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Empowering Ageing: Navigating the Future of Digital Healthcare for Older Adults – a Rapid Review of Perspectives and Challenges

Amina Singh-Mehta, Philipp Nixdorf, Sophia Schulz

(Prof. Amina Singh-Mehta, University of Applied Management Studies, Oskar-Meixner-Straße 4-6, 68163 Mannheim, amina.singh-mehta@hdwm.org)
(Prof. Philipp Nixdorf, University of Applied Management Studies, Oskar-Meixner-Straße 4-6, 68163 Mannheim, philipp.nixdorf@hdwm.org)
(MA Sophia Schulz, University of Applied Management Studies, Oskar-Meixner-Straße 4-6, 68163 Mannheim, sophia.schulz@hdwm.org)

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1 ABSTRACT

Digital health offers innovative and promising solutions addressing the challenges of an ageing population. The pandemic has shown the advantages of treating and monitoring patients with assisted technology and their cost-effectiveness. Several studies demonstrate that older people can benefit from assisted technology to monitor their health, manage their medication and treatment, and receive online consultations by healthcare providers. Nevertheless, a growing literature show conflicting results with respect to the integration of digital devices for older people in practice. Integration of digital health means to explore how different processes are employed, incorporated and connected with each other in order to realise a positive outcome for older people. Recent studies demonstrate that older people use the internet in diverse ways and a gender gap has been noticed in the way older men and older women make use of modern technology in everyday life. Moreover, some studies suggest that Ageism would pose a risk of excluding older people to use digital health. However, some focus on older people's experiences and perceptions which determine the use of digital technology and the meaning for them. Hence, there is a sparse understanding of how digital health is implemented and experienced by older people in practice. Therefore, this paper provides a rapid review of the gaps of knowledge and understanding in how digital health is implemented, perceived, and experienced by older people.

The objectives are: 1. To examine the practical applications and effectiveness of assisted technology in the care of older adults, specifically focusing on health outcomes. 2. To descriptively map the key themes and trends in assisted technology for older adults, aiding in the formulation of targeted future research priorities. By addressing these objectives, this paper aspires to contribute to the advancement of digital health for older adults, offering insights that can inform policy, practice, and future research endeavours.

Keywords: planning, smart homes, digital health, ageing, elderly

2 INTRODUCTION

It is estimated that the global population of people aged 60 years and over will increase to 1.4 billion by 2030 and 2.1 billion by 2050 (WHO, 2024). This means that the way healthcare is structured needs to adapt to the complex health needs of this distinct population. Since the pandemic, digital technology has come to the forefront and is increasingly being integrated into healthcare, with huge potential to access health services remotely at any place and time. This was particularly pertinent during the height of the COVID pandemic. Without this opportunity, many vulnerable people of all ages would have had a disadvantage with respect to their experiences of health during periods of lockdown. The incorporation of digital healthcare in the medical field raises significant issues concerning access, technical literacy, and the possibility of worsening inequality among older adults. This necessitates a review of healthcare systems to ensure that they prioritize the unique preferences, requirements, and values in this age group while remaining person-centred. Therefore, the focus of our paper is on older people, examining the implications of digital healthcare and exploring how it is experienced, implemented and perceived by them to discover insights that can inform the creation of more inclusive, accessible, and effective digital healthcare solutions that meet the specific needs of older adults.

Digital health confronts us with two major concepts: namely 'health' and 'digital'. So, the question arises what brings these two seemingly contradicting terms together? In essence, 'digital' refers to data or signals being recorded, stored, expressed, and transmitted as series of digits, 1 and 0 (Odone et al. 2019). It serves as the foundation for technical processes of how information is processed and delivered as well as how

transitional changes are recorded and managed (Iyamu et al. 2021). Throughout the evolution of the internet, digitization has been integrated into health to improve health outcomes Rowlands (2020). Since the development of the first computers, there have been significant strides in health informatics. Once hardware and software were introduced in the 1960s, data-processing applications were applied in hospitals (Rowlands 2020) to support healthcare processes. With the maturity of the internet and the development of Artificial Intelligence (AI), a breakthrough occurred with developing health apps and wearable devices (Rowlands 2020). This all has significantly led to a new approach of health management and delivery away from traditional concepts.

The conceptual understanding of "health" has been elaborated upon many times and modern concepts of health agree that this is dynamic and relative (Svalastog et al. 2017). To make social health care services operational the World Health Organization (WHO) defined health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" in 1948. Since then, this definition has been debated by many scholars regarding the wider and multi-sided understanding of this concept. Van Druten et al. (2022) analysed the literature of this concept and concluded that 'health' can be viewed from a subjective, professional, and philosophical perspective. This implies different meanings in different settings. Therefore, Krahn et al. (2021) define it as follows: "health is the dynamic balance of physical, mental, social, and existential well-being in adapting to conditions of life and the environment". This reconsideration of the concept has led to a broader understanding that includes the following dimensions: a) health is dynamic and varies along a continuum, b) it is multi-dimensional, c) health is distinct from function, d) balance is achieved through adaptation, and e) health is influenced by social and environmental influences (Krahn et al. 2021).

There is still a lack of common understanding what "digital health" means (Fatehi et al. 2020; Rowlands, 2020; Wienert et al. 2022). Nonetheless, we will endeavour to explore the commonalities of different definitions and concepts under this umbrella term and help in bridging the gap between technology and health. The WHO (2024) provides a broad definition of digital health as "the field of knowledge and practice associated with the development and use of digital technologies to improve health." It is an expansion of the concept of eHealth and many other terms appear to be used inter-changeably such as mHealth, telehealth, telemedicine, and assisted technology. The main idea behind this concept is to enhance the delivery, efficiency, and processes of healthcare delivery. One of the major challenges is determining how this concept can be integrated into existing health concepts such as public health (Wienert et al. 2022). An exploration of the literature suggests that the focus of digital health is on the management of health and illness rather than the proper use of technology itself (Fatehi et al. 2020; Ronquillo et al. 2023). By 'proper use,' we mean that assisted technology should not be viewed solely as a mandatory tool but as a meaningful aid to achieve certain well-being and overall health goals for individuals. This also means that digital health is a tool that allows care coordination processes in an efficient manner and provides patients with more control and autonomy over their health management rather than being controlled by the digital health (Rowlands 2020).

Most definitions of digital health agree that it is about the integration of digital technologies to achieve public health goals and improve health outcomes in an efficient manner (Iyamu et al. 2021). The features of digital technologies such as "personalisation and precision" (enhancing the training of professionals and patients through AI), "automation" (make a process work automatically), "prediction" (using electronic data to inform AI and non-AI prediction models), "data analytics" (facilitating the sharing of large amounts of data), and "interaction" (monitoring and interpreting health through communication) can be summarized as a conceptual framework of digital technologies (Odone et al. 2019). Three main perspectives have been suggested by Iyamu et al. (2021) to encapsulate the complexity and comprehensiveness of digital technologies in health care practices as 1) "Digitization" (the technical process of converting existing analogue records to digital data), 2) "Digitalisation" (reflecting the cultural shifts necessary to incorporate and sustain technologies in healthcare delivery) and 3) "Digital transformation" (encompassing fundamental changes to the culture, operational models and goals of public health services). It means that technologies not only assist and support processes in healthcare services but also transform the quality and management of healthcare. Most definitions agree that there is a fundamental shift in the way healthcare is going to be delivered by placing the patient at the centre. This grants patients the ability to take control over their health and health behaviour, enabling them to be more autonomous than ever before.

This paradigm shift towards preventive, proactive health and data-driven decision making involves benefits and challenges (Bangare et al. 2023). Patients have the chance to oversee their own health and health behaviour change is increasingly centred in the hands of patients. However, this does not come without important challenges that need to be considered for a successful practice implementation. Data protection and privacy are one of the factors that need attention to protect personal patient information and to ensure the secure sharing of this data electronically with other professionals or agencies. In addition, several studies have shown that there are gender gaps and a digital divide in internet usage among younger and older people (Bangare et al. 2023; Fadzil et al. 2023; Lu et al. 2022; Shi et al. 2023; Wang et al. 2023). To combat health inequalities, there is a need to adopt a multidisciplinary approach that considers psychosocial and economic differences among populations to streamline healthcare. Older people face unique challenges due to age-related changes of varying degrees alongside possessing diverse levels of digital literacy. However, there is significant potential for older people to be digitally inclusive when guided with the right information and interventions (The Lancet Digital Health, 2023).

Therefore, the aim of this paper is to explore how digital health is experienced, perceived, and adopted by older people through undertaking a rapid review of the literature. This has the potential to inform future research and healthcare programmes, aiming to improve health outcomes and the patient experience for older adults. A rapid review is useful when there are time constraints and policy-makers or professionals have to make immediate decisions (Moons et al. 2021). Whilst systematic reviews are more detailed and focus on using statistical techniques to synthesize the data from several studies and hence, they are more time-consuming (generally between 6 months and 2 years) , rapid reviews tend to be more time-efficient (Hamel et al. 2021). Because rapid reviews are not as detailed as systematic review, there is a risk of bias. Therefore, the Cochrane Collaboration has established the Cochrane Rapid Reviews Methods Group to outline the standards (Garritty et al.2021). Our approach was to use this as a guideline for formulating the research question, limiting our searches, and analyzing the sources found into a comprehensive yet timely manner. The intention is merely being descriptive, so future research programs can be developed to inform healthcare practices.

2.1 Search strategies

The literature search was undertaken by using the following databases Google Scholar, Medline, Medline Plus PubMed, and EBSCO. The first step involved to create a list of Mesh terms which is shown Table 1 below.

Search terms and combinations
(Digi* AND acc*) AND old* people* , (Home* AND care*) AND (digi* health*)
(Digi* AND tech*) AND (old* AND people*)
Experience* AND (digi* AND care*)
(digi* AND health* AND tech*) AND (care* AND old* AND adult*) AND COVID-19*
(Internet* AND tech*) AND (old* AND people*) OR (eld*)
(digi* AND engage*) AND (old* AND age*)
(Digi* AND health* AND/OR care*) AND adopt* AND old* people*
(Digi* AND health* AND/OR care*) AND intervent* AND old* people*
Tech* AND (support* AND old* people*)
(Digi* AND health* AND/OR care*) AND adopt* AND old* people*
virtual* AND Real* AND old* People* OR adult*
health* AND inform* AND old* People* OR adult*
(Digi* AND health* AND/OR care*) AND (care* AND transition*)

Table 1: Mesh Terms and combinations of terms

Two authors (ASM and GC) undertook the searches using these Mesh terms above independently. The papers were included on an Excel spreadsheet which was shared as a document amongst all the authors. The first stage involved screening the titles and abstracts concerning digital health and older people. The second stage involved screening the collection of papers against our inclusion and exclusion criteria. The third stage involved a thorough reading of each included paper by four authors (ASM, GC, AT, SS) independently and making an assessment on the quality on the papers using the CAT (Critical Appraisal Tool) by Joanna Briggs Institute (2017). The process of screening is shown in the PRISMA flow Diagram 1 below. We included n=59 for our descriptive analysis and used a thematic analysis approach according to Braun and Clarke (2006).

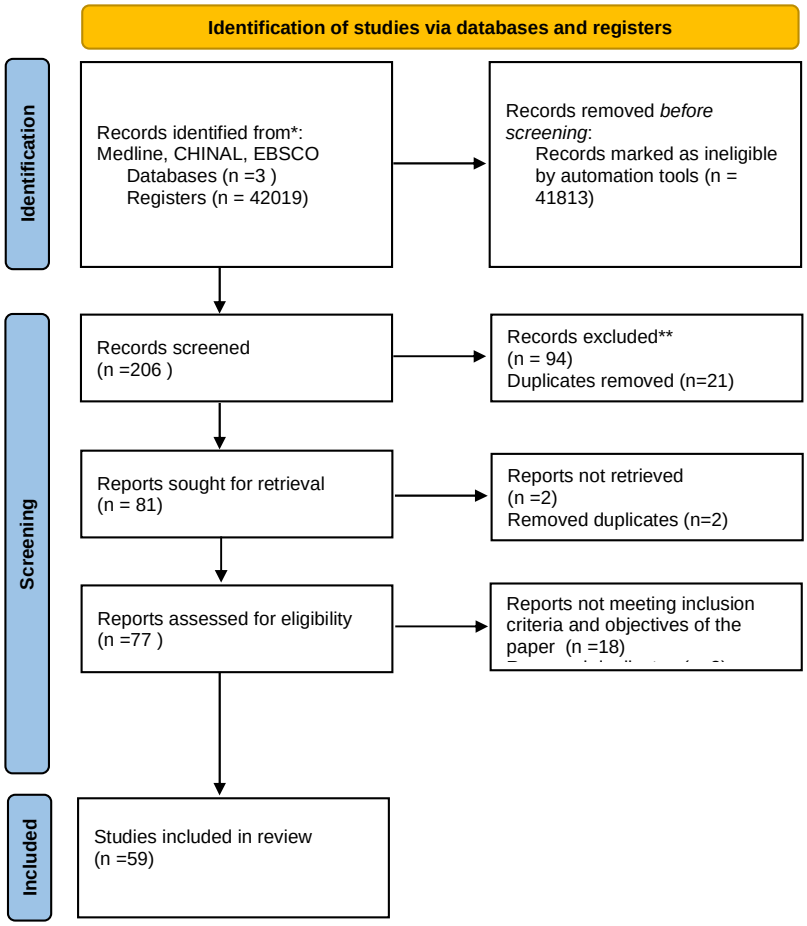

Diagram 1: PRISMA Flow diagram

2.2 Inclusion Criteria

Studies published after 2019 were included, thus setting a marker for the beginning of the pandemic and with this the acceleration of digital healthcare technology. As many studies define older people at the age of 60 and above, we used this as a cut-off age. We also considered cross-sectional studies focussing on older adults 60 and above as well as younger than 60 comparing older and younger age groups. Specifically, illnesses and disabilities related to older age groups such as dementia, frailty, cognitive impairment, and geriatric care were included. There were no restrictions as such to certain illnesses and chronic conditions. Systematic reviews, meta-analysis, scoping reviews, or umbrella reviews were also considered. Studies were also considered that focus on the evaluation or intervention of digital health devices by older people. We considered quantitative, qualitative and mixed methods studies, randomized controlled trials (RCTs), observational studies, and empirical research related to training on digital healthcare for older people. As some studies were conducted in Asia, Australia and the United States, this helped us to broaden the scope and fine-tune our understanding of how older people are ageing with health technologies and the factors influencing their behaviour and digital usage within this context. Papers written in English and German languages were considered. In addition, we also considered conference papers and abstracts and dissertations focussing on digital healthcare for older people.

2.3 Exclusion Criteria

We excluded papers published before 2019 that focused on adults younger than 60 years of age. Studies that only looked at medical records, diagnostics, and prescriptions, or social inclusion without any focus on health were also excluded. Additionally, we did not consider papers that focused on social inclusion, caregivers' or practitioners' experiences, or the general population. Empirical research that focused on general internet use unrelated to health was also not considered. Furthermore, we did not include e-health apps or databases used by healthcare professionals to diagnose illnesses as they did not align with our research objectives for this review.

3 FINDINGS

The final analysis included n=59 papers for this review of which 20 were review papers, 11 were concerned with interventions, 2 were randomised controlled trials, 18 were qualitative studies, 2 were quantitative studies, 3 were cohort studies and 3 mixed methods studies. A narrative synthesis was performed to present the findings according to Popay et al. (2006). This approach of presentation is useful when you have diverse sources of information and comparing different factors. Hence, we have summarised the findings into two themes: Assisted technology in diverse contexts, Dimensions of assisted technology implementation.

3.1 Assisted technology in diverse contexts

The use of assisted technology was studied in the selected papers with different intentions, focussing on barriers and facilitators, and by including a diverse sample size. In the following two sections, this will be elaborated in more detail.

3.1.1 The context and intention of study

In our review the research-evidence of the presented papers provided a diverse and rather 'patchy' picture in which context assisted technology was used and implemented. These contexts pertained to the use of wearable devices (Moore et al. 2021; Peng et al. 2021; Wu et al. 2023), telehealth (Ding et al. 2023; Hullick et al. 2022; Jiang et al. 2022; Raja et al. 2021 Sari et al. 2023), few studies focussed on smart home technology for older people (Aggar et al. 2023; Facchinetti et al. 2023; Oyiobi et al. 2023). Three studies used a pre-and post-intervention study design (Aggar et al. 2023; Sari et al. 2023; Tuena et al. 2023). Many studies focussed on the physical outcomes of older people such as examining how mobility and functionality improved over time by implementing assisted technology (Dermody et al. 2020; Oyibo et al. 2023; Pais et al. 2020; Ren et al. 2023; Sari et al. 2023) and rehabilitation and risk of falls (Gasper & Lapao, 2022; Tuena et al. 2023; Zak et al. 2023). Few studies also focussed on whether assisted technology was feasible in a particular context such as a tele-home-based exercise program by Sari et al. (2023) or an eHealth home-based intervention to improve dietary and physical activity (Gomes et al. 2021). Some studies showed lack of detail in reporting their findings and came to conclusions that assisted technology was helpful based on small sample sizes (Chang et al. 2021; Guo et al. 2022; Hullick et al. 2022;Kim et al. 2023). A few studies focussed on behaviour change such as diabetes management (Balsa et al. 2020; Ren et al. 2023).

3.1.2 Barriers and facilitators

Since many of our papers were systematic reviews followed by scoping reviews, the quality of their reporting varied significantly. Many focussed on how assisted technology impacted physical health and quality of life (Oyibo et al. 2023; van Acker et al. 2023; Wu et al. 2023; Zak et al. 2022; Zasvlasky et al. 2019). Some specifically focussed on barriers and facilitators whilst using assisted technology for older people (Kebede et al. 2022). Although the reporting varied in these reviews, they still reported similar trends pertaining to the fact that assisted technology was helpful and improving physical health and overall functioning. User engagement was reported in some studies and revealed that older people are interested and accepted to use assisted technology (Aslan et al. 2024; Gomes et al. 2021; Steng et al. 2022; Wanyonyi et al. 2022) , but they still experience barriers that hinder them to feel confident and they feel uncertain (Wilson et al. 2021; Zoorob et al. 2022). When interpreting these findings, one must consider that some studies have used samples from larger population studies (Brunzini et al., 2023; Kouri et al. 2023; Linn et al. 2021) which questions a bias towards the cohort group chosen.

3.1.3 Profile of older people

Participants across the studies ranged in age from 51 to 94 years, with a significant focus on older adults, specifically those aged 60 and over. One study using a cross sectional design recruited participants from age 18 up to 64. This includes a diverse age representation within the older adult population, from early retirement to advanced age, highlighting a broad interest in ageing populations across different health contexts.There is a mixed gender representation, with a noticeable proportion of studies including more females, especially in studies with older adults. However, specific studies also highlight a balanced or male-dominant participation. The sample sizes of the studies varied significantly, with some as small as 7 participants and others as large as 6183 participants. This demonstrates a broad spectrum of study scales ranging from individual case studies to large-scale surveys and interventions.

The participants come from varied health backgrounds, including dementia-free community dwellers, individuals with mobility and vision problems, people living with dementia undergoing telehealth exercise programs, and participants with conditions like asthma or COPD using digital mHealth devices. Many studies focus on older adults without specific health conditions but aim to understand the impact of interventions on general health, mobility, or disease prevention. A notable number of older adults live alone, focusing on individuals who may require additional support or interventions tailored to solitary living conditions.

Various studies have been conducted between 1998 and 2024 in different parts of the world, such as Asia, Europe, the Middle East, and mainly developed countries. This indicates a broad geographical distribution, with more emphasis on affluent regions. Few studies involved low-income participants, highlighting the need for interventions catering to people from different socioeconomic backgrounds.

3.2 Dimensions of assisted technology implementation

3.2.1 The practical dimension

In many qualitative studies undertaken older people reported positive as well as negative benefits using assisted technology (Ferreira-Brito et al. 2024). Intrinsic and extrinsic barriers were identified by some studies (Jakobsson et al. 2019; Korkmaz et al. 2022; Moore et al. 2020; Raja et al. 2022; Tu et al. 2021; van Acker et al. 2023;Wilson et al. 2022;). Facilitators mostly pertained to the engagement and availability of a healthcare professional and ability to live independently. At the same time, this can be equally a barrier, if a professional is not available to help and this in turn could hinder older people to use digital technology. This has not been specified in the studies we examined though. However, barriers that caused anxiety and being wary of assisted technology were related to physical capability of using it, the convenience of logging in and reading icons, safety concerns were reported in most studies and data protection (Aslan et al. 2023). One study clearly stated that older people felt that the human contact could not be replaced (Raja et al. 2021). Hence, assisted technology for older people is a supportive mechanism to their health maintenance rather than a complete tool to manage their health.

3.2.2 E-health literacy variation within this population

There is indication in some studies that older people require time to feel confident with assisted technology and build up their efficacy which is often positively reinforced by professionals' support to train them or their family (Cao et al 2023; Kebede et al. 2022; Tu et al. 2021). Often there is missing information on how much digital experience and skills those older people had who participated in the studies we selected. Whilst some older people may have had prior experience with digital technology during their working years (when they were mostly younger), the oldest members of this population may have had little or no exposure to technology. This presents a challenge when it comes to developing assisted technology that can cater to the entire cohort of older individuals.

3.2.3 Emotional experience

Using digital health for older people entailed many aspects to their emotional journey. We identified n=18 qualitative studies focussing on the experiences and perceptions of older people in relation to using digital health. Motivation, confidence to use it, feeling connected to their healthcare provider, and understanding the purpose of why digital technology might be helpful in their situation were critical during the implementation of digital health technology (Acker et al. 2023; Aslan et al. 2024; Fothergill et al. 2023; Lindberg et al. 2021). For many study participants the following factors played a critical role whilst using digital health care pertaining to their relationships, efficacy, motivation, safety and autonomy (Aslan et al. 2024; Fothergill et al. 2023; Moore et al. 2020; Raja et al. 2021).

4 DISCUSSION

This paper intends to provide a rapid review of the gaps in knowledge and understanding in how digital health is implemented, perceived, and experienced by older people. For this we developed the following two objectives: 1. To examine the practical applications and effectiveness of assisted technology in the care of older adults, specifically focusing on health outcomes. 2. To descriptively map the key themes and trends in assisted technology for older adults, aiding in the formulation of targeted future research priorities. Overall,

one can say that primary research studies and review studies vary in their aims and overall objectives indicating that older people are a complex population and chronological age may not be sufficient enough when exploring how assisted technology should be implemented. Nonetheless, most studies agree that older people face extrinsic and intrinsic barrier that determine their experience using digital health technology.

The review emphasizes the importance of older adults' health and their overall well-being, with a particular focus on the integration of digital health technologies. The study participants belong to diverse age groups, have varying health conditions, and live in different situations, reflecting the complexity of ageing and highlighting the need for individualized and accessible health interventions. Although the studies' geographical distribution is diverse, most are concentrated in developed countries, indicating a potential gap in research from less developed regions or diverse cultural contexts. Our review confirms Berridge et al.'s (2019) study that multicultural contexts and individual profile should be considered. The various interventions and methodologies used in these studies demonstrate the dynamic and multifaceted nature of digital health and ageing research, highlighting the challenges and opportunities in improving health outcomes and quality of life for older adults.

Numerous studies have found that women are more prevalent in participant samples due to their longer life expectancy. Therefore, digital health research requires a gender-sensitive analysis and it is essential to understand that older women's engagement with technology is influenced by various factors such as life experiences, societal roles, and individual capabilities. The Cumulative Advantage/Disadvantage theory (Merton 1968) suggests that differences in technology use and confidence among older women may be rooted in lifelong social and economic factors. Historically, women are more likely to assume homemaker roles, resulting in fewer opportunities to interact with technology in professional settings, potentially leading to lower efficacy in using digital tools in later life.

This perspective emphasizes the need for digital health initiatives to consider gender dynamics and how historical and societal contexts influence technology use among older adults. Tailoring digital health interventions to address these unique challenges and leveraging theories of lifespan development can enhance the effectiveness and accessibility of technology for older women, ensuring that digital health solutions are inclusive and supportive of all users' needs. We have encountered no study focussing on specifically older people with migrant backgrounds as this could have played crucial role in the level of ehealth literacy, language and cultural factors impacting it. Our review confirms that digital health cannot fit everyone and needs to be tailored according to the individual needs of older people (Berridge et al. 2019; Peng et al. 2021) and that chronological age as an inclusion criterion alone may not be suitable for research design. Hence, we propose incorporating different criteria for recruitment when designing a study that could be based on common comorbidities or health conditions rather than age.

5 CONCLUSION

As we explore the ever-changing landscape of digital health, it is important to realize that a one-size-fits-all approach is no longer practical, especially regarding the unique needs of older adults. Integrating digital technologies into healthcare has opened new opportunities to improve quality of life and health outcomes. However, we still have a long way to go to achieve genuinely inclusive digital health. The diversity among older adults, not just in age but also in gender, lifestyle, cultural background, and health status, highlights the need for more personalized, adaptable, and culturally sensitive health solutions.

This requires a significant rethink of digital health interventions. Future research should not only focus on understanding the unique experiences of underrepresented groups, such as older women and migrants but also on developing technologies that are as dynamic and varied as the populations they aim to serve. By embracing this diversity, we can unlock the full potential of digital health to empower every older adult, making technology an aid and a cornerstone of healthy ageing. As we move forward, we should be guided by older adults' diverse voices and experiences, ensuring that the digital health revolution is inclusive and equitable. The age of personalized digital health is here, and it promises a brighter, healthier future for all.

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