

DIGITAL THERAPY FOR ELDERLY: A REVIEW STUDY OF ADVANTAGES AND EFFECTIVENESS

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Abstract

The aging global population has led to a surge in chronic conditions and age-related disorders, placing immense pressure on healthcare systems worldwide. Digital therapy interventions tailored for the elderly have emerged as innovative solutions to address these complex healthcare challenges. This review explores the benefits and effectiveness of digital therapy interventions for elderly populations, focusing on their impact on mental health, emotional well-being, and quality of life. Key advantages identified include enhanced accessibility, reduced loneliness, improved cognitive health, and strengthened emotional resilience. Furthermore, the study highlights the potential of digital therapies to integrate elements of spiritual values, catering to the holistic needs of elderly users. By synthesizing existing evidence, this review offers valuable insights for healthcare practitioners, researchers, and policymakers, emphasizing the transformative potential of digital technologies in an increasingly digitalized healthcare landscape. The findings underscore the importance of designing inclusive, user-centered interventions that address both functional and emotional needs, paving the way for future innovations in elderly care.

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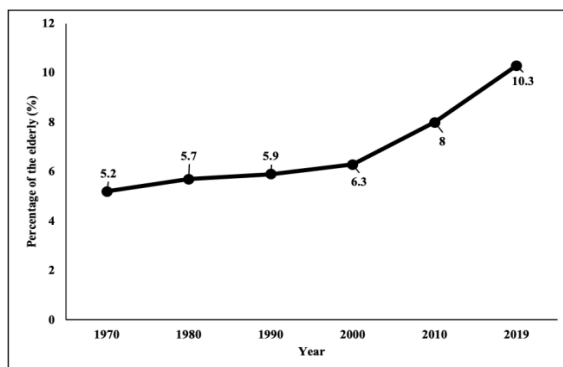
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Introduction

The World Health Organization (WHO) has recognized by 2030, 1 in 6 people in the world will be aged 60 years or over. At this time the share of the population aged 60 years and over will increase from 1 billion in 2020 to 1.4 billion. By 2050, the world’s population of people aged 60 years and older will double (2.1 billion). The number of persons aged 80 years or older is expected to triple between 2020 and 2050 to reach 426 million (World Health Organization: WHO, 2022). This can be attributed to the fact that the population of the world is growing older and sick, and developing more chronic diseases and other age-related conditions that strain the health care facilities.



Sources: Department of Statistics Malaysia (2019a)

Figure 1: Percentage of the elders in Malaysia, 1970-2019e

Figure 1 shows the number of elders in Malaysia from 1970 to 2019, however, the value in 2019 is only an estimation. Figure 1 shows the increase in the number of elders from 1970 to 2019, with an annual increment of 546,000 in 1970 to 3.4 million in 2019. (Md Nor & Ghazali, 2021). Although conventional healthcare delivery systems have some weaknesses that make them inadequate in addressing such needs, digital therapy has the potential to be a solution in the case of the elderly. However, it is still unknown how digital interventions can help to enhance the mental health, emotional state, and quality of life of the elderly digital users.

In the same way, it is important to determine how digital interventions can help mitigate issues of social isolation, improve access, and incorporate aspects of spirituality to produce a more comprehensive strategy. This issue calls for a critical assessment of the advantages and disadvantages as well as the prospects of digital health technologies in the management of the elderly. Digital therapeutics is a newly defined class of digital health that uses digital technologies (for example; apps, the Internet, and text messaging) to provide health treatments that are proven effective and have demonstrated outcomes (Kaufman, n.d.). Besides, digital therapeutics (DTx) use software to treat, prevent and manage diseases and conditions. It offers better care, personalization, empowerment and lower healthcare costs (Ahlqvist & Kalliola, 2021). Based on Table 1 below, the table shows the digital health categories for patients, professionals and healthcare providers.

Table 1: Digital health categories

	For patients			For professionals	Healthcare provider
Category of solution	Patient-facing wellness	Patient-facing diagnostics and monitoring	Patient-facing therapeutic interventions	Services for healthcare professionals	Enterprise systems
Description	Solutions that support personal health	Solutions used to diagnose or monitor patients	Solutions that deliver medical interventions	Solutions for healthcare professionals	Solutions for core healthcare providers
Examples	<ul style="list-style-type: none"> Wellness apps Activity tracking Wearables Medication reminder 	<ul style="list-style-type: none"> Remote monitoring Clinical wearables Digital diagnostics 	<ul style="list-style-type: none"> Digital therapeutics Non-DTx medical devices (such as an insulin pump) 	<ul style="list-style-type: none"> Electronic health record Point-of-care tools Telehealth Decision support systems 	<ul style="list-style-type: none"> Tools for admin and management Predictive analytics

Sources: *How can digital therapeutics help Europe?* (Ahlqvist & Kalliola, 2021)

Nowadays, digital technologies or digital therapeutics have become a part of human lives. People are utilizing these technologies in almost every task of their daily life. The advanced developments in the healthcare field introduced digital technology-based health solutions to people. With the help of these technologies, older people can now reside in their homes independently and take care of their health without burdening caregivers (Yousef Jasemian, 2008)

This study aims to review the benefits and effectiveness of digital in healthcare for the elderly. The objectives of the study are as follows:

- To assess the advantages of digital therapy for the elderly
- To analyze the effectiveness of digital therapy interventions

The remaining part of this study is organized in the following way: Section 2, literature review of this study. Next, Section 3, presents the methodology of this study. While in Section 4, this study explains the reviewing of the papers and finally in Section 5 are findings of this study. To conclude this study was in section 6.

Literature Review

Presented in this study is a review of related works that support the title of digital therapy for the elderly. All equivalent literature reviews (LR) within this study are from previous researchers for a better understanding of the research.

Elderly population

Based on OECD Data, the Organisation for Economic Co-operation and Development (OECD) 2024, the elderly population is defined as people aged 65 and over. The share of the dependent population is calculated as the total elderly and youth population expressed as a ratio of the total population. The elderly dependency rate is defined as the ratio between the elderly population and the working-age (15-64 years) population (*OECD Labour Force Statistics 2022, 2023*).

According to Shamser Singh, in clinical guidelines, a person aged 65 years or more is typically referred to as "elderly" (Singh & Bajorek, 2014). Based on the CDC notes that by 2060, nearly a quarter of the U.S. population will be aged 65 years or older, reflecting significant growth in the older adult population (Tsao et al., 2023). Besides, healthy aging, as defined by the WHO, involves maintaining the functional ability and well-being in older age, emphasizing the importance of physical, mental, and social health (World Health Organization: WHO, 2022).

Digital Therapy

Digital therapy also known as digital therapeutics (DTx) is a subdivision of digital health, which represents a collection of technologies, products, and services across healthcare and wellness industries (Chowdhury & Chakraborty, 2017).

Now more people have started using digital solutions for their health check-ups. People use web/mobile health apps, smartwatches, fitness bands, and personal medical devices (BP monitors, Glucometer, Oximeter etc.) to get updated about their daily health conditions. In general, younger people mostly use these solutions, or we can say that older adults (above 60 years) face difficulties while using these products or services for many reasons. The world's population is ageing fast, which will increase the demand for healthcare solutions. (Nautiyal et al., 2022)

According to Sara Santini, Digital therapy is the use of technology for mental health treatment, whereas digital interventions are technology-based strategies for health improvement (Santini et al., 2023). Furthermore, based on Quenza website, digital therapy platforms, also known as behavioural health platforms, are online platforms that enable individuals to access mental health services remotely. These platforms provide a virtual space where individuals can connect with licensed therapists, psychologists, and other mental health professionals (*Digital Therapy for Mental Health: Unveiling Telemedicine's Potential - Quenza*, 2023)

According to NIHR Maudsley Biomedical Research Centre (2024), Digital therapies are software-based therapies that can be offered as blended or standalone therapies, replacing time-intensive treatments. They can enhance existing therapeutic methods and they also help standardise the delivery of interventions (Wierzbicki, 2018)

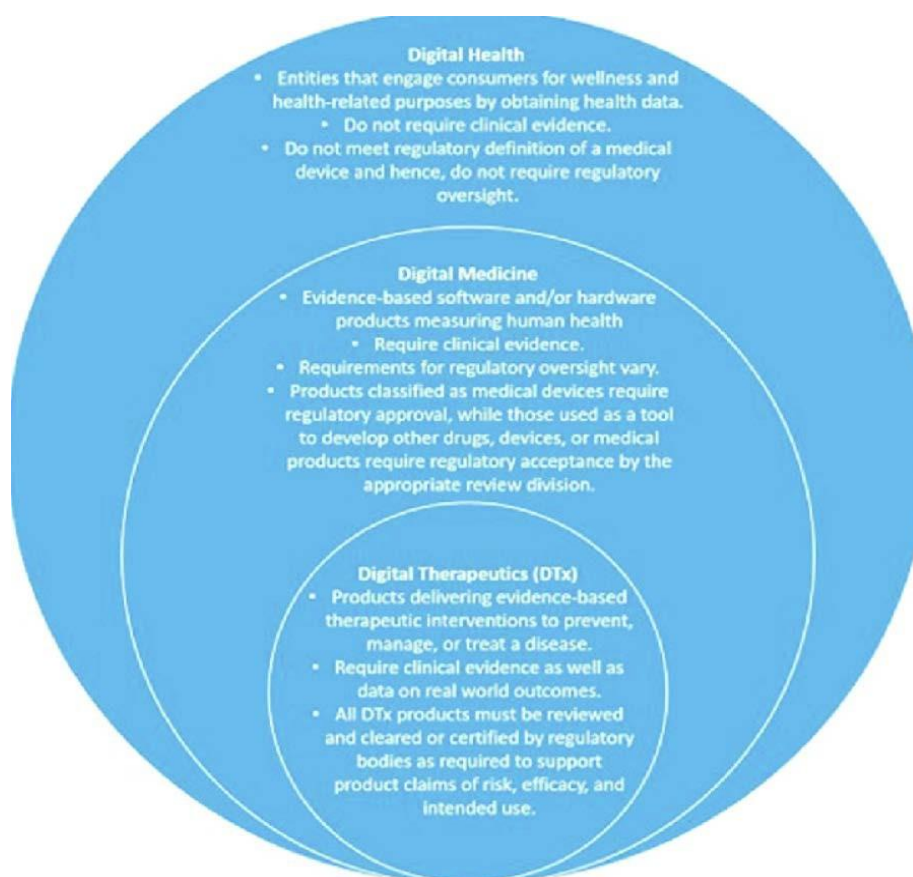
Digital Health

Based on the article Digital Health, Digital Medicine, and Digital Therapeutics in Cardiology, digital health is a comprehensive concept of the utilization of information and communication technology (ICT) for all medical, nursing care, or healthcare support (Nomura, 2023)

Besides, some articles from (Frishammar et al., 2023) Digital healthcare platforms (DHPs) represent a relatively new phenomenon that could provide a valuable complement to physical primary care – for example, by reducing costs, improving access to healthcare, and allowing patient monitoring. The article from the National Library of Medicine mentions that digital health refers to the proper use of technology for improving the health and well-being of people and enhancing the care of patients through the intelligent processing of clinical and genetic data (Smits et al., 2022)

According to the article Digital Health Interventions for promoting healthy aging, digital health is digital health technologies may benefit older adults through enhanced access, monitoring, and self-care. Besides the article from Kasoju, Digital health interventions refer to the use of digital technology and connected devices to improve health outcomes and healthcare delivery. This includes telemedicine, electronic health records, wearable devices, mobile health applications, and other forms of digital health technology (Kasoju et al., 2023)

Differentiate between digital health and digital therapy



Source: (Difference between Digital Health, Digital Medicine, and DTx Products... | Download Scientific Diagram, n.d.)

Figure 2: Difference between Digital Health, Digital Medicine and Digital Therapeutics (Dtx).

The picture in Figure 2 shows that each has a different function in treating users, especially the elderly. Digital health engages consumers for wellness and health-related purposes by obtaining health data, whereas digital therapy, or digital therapeutics, is the product that delivers evidence-based therapeutic intervention to prevent, manage, or treat a disease. Meanwhile, there is an opinion from the JogoHealth website mentions, that Digital health includes digital medicine, which includes digital therapeutics. In contrast, digital therapeutic products have varying clinical evidence with varying levels of risk and therefore have varying regulatory guidelines. Digital health is the intersection of healthcare and technology (*Digital Therapeutics Solution VS Digital Health*, n.d.)

Methodology

This study begins by searching academic databases such as PubMed, Google Scholar, PsycINFO, and IEEE Xplore using keywords related to digital therapy, elderly, advantages, and effectiveness. For example, search for combinations like "digital therapy for elderly review," "digital interventions for older adults' effectiveness," or "technology for senior health advantages." This study evaluates the titles and abstracts of the search results to identify relevant articles that discuss the advantages and effectiveness of digital therapy for the elderly. This study pays attention to inclusion criteria such as the focus on digital interventions, outcomes related to older adults' health and well-being, and study design.

Discussion

A review of the advantages and effectiveness of digital therapy for the elderly

Table 2: Advantages of digital therapy for the Elderly

Number	Study of research	Method of use	Reduce Loneliness	Advantages	
				Accessibility & Convenient	Enhanced Cognitive Health
NP01	(Dong et al., 2023)	Meta-analysis	/	/	x
NP02	(Wang & Huang, 2023)	Prototype system development	/	/	/
NP03	(Shah et al., 2021a)	Systematic Review and Meta-analysis.	x	/	x
NP04	(Dequanter et al., 2021)	A Systematic Review	/	/	/
NP05	(Lestari, 2023)	A literature review using three databases: Scopus, PubMed, and Web of Science	x	/	/
NP06	(Sen et al., 2022)	Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)	/	/	/
NP07	(Boucher et al., 2022)	Retrospective analysis of real-world user data	/	/	/
NP08	(Balki et al., 2022)	A Systematic Umbrella Review	/	/	/

Based on NP01, an advantage of the Digital Health Literacy (DHL) intervention improves health status and management in older adults by reducing loneliness. Besides, this intervention is convenient because it can be used in face-to-face education and web-based education and it is also important based on this study's demographic. This study cannot provide proof for the target user especially older adults and its must further research may be needed to address the skills gap in this population.

An advantage of NP02, the digital gaming system is important in promoting social interaction among elderly users, including a sense of community and reducing social isolation. This study includes the nostalgic element to enhance enjoyment and significantly mitigates feelings of loneliness by connecting users especially elder people with fond memories from their past. Besides, this study was designed with simple and user-friendly interfaces, these systems are highly accessible to elderly individuals, ensuring ease of use. Furthermore, such digital gaming systems support active aging by enhancing both cognitive and motor abilities, making them particularly beneficial for slightly disabled elderly individuals.

NP03 used meta-analysis to study the impact of digital technology interventions (DTIs) on loneliness among older adults. Based on this study, despite the variety of digital interventions used, no conclusive evidence indicated their success in reducing feelings of loneliness among older adults. Futhermore, the

analysis showed no evidence supporting the effectiveness of DTIs, which included social internet-based activities, videoconferencing, and customized platforms, in alleviating loneliness in this demographic. Given these findings, future research should focus on conducting larger randomized controlled trials to better assess the effectiveness of these interventions and potentially identify more successful approaches (Shah et al., 2021b).

Based on NP04, this study supportive web platforms showed positive effects on reducing loneliness to the elderly. This study also has provided the educational and supportive web platforms for caregivers are also prevalent, offering valuable resources and support to those caring for older adults (Dequanter et al., 2021). Furthermore, this study shows cognitive training technologies showed positive effects on older adults' cognition and it had positive effects on behavioral symptoms of dementia.

The study of NP05 shows that the technology based on intervention does not reduce loneliness for the elderly. Besides, the technology based on intervention can provide access to emotional support and social interaction and it can also help the elderly can connect with family, friends, and resources.

The advantages of study NP06, show that technology reduces social isolation in older adults, for example, loneliness. That technology affordable and accessible technology benefits older adults and it is also can connect families, provide healthcare resources, and enhance wellbeing. The technology devices address cognitive needs in older adults.

NP07 show that older adults experienced improvements in subjective well-being and anxiety using digital well-being interventions. Based on this study, the older engaged with digital intervention, showing accessibility and convenience. This study also indicates older adults engaging at the recommended level showed improved cognitive health which led to enhanced subjective well-being and reduced anxiety. In closing NP08, the advantages of this study technology intervention can reduce loneliness through ICT and videoconferencing. Besides, the technology interventions offer rapid deployability and convenience for older adults. Furthermore, this study also improves social connectedness in older adults (Balki et al., 2022).

Table 3: Effectiveness of digital therapy for the Elderly

Number	Study of research	Method of use	Effectiveness		
			Mental Health Improvements	Emotional Well-being	Quality of life
NP01	(Dong et al., 2023)	Meta-analysis	/	/	/
NP02	(Wang & Huang, 2023)	Prototype system development	/	/	/
NP03	(Shah et al., 2021a)	Systematic Review and Meta-analysis.	x	x	x
NP04	(Dequanter et al., 2021)	A Systematic Review	/	/	/
NP05	(Lestari, 2023)	A literature review using three databases: Scopus, PubMed, and Web of Science	/	/	/
NP06	(Sen et al., 2022)	Preferred Reporting Items for Systematic	/	/	/

		Reviews and Meta-Analyses (PRISMA)			
NP07	(Boucher et al., 2022)	Retrospective analysis of real-world user data	/	/	/
NP08	(Balki et al., 2022)	A Systematic Umbrella Review	/	/	/

Based on NP01, NP02, NP04, NP05, NP06, NP07 and NP08, the result shows that the effectiveness of mental health improvement, emotional well-being and quality of life were present to the user especially the elderly. Unfortunately, in the study of NP03, the results show the opposite. The effectiveness that was studied did not show that digital technology interventions benefited users of the elderly group. The use of digital technology intervention does not help and studies encourage the use of real human intervention.

Finding

This study needs to be researched by using a large number to test the user especially old adults or elderly for the effectiveness of digital technology intervention. This study cannot use only one place and it must be different types of the elderly for example demographics of the users. Besides, most of the study focuses on the memory of the elderly and their usage of technology and does not more focuses to the internal like spiritual.

Future Recommendation

The future of this study suggests applying artificial intelligence to digital therapy. For example, capturing facial expressions using a smartphone camera will detect the body temperature high blood pressure or illness of the user especially the elderly. Based on the article Drug Discovery Today, suggests research into health analytics and artificial intelligence (AI), their implications, and risks in the context of DTx. For example, motion capturing via smartphone cameras, as with Kaia Health, produces large data amounts for designing personalized training programs and validates and optimizes these programs over time via real-world evidence. (Vasdev et al., 2024)

Conclusion

This study about digital therapy for the elderly encompasses a range of interventions delivered through digital platforms to address various health and well-being concerns among older adults. Reviews and studies have detailed the advantages and effectiveness of such interventions. Advantages include reduced loneliness, accessibility and convenience, and also enhanced cognitive health. While some studies suggest potential benefits in quality of life, emotional well-being, and mental health improvement.

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