

Rethinking technology for an aging population: From active aging to digital aging

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Abstract

Given the rapidly growing older adult population, it is necessary to provide appropriate care and ensure an adequate healthcare workforce. During the COVID-19 pandemic, older adults experienced deficiencies in care and were deprived of face-to-face services. In addition, the shortage of healthcare providers was particularly evident during this period. Conversely, the COVID-19 pandemic accelerated the use of smart technologies, AI, robotics, and wearable technologies, which help reduce the care burden on healthcare providers. However, the adoption of these technologies faces several limitations. These include the top-down approach to technology development, which disregards older adults' priorities and preferences, as well as concerns about cybersecurity, privacy, trust, and costs. Although the use of these technologies offers many advantages for the older adult population, further research is needed to determine their actual effectiveness in accordance with older adults' willingness to use them. More importantly, technology must complement human interaction rather than replace it.

Editorial

Maintaining a high standard of living for older adults requires greater social and economic efforts as the world's population ages rapidly (1). However, traditional services-which primarily rely on in-person, human-dependent interactions with medical and nursing personnel-may struggle to meet these needs given the growing shortage of healthcare workers (2).

The COVID-19 pandemic has exacerbated the shortage of caregivers and medical professionals serving older adults, representing a significant challenge in this context. Simultaneously, the pandemic-related increase in technology use among older adults has created a valuable opportunity to implement digital solutions that improve health outcomes and promote independence (3).

In general, research on digital aging is currently in a Janus-faced state. On the one hand, the body of research on the positive and negative effects of digitalization on older adults' quality of life has expanded substantially worldwide over the past 20 years (4).

Simultaneously, the rapid development of digital technology has profoundly affected older adults' lives. These technologies can reduce social deprivation, increase social interaction, promote activity, and improve healthcare in the long term. Such changes foster active and healthy aging (5). The Internet of Things (IoT), robotics, artificial intelligence (AI), Ambient and Active Assisted Living (AAL), and other emerging technologies have considerable potential to support independent living, improve quality of life, and enhance physical and psychological health. Among these technologies, fall-prevention devices, wearable technologies, and AI-based health applications are particularly important. More broadly, AI-driven solutions are regarded as transformative tools in senior care, offering novel ways to preserve health and promote independence (6,7). These technologies can also reduce the burden on caregivers, potentially resulting in more targeted and higher-quality care (8).

Nevertheless, despite their importance, these technologies have not gained substantial traction. One significant obstacle is the common "top-down" design methodology, which frequently disregards users' perspectives, preferences, and practical constraints in favor of assumptions made by technologists or, at best, geriatricians (9). Providing education and information about technology use is therefore crucial and may be undertaken by younger family members or expert instructors. Education regarding these technologies and the involvement of older adults in designing or developing devices intended for them are

essential; otherwise, older adults may become more dependent on others when performing their daily activities (10).

The current approach to developing and designing digital information technologies for older adults appears to be criticized on several grounds. First, many recommendations focused on simplicity fail to account for the diversity of older adults' experiences and implicitly contain ageist assumptions. For example, they frequently assume diminished cognitive and perceptual capacities or a lack of interest in sophisticated technologies, neither of which applies universally (11). Recent reviews emphasizing "age-related deficiencies" and "technological illiteracy" in research further demonstrate this problem (12). Consequently, these perspectives may reinforce the notion that older adults are weak, incapable, or vulnerable (13,14).

Furthermore, in both home and workplace environments, robots and AI can assist with Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), and Enhanced Activities of Daily Living (EADL). However, interacting with smart technologies remains more challenging for many older adults than the technologies themselves. Therefore, coordination among stakeholders, technologies, and older users is necessary to establish effective human-AI collaboration (4). Research findings indicate that usability, costs, privacy, and trust are the most important considerations for older adults when responding to technology. Social stigma, low digital literacy, concerns about dependency, and a lack of relevance to their needs are barriers to technology acceptance among older adults (15).

Nevertheless, excessive dependence on smart technologies can introduce new risks. In sensitive domains such as health and finance, older adults may not recognize errors or inaccurate information, potentially resulting in biased decision-making and reduced independence. In addition, they are particularly vulnerable to online threats such as phishing, identity theft, misinformation, and data breaches (16).

In conclusion, research has shown that the application of technology can help improve older adults' well-being; however, it has not yet addressed its long-term effects, including cybersecurity attacks, inadequate infrastructure in developing countries, and limited internet access. Although these technological applications can facilitate social interaction, they should be regarded as temporary or complementary solutions, particularly during emergencies. These technologies must not replace face-to-face interactions and close human relationships. Finally, one important question remains to be answered: Do these technologies improve older adults' sense of well-being in everyday life?

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Author Contributions

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The author declares that no artificial intelligence tools were used in the preparation or writing of this manuscript.

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