



## EDITORIAL

# Is it possible to circumnavigate the APIcalypse? On challenges to study mental health in the age of digitalization and AI

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## Technology use and mental health

The world is experiencing a rapid transition from the pre-AI to AI era. This has ushered rapid developments towards broader technology integration in our lives, including the Internet of Things, and this has stimulated new and critical research questions. Scholars have attempted to quantify the effects of technology use (e.g., social media) on social and mental wellbeing. All human interaction with technology leaves a digital footprint from which we can glean key insights into human behavior and varying states of mind, and deepening our understanding of mental health.<sup>1</sup> Digital phenotyping is an incredible advance in understanding the human condition, especially timely as our lives become increasingly digital, but quantifying these human-machine-interactions remains limited by existing methods.

## The APIcalypse is hindering research

A prevailing roadblock to scientific discovery is that Application Programming Interfaces (APIs) are largely closed on social media platforms,<sup>2</sup> therefore not allowing to study what people are actually doing on these platforms or to link their digital footprints to self-reported experiences including mental health topics (before the Cambridge Analytica scandal this was possible). The so called “APIcalypse”<sup>3</sup> led to an overreliance on self-report to gain insights into technology use. Self-report is more suitable to study certain phenomena (e.g., opinions and attitudes, subjective well-being), while objective technology use can quantify patterns of technology use and explore digital footprints and their key insights into mental states or psychological traits.<sup>4,5</sup>

## How can the APIcalypse be circumnavigated?

Programmers can develop bespoke smartphone tracking technologies that can track call behavior, use of certain apps, screen-time and GPS data.<sup>6</sup> Such an approach can

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be combined with ecological momentary assessment, hence asking participants about their well-being, depressive symptoms (or the prodromal signals) or other variables of interest. Unfortunately, using such tracking technologies still requires specialists to ensure proper tracking of the phones and the depth of digital phenotyping allowed also relies to a degree on the operation system (OS) installed on the phones and the policies of the companies behind the OS.<sup>7</sup> A further problem arising from smartphone tracking technologies represents the sandboxing principle: Every app can be seen as a sandbox and although it is possible to track what app is installed and how long it is used, it is very difficult to see how people behave within such an app (for instance to study language use, which is a digital signal linked to depression). With APIs being largely closed and the limitations of smartphone tracking mentioned, one way to still get insights into what people are doing on a certain application can be achieved with data donation portals. For instance, WhatsApp data can be studied using the “ChatDashboard” tool<sup>8</sup> following privacy by design principles. While promising, the data donation solution is also not optimal, because it requires constructing different platform solutions for different applications to study digital footprints.

Other researchers put forward the idea to study Google Trends data to understand what prompts people are

feeding into search engines (or soon, generative AI products). By this, the advantage arises that one can rather easily study what people are interested in at the moment and it is also possible to narrow this down to certain areas of the world to come up with meaningful insights<sup>9,10</sup> – perhaps with these insights being proxies for mental states. The problem remains here though that it is not possible to tie person variables including self-report data to the online queries. Therefore, uncertainties arise regarding the correct interpretation of Google Trends or similar data and the accuracy of interpretation of these data. For example, algorithms are not yet sophisticated enough to differentiate between searches on the topic for a project, versus trying to self-diagnose or seek psychoeducational materials for personal or family relevance. In other words, the motivations behind the queries are not clear at all. The positive aspect about studying Google Trends data compared to the use of smartphone tracking technologies is its much higher degree of privacy, because mobile sensing and digital phenotyping principles relying on individual tracked digital footprints of course face ethical challenges.<sup>11</sup> Studies basing on such principles need to ensure that re-identification of participants is not possible.

For an overview on approaches with their advantages and disadvantages see [Table 1](#).

**Table 1** Advantages and Disadvantages of Studying Digital Footprints with different approaches.

Approach to analyze digital footprints in the context of mental health	Advantages	Disadvantages
Social media data	<ul style="list-style-type: none"> <li>- Getting insights into many variables such as Likes, text information, uploaded pictures providing insights into mental states and traits</li> <li>- With open APIs information on digital footprints could be linked to self-reported (and biological) data – if available</li> </ul>	<ul style="list-style-type: none"> <li>- At the moment, many APIs are closed</li> <li>- Difficulties in linking digital footprints from one platform to behavior on another platform (do people behave differently online when on Facebook via LinkedIn?)</li> <li>- Privacy issues (but can be fixed with privacy by design principles)</li> </ul>
Smartphone tracking technologies	<ul style="list-style-type: none"> <li>- Overview on many relevant phone variables such as screentime, apps used, GPS activity</li> <li>- It is possible to link this data to self-report variables</li> </ul>	<ul style="list-style-type: none"> <li>- Changing policies of operation systems while a study is going on might reduce what is possible</li> <li>- Difficulties in understanding what people are doing within an application</li> <li>- Privacy issues (but can be fixed with privacy by design principles)</li> </ul>
Data donation platforms	<ul style="list-style-type: none"> <li>- In times of closed APIs, one way to understand behavior of people on a respective platform</li> </ul>	<ul style="list-style-type: none"> <li>- Tremendous efforts to create such platforms (and every data donation portal must adjust to the different platforms)</li> <li>- Privacy issues (but can be fixed with privacy by design principles)</li> </ul>
Search engine queries	<ul style="list-style-type: none"> <li>- Easy to harvest data when tools such as Google Trends are openly available</li> <li>- Less privacy concerns</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of possibility of linking self-report data</li> <li>- Interpretation of such queries are blurry</li> </ul>

## Political regulation needs to support independent academics

We believe that studying digital footprints needs to be enabled for independent scientists and initiatives such as the Digital Services Act from the EU<sup>12</sup> hopefully will support to force large platforms to open up their APIs again for the study of relevant questions arising from interacting with these platforms for societies.

Mirroring the EU's Digital Services Act, Asia has pursued similar initiatives to regulate digital platforms and enhance data accessibility for research, with varied outcomes across the region. China, for example, has proactively formulated policies to foster open research data, demonstrated by its national strategies and the creation of data repositories and journals.<sup>13</sup> These moves underscore the growing recognition of open data's significance for scientific progress and societal advantage in Asia.

In contrast, Taiwan's attempt to regulate digital platforms through the Digital Intermediary Services Act (DISA), also inspired by the EU's Digital Services Act, aimed at increasing platform accountability and transparency, potentially including mandates for platforms to open their APIs to facilitate societal engagement. However, DISA faced significant pushback from the public and industry due to concerns over potential encroachments on free speech and ambiguous legal stipulations. Critics highlighted those specific provisions, such as information restriction orders, could lead to censorship and were not sufficiently defined, posing compliance challenges for platforms and enforcement difficulties for courts. This opposition led to the draft being reconsidered and sent back for further review.<sup>14</sup>

This regional divergence in outcomes reflect the broader challenges in Asia's rapidly digitized landscape and considerations in regulating digital platforms and enhancing data accessibility for research. These case studies highlight the delicate balance between regulation, freedom of speech, and the promotion of open data for the collective good.

Of course, research on the re-opened platforms (re-opened APIs) need to be done with oversight from IRBs and sound data protection plans (and also ensuring that the insights derived are used for the public good). As discussed in this short piece, many research questions exist which might not directly fall in the realm of regulation initiatives, but still hold great potential for tackling global mental health. If platforms stay closed here or scientists are not able to find creative solutions to study digital footprints, innovation for the health sciences and power by owning digital data will only be held in the hands of those who are running these platforms.

## Ethical Considerations

Does not apply, as this is no empirical work.

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None.

## Declaration of competing interest

Dr. Montag reports no conflict of interest. However, for reasons of transparency Dr. Montag mentions that he has received (to Ulm University and earlier University of Bonn) grants from agencies such as the German Research Foundation (DFG). Dr. Montag has performed grant reviews for several agencies; has edited journal sections and articles; has given academic lectures in clinical or scientific venues or companies; and has generated books or book chapters for publishers of mental health texts. For some of these activities he received royalties, but never from gaming or social media companies. Dr. Montag mentions that he was part of a discussion circle (Digitalität und Verantwortung: <https://about.fb.com/de/news/h/gesprachskreis-digitalitaet-und-verantwortung/>) debating ethical questions linked to social media, digitalization and society/democracy at Facebook. In this context, he received no salary for his activities. Finally, he mentions that he currently functions as independent scientist on the scientific advisory board of the Nymphenburg group (Munich, Germany). This activity is financially compensated. Moreover, he is on the scientific advisory board of Applied Cognition (Redwood City, CA, USA), an activity which is also compensated. Dr. Hall and Dr. Lin report no conflict of interest.

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