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DOI: 10.21106/ijma.588**COMMENTARY | DIGITAL HEALTH****Digital Well-being Through the Use of Technology—A Perspective****Sudip Bhattacharya, MD<sup>1</sup>✉; Sandip Bhattacharya, PhD<sup>2</sup>; Vidisha Vallabh, MD<sup>3</sup>; Roy Rillera Marzo, MD, MPH, FRSPH<sup>4,5</sup>; Ruchi Juyal, MD<sup>3</sup>; Ozden Gokdemir, PhD<sup>6</sup>**

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✉ **Corresponding author email:** [drsudip81@gmail.com](mailto:drsudip81@gmail.com)**ABSTRACT***“No man is an island unto himself” – John Donne*

According to the World Health Organization, health is “a state of complete physical, mental and social well-being and not merely the absence of disease and infirmity.” Our healthcare industry, public behaviors, and environment have grown exponentially with digital technologies in the era of the 4<sup>th</sup> industrial revolution. Due to rapid digitalization and easy availability of the internet, we are now online round the clock on our digital devices, leaving behind digital traces/information. These digital footprints serve as an increasingly fruitful data source for social scientists, including those interested in demographic research. The collection and use of digital data (quantitative and qualitative) also present numerous statistical and computational opportunities, further motivating the development of new research approaches to address health issues. In this paper, we have described the concept of digital well-being and proposed how we can use digital information for good health.

**Keywords:** • Digital Health • Digital Well-being • Data • Qualitative • Quantitative

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**I. Introduction**

The World Health Organization (WHO) defines health as “a condition of complete physical, mental, and social well-being and not only the absence of disease and infirmity.”<sup>1</sup> In the 4<sup>th</sup> industrial revolution, our healthcare industry, public behavior, and environment have all changed swiftly because of the rapid advancement of digital technologies.<sup>2-4</sup> We are now attached to our digital devices, leaving behind digital traces/information because of growing digitalization and the easy availability of the internet. There has been a recent boom in the use of web

data by social scientists, particularly those interested in demographics. Various statistical, computational, and ethical difficulties arise from the acquisition and use of digital data, and these issues are driving the development of new research methodologies. The healthcare industry could benefit from this.<sup>5</sup>

Being away from our electronic gadgets causes us to experience FOMO—fear of missing out, a condition caused by the pervasiveness of digital technologies in our daily lives. A well-known example of FOMO is a psychiatric ailment known as Nomophobia (fear of being cut off from mobile

phone connectivity).<sup>6-8</sup> For us to evolve as human beings, we need the company of others. In other words, social interaction can alleviate stress, worry, and depression; on the other hand, social isolation can be extremely harmful to one's mental health. Many people spend a significant amount of time each day on popular social media apps and websites such as messenger, Instagram, and Facebook.

Additionally, in 2019, there were 3.484 billion social media users globally, an increase of 9% over the previous year. Many lives have been transformed by social media. The impact of social media and its applications on a wide range of lives is being studied by researchers and intellectuals.<sup>9</sup> Now that we are living in a digital world, exposure has an impact on our social lives and health-related behaviors. The way people seek medical care has also changed due to this enormous shift in the external world and social media contacts. The recent pandemic has made us more comfortable with using social media to communicate with our loved ones rather than meeting them face-to-face. Metaverse, Second Life, and The Sims are popular social media apps for millennial and Gen Z members to develop intimate relationships and to create the ideal virtual life that they are unable to achieve in the real world. For example, LIKE emojis can convey happiness and acceptance of successes, while sad emojis can be used to show sorrow or dejection on the internet.<sup>10</sup> Some individuals post inspirational quotations on social media when they have had a bad day, when they have had a good day, or when they are feeling down.<sup>9</sup> We should not be surprised that people's health-seeking habits have shifted so dramatically because of their extensive use of the internet. When people notice a symptom, they are now more likely to turn to Google rather than their primary care physician. It is crucial that the general population should seek health information from reliable sources, such as their primary care physician due to the increasing prevalence of false and misleading materials on the internet.<sup>10</sup>

There have been changes in health-seeking behavior, as well as gadgets and software that collect and store these data. A wide range of wearable devices, such as live cameras and gaming interfaces, and mobile phone applications, record a wide range

of basic health data in the era of the fourth industrial revolution. Data include pulse rate, heartbeat, oxygen saturation, and calorimeter readings, as well as more complex health information, such as measuring the intraocular pressure,<sup>11-13</sup> the fetal heartbeat,<sup>14</sup> and gait recognition.<sup>15</sup>

Virtual hospitals have been strengthened by the pandemic because patients can plan consultations with professionals worldwide to discuss their health, get an opinion on tests, and receive treatment recommendations via a virtual hospital network. A virtual hospital has been shown to be a godsend in the pandemic because of its accessibility, affordability, ease of doing, vast reach, and money generating. The preceding statements supported how our health and behavior are being affected by the digital ecosystem, making it impossible to separate from our daily lives.<sup>16</sup>

## 2. Health and Well-Being in the Digital Age

People throughout the world have never been more linked than they are today, thanks to the widespread use of digital health and digital technologies. An unparalleled level of technological advancement is taking place. Despite this, there is still a great deal of potential for digital health solutions to improve the health of populations. To hasten the global attainment of health and well-being, international organizations like WHO are turning to digital technology to exploit their full potential.<sup>17</sup> Everyone, everywhere, and at any age can benefit from the World Health Organization's Global Strategy on Digital Health 2020-2025. Digital Health efforts must be directed by a comprehensive plan that incorporates financial, organizational, human, and technological resources to achieve their full potential, whether at the national or regional levels.<sup>18</sup> As part of India's Ayushman Bharat Digital Mission (ABDM), the nation's digital health infrastructure will be given the foundation it needs to thrive. It will be possible in the future to use digital highways to connect the many players in the healthcare ecosystem.<sup>19</sup>

Different authorities have described the concept of digital well-being, fueled by new technology, in different ways it is emerged as a medium for enhancing and improving human well-being over the last decade (UNESCO). When digital technology helps people

achieve their goals, they feel “satisfied” (Google) in an atmosphere characterized by excessive digital communication, a state in which one’s subjective well-being is maintained. When people are in a state of digital well-being they can use digital media in a way that makes them feel comfortable, secure, content, and fulfilled (Gui Fasoli and Carridore). The ideal balance is an individual’s subjective perception between the benefits and drawbacks of mobile connectivity. A combination of emotional and cognitive responses to the integration of digital connectivity into everyday life constitutes this state of mind.

The hallmarks of digital well-being include maximum enjoyment and functional support with little loss of control and functional impairment (Marieke Vanden Abeele). Now it is clear that the concept of DIGITAL WELLBEING will play a significant role in moving forward in terms of public health. Due to many restrictions, digital technology is now part of our daily lives like never before. Work from home and online education have become commonplace in our daily lives, which are increasingly dependent on digital technology.<sup>20</sup> Home confinement, grief, lack of human contact, and many other factors are leading to increased depression and mental health issues in post-pandemic settings.<sup>21</sup> Even if these problems are the result of technological developments, the concept of “digital well-being” suggests that they can be addressed in the same way.

Any time a person uses a digital device, whether intentionally or unintentionally, a digital trace or a footprint is left behind.<sup>5</sup> Health programs (e-health applications) are pre-installed on various mobile phones that record our vitals, which is a fact that few people are aware of. However, the device still has the health information saved on it.<sup>22</sup> Users who are aware of the various health-related programs installed the applications on their digital devices and keep track of health-related events or data on a personal basis. Doctors can use these measurements (such as blood pressure, pulse, respiratory rate, and oxygen saturation) during routine physical exams to make inferences about a patient’s health. Even though this is not widely practiced due to a variety of factors, the most prevalent of which is the digital divide and sub-optimal digital and health literacy (Table 1).<sup>23</sup>

In addition to keeping track of vitals, this data can be used to monitor medication compliance or to prescribe health promotion actions indirectly.<sup>24</sup> Using a patient’s smartwatch, pedometer app, or smartphone application, a doctor can double-check the recommended amount of walking for a diabetic patient. Similarly, oscillometric techniques can be used to track changes in blood pressure in hypertension patients, especially if the medicine is not taken as prescribed. Indirect proof of non-compliance will be sent to the treating physician because of this. New opportunities for innovation and technology have been created by the recent pandemic. Digital devices have been used by patients around the world to monitor their oxygen saturation, which has helped to identify the deterioration of a COVID-19-positive patient’s condition by watching any dip in the oxygen saturation.<sup>25</sup> As a result of the epidemic, virtual wards have been established. The COVID Oximetry Home service and post-hospital assessment models are headed by primary care in the United Kingdom’s virtual ward for remote monitoring of COVID-19 patients.<sup>25</sup> We can utilize digital data as an analog to get a sense of a patient’s “DIGITAL WELLBEING” prior to examination by using it with proper permission/consent. Analyzing digital applications using numerical data can assist patients and doctors in detecting any deviations from normal health and provide remedies in the form of feedback or warning signals.<sup>26</sup> With the patient’s permission, the patient’s social media posts, and chats can also be obtained and analyzed to provide insight into the patient’s mental health. Social media is now being utilized to model mental well-being and to understand the results of healthcare interventions. Psychological diseases including depression, suicidality, and anxiety may now be accurately predicted by computers, thanks to quantitative methods developed by the field’s leading researchers. When someone uses certain trigger phrases in a comment on social media, an alert can be sent, and immediate action is taken to save a life. It is hoped that the review above would aid in mental health monitoring, diagnosis, and treatment planning in the future. The validity of these reviews cannot be evaluated using a standardized procedure, hence more research is required. It is possible to

**Table 1: Attainment of digital well-being**

Data Types	Sources	Types of Health Information can be Gathered	Health Implications
Quantitative	Digital wearable-examples-smart watches, mobile phones with inbuilt health applications	Blood pressure, pulse rate, heart rate, rhythm abnormality, oxygen saturation, physical exercise/ calories burnt, respiratory rate	• Identifying the early warning health-related signals/signs and correction to attain digital well-being.
Qualitative	Social media use/reactions (icons), social media chats/contents, type of social media use duration of use	Motivational/spiritual posts during the crisis phase of life, negative thoughts during the depression	• Time trends and forecasting of individuals' health status and taking appropriate actions.

analyze and predict future health and illness patterns based on digital data, which may then be used to make changes in the healthcare system to meet those needs.<sup>26</sup> To make use of the digital well-being component, health metrics can be matched from a variety of sources, including personal digital devices, physical exams and laboratory studies. This allows for a more comprehensive assessment of health.

### 3. Conclusion and Global Health Implications

To summarize, the concept of “DIGITAL WELL-BEING” is very important to consider in the future and it should be incorporated into our healthcare system. It is high time now to redefine Health by incorporating the “DIGITAL WELL-BEING” component- “a state of complete physical, mental, social well-being, digital wellbeing and not merely the absence of disease and infirmity.”

#### Compliance with Ethical Standards

**Conflicts of Interest:** The authors declare no competing interests.

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#### Key Messages

- ▶ Digital Wellbeing is very important to consider in the future, and its implications for access to healthcare are far-reaching.
- ▶ It is high time that public health practitioners redefined Health by incorporating the “Digital Well-being” component into the overall definition of health and well-being.

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