

WHITEPAPER

Digital People: Bridging Access Gaps in Mental Health and Healthcare

Erica Lloyd
General Manager,
Healthcare & Education
Soul Machines



soul machines™

The Challenge Of Finding Mental Health Support In A Transactional World

Some call it the 'other' or the 'quiet' pandemic. Reported rates of mental health conditions have grown exponentially over the last few years, perhaps exacerbated by the uncertainty and distress caused by the COVID-19 pandemic.

There is no debate that mental health conditions are a substantial global health issue that's increasing rapidly in prevalence. My millennial daughter says, "Mom it's not one thing, it's this world that is making us all sick." And whether you'd subscribe to this view or not the facts are stark, close to one billion people worldwide are affected by a mental disorder.

Some mental illnesses, including depression, are associated with an increased risk of suicide. Tragically, more than 700,000 people die by suicide every year.¹

Stress has a significant impact on mental health. While a certain amount of stress is a normal part of daily life, when stress becomes overwhelming and prolonged, the risks for mental health problems and medical problems increase. Long-term stress increases the risk of mental health problems such as anxiety, depression, substance use, sleep issues, body pain and muscle tension. Stress also increases the risk of a range of medical problems such as headaches, gastrointestinal issues, a weakened immune system, difficulty conceiving, high blood pressure, cardiovascular disease and stroke.²

Loneliness also plays a significant role in mental health. In recent years, the COVID-19 pandemic, and resultant physical distancing measures, have exacerbated the already widespread social isolation and loneliness experienced by older people. Studies suggest that 20-34% of older people in China, India, United States, Europe and Latin America are lonely, with rates in institutions higher still. We now know that loneliness is not simply a personal state of suffering.

Loneliness and social isolation can lead to premature mortality, and increased risks of cardiovascular disease, stroke, cognitive decline, dementia, depression, anxiety, and suicide.³

Putting these issues into context, it is clear that mental health conditions not only have a significant impact on quality of life and cause suffering to people, their friends and families, but also have large economic costs.

Depression and anxiety alone are projected to cost the global economy an estimated US \$1 trillion annually.⁴ Yet, despite the high prevalence and impact of mental health conditions, the global median government expenditure on mental health is less than 2%.⁵ And with global issues in mental healthcare accessibility triggered by shortages in healthcare professionals, low health literacy, stigma, high cost, and physical restrictions (e.g., living rurally), it's no surprise that serious treatment gaps exist in terms of the supply and demand of mental health care services. Innovations are needed to increase the supply and accessibility of evidence-based mental healthcare.

Technology To Help Reach Those In Need

Soul Machines Digital People (i.e. virtual humans) can, and do, deliver mental health support in a uniquely kind and inclusive way. With a deep science legacy we have created hyper-realistic, embodied conversational agents that use artificial intelligence (AI) techniques to socially and emotionally connect with users (e.g., patients, care-givers, institutions, clients). Our Digital People are new to the world in that they incorporate sophisticated computer-generated imagery and autonomous animation techniques to deliver remote care 24/7/365 to anyone with a computer, tablet, or smartphone and an internet connection.

Soul Machines digital caregivers, companions, coaches, and aids are designed to actively demonstrate emotional intelligence and empathy while engaging with users.

The power here is that users feel something. Users feel seen and heard in the safe, 'judgment and stigma free' space created by their interaction with, and connection to, their own Digital Person. Interestingly, users feel more free to disclose and interact without fear of human or societal disapproval, giving them richer, more impactful treatment opportunities.

Soul Machines Digital People are highly customizable in terms of appearance, ethnicity, language, clothing, background image, voice, and personality. Design choices can be made to optimize suitability to a particular patient population, cultural group, or healthcare application, for a more connected, intimate and impactful support experience.

Digital People engage in multimodal analysis to estimate the emotional state of users from their audiovisual data. These emotional predictions are then used to evoke an empathetic response from the Digital Person in real-time. The Digital Person's Digital Brain incorporates a complex neurobehavioral processing model that enables perception, emotional intelligence, skill sets, autonomous animation, and integration with a natural language engine.

The result is that these Digital People are built to read, hear, see, understand, and respond with appropriate emotions and gestures to create a meaningful and autonomous empathic user experience. In addition, Soul Machines' research psychologists have incorporated rapport-building techniques such as praise, emotional expressiveness, reciprocal self-disclosure, and non-judgmental statements to enhance the engagement between the users and Digital People.

Digital People are clinically accurate and compliant, empathetic, infinitely scalable, and are already playing an important role in bridging healthcare access gaps.

Evidence Of Impact To Support Those Affected With Mental Health Conditions

A number of international studies have been conducted by different research groups with different types of virtual humans. The result is that virtual humans show promise for delivering electronic health (eHealth) interventions that address a broad array of health issues, including but not limited to, mental health, self-management of physical illness, and health behavior changes.⁶

Soul Machines Digital People have been shown to be a practical method of delivering psychological support, including cognitive behavioral treatment and interventions for loneliness, stress, and well-being.^{7,8,9}

Promising results have been seen in ages ranging from young adult through to older adult. Gradually, Digital People are being applied to broader populations and more areas of healthcare, filling roles such as educators, intervention facilitators, interviewers, counselors, and companions.

Soul Machines Digital People have been deployed by the World Health Organization (WHO) and the Pan American Health Organization (PAHO) to inform and support people towards positive behavioral change. PAHO utilizes Pahola and WHO utilizes Florence to educate, motivate, and screen users for alcohol and smoking misuse, and provide information about COVID-19 in eight languages.

Veteran Mental Health - A Way Forward

Virtual humans have also been shown to be acceptable for providing veterans with mental health support and for conducting mental health assessments.¹⁰ Veterans are at greater

risk of mental health conditions and suicide compared to the general population.¹¹ In the United States, veterans accounted for 13.8% of the country's suicide deaths despite only comprising 8% of the population.¹² In recent years, the Veterans Affairs has turned to digital health solutions, such as virtual humans, telehealth, patient portals, and smartphone applications, to support the mental healthcare of veterans.¹³

Veterans were found to disclose more information to a virtual human counselor compared to the standard administration of a post deployment health assessment.¹⁴

Indeed, the perception of privacy and a non-judgmental interaction was reported as benefits of Soul Machines Digital People, in a community sample receiving a stress management intervention.

Opportunity

Soul Machines is dedicated to evolving our technology to meet the delicate and complex needs of users affected with an array of mental and physical health conditions. We are investing heavily in programming resources that develop skills designed to benefit the healthcare industry, partnering with leading organizations, and using accuracy and diligence when reporting all claims and results.

Soul Machines Digital People are able to deliver mental healthcare and well-being assessments in a private, non-judgmental, accessible, and engaging format. Digital People can help reduce distress, facilitate the delivery of eHealth interventions, serve in treatment educator roles, and act as supplemental social support companions. And soon, a Digital Person will be able to obtain user data, via connected sensors which then integrates into a range of patient management systems, to monitor health outcomes and provide a personalized intervention and treatment plan, at home.

It's important to note that Digital People will also be able to administer validated self-report scales and present insights back to the user and their healthcare providers. Automated insights into a user's mental health will be gained from the speech and behavior analysis that Digital People use to predict emotional states. This automated analysis will be especially important for detecting real-time changes in mental health to trigger "just-in-time" interventions. Moreover, automated AI-driven analysis of psychological information presents novel opportunities to detect patterns of change, predictive of negative outcomes that a human might not recognize.

References

- 1 World Health Organization. (2021, October 10). **Key Messages**. WHO.
- 2 Centre for Addiction and Mental Health. **Stress**. CAMH.
- 3 World Health Organization. (2021, July 29). **Seeking shelter from social isolation and loneliness under the tree of friendship**. WHO.
- 4 World Health Organization. (2021, June 17). **Suicide: Fact Sheet**. WHO.
- 5 World Health Organization. (2022, April 8). **Mental Health: Burden**. WHO.
- 6 Chattopadhyay, D., Ma, T., Sharifi, H., & Martyn-Nemeth, P. (2020). Computer-controlled virtual humans in patient-facing systems: Systematic review and meta-analysis. *Journal of Medical Internet Research*, 22(7), e18839.
- 7 Loveys, K., Sagar, M., Pickering, I., & Broadbent, E. (2021). A Digital Human for Delivering a Remote Loneliness and Stress Intervention to At-Risk Younger and Older Adults During the COVID-19 Pandemic: Randomized Pilot Trial. *JMIR mental health*, 8(11), e31586.
- 8 Loveys, K., Antoni, M., Donkin, L., Sagar, M., & Broadbent, E. (2022a). The feasibility and acceptability of teletherapy, a digital human, and a self-guided manual for delivering Cognitive Behavioural Stress Management to healthy distressed adult women: A randomised pilot trial. Manuscript submitted for publication. Department of Psychological Medicine, the University of Auckland.
- 9 Loveys, K., Antoni, M., Donkin, L., Sagar, M., Xu, W., & Broadbent (2022b). The effect of Cognitive Behavioural Stress Management delivered by teletherapy, a digital human, and a self-guided manual on psychological and physiological outcomes in adult women: A randomised pilot trial. Manuscript in preparation. Department of Psychological Medicine, the University of Auckland.
- 10 Rizzo, A., Forbell, E., Lange, B., Galen Buckwalter, J., Williams, J., Sagae, K., & Traum, D. (2012). Simcoach: an online intelligent virtual human agent system for breaking down barriers to care for service members and veterans. *Healing War Trauma A Handbook of Creative Approaches*. Taylor & Francis.
- 11 Pemberton, M. R., Forman-Hoffman, V. L., Lipari, R. N., Ashley, O. S., Heller, D. C., & Williams, M. R. (2016). Prevalence of past year substance use and mental illness by veteran status in a nationally representative sample. SAMHSA Center for Behavioral Health Statistics and Quality, November.
- 12 Department of Veterans Affairs. (2019). National veteran suicide prevention annual report. Washington, DC: Department of Veterans Affairs.
- 13 National Academies of Sciences, Engineering, and Medicine. (2018). Evaluation of the Department of Veterans Affairs mental health services.
- 14 Lucas, G. M., Rizzo, A., Gratch, J., Scherer, S., Stratou, G., Boberg, J., & Morency, L. P. (2017). Reporting mental health symptoms: breaking down barriers to care with virtual human interviewers. *Frontiers in Robotics and AI*, 4, 51.

Thank you to Elizabeth Broadbent, PhD. FRSNZ, Professor in Health Psychology at the University of Auckland, New Zealand and Director AI Psychology Research at Soul Machines, and Kate Loveys, PhD. Honorary Research Fellow at the University of Auckland, New Zealand and Postdoctoral Research Associate at Soul Machines, for their thoughtful comments and critical suggestions on the production of this paper.

About the Author



Erica Lloyd
General Manager,
Healthcare & Education
Soul Machines

Erica is dedicated to the worldwide adoption and deployment of Soul Machines' digital workforce in multiple-scale healthcare and education enterprises and public sector entities. She has a background in technology, innovation ecosystem, and research in the private and public sectors.