Received: 15 December 2020 | Accepted: 18 December 2020

DOI: 10.1002/hbe2.249

EDITORIAL

WILEY

How humans behave with emerging technologies during the COVID-19 pandemic?

An unprecedented pandemic, an unprecedented shift, and an unprecedented opportunity are three phrases that we have used to describe the impacts of COVID-19 on human behavior with emerging technologies (Yan, 2020). First, COVID-19 is an unprecedented global pandemic across the world. It has been compared to the Second World War, the Great Depression, and the 1918 Spanish Flu in terms of unprecedented impacts on human behavior. Second, to control the COVID-19 pandemic, various types of human behavior (e.g., shopping, learning, working, meeting, and entertaining) shifted from offline to online, resulting in an accelerated diffusion of emerging digital technologies among ordinary people, while the digital divide further increases between citizens with and without access to the technologies. Third, unprecedented changes in both human behavior shifts and emerging technology diffusion generate an unprecedented opportunity for our research community to study technology-related behavior in the global crisis.

To respond to the unprecedented impacts of the COVID-19 pandemic and to advance the field of human behavior with emerging technologies, the journal has been seeking manuscripts urgently and enthusiastically. In April of 2020, we announced a call for manuscripts for a special issue on *COVID-19 and Human Behavior with Emerging Technologies*. The responses from our community have been overwhelmingly strong ever since. The process of submitting, reviewing, editing, and producing has been unexpectedly smooth given the ongoing pandemic. After about 8 months of work with our diligent authors and thoughtful reviewers, now we are pleased to present to our readers this special issue.

This special issue aimed to address a basic question: How do humans behave with emerging technologies during the COVID-19 pandemic? It has 20 articles, doubling the regular number of 10 articles per issue, which shows clear evidence of overwhelmingly strong responses from our community. These 20 articles strived to answer the basic question of the special issue from five different perspectives, knowledge-synthesis, theoretically, methodologically, empirically, and historically, and consequently have made unique scientific contributions to the field. Based on five different perspectives, we categorized these 20 articles into five sections, which are briefly outlined below. Together, the entire special issue provides one of the most comprehensive descriptions of human behavior with emerging technologies during the COVID-19 pandemic across the world. Its most important scientific contribution is that it has established the first scientific baseline knowledge of complex interactions between human beings and emerging technologies during a major crisis.

The first section of the special issue includes *three review articles*, addressing the basic question of how humans behave with emerging technologies during the COVID-19 pandemic from a knowledge-synthesis perspective. Based on 50-years cognitive science research (e.g., Loftus, 2005), Greenspan and Loftus (2020) have synthesized the extensive literature on effects of misinformation on thoughts, actions, and memories in a concise critical review. They pointed out a shocking fact that the COVID-19 *pandemic* occurs in parallel with the COVID-19 *infodemic*, that is, COVID-19 is currently penetrating both the human body through physical contacts and the human mind through digital contacts at the same time. Given this deep insight into COVID-19, we place this article as the first one of the special issue. The second review by Vargo, Zhu, Benwell, and Yan (2020) could be considered the most comprehensive rapid review at this moment. They have identified and synthesized 281 journal articles from multiple disciplines published before June 2020 in a broad theoretical framework and thus sketched out a large picture of the current knowledge of how humans are using digital technologies during the COVID-19 pandemic. Different from the first two reviews, Mbunge, Akinnuwesi, Fashoto, Metfula, and Mashwama (2020) explicitly focused on emerging technologies for tackling COVID-19. Their review is a beautiful technical synthesis of strengths and challenges of 10 emerging technologies, that is, geospatial technology, artificial intelligence, big data, telemedicine, blockchain, 5G technology, smart applications, Internet of Medical Things, robotics, and additive manufacturing in detecting, monitoring, diagnosing, screening, surveillance, mapping, tracking, and creating awareness. A literature review is a critical step for understanding the state of arts and for advancing scientific knowledge. These three reviews provide a broad context for readers to appreciate the special issue.

The second section of the special issue consists of *two theoretical articles*, addressing the basic question of how humans behave with emerging technologies during the COVID-19 pandemic from a theoretical perspective. Gaspar, Domingos, Brito, Leiras, Filipe, Raposo, and Arriaga (2020) advanced an innovative theoretical model, the Crisis Layers and Thresholds Model. They took the crisis management and crisis communication perspective to consider human responses to COVID-19, stressed the importance of achieving crisis resilience rather than crisis resolution, and suggested a crisis sensing approach mediated with information and communication technologies (especially social media) to monitor social sensors for management of the COVID-19 crisis. As a truly international team, Starcevic, Schimmenti, Billieux, and Berle (2020) took the perspective of public health and

clinic Psychiatry, specified a psychiatric symptom *cyberchondria* (i.e., worrying excessively about health and seeking excessively for online health information), advanced a five-factor model theorizing cyberchondria during public health crises, and provided theory-based suggestions for prevention and intervention of cyberchondria during the COVID-19 pandemic. Theoretical articles are difficult to develop but much needed to advance a field. These two theoretical articles present two latest theorizing efforts in understanding digital technologies and current pandemic and future crises.

The third section has *three methodological articles*, presenting three technological tools, (a) eMoodie for collecting mobile data passively (Domoff, Banga, Borgen, Foley, Robinson, Avery, Gentile, 2020), (b) SCD-MVA for conducting single-case experiments (Moeyaert, Bursali, Ferron, 2020), and (c) thematic maps for visualizing local COVID-19 pandemic development (Li, 2020). The history of science indicates that methodological advances often lead to major research breakthroughs. These three methodological articles, by designing, implementing, and validating new technical tools are examples of what the field really needs to improve the current knowledge significantly.

The fourth section includes *four empirical articles*. We have received about 50 submissions of empirical studies. However, many of them are quite similar, focusing on similar questions about the transition to online teaching and using similar survey methods with simple questionnaires. As a result, many of them have not generated important empirical evidence worth of publication. In contrast, the four empirical studies published in the special issue (Evers, Greenfield, & Evers, 2020; Su, Wu, Li, Xue, Zhu, 2020, Elhai, McKay, Yang, Minaya, Montag, & Asmundson, 2020; Brown & Greenfield, 2020) are thoughtful and innovative, addressing unique and profound research questions and using novel and feasible research methods. Thus, these studies have made significant contributions to the empirical literature on human behavior and emerging technologies during the pandemic. Empirical studies are a foundation of a field of research by describing, explaining, and intervening a wide variety of phenomena scientifically. Overall, our current empirical studies on COVID-19 and emerging technologies are essentially descriptive rather than explanatory or interventional. As demanded by scientific advancement and public health practice, we really look forward to seeing more explanatory or interventional studies in the near future.

The last section consists of *nine case studies*. The first case study (Zhu, 2020) reports an extremely popular video game called *Animal Crossing: New Horizons* that has been played worldwide during the COVID-19 pandemic. This study has drawn attention from major media worldwide after it was recently published online as an Early View paper. The other eight case studies include two from Africa (Hadjeris, 2020; Tarisayi & Munyaradzi, 2020), two from the United States (Haji-Georgi, Xu, & Rosca, 2020; Yan, S., 2020), two from Asia (Mahmood, 2020; Toquero & Talidong, 2020), and two from Europe (Westeren, Kjerkol, Linset, 2020; Zawacki-Richter, 2020). These case studies are priceless, generating authentic historical records about how humans used technologies in battling against COVID-19 across the world. Many of them might inspire and motivate new productive research programs.

The year of 2020 is ending and the year of 2021 is approaching. At present, the COVID-19 pandemic is still taking thousands of lives every day across the world. Humans' battle against it might continue until at least 2024 (Kissler, Tedijanto, Goldstein, Grad, & Lipsitch, 2020). Thus, this special issue marks not only the end of our initial efforts in publishing useful research on COVID-19 and emerging technologies but also the beginning of our continued efforts in disseminating usable knowledge of COVID-19 and emerging technologies. Furthermore, while 2020 is an unprecedented year in the history of human beings, it is also an unprecedented year in the history of scientific research. In early 2020 when the pandemic broke out, we could hardly see relevant publications (e.g., Li, Wang, Xue, Zhao, & Zhu, 2020; Ting, Carin, Dzau, & Wong, 2020). However, within just a few months, hundreds and hundreds of research publications have rapidly been emerging. Many academic publishers (e.g., Wiley) and many journal editors (e.g., three of us) have been overwhelmed by the large number of submissions to handle. More thoughtful, impactful, and innovative studies (e.g., Beaunoyer, Dupéré, & Guitton, 2020; Budd et al., 2020; Ferretti et al., 2020; Ndiaye, Oyewobi, Abu-Mahfouz, Hancke, Kurien, & Djouani, 2020; Sawyer, 2020) have been emerging during the process while we were editing this special issue. We have published three articles (Bao, 2020; Jiang, Chen, Yan, Lerman, & Ferrara, 2020; Skulmowski & Rey, 2020) in Issue 3 of 2020 through an expedited process in responding to the urgent needs before this special issue and will continue publishing COVID-19-related articles after this special issue. We hope that this special issue will inspire more "good work" (Gardner, Csikszentmihalyi, & Damon, 2001). When humans become more effective in adapting to and mitigating against the unprecedented pandemic in the coming months, we will have a better scientific knowledge to answer the question of how humans behave with emerging technologies during global crises and in daily lives.

CONFLICT OF INTEREST

None.

DATA AVAILABILITY STATEMENT

Not required.

Zheng Yan[1]
Rui Gaspar[2,3]
Tingshao Zhu[4]

[1]*Educational and Counseling Psychology, State University of New York, Albany, New York*
[2]*School of Human Sciences, Universidade Catolica Portuguesa, Lisbon, Portugal*
[3]*Catolica Research Centre for Psychological, Family and Social Wellbeing (CRC-W), Universidade Católica Portuguesa, Lisbon, Portugal*
[4]*Institute of Psychology, CAS, Beijing, Beijing, China*

Correspondence

Zheng Yan, State University of New York, Educational and Counseling Psychology, Education 227, 1400 Washington Avenue, Albany, NY 12222.

Email: zyan@albany.edu

ORCID

Zheng Yan https://orcid.org/0000-0002-1252-2928

Rui Gaspar https://orcid.org/0000-0002-0943-6658

REFERENCES

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, *2*(2), 113–115.

Beaunoyer, E., Dupéré, S., & Guitton, M. J. (2020). COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Computers in Human Behavior*, *111*, 106424.

Brown, G., & Greenfield, P. (2020). Staying connected during stay-at-home: Communication with family and friends and its association with well-being. *Human Behavior and Emerging Technologies*, *3*(1).

Budd, J., Miller, B. S., Mannng, E. M., Lampos, V., Zhuang, M., Edelstein, M., … Short, M. J. (2020). Digital technologies in the public-health response to COVID-19. *Nature Medicine*, *26*(8), 1183–1192.

Domoff, S., Banga, C. A., Borgen, A., Foley, R., Robinson, C., Avery, K., & Gentile, D. (2020). Use of passive sensing to quantify adolescent mobile device usage: Feasibility, acceptability, and preliminary validation of the eMoodie application. *Human Behavior and Emerging Technologies*, *3*(1).

Elhai, J., McKay, D., Yang, H., Minaya, C., Montag, C., & Asmundson, G. (2020). Health anxiety related to problematic smartphone use and gaming disorder severity during COVID-19: Fear of missing out as a mediator. *Human Behavior and Emerging Technologies*, *3*(1).

Evers, N., Greenfield, P., & Evers, G. (2020). COVID-19 shifts mortality salience, activities, and values in the United States: Big data analysis of online adaptation. *Human Behavior and Emerging Technologies*, *3*(1).

Ferretti, L., Wymant, C., Kendall, M., Zhao, L., Nurtay, A., Abeler-Dörner, L., … Fraser, C. (2020). Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing. *Science*, *368*(6491), eabb6936.

Gardner, H., Csikszentmihalyi, M., & Damon, W. (2001). *Good work: When excellence and ethics meet*, New York: Basic Books.

Gaspar, R., Domingos, S., Brito, D., Leiras, G., Filipe, J., Raposo, B., & Arriaga, M. (2020). Striving for crisis resolution or crisis resilience? The crisis layers and thresholds model and ICT mediated social sensing for evidence-based crisis management and communication. *Human Behavior and Emerging Technologies*, *3*(1).

Greenspan, R., & Loftus, E. (2020). Pandemics and infodemics: Research on the effects of misinformation on memory. *Human Behavior and Emerging Technologies*, *3*(1).

Hadjeris, F. (2020). Online teaching in the algerian higher education institutions during COVID-19: A meaningful instruction or content transmission? *Human Behavior and Emerging Technologies*, *3*(1).

Haji-Georgi, M., Xu, X., & Rosca, O. (2020). Academic conferencing in 2020: A virtual conference model. *Human Behavior and Emerging Technologies*, *3*(1).

Jiang, J., Chen, E., Yan, S., Lerman, K., & Ferrara, E. (2020). Political polarization drives online conversations about COVID-19 in the United States. *Human Behavior and Emerging Technologies*, *2*(3), 200–211.

Kissler, S. M., Tedijanto, C., Goldstein, E., Grad, Y. H., & Lipsitch, M. (2020). Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. *Science*, *368*(6493), 860–868.

Li, S., Wang, Y., Xue, J., Zhao, N., & Zhu, T. (2020). The impact of COVID-19 epidemic declaration on psychological consequences: a study on active Weibo users. *International Journal of Environmental Research and Public Health*, *17*(6), 2032.

Li, R. (2020). Visualizing COVID-19 information for public: Designs, effectiveness, and preference of thematic maps. *Human Behavior and Emerging Technologies*, *3*(1).

Loftus, E. F. (2005). Planting misinformation in the human mind: A 30-year investigation of the malleability of memory. *Learning & Memory*, *12*(4), 361–366.

Mahmood, S. (2020). Socio-educational implications of technology use during COVID-19: A case study in General Santos City, Philippines. *Human Behavior and Emerging Technologies*, *3*(1).

Mbunge, E., Akinnuwesi, B. A., Fashoto, S. G., Metfula, A. S., & Mashwama, P. (2020). A critical review of emerging technologies for tackling COVID-19. *Human Behavior and Emerging Technologies*, *3*(1).

Moeyaert, M., Bursali, B., & Ferron, J. (2020). SCD-MVA: A mobile application for conducting single-case experimental design research during the pandemic. *Human Behavior and Emerging Technologies*, *3*(1).

Ndiaye, M., Oyewobi, S. S., Abu-Mahfouz, A. M., Hancke, G. P., Kurien, A. M., & Djouani, K. (2020). IoT in the wake of COVID-19: A survey on contributions, challenges and evolution. *IEEE Access*, *8*, 186821–186839.

Sawyer, J. (2020). Wearable internet of medical things sensor devices, artificial intelligence-driven smart healthcare services, and personalized clinical care in COVID-19 telemedicine. *American Journal of Medical Research*, *7*(2), 71–77.

Skulmowski, A., & Rey, G. D. (2020). COVID-19 as an accelerator for digitalization at a German university: Establishing hybrid campuses in times of crisis. *Human Behavior and Emerging Technologies*. *3*(1).

Starcevic, V., Schimmenti, A., BILLIEUX, J., & Berle, D. (2020). Cyberchondria in the time of the COVID-19 pandemic. *Human Behavior and Emerging Technologies*, *3*(1).

Su, Y., Wu, B., Li, S., Xue, J., & Zhu, T. (2020). Public emotion responses during COVID-19 in China on social media: An observational study. *Human Behavior and Emerging Technologies*, *3*(1).

Tarisayi, K., & Munyaradzi, E. (2020). A teacher perspective on the impact of internet shutdown on the teaching and learning in high schools in Zimbabwe. *Human Behavior and Emerging Technologies*, *3*(1).

Ting, D. S. W., Carin, L., Dzau, V., & Wong, T. Y. (2020). Digital technology and COVID-19. *Nature Medicine*, *26*, 459–461.

Toquero, C., & Talidong, K. J. (2020). Instructional strategies for online teaching in COVID-19 pandemic. *Human Behavior and Emerging Technologies*, *3*(1).

Vargo, D., Zhu, L., Benwell, B., & Yan, Z. (2020). Digital technology use during the COVID-19 pandemic: A rapid review. *Human Behavior and Emerging Technologies*, *3*(1).

Westeren, K., Kjerkol, I., & Linset, K. (2020). Effects of COVID-19 on communication, services, and life situation for older persons receiving municipal health and care services in Stjørdal municipality in Norway. *Human Behavior and Emerging Technologies*, *3*(1).

Yan, S. (2020). COVID-19 and technology use by teenagers: A case study. *Human Behavior and Emerging Technologies*, *3*(1).

Yan, Z. (2020). Unprecedented pandemic, unprecedented shift, and unprecedented opportunity. *Human Behavior and Emerging Technologies*, *2*(3), 110–112.

Zawacki-Richter, O. (2020). The current state and impact of Covid-19 on digital higher education in Germany. *Human Behavior and Emerging Technologies*, *3*, 1.

Zhu, L. (2020). The psychology behind video games during COVID-19 pandemic: A case study of animal crossing: New horizons. *Human Behavior and Emerging Technologies*, *3*(1).