3.3.2 Sensibility. While culture mediates people's experiences of mental health, DP systems also reproduce and put forward a particular model of mental health, prescriptive of how a "mentally healthy" person should appear to the sensors. In playing out those normative accounts of mental health, DP is therefore deeply intertwined with moral judgement [67, 115, 204], affecting how mental health is experienced and expressed. Meanwhile, detecting and articulating a sign of distress requires an aesthetic sensibility. People in distress attempt to discern a particular feature of their perception or behaviour and place it within the whole of their lived experience—temporally and relationally. This process often takes a non-linguistic and sometimes even pre-cognitive form of a felt sense of the situation, rather than a clear discursive articulation [68]. Whether it surfaces to consciousness or not, this knowledge participates in making sense of one's (ill) health.

While DP apps seem to focus on their diagnostic potential, there are further potentialities related to distress or illness management. DP attempts to stimulate *insight*, a recognition of the presence of the illness and its consequences on one's relation to the world, oneself and others [122]. Meanwhile, this task of insight is traditionally undertaken by psychodynamic therapy—a learning process, in which

a patient comes to a better comprehension and interpretation of their mental lives and, as a result, coping more effectively with their condition [97, 115]. For instance, through tracking practices, people with bipolar disorder learn to identify the signs of the onset of manic or depressive episodes—i.e., cultivating a sensibility—and often complement clinician recommendations with their own methods of recognising early warning signs and tracking [119, 126]. In the recommendations for tracking practices, Matthews et al. [126] align the tracking itself with the "timeline" of bipolar disorder, thus adjusting the frequency of tracking activities to the point of withdrawing from tracking completely when the person learns to recognise and manage their state without support.

If a person is to trust the data provided by DP, they might develop a particular sensibility and certain idioms of distress that align with their datafied representation [139]. This alignment aspect should be represented during the design stages. A variety of mundane behaviours could be perceived as pathological: for instance, people might become more sensitive to digital biomarkers such as a variety of places visited, responsivity to calls and texts, vocal characteristics, phone interactions, typing patterns etc. and place them within medicalised sense-making frameworks. Moreover, an aesthetic judgement could be directed not only towards one's own expressions but also that of others, causing personal social tensions [33]. The articulations of mental distress or symptoms of disorders become quite tangential, flattened and fitted into measurable structures and classifications of "digitised suffering" provided by the platform, while other expressions that could not be straightforwardly translated into digital biomarkers are being marginalised or erased altogether [22, 53, 104, 150]. Thus, an alternative design of DP systems needs to consider plurality and complexity of articulations of distress.

3.3.3 Performance. DP can encourage the users not only to develop a sensibility towards embodied expressions of digital biomarkers but also new digital behaviours and interactions with technology. As was mentioned in Section 3.2, the majority of DP apps currently fail to facilitate any particular practices in interacting with the knowledge they provide. The data is simply displayed as is and suffers from being abstracted and decontextualised [171, 214]. This can propel a form of data anxiety [156], where users become apprehensive about which of their behaviours and inner states get translated into data and how and evoke *"digital bodymindwork practices"* (adapted from [145]), whereby users might enact or conceal particular illness behaviours because they are visible through the data [36, 165]. In the case of DP, people could try to perform those tangential signs of distress for the algorithms—whether so that they can receive feedback on the improvement of their state or to act out their illness identity. Meanwhile, suppose DP is to be at some point integrated into clinical practice. In some cases, patients might challenge the diagnosis an app has reached or the accuracy of the data, as a result performing *against* the algorithms. Designers of DP thus should consider the capacity for diagnostic dissent [60] and contestability that necessarily engages with one's experience and expression of mental health.

Without fully abandoning physiological aspects of mental health or discrediting existing clinical expertise, we believe that they can be enriched by findings of phenomenological philosophy and medical

anthropology presented in this section. Technological innovations in mental healthcare need to embed not only a perspective of clinical professionals, facilitating the production of evidence for diagnosis, but also acknowledge (prospective) patients who seek tools to live and cope with their condition, as much as the frictions and value conflicts those positions inevitably have.

In keeping with our analytical proposition outlined at the beginning of this section and expanded here, we contend that the key goal of DP apps should be the development of *aesthetic sensibility* towards one's own state, both mental and physical. Sensibility here means both "perceptual awareness that is developed, guided, and focused" [25] towards inner experience and attentiveness to the mode of expression. The difference between simply noting changes in one's condition and *aesthetic* sensibility lies in the strong interconnection between perception and reflectivity, which results in a dialectical relationship between aesthetic agent and object (even if they are one and the same, as discussed in Section 3.2) [125]. In this sense, DP emerges more explicitly as both collaborating and mediating agent, encouraging a particular mode of attention and engagement with one's felt and lived experience of mental health.

3.4 Relationality

Insel [93] states that "the promise of digital phenotyping is that this objective measure happens in the context of a patient's lived experience, reflecting how he/she functions in his/her world". Building on the claim of misemployment of the language of "lived experience", we reiterate that in its current form, DP fails to consider situated and relational components of the lived experience of mental health. Aesthetics, at its core, is concerned with perceiving relations and qualities of those relations within a field of particular experience [1, 32]. Similarly, mental distress or illness affects the relations with oneself, the world and others–some get damaged, some mutate, and some get created [47]. Instead of mending and strengthening these connections, thus engaging support resources and building resilience, the experience is reduced and flattened into discrete and selective events as a result of DP's computational logic.

The current design of DP apps mostly renders the interaction as one-on-one: either in the form of patient-technology or doctor-technology relationships. Despite pursuing clinical applications, the work on organising diagnostic pathways involving the health professional, service user and the AI is missing. As stated earlier, face-to-face mental health consulting and diagnostics are inherently aesthetic, and their "success" depends on all parties' sensing and sense-making skills. The way an aesthetic AI agent participates and collaborates in those existing sensory processes requires a carefully thought-out, appraised, and congruent strategy (see also [39]). DP apps enact the process of these digital diagnostics as a solitary act, where the person presents themselves to be "read" in real-time and given feedback in a numeric form within a limited range of metrics. Such an approach, even if indirectly and unintentionally, reproduces the flaws and limitations of the biomedical model of mental health. The experience is seen as contained within the activities and properties of the brain [204]. Furthermore, DP apps in their current state assume personal responsibility for one's mental health, including being responsible for initiating and engaging in personal health surveillance practices (and motivated to do so) [46].

Designers should be particularly aware of the relations they imply and embed into interactions with a DP system. Aesthetics, at its core, is concerned with perceiving relations and qualities of those relations within a field of particular experience [1, 32]. In turn, aesthetic sensibility is necessarily grounded in the social domain, as aesthetics both determines the mode of relating to the environment and others and how the relations are organised, juxtaposed, and exposed [23, 173]. Following Good [69], distress and illness are better understood as happening in the body-in-the-world, rather than simply in the body: that is, in time, in place, in history, and in the context of lived experience and the social realm [69]. Consequently, "[symptoms] are, at times, a necessary condition for the afflicted to articulate a new relationship to the world and others" [27]. Perceiving signs of mental distress and, possibly, disorders in others is also a *participatory* aesthetic engagement, where the performance of idioms of distress are noted or other signs intuitively sensed [24, 33]. Even in physical health "self"-tracking, authors such as [26, 42, 103, 135, 136, 155, 175, 205] demonstrate that PHT are rarely displaced from their local and social contexts, despite the intended individual-focused practice. Yet, when those symptoms are more elusive and their expression restrained due to the fear of stigma, misunderstanding, and/or moral blame, *digital* care-seeking behaviours might be seen as the only available safe choice. Who is made aware of those behaviours (if at all), who is allowed access to the data and sense-making together with the AI and the user, and who is intentionally excluded are all equally the concerns of ethics, but also a design of relational practices [4].

At the same time, it is worth expanding Good's articulation, adding that illness and distress occur in the socio-material world [111, 116, 120, 206]. In addition to informal care networks and healthcare staff, the experience of mental health involves configurations of medical and non-medical spaces, technologies, bureaucratic realities, regulations, policies, infrastructures, local social practices, and a multiplicity of other conditions that Kaziunas et al. [102] designated as *ecologies of care*. Its elements can both spawn frictions and facilitate expressing the need for and receiving care. As of now, being at the early stages of development, DP systems understandably present themselves as stand-alone, universal tools transforming diagnosis, management, and prediction. At the same time, being aware of the situatedness of digital health technologies within social, cultural, political, and medical contexts, and consequently having a grasp of what kinds of relations DP will be embedded in and which of those relations might it weaken or strengthen should be a valid design concern.

Importantly, the discourse around DP constructs a particular vision of algorithmic care: mental health is transparently visible and immediately legible, diagnosis requires minimal time and burden on the medical system, while, in an ideal situation, a hyperaesthetically vigilant, intelligent technology watches over the person to prevent any harm. It also carries significant normative positioning regarding autonomy, agency, subjectivity, identity, scientific authority, right to intervene and others. That said, some types of care can be oppressive and marginalising. Scholarship on AI in mental health is yet to define the specifics of what it means to receive good algorithmic care and how it can be provided. Grounding in the arguments of Saito [173] and DeFalco [48], designers, health professionals, and patients need to develop a clearer sensibility of how DP can care

well. Perhaps, that requires looking beyond the reproduction of current human capacities and activities in an automated and amplified way and, instead, engendering new practices, sites of care and organisation of care relations. Crucially, instead of reducing the complexity of the experience of mental ill health and its expression for the sake of legibility and capacity for intervention, an aesthetic approach calls for maintaining and sustaining its heterogeneity while providing new modes of care and support. Certainly, this is easier said than done. Yet, cultivating and developing an alternative model of DP alongside the mainstream discourse and practice is valuable enough at this stage.

4 Design Considerations in Felt Informatics

This paper surfaced the aesthetic aspect of mental health and placed DP within a different problem space, allowing a new lens to be applied. Mental distress and disorders are aesthetic concerns, as they implicate the perception of oneself, others, and the world, disturb or create new relations through that mode of perception, and are managed by developing a particular sensibility towards experiences and manifestations. Moreover, the significance of events, environments, connections and other stimuli is felt and only through the body do they acquire meaning [99]. The four aesthetic elements, or stages, within DP are intended to direct designers towards a more critical and reflexive approach in developing DP systems in view of how they are situated within the user's lived and felt experience and how they can serve to produce generative knowledge of mental health for both patients and practitioners.

In many ways, the approach proposed here aligns with Rooksby et al.'s [167] model of *lived informatics*. Authors highlight that people who track their health are rarely rational data collectors, but instead employ different styles of tracking and meaning-making depending on their experiences and current needs. Similarly, Kaziunas et al. [103] describe data "as already an inherently central and relational part of being in the world", foregrounding "data as an integral way of living, collectively produced and engaged with". However, we would like to go even further in our proposition of felt informatics. While building on existing propositions, we seek to centre the question of how mental health is felt somatically and affectively *in relation to the data*. Therefore, in our view, DP apps should aim to incite aesthetic engagement and cultivate aesthetic sensibility as a skill. To reiterate, foregrounding felt life (that is, sensing) through aesthetic sensibility will also intensify interpretation and reflection (that is, sense-making). The latter processes are particularly emphasised through the aesthetic agency of AI, existing in parallel with that of users. Despite this lens applied here to DP specifically, extending it to other mental health technologies and, perhaps beyond, appears possible. Felt informatics asserts that in designing for digital mental health, designers and researchers should take into account not only how technologies mediate values, behaviours and practices, but also how perception and interpretation of data influence and is influenced by cognitive capacities, affects, and somatic experience—that is, felt life. Considering the pragmatist aesthetic proposition outlined above, we provide considerations for design and an indication of areas of attention that were previously mostly unattended by DP proponents and critics.

Before providing more key points of reflection, the following table summarises our proposition and provides a general alternative direction (Table 1).

4.1 Creating Conditions for Sensory Experience

Designers should take responsibility for defining the boundaries and modalities of sensing and sense-making experiences of mental health. Algorithms, interfaces, and digital storytelling of the app content delimit the field of the senseable, normatively draw relations between behaviours and mental disorders, and determine how and which elements organise and enable particular configurations of one's experience. As such, through its design, DP should surface and intentionally curate the aesthetic dimension of experience, without immediately imposing diagnostic labels. Conversely, in the case of current apps employing solely vocal biomarkers, voice can be felt as a main proxy towards the whole of experience with users paying close attention to how they and others perform vocally in everyday life, creating a skewed notion of a manifestation of mental ill health. Furthermore, paying attention to that means noting where the system marginalises some forms of articulating distress that are, for example, culturally specific, class-based or gendered [150]. In other words, designers should not be led by the goal of including features into design simply because they are technically possible and uncomplicated but think holistically about what type of experience they are enabling and facilitating.

This involves carefully considering the level of seamfulness in design [37] and AI explainability. It also requires attention to which signs of mental health are made visible through the algorithms and interface, as well as how the absence of certain signs is addressed. Furthermore, from the examples in Section 3.2, it appears that current apps lean towards the pathologisation and medicalisation of behaviours. Instead of judgement, DP apps should open the possibility for people to aesthetically engage with their conditions and provide a site for sense-making [197]. Medical information should not be presented as a health symptom checker and, instead, be more interactive and encourage reflection and improving aesthetic sensibility in relation to mental health.

To sum up, designers should be more cognizant of the following questions:

- *What should be made visible and what should be hidden?*
- *Which aspects of what is visible can be discerned?*
- *Why should it be treated as valuable medical evidence? How should it be framed?*
- *How does it support insight and reflection or enhance the felt experience and encourage further actions?*

4.2 Engaging with Felt and Lived Experience of Mental Health

The untamed site of innovation for psychiatry lies in the engagement with somatic experience that could be difficult to bring to conscious awareness and put to words. Yet in some cases, it is in this felt form that distress is first perceived and identified [150]. For some people, mental conditions are manifested through somatoform disorder—that is, unexplainable and inconsistent physical symptoms "standing in" for mental ones. Therefore, instead of trying to engage in analytical meta-observation of one's life (as common for

Table 1: Elements of felt informatics approach for digital phenotyping

Element	Field of focus	Main concern(s)	Aesthetic intervention
Perception	Algorithm design	Claims of neutrality and objectivity	Positioning AI as an aesthetic agent
Representation	Data visualisation	Framing and data (non-)interactivity	Attention to elicited sensory experience; creating space for reflection and action
Experience	Internalised model of (ill) mental health	Claims of access to lived experience	Attention to normative performance and cultivation of sensibility in the everyday, based on internalisation and embodiment of data
Relationality	Socio-technical ecologies of care	Decontextualisation	Embeddedness in the socio-material worlds

surveys and some types of e-therapy) and monitoring behaviours outside of contexts they occur in, DP apps can engage in the elicitation, amplification, and enrichment of felt experiences. HCI already has experimented with body sensations as design material [202], body maps [40, 201], felt-sense methods [140, 141], as well as other soma-based design inquiries [188, 191, 200, 210].

Our recommendations lean towards DP as person-oriented tracking [126] that is directed at helping the user understand, monitor, and cope with their condition without an overwhelmingly clinical framing. At the same time, we do not rule out the implementation of elicited somatic reflections and insights as clinically relevant data for mental health practitioners to be employed for diagnosis and treatment planning. It has to be noted, however, that from the patient's side, some symptoms of mental disorders might intensify with heightened attention to the body (including already mentioned somatoform disorder) [180], while practitioners might misattribute physical symptoms to mental conditions in the process of "diagnostic overshadowing" [189]. Therefore, the way aesthetic engagement is implemented should be performed with the utmost care and have the capacity to be tailored to the user's immediate needs and concerns.

We call for designers to inquire further into modes of engagement of felt experiences through technologies, which should eventually be grounded in collaborative design and research with both people with distress or disorders and practitioners:

- *Which data visualisations and interactions can be the most meaningful to people with distress to understand and cope with their condition? Which are most useful for the practitioners? How to balance out the needs of both?*
- *How do the displayed results affect the user's somatic (or otherwise felt) experience of distress or disorder? Can they amplify it? Can they misguide the user?*
- *How are quantitative and qualitative metrics juxtaposed in the data analysis and representation?*
- *How does the app balance medical knowledge with lived experience?*

4.3 Developing Sensibilities Towards One's Experiences

As mentioned previously, shallow and schematic display of data should not be the end goal of DP (or other mental health apps, for that matter). Neither should diagnostic labelling—especially if it is predictive. Therefore, following Forgione [60], we urge designers to prioritise the reflective impact of diagnosis, "that is, how [it]

informs the patient's reflection on the states of affairs in her life, including who she is, how her mental disorder is expressed, how her interpersonal relationships proceed, and how these interact". DP should pursue meliorative aims to cultivate the aesthetic perception that is relevant and useful and that leads not so much to cure, but care and a "good life" [182]. When it comes to DP, its hyperaesthetic apparatus could assist in developing attunement to one's body and mind and their changes, yet it should be done in a collaborative format allowing for safe contestation and deliberation.

In search for tools for articulation and cultivation of sensory sensibilities, HCI and soma design researchers have proposed such concepts and methods as somadata [3], somatic facilitation, self-evidence, critical emotional biosensing [86, 176], affective loops [89], and micro-phenomenology [157]. While all these methods involve somatic experience, they are not the only form of sensibility that can be developed, since the somatic approach, as noted above, may not be suitable for every person or their specific situation. A broader notion of felt life can be mobilised. Consequently, DP interventions should be embedded into lived experience and with consideration of life events and life circumstances (including non-routine events and life disruptions) [52, 138, 161, 162]. For instance, Rapp & Tirassa [162] provided guidelines for PHT that involve different facets of the self: present, past, future, and interconnected self. Within this approach, technologies should, for instance, evoke one's memories of what, how and why something was felt and explore possible future scenarios (both positive and negative). With this in mind, embracing intricately intertwined temporality of mental (ill) health, rather than assuming a linear movement towards a "healthy state" could allow for more reflective illness/health narratives among users. For any of the suggestions, scaffolding is advised to cultivate sensing and sense-making skills [161, 186].

The following questions should be addressed by designers:

- *In which conditions and situations would a person benefit from a diagnostic label? In which cases would it lead to more harm and stigma?*
- *Which sensing and sense-making skills could be generative and therapeutic for people experiencing distress in terms of understanding, managing, and coping with their condition?*
- *What are those for people with particular mental disorders?*
- *How can people's sensing and sense-making skills be improved by collaborating with an AI? How to ensure that people maintain autonomy over their experience without DP impinging on and invalidating it?*

- *Which everyday practices could serve as a site for eliciting and cultivating sensing sensibility?*
- *In which ways does the design attune to the messiness and complexity of everyday life and allow for the "imperfect" use of the technology?*

4.4 Introducing Technology into Ecologies of Care

Despite the early years of DP, we still urge designers to consider thinking of DP as part of ecologies and infrastructures of care rather than a stand-alone technology [101, 102, 130]. Those ecologies consist of human and non-human actors, institutions and processes, producing an assemblage of care relations. Methodologically, Hwang et al. suggest designers should develop abstractions of systems ecology, e.g. infrastructural speculations that "offer designers tactics for interrogating the interactions among computing systems, people, social institutions and political environments" [88]. Pragmatically acknowledging the relationality of mental healthcare allows to "build a more just distribution of caring and increase participants' capacity to care and be cared for" [192] and, as a result, enables more aesthetic engagements of collective experiencing of care [173].

One of the aspects could be the engagement of informal circles of care. Murnane et al. [135] underline that, firstly, personal data is necessarily relational, and, secondly, despite the term self-tracking, its practices are embedded in interpersonal relationships: whether it involves collaborative sense-making, co-tracking, tracking for someone else, or data sharing (with the doctor or whoever was given access). Therefore, as the authors recommend, design for self-tracking (including DP) should consider multiple layers of sociality people are involved in and that affect the course of the condition as well as its quality, including the dynamism of those relations that tend to change or even break. Importantly, no assumptions should be made about the quality of those relationships. Flexibility in involving different actors is crucial: family is not always the ideal caretaker and doctors are not always the ones who bring healing.

To address these concerns, the following questions should be asked in the process of design:

- *What are the existing care pathways? At which point(s) in the service user journey should the technology serve as an intervention?*
- *What are the cultural, national, local, and in any other way situated practices of care regarding mental health? What is the social, political, and technological context that the technology is getting embedded into?*
- *In which social relations the user is embedded? How do they affect the person's perception, experience, and articulation of mental health? Among them, who should be involved in the data practices of DP and who should the user be protected from?*
- *In which ways can the user personalise the configuration of the care ecology embedded in the app/system?*
- *What roles can informal care circles assume and at which point should institutional mental health services join in?*

4.5 Coordinating Aesthetic Agencies in Tension

While current research often focuses on unilateral interactions such as patient-AI and doctor-AI, the relational element of participating in clinical decision-making should not be omitted. AI markedly mediates the experience and knowledge practices of both patients and clinicians. It shapes which behaviors are seen as significant or pathological, expands the understanding of risk, determines what evidence is mobilised to diagnose or assess treatment effectiveness, and establishes a possibility of contestation of these processes. Not only analytic reasoning but also tacit (felt, intuitive) knowledge, as well as the aesthetic skills of both patients and mental health professionals are being superseded by the assumed objectivity of AI. Most patients in the survey by Benda et al. [20] claim that if the clinician arrived at a conclusion against the presence of a mental disorder and the AI with 80% accuracy would contradict it, patients would rather lose trust in the doctor than question the AI .

AI-assisted psychiatric diagnosis should be inherently intersubjective and collaborative [110, 190], where AI does not show up simply as the deliverer of facts, but, as mentioned earlier, an aesthetic agent in its own right. The expectations of patients and clinicians in addressing respective needs, assuming responsibilities and roles, and offering personalisation or standardisation can significantly vary [38, 71, 213]. Without deliberate design of this collaboration, multi-stakeholder interactions with the patient-generated data, as well as paths of contestation and deliberation, DP can turn into a point of frustration, burden, and conflict. Human-AI reflexive practice [6] is required to establish meaningful interactions with data, allowing possibilities of care frictions [35], diagnostic dissent [60], and critical inquiry. Furthermore, Cila's [39] framework of human-agent collaboration proposes a practical approach for organising such relations by evaluating collaboration qualities such as code of conduct, intelligibility, and common ground in the process of design. As such, the model of a multi-user system should be followed, in which both patients and clinicians have access to the same system and thus both are able to participate in decision-making [94].

The following questions should be addressed:

- *What are the mechanisms of contestation with AI's conclusions for the patient?*
- *Which part of clinical practice (intake, diagnosis, treatment options, monitoring etc.) will AI intervene in and how is its role delimited in each of them?*
- *How can expectations of each actor be established in a clinical encounter and everyday context?*
- *How should aesthetic agency and expertise be distributed among the collaborators? What is the mechanism of each contributing to the diagnostic and other processes?*

5 Conclusion

It would be unfair to say that DP's proposition for revolutionising psychiatry is not without its virtues and genuine concern for both practitioners and patients. Yet, to truly develop a tool or method that will provide people with distress or mental health conditions with the help and support they need and clinicians with more expansive information to understand their patients better for the more generative path of healing, DP has to look beyond clinical and biomedical knowledge towards transdisciplinarity and pluralism. A technology that promises a window to the lived experience of patients needs to recognise the messy, unquantifiable, and irrational parts of life. Drawing on the perspective we outlined, future work

could further look into more thoughtful and engaging ways of collecting, organising, presenting, and interacting with mental health data. Instead of translating behaviours into metrics and determining a diagnostic label as an ultimate goal, DP could possess a more intimate and heedful role in a care-seeker's life. To do so, instead of a forensic quality of DP's sensing, an embodied, relational and felt nature of mental health experiences and articulations should be a guiding notion in DP design. As evidence from physical health technologies demonstrated, clinicians similarly are apprehensive of decontextualised data points. Therefore, a proper DP design should be largely informed by the needs of patients and doctors, rather than simply the availability of technology. As this paper serves as a first proposal of a felt informatics approach to digital mental health and DP, we hope that it will serve as an encouragement for researchers and designers to explore the aesthetic engagements and practices of algorithmic care, including the generation of methods and case studies.

References

[1] Ramsey Affifi. 2023. Aesthetic knowing and ecology: cultivating perception and participation during the ecological crisis. *Environmental Education Research* 30, 7 (2023), 1041–1060. doi:10.1080/13504622.2023.2286933

[2] Luciana Albuquerque, Ana Rita S. Valente, António Teixeira, Daniela Figueiredo, Pedro Sa-Couto, and Catarina Oliveira. 2021. Association between acoustic speech features and non-severe levels of anxiety and depression symptoms across lifespan. *PLoS ONE* 16, 4 (2021), e0248842. doi:10.1371/journal.pone.0248842

[3] Miquel Alfaras, Vasiliki Tsaknaki, Pedro Sanches, Charles Windlin, Muhammad Umair, Corina Sas, and Kristina Höök. 2020. From Biodata to Somadata. 14 pages. doi:10.1145/3313831.3376684

[4] Isaac Arturo Ortega Alvarado. 2024. Relationality in design: What can be understood?. In *DRS2024: Boston, 23–28 June, Boston, USA*, C. Gray, E. Ciliotta Chehade, P. Hekkert, L. Forlano, P. Ciuccarelli, and P. Lloyd (Eds.). Design Research Society (DRS), Boston, USA. doi:10.21606/drs.2024.1097

[5] Jessica S. Ancker, Holly O. Witteman, Baria Hafeez, Thierry Provencher, Mary van de Graaf, and Esther Wei. 2015. "You Get Reminded You're a Sick Person": Personal Data Tracking and Patients With Multiple Chronic Conditions. *Journal of Medical Internet Research* 17, 8 (2015). doi:10.2196/jmir.4209

[6] Anne Arzberger, Maria Luce Lupetti, and Elisa Giaccardi. 2024. Reflexive Data Curation: Opportunities and Challenges for Embracing Uncertainty in Human–AI Collaboration. *ACM Trans. Comput.-Hum. Interact.* 31, 6, Article 74 (2024), 33 pages. doi:10.1145/3689042

[7] Rhoda Au, Vijaya B. Kolachalama, and Ioannis C. Paschalidis. 2022. Redefining and Validating Digital Biomarkers as Fluid, Dynamic Multi-Dimensional Digital Signal Patterns. *Frontiers in Digital Health* 3 (2022). doi:10.3389/fdgth.2021.751629

[8] Priscillia Averous, Elodie Charbonnier, and Lionel Dany. 2020. Relationship Between Illness Representations, Psychosocial Adjustment, and Treatment Outcomes in Mental Disorders: A Mini Review. *Frontiers in Psychology* 11 (2020). doi:10.3389/fpsyg.2020.01167

[9] Pradeep Raj Krishnappa Babu, J. Matias Di Martino Vikram Aikat, Zhuoqing Chang, Sam Perochon, Steven Espinosa, Rachel Aiello, Kimberly L. H. Carpenter, Scott Compton, Naomi Davis, Brian Eichner, Jacqueline Flowers, Lauren Franz, Geraldine Dawson, and Guillermo Sapiro. 2023. Blink rate and facial orientation reveal distinctive patterns of attentional engagement in autistic toddlers: a digital phenotyping approach. *Scientific Reports* 13 (2023). doi:10.1038/s41598-023-34293-7

[10] Jeffrey Bardzell and Shaowen Bardzell. 2008. Interaction criticism: a proposal and framework for a new discipline of hci. In *CHI '08 Extended Abstracts on Human Factors in Computing Systems* (Florence, Italy) *(CHI EA '08)*. Association for Computing Machinery, New York, NY, USA, 2463–2472. doi:10.1145/1358628.1358703

[11] Ian Barnett, John Tourous, Patrick Staples, Luis Sandoval, Matcheri Keshavan, and Jukka-Pekka Onnela. 2018. Relapse prediction in schizophrenia through digital phenotyping: A pilot study. *Neuropsychopharmacology* 43 (2018), 1660–1666. doi:10.1038/s41386-018-0030-z

[12] Daniel Barron. 2021. *Reading Our Minds: The Rise of Big Data Psychiatry*. Columbia Global Reports, NY.

[13] Michael Bauer, Tasha Glenn, Scott Monteith, Rita Bauer, Peter C. Whybrow, and John Geddes. 2017. Ethical perspectives on recommending digital technology for patients with mental illness. *international Journal of Bipolar Disorders* 5

[14] Renate Baumgartner. 2021. Precision medicine and digital phenotyping: Digital medicine's way from more data to better health. *Big Data & Society* 8, 2 (2021), 20539517211066452. doi:10.1177/20539517211066452

[15] Michel Beaudouin-Lafon. 2004. Designing interaction, not interfaces. In *Proceedings of the Working Conference on Advanced Visual Interfaces* (Gallipoli, Italy) *(AVI '04)*. Association for Computing Machinery, New York, NY, USA, 15–22. doi:10.1145/989863.989865

[16] Behavidence. 2024. About. https://www.behavidence.com/about Accessed: 2024-12-06.

[17] Behavidence. 2024. BehavidenceCare. https://www.behavidence.com/behavidencecare-lp Accessed: 2025-02-06.

[18] Dörte Bemme, Natassia Brenman, and Beth Semel. 2020. The subjects of digital psychiatry. https://somatosphere.com/2020/subjects-of-digital-psychiatry.html/

[19] D. Ben-Zeev, M. A. Young, and P. W. Corrigan. 2010. DSM-V and the stigma of mental illness. *Journal of Mental Health* 19, 4 (2010), 318–327. doi:10.3109/09638237.2010.492484

[20] Natalie C. Benda, Pooja M. Desai, Zayan Reza, Anna Zhang, Shiveen Kumar, Sarah Harkins, Alison Hermann, Yiye Zhang, Rochelle Joly, Jessica Kim, Jyotishman Pathak, and Meghan Reading Turchioe. 2024. Patient Perspectives on AI for Mental Health Care: Cross-Sectional Survey Study. *JMIR Mental Health* 11 (2024), e58462. doi:10.2196/58462

[21] Gillian Bendelow. 2009. *Health, Emotion and The Body*. Polity, Cambridge, UK.

[22] Suze G. Berkhout and Juveria Zaheer. 2021. Digital Self-Monitoring, Bodied Realities: Recasting App-based Technologies in First Episode Psychosis. *Catalyst: Feminism, Theory, Technoscience* 7, 1 (2021), 27 pages. doi:10.28968/cftt.v7i1.34101

[23] Arnold Berleant. 2005. Ideas for a Social Aesthetic. In *The Aesthetics of Everyday Life*, Andrew Light Smith and Jonathan M. (Eds.). Columbia University Press, NY, 23–38.

[24] Arnold Berleant. 2012. What is aesthetic engagement? https://digitalcommons.risd.edu/cgi/viewcontent.cgi?article=1269&context=liberalarts_contempaesthetics

[25] A. Berleant. 2015. Aesthetic Sensibility. doi:10.4000/ambiances.526

[26] Karthik S. Bhat and Neha Kumar. 2020. Sociocultural Dimensions of Tracking Health and Taking Care. *Proceedings of the ACM on Human-Computer Interaction* 4, CSCW2 (2020), 1–24. doi:10.1145/3415200

[27] João Biehl and Amy Moran-Thomas. 2009. Symptom: Subjectivities, Social Ills, Technologies. *Annual Review of Anthropology* 38, 1 (2009), 267–288. doi:10.1146/annurev-anthro-091908-164420

[28] Rasmus Birk, Anna Lavis, Federica Lucivero, and Gabrielle Samuel. 2021. For what it's worth. Unearthing the values embedded in digital phenotyping for mental health. *Big Data & Society* 8, 2 (2021). doi:10.1177/20539517211047319

[29] Rasmus H. Birk and Gabrielle Samuel. 2020. Can digital data diagnose mental health problems? A sociological exploration of 'digital phenotyping'. *Sociology of Health & Illness* 42, 8 (2020). doi:10.1111/1467-9566.13175

[30] Trevor J. Blank and Andrea Kitta. 2015. *Diagnosing Folklore: Perspectives on Disability, Health, and Trauma*. University Press of Mississippi, Jackson, MS.

[31] Jonah Bossewitch, Lydia X. Z. Brown, Piers Gooding, Leah Harris, James Horton, Simon Katterl, Keris Myrick, Kelechi Ubozoh, and Alberto Vasquez. 2021. *Digital Futures in Mind: Reflecting on Technological Experiments in Mental Health & Crisis Support*. Report. University of Melbourne. https://automatingmentalhealth.cc/media/pages/digital-futures-in-mind-report/a2b0b2aff3-1686009761/digital-futures-in-mind-report-aug-2022-final-2023.pdf

[32] Nicolas Bourriaud. 2002. *Relational Aesthetics*. Les Presses du réel, Paris.

[33] Pascal Boyer. 2011. Intuitive expectations and the detection of mental disorder: A cognitive background to folk-psychiatries. *Philosophical Psychology* 24, 1 (2011), 95–118. doi:10.1080/09515089.2010.529049

[34] Pasquale Bufano, Marco Laurino, Sara Said, Alessandro Tognetti, and Danilo Menicucci. 2023. Digital Phenotyping for Monitoring Mental Disorders: Systematic Review. *Journal of Medical Internet Research* 25 (2023), e46778. doi:10.2196/46778

[35] Eleanor R. Burgess, Elizabeth Kaziunas, and Maia Jacobs. 2022. Care Frictions: A Critical Reframing of Patient Noncompliance in Health Technology Design. *Proceedings of the ACM on Human-Computer Interaction* 6, CSCW2 (2022), 1–31. doi:10.1145/3555172

[36] Linda D. Cameron and Rona Moss-Morris. 2010. Illness-related cognition and behaviour. In *Health Psychology* (2nd ed.), Ad A. Kaptein David French, Kavita Vedhara and John Weinman (Eds.). BPS Blackwell, Chichester.

[37] M. Chalmers. 2003. Seamful design: showing the seams in wearable computing. 11-16 pages. doi:10.1049/ic:20030140

[38] Emil Chiauzzi and Amy Newell. 2019. Mental Health Apps in Psychiatric Treatment: A Patient Perspective on Real World Technology Usage. *JMIR Ment Health* 6, 4 (2019), e12292. doi:10.2196/12292

[39] Nazli Cila. 2022. Designing Human-Agent Collaborations: Commitment, responsiveness, and support. 18 pages. doi:10.1145/3491102.3517500

[40] Karn Anne Cochrane, Kristina Mah, Anna Ståhl, Claudia Núñez-Pacheco, Madeline Madeline Balaam, Naseem Ahmadpour, and Lian Loke. 2022. Body Maps: A Generative Tool for Soma-based Design. 14 pages. doi:10.1145/3490149.3502262

[41] Simon Coghlan and Simon D'Alfonso. 2021. Digital phenotyping: An epistemic and methodological analysis. *Philosophy and Technology* 34, 4 (2021), 1905–1928. doi:10.1007/s13347-021-00492-1

[42] Aykut Coşkun and Armağan Karahanoğlu. 2022. Data Sensemaking in Self-Tracking: Towards a New Generation of Self-Tracking Tools. *International Journal of Human-Computer Interaction* 39, 12 (2022), 2339–2360. doi:10.1080/10447318.2022.2075637

[43] Paul Dagum and Christian Montag. 2022. Ethical Considerations of Digital Phenotyping from the Perspective of a Healthcare Practitioner Including Updates. In *Digital Phenotyping and Mobile Sensing: New Developments in Psychoinformatics* (2nd ed.), Christian Montag Baumeister and Harald (Eds.). Springer, Cham, 25–40.

[44] Jiacheng Dai, Yu Chen, Cuihua Xia, Jiaqi Zhou, Chunyu Liu, , and Chao Chen. 2020. Digital Sensory Phenotyping for Psychiatric Disorders. *Journal of Psychiatry and Brain Science* 5 (2020), e200015. doi:10.20900/jpbs.20200015

[45] Brittany I. Davidson. 2022. The crossroads of digital phenotyping. *General Hospital Psychiatry* 74 (2022), 126–132.

[46] Ben Davies. 2021. 'Personal Health Surveillance': The Use of mHealth in Healthcare Responsibilisation. *Public Health Ethics* 14, 3 (2021), 268–280. doi:10.1093/phe/phab013

[47] Sanneke de Haan. 2020. An Enactive Approach to Psychiatry. *Philosophy, Psychiatry, & Psychology* 27, 1 (2020), 3–25. doi:10.1353/ppp.2020.0001

[48] Amelia DeFalco. 2020. Towards a Theory of Posthuman Care: Real Humans and Caring Robots. *Body & Society* 26, 3 (2020), 31–60. doi:10.1177/1357034X20917450

[49] John Dewey. 2005 (1934). *Art as Experience*. TarcherPerigee, NY.

[50] Joseph Dumit. 2003. Is It Me or My Brain? Depression and Neuroscientific Facts. *Journal of Medical Humanities* 24 (2003), 35–47. doi:10.1023/A:1021353631347

[51] Simon D'Alfonso, Simon Coghlan, Simone Schmidt, and Shaminka Mangelsdorf. 2024. Ethical Dimensions of Digital Phenotyping Within the Context of Mental Healthcare. doi:10.1007/s41347-024-00423-9

[52] Chris Elsden, David S. Kirk, and Abigail C. Durrant. 2015. A Quantified Past: Toward Design for Remembering With Personal Informatics. *Human–Computer Interaction* 31, 6 (2015), 518–557. doi:10.1080/07370024.2015.1093422

[53] Lukas Engelmann. 2022. Digital epidemiology, deep phenotyping and the enduring fantasy of pathological omniscience. *Big Data & Society* 9, 1 (2022). doi:10.1177/20539517211066451

[54] Steven Epstein and Stefan Timmerman. 2021. From Medicine to Health: The Proliferation and Diversification of Cultural Authority. *Journal of Health and Social Behaviour* 62, 3 (2021), 240–254. doi:10.1177/00221465211010468

[55] Barbara Fawcett, Zita Weber, and Helen Bannister. 2020. *The Medicalisation of Everyday Life: Critical Perspective*. Red Globe Press, London.

[56] Salvatore Fiore, Peter Wright, and Alistair Edwards. 2005. A pragmatist aesthetics approach to the design of a technological artefact. In *Proceedings of the 4th Decennial Conference on Critical Computing: Between Sense and Sensibility* (Aarhus, Denmark) *(CC '05)*. Association for Computing Machinery, New York, NY, USA, 129–132. doi:10.1145/1094562.1094581

[57] Brittany Fiore-Gartland and Gina Neff. 2015. Communication, Mediation, and the Expectations of Data: Data Valences Across Health and Wellness Communities. *International Journal of Communication* 9 (2015), 1466–1484. https://ijoc.org/index.php/ijoc/article/view/2830/1381

[58] Paul A. Fishwick. 2006. *Aesthetic Computing*. The MIT Press, Cambridge, MA.

[59] Elizabeth Ford, Richard Milne, and Keegan Curlewis. 2023. Ethical issues when using digital biomarkers and artificial intelligence for the early detection of dementia. *WIREs Data Mining and Knowledge Discovery* 13, 3 (2023). doi:10.1002/widm.1492

[60] Faith A. Forgione. 2018. Diagnostic Dissent: Experiences of Perceived Misdiagnosis and Stigma in Persons Diagnosed With Schizophrenia. *Journal of Humanistic Psychology* 59, 1 (2018), 69–98. doi:10.1177/0022167818777151

[61] Jane Forsey. 2013. *The Aesthetics of Design*. Oxford University Press, NY.

[62] Allen Frances. 2014. *Saving Normal: An Insider's Revolt against Out-of-Control Psychiatric Diagnosis, DSM-5, Big Pharma, and the Medicalization of Ordinary Life*. Mariner Books, Boston, MA.

[63] Thomas Fuchs and Frank Röhricht. 2017. Schizophrenia and intersubjectivity: An embodied and enactive approach to psychopathology and psychotherapy. *Philosophy, Psychiatry, & Psychology* 24, 2 (2017). doi:10.1353/ppp.2017.0018

[64] Matthew Fuller and Eyal Weizman. 2021. *Investigative Aesthetics: Conflicts and Commons in the Politics of Truth*. Verso Books, London.

[65] Fusion. 2021. Behavidence | by Roy Cohen. https://youtu.be/OA0ADsEmxn8?si=Tgx4vcBSBuYTNhY_&t=12

[66] Vittorio Gallese and Francesca Ferri. 2015. Schizophrenia, bodily selves, and embodied simulation. In *New Frontiers in Mirror Neurons Research*, Pier Francesco Ferrari Rizzolatti and Giacomo (Eds.). Oxford University Press, NY.

[67] Rose Galvin. 2002. Disturbing Notions of Chronic Illness and Individual Responsibility: Towards a Genealogy of Morals. *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine* 6, 2 (2002), 107–137.

doi:10.1177/136345930200600201

[68] Eugene T. Gendlin. 1982. *Focusing*. Random House Publishing, NY.

[69] Byron J. Good. 2012. *Medicine, Rationality and Experience*. Cambridge University Press, Cambridge, UK. doi:10.1017/cbo9780511811029

[70] Sara Green and Mette N. Svendsen. 2021. Digital phenotyping and data inheritance. *Big Data & Society* 8, 2 (2021). doi:10.1177/20539517211036799

[71] Christian Götzl, Selina Hiller, Christian Rauschenberg, Anita Schick, Janik Fechtelpeter, Unai Fischer Abaigar, Georgia Koppe, Daniel Durstewitz, Ulrich Reininghaus, and Silvia Krumm. 2022. Artificial intelligence-informed mobile mental health apps for young people: a mixed-methods approach on users' and stakeholders' perspectives. *Child and Adolescent Psychiatry and Mental Health* 16, 1 (2022). doi:10.1186/s13034-022-00522-6

[72] Paul Haimes. 2021. Beyond Beauty: Towards a Deeper Understanding of Aesthetics in HCI. In *Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI EA '21)*. Association for Computing Machinery, New York, NY, USA, Article 27, 7 pages. doi:10.1145/3411763.3450381

[73] Richard Hallam. 2018. *Abolishing the concept of mental illness: Rethinking the nature of our woes*. Routledge, Milton Park.

[74] Marc Hassenzahl. 2008. Aesthetics in interactive products: Correlates and consequences of beauty. In *Product Experience*, Hendrik N.J. Schifferstein and Paul Hekkert (Eds.). Elsevier, Amsterdam.

[75] Kintsugi Health. 2024. Kintsugi App. https://www.kintsugihealth.com/solutions/kintsugiapp. Accessed: August 5, 2024.

[76] Sonde Health. 2022. Mental Fitness Voice Features. https://sondehealth.atlassian.net/wiki/spaces/SA/pages/2706309124/Mental+Fitness+Voice+Features Accessed: 2025-02-06.

[77] Sonde Health. 2025. Sonde Mental Fitness. https://play.google.com/store/apps/details?id=com.sonde.mentalfitness&hl=en. 1.8.8.

[78] Richard Heersmink. 2018. The narrative self, distributed memory, and evocative objects. *Philosophical Studies* 175 (2018), 1829–1849. doi:10.1007/s11098-017-0935-0

[79] Paul Hekkert. 2006. Design aesthetics: principles of pleasure in design. *Psychology Science* 48, 2 (2006), 157–172. https://pure.tudelft.nl/ws/portalfiles/portal/54686438/Hekkert_P._Design_aesthetics_principles_of_pleasure_in_design.pdf

[80] Ilpo Antero Helen. 2011. The depression paradigm and beyond: The practical ontology of mood disorders. 82-112 pages. http://hdl.handle.net/10138/27385

[81] Mathew E. Hirschtritt and Thomas R. Insel. 2018. Digital Technologies in Psychiatry: Present and Future. *FOCUS* 16, 3 (2018), 251–258. doi:10.1176/appi.focus.20180001

[82] Victoria Hollis, Alon Pekurovsky, Eunika Wu, and Steve Whittaker. 2018. On Being Told How We Feel: How Algorithmic Sensor Feedback Influences Emotion Perception. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 2, 3 (2018), 1–31. doi:10.1145/3264924

[83] Matthew Holt. 2017. Semiotics and design: Towards an aesthetics of the artificial. *The Design Journal* 12 (2017), S332–S341. doi:10.1080/14606925.2017.1352860

[84] Allan V. Horwitz and Jerome C. Wakefield. 2007. *The Loss of Sadness: How Psychiatry Transformed Normal Sorrow into Depressive Disorder*. Oxford University Press, NY.

[85] Allan V. Horwitz and Jerome C. Wakefield. 2012. *All We Have to Fear: Psychiatry's Transformation of Natural Anxieties into Mental Disorders*. Oxford University Press, NY.

[86] Noura Howell, John Chuang, Abigail De Kosnik, Greg Niemeyer, and Kimiko Ryokai. 2018. Emotional Biosensing. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 1–25. doi:10.1145/3274338

[87] Jina Huh, Mark S. Ackerman, and Robert Douglas. 2007. The use of aesthetics in HCI systems. In *CHI '07 Extended Abstracts on Human Factors in Computing Systems* (San Jose, CA, USA) *(CHI EA '07)*. Association for Computing Machinery, New York, NY, USA, 2441–2446. doi:10.1145/1240866.1241021

[88] Angel Hsing-Chi Hwang, Dan Adler, Meir Friedenberg, and Qian Yang. 2024. Societal-Scale Human-AI Interaction Design? How Hospitals and Companies are Integrating Pervasive Sensing into Mental Healthcare. 16 pages. doi:10.1145/3613904.3642793

[89] Kristina Höök. 2009. Affective loop experiences: designing for interactional embodiment. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364, 1535 (2009), 3585–3595. doi:10.1098/rstb.2009.0202

[90] Kristina Höök. 2018. *Designing with the Body: Somaesthetic Interaction Design*. MIT Press, Cambridge, MA.

[91] Thomas Insel. 2023. Foreword. In *Digital Phenotyping and Mobile Sensing: New Developments in Psychoinformatics* (2nd ed.), Christian Montag and Harald Baumeister (Eds.). Springer, Cham.

[92] Thomas R. Insel. 2017. Digital Phenotyping: Technology for a New Science of Behavior. *JAMA* 318, 13 (2017), 1215–1216. doi:10.1001/jama.2017.11295

[93] Thomas R. Insel. 2018. Digital phenotyping: a global tool for psychiatry. *World Psychiatry* 17, 3 (2018), 276–277. doi:10.1002/wps.20550

[94] Maia Jacobs, Jeffrey He, Melanie F. Pradier, Barbara Lam, Andrew C. Ahn, Thomas H. McCoy, Roy H. Perlis, Finale Doshi-Velez, and Krzysztof Z. Gajos. 2021. Designing AI for Trust and Collaboration in Time-Constrained Medical

Decisions: A Sociotechnical Lens. 14 pages. doi:10.1145/3411764.3445385

[95] Sachin Jain, Brian W Powers, Jared Hawkins, and John S Brownstein. 2015. The digital phenotype. *nature biotechnology* 33 (2015), 462–463. doi:10.1038/nbt.3223

[96] Casper Bruun Jensen. 2010. *Ontologies for Developing Things: Making Health Care Futures Through Technology*. Brill, Leiden.

[97] Paul Johansson, Per Høglend, Randi Ulberg, Svein Amlo, Alice Marble, Kjell-Petter Bøgwald, Oystein Sørbye, Mary Cosgrove Sjaastad, and Oscar Heyerdahl. 2010. The mediating role of insight for long-term improvements in psychodynamic therapy. *J Consult Clin Psychol* 78, 3 (2010), 438–48. doi:10.1037/a0019245

[98] Jeff Johnson. 2021. *Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Guidelines* (3rd ed.). Elsevier, Cambridge, MA.

[99] Mark Johnson. 2007. *The Meaning of the Body: Aesthetics of Human Understanding*. The University of Chicago Press, Chicago, IL.

[100] Jayesh Kamath, Roberto Leon Barriera, Neha Jain, Efraim Keisari, and Bing Wang. 2022. Digital phenotyping in depression diagnostics: Integrating psychiatric and engineering perspectives. *World Journal of Psychiatry* 12, 3 (2022), 393–409. doi:10.5498/wjp.v12.i3.393

[101] Naveena Karusala, Victoria G, Shirley Yan, and Richard Anderson. 2023. Unsettling Care Infrastructures: From the Individual to the Structural in a Digital Maternal and Child Health Intervention. 16 pages. doi:10.1145/3544548.3581553

[102] Elizabeth Kaziunas, Michael S. Klinkman, and Mark S. Ackerman. 2019. Precarious Interventions. *Proceedings of the ACM on Human-Computer Interaction* 3, CSCW (2019), 1–27. doi:10.1145/3359215

[103] Elizabeth Kaziunas, Silvia Lindtner, Mark S. Ackerman, and Joyce M. Lee. 2017. Lived Data: Tinkering With Bodies, Code, and Care Work. *Human-Computer Interaction* 33, 1 (2017), 49–92. doi:10.1080/07370024.2017.1307749

[104] Os Keyes. 2020. Automating autism: Disability, discourse, and Artificial Intelligence. *Sociotechnical Critique* 1, 1 (2020), 1–31. doi:10.25779/89bj-j396

[105] John L. Kilgallon, Ishaan Ashwini Tewarie, Marike L. D. Broekman, Aakanksha Rana, and Timothy R. Smith. 2022. Passive Data Use for Ethical Digital Public Health Surveillance in a Postpandemic World. *Journal of Medical Internet Research* 24, 2 (2022), e30524. doi:10.2196/30524

[106] Laurence J. Kirmayer. 2005. Culture, Context and Experience in Psychiatric Diagnosis. *Psychopathology* 38, 4 (2005), 192–196. doi:10.1159/000086090

[107] Laurence J. Kirmayer, Eugene Raikhel, and Sadeq Rahimi. 2013. Cultures of the Internet: Identity, community and mental health. *Transcultural Psychiatry* 50, 2 (2013), 165–191. doi:10.1177/1363461513490626

[108] Laura Maria Maija Kivelä, Arjan Jan Willem van der Does, Ruth Gilissen, and Niki Antypa. 2024. Digital Phenotypes of real-time suicidal ideation: Correlates and consequences. *Acta Psychiatrica Scandinavica* 151, 3 (2024), 375–387. doi:10.1111/acps.13750

[109] Laura Koesten, Kathleen Gregory, Paul Groth, and Elena Simperl. 2021. Talking datasets – Understanding data sensemaking behaviours. *International Journal of Human-Computer Studies* 146 (2021), 102562. doi:10.1016/j.ijhcs.2020.102562

[110] Olya Kudina and Bas de Boer. 2021. Co-designing diagnosis: Towards a responsible integration of Machine Learning decision-support systems in medical diagnostics. *Journal of Evaluation in Clinical Practice* 27, 3 (2021), 529–536. doi:10.1111/jep.13535

[111] Inger Beate Larsen, Tore Dag Bøe, and Alain Topor. 2020. Things matter: about materiality and recovery from mental health difficulties. *International Journal of Qualitative Studies on Health and Well-being* 15, 1 (2020). doi:10.1080/17482631.2020.1802909

[112] Tom Leddy and Kalle Puolakka. 2023. *Dewey's Aesthetics*. Stanford Encyclopedia of Philosophy. https://plato.stanford.edu/entries/dewey-aesthetics/ Accessed: 2024-12-04.

[113] Andrew Light and Jonathan M. Smith. 2005. *The Aesthetics of Everyday Life*. Columbia University Press, NY.

[114] Stine Lomborg, Henriette Langstrup, and Tariq Osman Andersen. 2020. Interpretation as luxury: Heart patients living with data doubt, hope, and anxiety. *Big Data & Society* 7, 1 (2020). doi:10.1177/2053951720924436

[115] Tanya M. Luhrmann. 2001. *Of Two Minds: An Anthropologist Looks at American Psychiatry*. Vintage, London.

[116] Deborah Lupton. 2019. The thing-power of the human-app health assemblage: thinking with vital materialism. *Social Theory & Health* 17, 2 (2019), 125–139. doi:10.1057/s41285-019-00096-y

[117] Deborah Lupton and Annemarie Jutel. 2015. 'It's like having a physician in your pocket!' A critical analysis of self-diagnosis smartphone apps. *Social Science & Medicine* 133 (2015), 128–135. doi:10.1016/j.socscimed.2015.04.004

[118] Ben Lyall. 2024. Narratives in numbers: Sociotechnical storytelling with self-tracking. *Memory, Mind & Media* 2 (2024), e1. doi:10.1017/mem.2023.12

[119] Shazmin Majid, Richard Morriss, Grazziela Figueredo, and Stuart Reeves. 2022. Exploring self-tracking practices for those with lived experience of bipolar disorder: Learning from combined principles of Patient and Public Involvement and HCI. In *Proceedings of the 2022 ACM Designing Interactive Systems Conference* (Virtual Event, Australia) *(DIS '22)*. Association for Computing Machinery, New York, NY, USA, 1907–1920. doi:10.1145/3532106.3533531

[120] Lambros Malafouris and Frank Röhricht. 2024. Re-thinging embodied and enactive psychiatry: A material engagement approach. *Culture, Medicine, and*

[121] Katya Mandoki. 2007. *Everyday Aesthetics: Prosaics, the Play of Culture and Social Identities*. Routledge, Milton Park.

[122] Ivana Marková and German Berrios. 1995. Insight in Clinical Psychiatry: A New Model. *The Journal of Nervous and Mental Disease* 183, 12 (1995), 743–751. doi:10.1097/00005053-199512000-00003

[123] Nicole Martinez-Martin, Henry T. Greely, and Mildred K. Cho. 2021. Ethical development of digital phenotyping tools for mental health applications: Delphi study. *JMIR mHealth and uHealth* 9, 7 (2021), e27343. doi:10.2196/27343

[124] Nicole Martinez-Martin and Karola Kreitmar. 2018. Ethical issues for direct-to-consumer digital psychotherapy apps: Addressing accountability, data protection, and consent. *JMIR Mental Health* 5, 2 (2018), e32. doi:10.2196/mental.9423

[125] Giovanni Matteucci. 2017. Everyday Aesthetics and Aestheticization: Reflectivity in Perception. *Studi di Estetica* XLV, 1 (2017), 207–227. doi:10.7413/18258646013

[126] Mark Matthews, Elizabeth Murnane, Jaime Snyder, Shion Guha, Pamara Chang, Gavin Doherty, and Geri Gay. 2017. The double-edged sword: A mixed methods study of the interplay between bipolar disorder and technology use. *Computers in Human Behavior* 75 (2017), 288–300. doi:10.1016/j.chb.2017.05.009

[127] John McCarthy and Peter Wright. 2005. Putting 'felt-life' at the centre of human–computer interaction (HCI). *Cognition, Technology & Work* 7 (2005), 262–271. doi:10.1007/s10111-005-0011-y

[128] John McCarthy and Peter Wright. 2007. *Technology as Experience*. MIT Press, Cambridge, MA.

[129] Dominic McIver Lopes. 2021. Normativity, agency, and value: A view from aestthetics. *Philosophy and Phenomenological Research* 102, 1 (2021), 232–242. doi:10.1111/phpr.12750

[130] Francesco Miele. 2022. On care infrastructures and health practices: How people in health promotion programmes try to change their everyday life. *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine* 27, 6 (2022), 980–997. doi:10.1177/13634593221093503

[131] Christian Montag, Jon D. Elhai, and Paul Dagum. 2021. On Blurry Boundaries When Defining Digital Biomarkers: How Much Biology Needs to Be in a Digital Biomarker? *Frontiers in Psychiatry* 12 (2021). doi:10.3389/fpsyt.2021.740292

[132] Stéphane Mouchabac, Ismael Conejero, Camille Lakhlifi, Ilyass Msellek, Leo Malandain, Vladimir Adrien, Florian Ferreri, Olivier Bonnot Bruno Millet, Alexis Bourla, and Redwan Maatoug. 2021. Improving clinical decision-making in psychiatry: implementation of digital phenotyping could mitigate the influence of patient's and practitioner's individual cognitive biases. *Dialogues in Clinical Neuroscience* 23, 1 (2021), 56–61. doi:10.1080/19585969.2022.2042165

[133] Ivan Moura, Ariel Teles, Davi Viana, Jean Marques, Luciano Coutinho, and rancisco Silva. 2023. Digital Phenotyping of Mental Health using multimodal sensing of multiple situations of interest: A Systematic Literature Review. *Journal of Biomedical Infromatics* 138 (2023), 104278. doi:10.1016/j.jbi.2022.104278

[134] Shai Mulinari. 2023. Short-circuiting biology: Digital phenotypes, digital biomarkers, and shifting gazes in psychiatry. *Big Data & Society* 8, 1 (2023). doi:10.1177/20539517221145680

[135] Elizabeth L. Murnane, Tara G. Walker, Beck Tench, Stephen Voida, and Jaime Snyde. 2018. Personal Informatics in Interpersonal Contexts: Towards the Design of Technology that Supports the Social Ecologies of Long-Term Mental Health Management. *Proceedings of the ACM on Human-Computer Interaction* 2, CSCW (2018), 1–27. doi:10.1145/3274396

[136] Dawn Nafus. 2019. Data Aggregation as Social Relations: Making Datasets from Self-Tracking Data. *European Review* 27, 3 (2019), 440–454. doi:10.1017/S106279871900005X

[137] Bence Nanay. 2016. *Aesthetics as Philosophy of Perception*. Oxford University Press, NY.

[138] Ada Ng, Ashley Marie Walker, Laurie Wakschlag, Nabil Alshurafa, and Madhu Reddy. 2022. Understanding Self-Tracked Data from Bounded Situational Contexts. 1684-1697 pages. doi:10.1145/3532106.3533498

[139] Mark Nichter. 2010. Idioms of Distress Revisited. *Culture, Medicine, and Psychiatry* 34, 2 (2010), 401–416. doi:10.1007/s11013-010-9179-6

[140] Claudia Núñez-Pacheco and Lian Loke. 2016. Felt-sensing archetypes. 462-471 pages. doi:10.1145/3010915.3010932

[141] Claudia Núñez-Pacheco and Lian Loke. 2022. Focusing for Interaction Design: An Introspective Somatic Method. 18 pages. doi:10.1145/3491102.3501978

[142] Robert Ohlsson. 2016. Diagnosis as a Resource in the Social Representation of Mental Illness. 24 pages. https://psr.iscte-iul.pt/index.php/PSR/article/download/69/40

[143] Jukka-Pekka Onnela and Scott L. Rauch. 2016. Harnessing Smartphone-Based Digital Phenotyping to Enhance Behavioral and Mental Health. *Neuropsychopharmacology* 41 (2016), 1691–1696. doi:10.1038/npp.2016.7

[144] World Health Organization and United Nations. 2023. *Mental health, human rights and legislation: Guidance and practice*. Report. World Health Organization and United Nations. https://iris.who.int/bitstream/handle/10665/373126/9789240080737

[145] Kate O'Riordan. 2011. Revisiting digital technologies: envisioning biodigital bodies. *Communications* 36, 3 (2011), 291–312. doi:10.1515/comm.2011.015

Psychiatry 48 (2024), 816–839. doi:10.1007/s11013-024-09872-6

[146] Antoine Oudin, Redwan Maatoug, Alexis Bourla, Florian Ferreri, Olivier Bonnot, Bruno Millet, Félix Schoeller, Stéphane Mouchabac, and Vladimir Adrien. 2023. Digital Phenotyping: Data-Driven Psychiatry to Redefine Mental Health. *Journal of Medical Internet Research* 25 (2023), e44502. doi:10.2196/44502

[147] Mike Pantzar and Minna Ruckenstein. 2017. Living the metrics: Self-tracking and situated objectivity. *DIGITAL HEALTH* 3 (2017). doi:10.1177/2055207617712590

[148] Joel Paris. 2020. *Overdiagnosis in Psychiatry: How Modern Psychiatry Lost Its Way While creating a diagnosis for almost all of life's misfortunes.* Oxford University Press, NY.

[149] Christopher D. Parsons and Peter Wakeley. 1991. Idioms of distress: Somatic responses to distress in everyday life. *Culture, Medicine, and Psychiatry* 15, 1 (1991), 111–132. doi:10.1007/BF00050830

[150] Sachin R. Pendse, Daniel Nkemelu, Nicola J. Bidwell, Sushrut Jadhav, Soumitra Pathare, Munmun De Choudhury, and Neha Kumar. 2022. From Treatment to Healing:Envisioning a Decolonial Digital Mental Health. 23 pages. doi:10.1145/3491102.3501982

[151] Ignacio Perez-Pozuelo, Dimitris Spathis, Jordan Gifford-Moore, Jessica Morley, and Josh Cowls. 2021. Digital phenotyping and sensitive health data: Implications for data governanc. *Journal of the American Medical Informatics Association* 28, 9 (2021), 2002–2008. doi:10.1093/jamia/ocab012

[152] Marianne Graves Petersen, Ole Sejer Iversen, Peter Gall Krogh, and Martin Ludvigsen. 2004. Aesthetic interaction: a pragmatist's aesthetics of interactive systems. In *Proceedings of the 5th Conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques* (Cambridge, MA, USA) *(DIS '04)*. Association for Computing Machinery, New York, NY, USA, 269–276. doi:10.1145/1013115.1013153

[153] Behavidence Digital Phenotyping. 2024. Behavidence Research App. https://play.google.com/store/apps/details?id=com.cohen.behavidence&hl=en&pli=1. 3.6.6.

[154] Martyn Pickersgill. 2018. Digitising psychiatry? Sociotechnical expectations, performative nominalism and biomedical virtue in (digital) psychiatric praxis. *Sociology of Health & Illness* 41, S1 (2018), 16–30. doi:10.1111/1467-9566.12811

[155] Laura K. Pina, Sang-Wha Sien, Teresa Ward, Jason C. Yip, Sean A. Munson, James Fogarty, and Julie A. Kientz. 2017. From Personal Informatics to Family Informatics: Understanding Family Practices around Health Monitoring. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing* (Portland, Oregon, USA) *(CSCW '17)*. Association for Computing Machinery, New York, NY, USA, 2300–2315. doi:10.1145/2998181.2998362

[156] Sarah Pink, Debora Lanzeni, and Heather Horst. 2018. Data anxieties: Finding trust in everyday digital mess. *Big Data & Society* 5, 1 (2018). doi:10.1177/2053951718756685

[157] Mirjana Prpa, Sarah Fdili-Alaoui, Thecla Schiphorst, and Philippe Pasquier. 2020. Articulating Experience. 14 pages. doi:10.1145/3313831.3376664

[158] Aare Puussaar, Adrian K. Clear, and Peter Wright. 2017. Enhancing Personal Informatics Through Social Sensemaking. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. Association for Computing Machinery, New York, NY, USA, 6936–6942. doi:10.1145/3025453.3025804

[159] Kavita Radhakrishnan, Miyong T. Kim, Marissa Burgermaster, Richard Allen Brown, Bo Xie, Molly S. Bray, and Catherine A. Fournier. 2020. The potential of digital phenotyping to advance the contributions of mobile health to self-management science. *Nursing Outlook* 68, 5 (2020), 548–559. doi:10.1016/j.outlook.2020.03.007

[160] Jacques Rancière. 2004. *The Politics of Aesthetics: The Distribution of the Sensible.* Continuum, London.

[161] Amon Rapp and Arianna Boldi. 2023. Exploring the Lived Experience of Behavior Change Technologies: Towards an Existential Model of Behavior Change for HCI. *ACM Transactions on Computer-Human Interaction* 30, 6 (2023), 1–50. doi:10.1145/3603497

[162] Amon Rapp and Maurizio Tirassa. 2017. Know Thyself: A Theory of the Self for Personal Informatics. *Human–Computer Interaction* 32, 5-6 (2017), 335–380. doi:10.1080/07370024.2017.1285704

[163] Ian M. Raugh, Sydney H. James, Cristina M. Gonzalez, Hannah C. Chapman, Brian Kirkpatrick Alex S. Cohen, and Gregory P. Strauss. 2021. Digital phenotyping adherence, feasibility, and tolerability in outpatients with schizophrenia. *Journal of Psychiatric Research* 138 (2021), 436–443. doi:10.1016/j.jpsychires.2021.04.022

[164] Natali Rauseo-Ricupero, Philip Henson, Mica Agate-Mays, and John Torous. 2021. Case studies from the digital clinic: Integrating digital phenotyping and clinical practice into today's world. *International Review of Psychiatry* 33, 4 (2021), 363–365.

[165] Mette Bech Risør. 2006. Illness Behavior and Functional Somatic Symptoms – Rethinking the Concept of Illness Behavior from an Anthropological Perspective. *Social Theory & Health* 4, 2 (2006), 180–201. doi:10.1057/palgrave.sth.8700070

[166] Rosa Ritunnano. 2022. Overcoming Hermeneutical Injustice in Mental Health: A Role for Critical Phenomenology. *Journal of the British Society for Phenomenology* 53, 3 (2022), 243–260. doi:10.1080/00071773.2022.2031234

[167] John Rooksby, Mattias Rost, Alistair Morrison, and Matthew Chalmers. 2014. Personal tracking as lived informatics. 1163-1172 pages. doi:10.1145/2556288.2557039

[168] John Mirowsky Ross and Catherine E. 1989. Psychiatric Diagnosis as Reified Measurement. *Journal of Health and Social Behaviour* 30, 1 (1989), 11–25. doi:10.2307/2136907

[169] Heleen Rutjes, Martijn C. Willemsen, Janne van Kollenburg, Sander Bogers, and Wijnand A. IJsselsteijn. 2017. Benefits and costs of patient generated data, from the clinician's and patient's perspective. In *Proceedings of the 11th EAI International Conference on Pervasive Computing Technologies for Healthcare* (Barcelona, Spain) *(PervasiveHealth '17)*. Association for Computing Machinery, New York, NY, USA, 436–439. doi:10.1145/3154862.3154920

[170] Nicolas Rüsch, Patrick W. Corrigan, Karsten Heekeren, Anastasia Theodoridou, Diane Dvorsky, Sibylle Metzler, Mario Müller, Susanne Walitza, and Wulf Rössler. 2014. Well-Being Among Persons at Risk of Psychosis: The Role of Self-Labeling, Shame, and Stigma Stress. *Psychiatric Services* 65, 4 (2014), 483–489. doi:10.1176/appi.ps.201300169

[171] John Z. Sadler. 2009. The instrument metaphor, hyponarrativity, and the generic clinician. In *Philosophical Perspectives on Technology and Psychiatry*, James Phillips (Ed.). Oxford Univeristy Press, NY.

[172] Yuriko Saito. 2010. *Everyday aesthetics.* Oxford University Press, NY.

[173] Yuriko Saito. 2022. *Aesthetics of Care: Practice in Everyday Life.* Bloomsbury, London.

[174] Rayna Sariyska and Christian Montag. 2022. An Overview on Doing Psychodiagnostics in Personality Psychology and Tracking Physical Activity via Smartphones Including Updates. In *Digital Phenotyping and Mobile Sensing: New Developments in Psychoinformatics*, Christian Montag Baumeister and Harald (Eds.). Springer, Cham.

[175] Robyn Schimmer. 2021. *Between health and healthcare: a lifeworld perspective on personal informatics.* Thesis. Umeå University. https://www.diva-portal.org/smash/get/diva2:1547681/FULLTEXT01.pdf

[176] Thecla Schiphorst. 2011. Self-evidence. 145-160 pages. doi:10.1145/1979742.1979640

[177] Beth M. Semel. 2021. Listening Like a Computer: Attentional Tensions and Mechanized Care in Psychiatric Digital Phenotyping. *Science, Technology, & Human Values* 47, 2 (2021), 266–290. doi:10.1177/01622439211026371

[178] Francis X. Shen, Benjamin C. Silverman, Patrick Monette, Sara Kimble, Scott L. Rauch, and Justin T. Baker. 2022. An Ethics Checklist for Digital Health Research in Psychiatry: Viewpoint. *Journal of Medical Internet Research* 24, 2 (2022), e31146. doi:10.2196/31146

[179] Richard Shusterman. 1999. Somaesthetics: A Disciplinary Proposal. 299-313 pages. https://www.fau.edu/artsandletters/humanitieschair/pdf/somaesthetics-a-disciplinary-proposal.pdf

[180] Richard Shusterman. 2010. Soma and Psyche. *The Journal of Speculative Philosophy* 24, 3 (2010). doi:10.5325/jspecphil.24.3.0205

[181] Richard Shusterman. 2013. Affective Cognition: From Pragmatism to Somaesthetics. *Intellectica. Revue de l'Association pour la Recherche Cognitive.* 60 (2013), 49–68. doi:10.3406/intel.2013.1056

[182] Richard Shusterman. 2018. Introduction: Aesthetic Experience and Somaesthetics. In *Aesthetic Experience and Somaesthetics.* Brill, Leiden. doi:10.1163/9789004361928_002

[183] Richard Shusterman and Dag Svanæs. 2023. Designing for Somaesthetic Transformation. In *Somaesthetics and Design Culture*, Richard Shusterman Veres and Bálint (Eds.). Brill, Leiden.

[184] J. A. Skelton and Robert T. Croyle. 1991. *Mental Representation in Health and Illness.* Springer, Berlin.

[185] Stephanie K. Slack and Linda Barclay. 2023. First-person disavowals of digital phenotyping and epistemic injustice in psychiatry. *Medicine, Health Care and Philosophy* 26 (2023), 605–614. doi:10.1007/s11019-023-10174-8

[186] Phoebe A. Staab, A. Jess Williams, Mackenzie D. A. Robertson, and Petr Slovak. 2024. "Can you be with that feeling?": Extending Design Strategies for Interoceptive Awareness for the Context of Mental Health. 21 pages. doi:10.1145/3613904.3643054

[187] Giovanni Stanghellini and Federico Leoni. 2020. Digital Phenotyping: Ethical Issues, Opportunities, and Threats. *Frontiers in Psychiatry* 11 (2020). doi:10.3389/fpsyt.2020.00473

[188] Anna Ståhl, Madeline Balaam, Rob Comber, Pedro Sanches, and Kristina Höök. 2022. Making New Worlds – Transformative Becomings with Soma Design. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 176, 17 pages. doi:10.1145/3491102.3502018

[189] Ida Nielsen Sølvhøj, Amalie Oxholm Kusier, Pia Vivian Pedersen, and Maj Britt Dahl Nielsen. 2021. Somatic health care professionals' stigmatization of patients with mental disorder: a scoping review. *BMC Psychiatry* 21, 1 (2021). doi:10.1186/s12888-021-03415-8

[190] Şerife Tekin. 2022. Participatory Interactive Objectivity in Psychiatry. *Philosophy of Science* 89, 5 (2022), 1166–1175. doi:10.1017/psa.2022.47

[191] Paul Tennent, Kristina Höök, Steve Benford, Vasiliki Tsaknaki, Anna Ståhl, Claudia Dauden Roquet, Charles Windlin, Pedro Sanches, Joe Marshall, Christine Li, Juan Pablo Martinez Avila, Miquel Alfaras, Muhammad Umair, and Feng Zhou. 2021. Articulating Soma Experiences using Trajectories. 16 pages. doi:10.1145/3411764.3445482

[192] James Thompson. 2020. Performing the 'aesthetics of care'. In *Performing care: New perspectives on socially engaged performance*, Amanda Stuart Fisher Thompson and James (Eds.). Manchester University Press, Manchester.

[193] thymia. 2024. *Making mental health visible.* thymia. https://thymia.ai Accessed: 2024-12-09.

[194] Sami Timimi. 2014. No more psychiatric labels: Why formal psychiatric diagnostic systems should be abolished. *International Journal of Clinical and Health Psychology* 14, 3 (2014), 208–2015. doi:10.1016/j.ijchp.2014.03.004

[195] Stefan Timmermans and Mara Buchbinder. 2010. Patients-in-Waiting: Living between Sickness and Health in the Genomics Era. *Journal of Health and Social Behaviour* 51, 4 (2010), 408–423. doi:10.1177/0022146510386794

[196] Nathaniel Tkacz. 2022. *Being with Data: The Dashboarding of Everyday Life.* Polity Press, Cambridge.

[197] Romain Toebosch, Arne Berger, and Carine Lallemand. 2024. Non-judgmental Interfaces: A New Design Space for Personal Informatics. 166-170 pages. doi:10.1145/3656156.3663706

[198] John Torous and Laura Weiss Roberts. 2017. The ethical use of mobile health technology in clinical psychiatry. *The Journal of Nervous and Mental Disease* 205, 1 (2017), 4–8. doi:10.1097/NMD.0000000000000596

[199] Lénie J. Torregrossa, Matthew A. Snodgress, Seok Jin Hong, Heathman S. Nichols, Enrico Glerean, Lauri Nummenmaa, and Sohee Park. 2019. Anomalous Bodily Maps of Emotions in Schizophrenia. *Schizophrenia Bulletin* 45, 5 (2019), 1060–1067. doi:10.1093/schbul/sby179

[200] Vasiliki Tsaknaki, Kelsey Cotton, Pavel Karpashevich, and Pedro Sanches. 2021. "Feeling the Sensor Feeling you": A Soma Design Exploration on Sensing Non-habitual Breathing. 16 pages. doi:10.1145/3411764.3445628

[201] Laia Turmo Vidal, Yinchu Li, Martin Stojanov, Karin B. Johansson, Beatrice Tylstedt, and Lina Eklund. 2023. Towards Advancing Body Maps as Research Tool for Interaction Design. 14 pages. doi:10.1145/3569009.3573838

[202] Laia Turmo Vidal, José Manuel Vega-Cebrián, María Concepción Valdez Gastelum, Elena Márquez Segura, Judith Ley-Flores, Joaquin R. Diaz Duran, and Ana Tajadura-Jiménez. 2024. Body Sensations as Design Material: An Approach to Design Sensory Technology for Altering Body Perception. 2545-2561 pages. doi:10.1145/3643834.3660701

[203] Lars Erik Udsen and Anker Helms Jørgensen. 2006. The aesthetic turn: unravelling recent aesthetic approaches to human-computer interaction. *Digital Creativity* 16, 4 (2006), 205–216. doi:10.1080/14626260500476564

[204] Fernando Vidal and Francisco Ortega. 2019. *Being Brains: Making the Cerebral Subject.* Fordham University Press, NY.

[205] Lisa M. Vizer, Jordan Eschler, Bon Mi Koo, James Ralston, Wanda Pratt, and Sean Munson4. 2019. "It's not just technology, it's people": Constructing a conceptual model of shared health informatics for tracking in chronic illness management. *Journal of Medical Internet Research* 21, 4 (2019), e10830. doi:10.2196/10830

[206] Sebastian von Peter. 2013. Agency, materiality and mental illness. *Social Theory & Health* 11 (2013), 317–326. doi:10.1057/sth.2013.3

[207] Ronald L. Wakkary. 2009. *Experiencing interaction design: A pragmatic theory.* Thesis. University of Plymouth. doi:10.24382/4235

[208] Colin G. Walsh, Beenish Chaudhry, Prerna Dua, Kenneth W. Goodman, Bonnie Kaplan, Ramakanth Kavuluru, Anthony Solomonides, and Vignesh Subbian. 2020. Stigma, biomarkers, and algorithmic bias: recommendations for precision behavioral health with artificial intelligence. *JAMIA Open* 3, 1 (2020), 9–15. doi:10.1093/jamiaopen/ooz054

[209] Charmaine C. Williams. 2008. Insight, Stigma, and Post–Diagnosis Identities in Schizophrenia. *Psychiatry: Interpersonal and Biological Processes* 71, 3 (2008). doi:10.1521/psyc.2008.71.3.246

[210] Charles Windlin, Kristina Höök, and Jarmo Laaksolahti. 2022. Sketching Soma Bits. 1758-1772 pages. doi:10.1145/3532106.3533510

[211] Michael Wong. 2020. Values, Meanings, Hermeneutics and Mental Health. In *International Perspectives in Values-Based Mental Health Practice: Case Studies and Commentaries*, Drozdstoy Stoyanov, Bill Fulford, Giovanni Stanghellini, Werdie Van Staden, and Michael TH Wong (Eds.). Springer, Cham.

[212] Peter Wright, Jayne Wallace, and John McCarthy. 2008. Aesthetics and experience-centered design. *ACM Transactions on Computer-Human Interaction (TOCHI)* 15, 4 (2008), 21 pages. doi:10.1145/1460355.1460360

[213] Dong Whi Yoo, Michael L. Birnbaum, Anna R Van Meter, Asra F. Ali, Elizabeth Arenare, Gregory D. Abowd, and Munmun De Choudhury. 2020. Designing a Clinician-Facing Tool for Using Insights From Patients' Social Media Activity: Iterative Co-Design Approach. *JMIR Mental Health* 7, 8 (2020), e16969. doi:10.2196/16969

[214] Şerife Tekin and Melissa Mosko. 2015. Hyponarrativity and context-specific limitations of the DSM-5. *Public Affairs Quarterly* 29, 1 (2015), 109–134. https://www.jstor.org/stable/43574516