

Loneliness and Social Isolation of the Elderly: A Digital Transformation Intervention

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Abstract

In contemporary times the issue of elderly care has become a pressing concern, with many elderly individuals finding themselves separated from their families. The World Health Organization reported that 1 in 4 older people experience loneliness and social isolation. Studies have found that this has serious consequences on the elderly's physical and mental health and longevity of life. Hence there is a need to find a solution to reduce the effect of loneliness and social isolation on the elderly population. This paper focuses on the importance of technology, particularly social media platforms in this era of digital transformation in mitigating the challenges faced by the aging generation who found themselves separated from their families. It addresses the impact of technology on vulnerable groups of society, particularly the elderly. The discourse is hinged on the Technology Acceptance Model (TAM), Social Cognitive Theory, and Diffusion of Innovations Theory. The paper underscores the importance of addressing digital literacy and the perceived usefulness of technology among the elderly. This paper recommends the use of social media for elderly connectivity and incorporating digital literacy initiatives. It advocates for a proactive approach to harnessing the potential of social media to enhance the quality of life for elderly individuals. This is by recognizing the transformative power of technology and promoting digital inclusion initiatives, stakeholders can ensure that aging populations remain actively engaged, connected, and valued in an increasingly digitalized world.

Keywords: Loneliness, Social Isolation, Elderly, Digital Transformation

Introduction

In contemporary times, the global population of the elderly is rising at an unprecedented rate. According to the United Nations, people aged 60 years and above are projected to increase from 962 million in 2017 to 1.4 billion by 2030 and 2.1 billion by 2050 (United Nations, 2017). In Nigeria the elderly population is also growing, the report of the United Nations DESA (2019) shows that the population of Nigerians in this age category is estimated to increase from 9.1 million in 2019 to 11.5 million in 2025, and to 25.5 million in 2050. This demographic shift is largely due to increased life expectancy and declining fertility rates. The growing elderly population presents numerous societal challenges, particularly regarding healthcare, social services, and economic support.

A significant challenge the elderly face is the prevalence of loneliness and social isolation (NASEM,2020). Loneliness is a subjective feeling when elderly social needs are not

met in terms of quality and quantity of social relationships. On the other hand, social isolation occurs when the elderly have little or no contact with other people for a long or short period. However, loneliness and social isolation are different but interconnected as loneliness can lead to social isolation when it is persistent. (Cacioppo & Cacioppo, 2018) Loneliness and social isolation are global issues for the elderly population. A recent survey by the University of Michigan's National Poll on Healthy Ageing (2023) reveals that one-third of older adults reported loneliness and social isolation due to limited social contact, The World Health Organization (2021) reports that 1 out of 4 elderly people suffer from loneliness and social isolation. These figures are expected to rise due to increasing life expectancy and the growing number of elderly individuals living alone or in institutional care settings (Victor *et al.*, 2020). However, further research indicates that the occurrence of loneliness and social isolation among the elderly can vary significantly based on geographic location, social networks, and individual health status. (Holt-Lunstad, 2021)

These issues of loneliness and social isolation arise from various factors, including the bereavement of a spouse or close friend, reduced mobility, retirement, and the migration of younger family members (Victor *et al.*, 2020). Loneliness and social isolation have been linked to adverse health outcomes, such as increased risks of cardiovascular diseases, depression, cognitive decline, and even mortality (Ojembe & Kalu, 2018). World Health Organization, (2021) reports that one in four older adults experiences these detrimental conditions, highlighting the urgency of addressing this public health concern.

Many studies have examined interventions for mitigating the effects of loneliness and social isolation, especially among the elderly by health and social care providers such as promoting social engagement through physical activities, volunteering, structured programmes, and technology-based intervention (Gardiner *et al.*, 2018; Ojembe & Kalu, 2019; Zaharia *et al.*, 2024), The issue of loneliness and social isolation with its detrimental effect on the elderly is also of great concern to social workers who work with the elderly population to enhance their social and emotional well-being. Social work is a practice-based profession and an academic discipline that promotes social change and development, social cohesion, and the empowerment and liberation of people. Principles of social justice, human rights, collective responsibility, and respect for diversity are central to Social Work. Underpinned by theories of social work, social sciences, humanities, and Indigenous knowledge, social work engages people and structures to address life challenges and enhance well-being (IFSW, 2014)

One of the fastest-growing populations that social workers provide services to in recent times is the aging population. Aging adults face many challenges in our society. Social workers are at the forefront of tackling the growing issue of loneliness and social isolation among the elderly and this was demonstrated during the COVID-19 pandemic. (Weger & Morley, 2020). These Geriatric social workers are professionals trained to address the unique challenges older adults and their families face. They help families understand the physical, emotional, and financial changes that accompany aging and work with them to develop coping strategies and resilience, especially in tackling the growing issue of loneliness and isolation among the elderly.

The emergence of digital technology offers promising solutions to mitigating loneliness and social isolation among the elderly. Innovations such as social media platforms, virtual

communication tools, and specialized devices like Komp, tailored for the elderly with minimal technological experience, have shown the potential to maintain and enhance social connections. These tools can provide meaningful communication opportunities with families and friends, by facilitating meaningful interactions and providing access to information and support networks. Technology can significantly improve the quality of life for elderly individuals when used in care settings and homes. (Frontiers, 2024) However, the effectiveness of these digital interventions depends on the elderly's acceptance and ability to use these technologies.

The paper examines the reality and prevalence of loneliness and social isolation among the elderly population, the risk factors and consequences of loneliness and social isolation on the elderly, are discussed using various research findings. The role of technology, particularly social media platforms, in mitigating the challenges of loneliness and social isolation among the elderly is examined by discussing the potential of digital transformation in enhancing elderly connectivity by perusing related academic papers. The paper aims to provide practical recommendations for incorporating digital literacy initiatives and promoting the utilization of technology among older adults to reduce loneliness and social isolation among the elderly. Through the application of technology assistance Model (TAM), Social Cognitive Theory (SCT), and Diffusion of Innovations Theory (DIT), the paper seeks to underscore the importance of a proactive approach in leveraging the transformative power of technology to improve the quality of life for the elderly.

The impact of loneliness and social isolation on the mental and physical health of the elderly is intense and multifaceted. Recent research highlights that social isolation and loneliness significantly increase mortality risks, with effects comparable to smoking and obesity (Holt-Lusted, 2021). Loneliness has also been linked to chronic illnesses, including cardiovascular diseases, high blood pressure, and weakened immune function, which make the elderly more vulnerable to infections (Cacioppo et al., 2020). Also, Social isolation and loneliness have also been linked to various mental and physical conditions, including depression, anxiety, cognitive decline, Alzheimer's disease, and premature death (WHO, 2021). Prolonged social isolation has been associated with cognitive decline and increased risks of dementia, including Alzheimer's disease and the psychological effects of loneliness have also been found to exacerbate feelings of helplessness, thus lowering the quality of life among older adults (Novotney, 2020).

Various interventions that have been implemented to address loneliness and social isolation among the elderly, ranging from community-based programs to technological solutions. Community-based interventions often involve social clubs, volunteer opportunities, and support groups to foster social connections among older adults (Chen, 2021). These programs can be effective but often face limitations such as insufficient funding, accessibility issues, and varying levels of engagement among participants (Gardiner et al., 2018).

Digital interventions have also been used to mitigate social isolation or loneliness in older adults by facilitating social interaction or by delivering programs or services (Welch *et al.*, 2023). While these digital tools offer innovative ways to maintain and enhance social connections, they are not without limitations. Many elderly individuals face barriers to technology adoption, such as lack of digital literacy, physical impairments, and limited access to devices and Internet services (Seifert *et al.*, 2019). Moreover, the effectiveness of technological interventions can be hindered by usability issues and the perceived relevance of

technology in the lives of the elderly. A study by Tsai *et al.*, (2020) found that while technology can help reduce feelings of loneliness, it often fails to address the underlying causes of social isolation, such as physical mobility limitations and loss of close relationships.

Digital transformation refers to the integration of digital technology into all areas of life, fundamentally changing how individuals and communities operate and deliver value. In the context of elderly care, digital transformation encompasses the adoption of various digital tools and platforms aimed at improving the quality of life for older adults. This includes the adoption of Electronic Health Records (EHRs), telemedicine, remote patient monitoring, and other technologies that support data analytics, AI-powered diagnosis, and personalized medicine. (Ojeka, 2023).

The relevance of digital transformation to elderly care is multifaceted. It addresses critical issues such as accessibility to healthcare, social engagement, and overall well-being. With the increasing number of elderly individuals living alone or in institutional settings, digital tools offer practical solutions for maintaining social connections and accessing necessary services. For instance, telehealth services enable remote consultations, reducing the need for travel and making healthcare more accessible for those with mobility challenges (Smith *et al.*, 2020).

Social media platforms have emerged as powerful tools for enhancing social connectivity among the elderly. These platforms offer various benefits that can help mitigate feelings of loneliness and social isolation. Social media allows elderly individuals to stay in touch with family and friends, regardless of geographical distances. Platforms like Facebook, WhatsApp, TikTok, Snapchat, Skype, Zoom, and Instagram enable regular communication through messages, calls, and video chats (Nkosi *et al.* 2020). Online communities and groups provide a space for elderly individuals to share experiences, seek support, and engage in discussions on topics of interest. This fosters a sense of belonging and community (Okeke *et al.*, 2023).

Social media platforms are rich sources of information and resources related to health, wellness, and hobbies. Elderly individuals can access educational content, participate in virtual events, and stay informed about current events (Oluwaseun *et al.*, 2020). Also, regular use of social media platforms can improve mental health by reducing feelings of loneliness and depression. It offers an avenue for social interaction, which is crucial for mental well-being (Assefa *et al.*, 2021).

The transformative power of technology in addressing loneliness and social isolation among the elderly cannot be overstated. Technology, particularly social media platforms, has the potential to revolutionize the way elderly individuals connect with their loved ones and their communities. By providing tools for enhanced communication, access to information, and virtual social interactions, technology can significantly improve the quality of life for the elderly population. The integration of digital tools into elderly care programs can lead to greater social engagement, reduced feelings of loneliness, and improved mental health outcomes. (Chopik *et al.*, 2020) Moreover, technology can empower elderly individuals by fostering independence and self-efficacy. When elderly users become proficient in using digital tools, they gain confidence in their ability to navigate the digital world, which can translate into greater autonomy in other aspects of their lives. (Franco, D. 2020).

In Japan, the government has implemented digital initiatives to support the elderly and combat social isolation (Japan Up Close (2022)). One notable example is the use of robots like “Pepper” in care settings in the U.K. and Japan which facilitate communication and social interaction to reduce feelings of loneliness and improve the mental health of the elderly. These robots are equipped with social media capabilities, allowing elderly individuals to interact regularly with family members and other residents. (Papadopoulos, 2024). In Nigeria, digital transformation has also played a crucial role in mitigating loneliness and social isolation among the elderly, particularly during the COVID-19 pandemic. Social media platforms were used to maintain social networks within families and communities. Initiatives such as virtual religious services and online community meetings became vital for keeping the elderly engaged and connected. These efforts have shown significant positive impacts on the mental and emotional well-being of older adults. (Adedeji et al, 2023)

Theoretical Framework

Technology Acceptance Model (TAM): Conceptualization and Relevance to the Elderly

The Technology Acceptance Model (TAM), developed by Davis (1989), is a widely used framework for understanding how users come to accept and use technology. According to TAM, two primary factors influence an individual's decision to use a new technology: perceived usefulness and perceived ease of use. Perceived usefulness is the degree to which a person believes that using a particular technology will enhance their performance or quality of life. Perceived ease of use refers to the extent to which a person believes that using technology will be free from effort. For the elderly, these factors are particularly pertinent. As individuals age, they may become more cautious about adopting new technologies due to physical limitations, cognitive changes, or a lack of familiarity with digital tools. Therefore, technologies designed for elderly users must clearly demonstrate their benefits and be easy to use (Fasoli *et al.*, 2023). For example, a social media platform that helps elderly individuals stay in touch with family members can be seen as useful if it enhances their social interactions and reduces feelings of loneliness. Similarly, if the platform has an intuitive interface and requires minimal technical skills, it will likely be perceived as easy to use. The relevance of TAM to elderly technology adoption is also reflected in the necessity to provide appropriate training and support. Educational initiatives that highlight the practical benefits of technology and offer hands-on experience can enhance perceived usefulness and ease of use, thereby increasing acceptance among older adults (Paul & Spiru, 2023)

Social Cognitive Theory: Its Application to Elderly Technology Adoption

Social Cognitive Theory (SCT), formulated by Bandura (1986), emphasizes the importance of observational learning, imitation, and modeling in behavior acquisition. SCT posits that people learn from one another through observation, imitation, and modeling, which involves attention, retention, reproduction, and motivation. Key components of SCT include self-efficacy, or the belief in one's ability to succeed in specific situations, and outcome expectations, which are the anticipated consequences of a behavior. Applying SCT to elderly technology adoption involves understanding how older adults learn to use new technologies by observing peers, family members, or caregivers who demonstrate their use. For instance, an elderly person may be more inclined to try using a tablet or smartphone if they see others in their social circle successfully

using these devices and enjoying their benefits (Shao et al., 2023). The role of self-efficacy is crucial here; elderly individuals who believe they can effectively use technology are more likely to adopt it. Programs that build digital literacy should thus focus on enhancing self-efficacy through positive reinforcement and step-by-step guidance (Tsai et al, 2021). Moreover, outcome expectations play a significant role. If elderly individuals anticipate that using technology will improve their social connections or provide entertainment, they are more likely to adopt it. Therefore, demonstrating the positive outcomes of technology use through testimonials and success stories can be an effective strategy for encouraging adoption among older adults (Kim & Choi, 2022).

Diffusion of Innovations Theory: Understanding the Spread of Technological Solutions Among the Elderly

Diffusion of Innovations Theory, developed by Rogers (2003), explains how, why, and at what rate new ideas and technologies spread through cultures. The theory identifies several key elements that influence the diffusion process: the innovation itself, communication channels, time, and the social system. Innovations are more likely to be adopted when they offer a clear relative advantage, compatibility with existing values and practices, simplicity, trialability, and observable results (Yusuf et al, 2020).

In the context of elderly technology adoption, these elements are critical. The relative advantage of technology, such as enhanced communication with family or improved access to healthcare, must be apparent to elderly users. Compatibility with their existing lifestyle and values is also important; for example, technologies that respect privacy and are designed to be non-intrusive are more likely to be accepted (Gitlin et al, 2019). Communication channels play a vital role in spreading awareness about new technologies among the elderly. Word-of-mouth, social networks, and trusted community leaders can significantly influence the adoption process. For instance, elderly individuals may be more inclined to try a new device if recommended by a provider or a peer who has had a positive experience with it (Lee et al, 2022).

The time factor involves the rate at which different segments of the population adopt an innovation. According to Rogers, adopters can be categorized as innovators, early adopters, early majority, late majority, and laggards. Understanding these categories helps tailor strategies to different groups within the elderly population. Early adopters among the elderly, who are typically more open to new experiences, can serve as role models and influence the late majority and laggard

Strategies for Improving Digital Literacy

Improving digital literacy among the elderly requires targeted strategies that address their unique needs and challenges. Effective strategies include educational programmes specifically designed for older adults can significantly enhance digital literacy. These programs should focus on basic skills, such as using a smartphone, navigating the internet, and understanding online safety. As they are guided step by step, it gradually builds self-confidence in the elderly. (Stepping Up for Seniors, 2024). Also, practical, hands-on training sessions where elderly individuals can learn by doing, combined with support, can boost their confidence and proficiency in using digital tools (Tsai et al., 2020).

Customized training programs on digital literacy specifically tailored for older adults, such as how to turn on a computer or tablet, use a keyboard and mouse, and connect to the internet. Practical applications might include setting up and using email accounts to communicate with family and friends, navigating social media platforms like Facebook to stay connected, and using search engines to find information or hobbies of interest. Also, sessions on online safety, teaching seniors how to identify and avoid phishing scams and protect their personal information online. These programs should address the basics of using digital devices and navigating social media, focusing on practical applications that enhance daily living (Smith et al., 2021). Peer-led workshops where digitally literate elderly individuals can teach their peers. This approach not only leverages existing knowledge within the community but also creates a comfortable learning environment (Tsai et al., 2020).

Integrating the use of digital tools like tablets and smartphones into the daily routines of elderly care programs. For example, care facilities can incorporate tablet use during recreational activities or offer internet browsing sessions as part of their schedule (Brown & Green, 2022). Moreover, developing technology with intuitive interfaces and simplified navigation can also help to reduce the learning problem encountered by elderly users. Features like larger text, and clear instructions by including step-by-step guides, video tutorials, and large-print manuals. These materials should be easy to follow and readily available. Voice commands can make digital tools more accessible and user-friendly. Use of Accessible Learning Materials. (Park & Lee 2023).

Strategies such as encouraging intergenerational learning, where younger people teach older adults how to use technology can be beneficial. This not only helps the elderly learn new skills but also fosters social bonds between generations (Stepping Up for Seniors, 2024). Establishing digital literacy programs in community centers, libraries, and senior living facilities provide a supportive environment for learning. These initiatives can promote intergenerational engagement, which is a form of intergenerational connections. This is done by encouraging younger family members and community volunteers to interact with elderly individuals through social media and will help bridge the digital divide and enhance the social experience of the elderly (Park & Lee, 2023).

Organizing and hosting regular virtual social events such as book clubs, exercise classes, and discussion groups that can be easily accessed through social media platforms can provide a structured opportunity for social interaction and community building (Tsai et al., 2020). Providing ongoing technical support by establishing help desks or online support groups where elderly users can seek assistance with technical issues will aid the use of technology among the elderly. This reliable support system can encourage continuous use and reduce frustration among the elderly. (Taylor et al., 2021). Integrating the use of digital tools like tablets and smartphones into the daily routines of elderly care programs. For example, care facilities can incorporate tablet use during recreational activities or offer internet browsing sessions as part of their schedule (Brown & Green, 2022).

Promoting digital inclusion for the elderly requires the coordinated efforts of various stakeholders, including government agencies, non-profit organizations, technology companies, and the community. Government agencies play a crucial role in developing policies and programs that support digital literacy and inclusion. This includes funding for community programs, creating public awareness campaigns, and ensuring that digital services are

accessible to all citizens (Smith et al., 2020). Non-profit organizations are to provide essential services such as digital literacy training, technology access programs, and advocacy for digital inclusion.

Organizations dedicated to aging and technology are to develop resources and training materials tailored to the elderly. This includes initiated programmes focusing on improving accessibility for marginalized older adults (Kim & Choi et al., 2020). Technology Companies also contribute by designing age-friendly products and services, offering technical support, and collaborating with non-profits and government agencies to develop digital literacy programs at affordable devices.

The role of Community and Family in promoting digital inclusion cannot be left out because local communities and families are integral in promoting digital inclusion. Community centers, libraries, and senior clubs can host digital literacy workshops and provide a space for social interaction and learning. Family members can offer personal support and encouragement, helping elderly relatives navigate the digital world (Park & Lee, 202).

Challenges of Digitalization in Addressing Loneliness and Social Isolation of the Elderly

It should be noted that though digitalization offers numerous benefits in addressing feelings of loneliness and social isolation among the elderly, it also has challenges and limitations: Many older adults lack access to technology due to financial constraints, limited internet availability, or lack of devices. (Seifert et al., 2020). Digital solutions can unintentionally replace in-person interactions, which are crucial for emotional well-being. Furthermore, communication through social media platforms may not provide the same depth of connection or physical presence that face-to-face interactions offer (Holt-Lunstad, 2021).

Recommendations

Practical Recommendations for Using Digital tools to Enhance Elderly Connectivity

Facilitate Easy Access to Digital Platforms: Simplify the user interface of social media and other digital platforms to cater to the needs of elderly users. This can include larger fonts, clearer icons, and intuitive navigation to make these platforms more accessible and user-friendly (Zhou et al., 2021). Digital technology from this discourse is a powerful tool that should be employed by professionals in social work practice. This should be integrated effectively in their intervention with the elderly to enhance connectivity by reducing issues of loneliness and social isolation thereby enhancing their well-being.

Policy Recommendations for Stakeholders

Government Initiatives: Governments should develop, and fund national programmes aimed at increasing digital literacy among the elderly. This can include subsidies for purchasing digital devices, grants for community digital literacy programmes by the government, and public awareness campaigns highlighting the importance of digital inclusion (Smith et al., 2020).

Incentives for Technology Companies: Governments and private sector partners can provide incentives for technology companies to create products and services that are elderly friendly. This can involve tax breaks, innovation grants, and recognition awards for companies that design age-friendly technologies (Johnson et al, 2022).

Standards for Age-Friendly Technology: Establish standards and guidelines for designing age-friendly technology. These standards should address accessibility features, user interface design, and the inclusion of support options to ensure that digital products meet the needs of elderly users (Park & Lee, 2023).

Support for Non-Profit Organizations: Offer funding and resources to non-profit organizations that provide digital literacy training and support for the elderly. Non-profits play a crucial role in reaching underserved populations and can effectively bridge gaps in service delivery (Tsai & Roberts, 2020).

Collaboration Between Stakeholders: Encourage collaboration between government bodies, non-profits, educational institutions, and the private sector to develop comprehensive digital inclusion strategies. Such partnerships can leverage the strengths of each sector to create more effective and sustainable programs (Chen et al, 2021).

Monitoring and Evaluation: Implement systems to monitor and evaluate the effectiveness of digital inclusion programs. Regular assessments can help identify successful strategies, uncover areas needing improvement, and ensure that resources are used efficiently (Smith et al., 2020).

Conclusion

This paper has explored the pressing issue of loneliness and social isolation among the elderly, highlighting the significant negative impacts on their physical and mental health. The prevalence of these conditions is substantial, with many elderly individuals experiencing profound feelings of disconnection and isolation. Various interventions have been discussed, including community-based and technological solutions, which, despite their benefits, face limitations in effectively addressing the root causes of loneliness and social isolation.

The role of digital transformation in mitigating these challenges has been examined, with a particular focus on social media platforms. The benefits of these platforms for elderly connectivity are numerous, offering enhanced communication, community engagement, access to information, and psychological benefits. The paper illustrates the positive impacts of digital initiatives on elderly care. However, the success of these interventions largely depends on the digital literacy of the elderly population and the perceived usefulness of technology.

The theoretical frameworks of the Technology Acceptance Model (TAM), Social Cognitive Theory, and Diffusion of Innovations Theory provide valuable insights into the factors influencing technology adoption among the elderly, intergenerational learning, and community-based initiatives. Stakeholders, including Strategies for improving digital literacy and promoting digital inclusion have been proposed, emphasizing the need for tailored education programs, hands-on training, user-friendly technology. Government agencies, non-profit organizations, technology companies, and the community play a crucial role in fostering digital inclusion.

Final Thoughts on Promoting Digital Inclusion for the Elderly

Promoting digital inclusion for the elderly requires a multifaceted and collaborative approach. It is essential to address the unique challenges older adults face in adopting and using technology. This involves creating age-friendly technology, providing comprehensive digital

literacy training, and ensuring ongoing support. Stakeholders from various sectors must work together to develop and implement policies and programs that facilitate digital inclusion.

Governments should prioritize digital inclusion in their agendas, providing funding and resources for digital literacy initiatives. Technology companies should focus on designing products that are accessible and user-friendly for the elderly. Non-profit organizations and community groups can play a vital role in delivering digital literacy training and support. Families and younger generations can contribute by encouraging and assisting their elderly relatives in using technology.

Finally, digital inclusion for the elderly is not just about access to technology; it is about fostering a society where the elderly feel valued, connected, and empowered. By embracing the transformative potential of technology and working together to remove barriers, we can create an inclusive digital landscape that enhances the well-being and quality of life for the elderly population. Through sustained efforts and collaborative initiatives, we can ensure that elderly individuals remain connected with families, groups and their communities, making them active, engaged, and integral members of our increasingly digitalized world.

References

Adedeji, I. A., Wister, A., & Pickering, J. (2023). COVID-19 experiences of social isolation and loneliness among older adults in Africa: A scoping review. *Frontiers in Public Health*, 11, Article 1158716. <https://doi.org/10.3389/fpubh.2023.1158716>.

Assefa, M. D., Haile, D., & Tadesse, E. (2021). The impact of social media on mental well-being of older adults in Ethiopia. *Aging & Mental Health*, 25(6), 1049-1055

Bandura A. (1986). *Social foundations of thought Action: A social cognitive theory*. Englewood Cliffs: Prentice-Hall.

Brown, M., & Green, T., (2022) Enhancing Social Inclusion through digital tools in Elderly care Programs. *Journal of Gerontology and Digital Health*, 14(3), 219-232

Cacioppo, S., Capitanio, J. P., & Cacioppo, J. T. (2020). Toward a neuroscience of social connection. *Social Neuroscience*, 15(1), 15–21. <https://doi.org/10.xxxx>

Chen, J., & Schulz, P. (2022). Community-based interventions to combat loneliness in older adults: A review. *Aging & Mental Health*, 26(3), 489–503. <https://doi.org/10.xxxx>

Chen, Y., & Schulz, P. J. (2016). The effect of information communication technology interventions on reducing social isolation in the elderly: A systematic review. *Journal of Medical Internet Research*, 18(1), e18. <https://doi.org/10.2196/jmir.4596>

Chopik, W. J., Clark, M. A., & O'Brien, E. L. (2020). Digital engagement and well-being among older adults: The role of technology in social connectedness and quality of life. *Journal of Aging & Social Policy*, 32(1), 70-83. <https://doi.org/10.1080/08959420.2019.1684807>

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. <https://doi.org/10.2307/249008>

Franco, D. (2020). Empowering the Elderly Through Technology: A Focus on Independence and Self-Efficacy. *Journal of Gerontechnology*, 19(3), 156-165

Fasoli, A., Beretta, G., Pravettoni, G., & Sanchini, V. (2023). Mapping emerging technologies in aged care: results from in-depth online research. *BMC Health Services Research*, 23(1), 528. <https://doi.org/10.1186/s12913-023-09513-5>

Frontiers. (2024). Socially connected while apart: The use of technology to increase social connection between nursing home residents and their relatives. *Frontiers in Psychology*. Retrieved from (<https://www.frontiersin.org>)

Gardiner, C., Geldenhuys, G., & Gott, M. (2018). Interventions to reduce social isolation and loneliness among older people: An integrative review. *Health & Social Care in the Community*, 26(2), 147-157. <https://doi.org/10.1111/hsc.12367>

Gitlin, L. N., Winter, L., & Dennis, M. P. (2019). Assistive technology in reducing caregiver burden: A randomized trial. *Gerontologist*, 39(1), 33-42. <https://doi.org/10.1093/geront/gnx160>

Holt-Lunstad, J. (2021). Loneliness and social isolation as risk factors: The public health perspective. *Public Policy & Aging Report*, 31(2), 46–52. <https://doi.org/10.xxxx>

Japan Up Close (2022). Digitalization is making a difference in the lives of the elderly. Retrieved from https://japanupclose.web-japan.org/techculture/t20220324_1.html

Kim, H., & Choi, Y. (2022). Understanding older adults' intention to use technology: The moderating role of self-efficacy. *Computers in Human Behavior*, 129, 107147.

University of Michigan National Poll on Healthy Aging. (2023). Loneliness and isolation among older adults remain significant. Retrieved from ihpi.umich.edu

National Academies of Sciences, Engineering, and Medicine. (NASEM)), (2020). *Social Isolation and Loneliness in Older Adults: Opportunities for the Health Care System*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25663>

Novotney, A. (2020). The risks of social isolation. *Monitor on Psychology*, 51(2), 32–34. <https://doi.org/10.xxxx>

Ojeka, P. (2023). Digital transformation in health care and elderly care – a comparison of three countries. https://healthpolicy.se/wp-content/uploads/2023/09/Report_digital-transformation-2023-English_final.pdf

Ojembe, B.U. & M.E. Kalu (2018) 'Describing Reasons for Loneliness among Older People in Nigeria', *Journal of Gerontological Social Work* 61(6), 640–58 (<https://doi.org/10.1080/01634372.2018.1487495>)

Ojembe, B. U., & Kalu, M. E. (2019). Television, radio, and telephone: Tools for reducing loneliness among older adults in Nigeria. *Geron technology*, 18(1), 36–46.

Okeke, C., Ijioma, A., & Emeka, E. (2023). Exploring social media platforms in reducing loneliness among older adults in Nigeria. *African Journal of Social Sciences*, 16(1), 19-2

Oluwaseun, O., Adebayo, J., & Lawal, A. (2020). The role of social media in facilitating elderly wellness in Nigeria. *Journal of Aging & Health*, 32(5), 590-598.

Papadopoulos, C. (2024). Spending time with the robot Pepper can reduce loneliness in elder care homes. *The World*.

Park, S., & Lee, H. (2023). Developing accessible learning materials for older adults: Best practices and outcomes. *Computers in Human Behavior*, 136, 107451.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Seifert, A., Cotton, S.R., & Xie, B. (2019). A double burden of exclusion? Digital and social exclusion of older adults in times of COVID-19. *Journals of Gerontology: Series B*. <https://doi.org/10.1093/geronb/gbaa098>

Smith, M. L., Steinman, L. E., & Casey, E. A. (2020). Combatting social isolation among older adults in a time of physical distancing: The COVID-19 social connectivity paradox. **Frontiers in Public Health*, 8, 403. <https://doi.org/10.3389/fpubh.2020.00403>

Taylor, P., Johnson, T., & Wong, L. (2023). Intergenerational learning in digital literacy programs for seniors. *Educational Gerontology*, 49(7), 451-466

Tsai, H. H., Tsai, Y. F., Wang, H. H., Chang, Y. C., & Chu, H. H. (2020). Videoconference program enhances social support, loneliness, and depressive status of elderly nursing home residents. *Aging & Mental Health*, 14(8), 947-954. <https://doi.org/10.1080/13607861003713130>.

Tsai, H. S., Shillair, R., & Cotten, S. R. (2023). Understanding the role of digital interventions in addressing loneliness among older adults. *Journal of Gerontology: Psychological Sciences*, 78(1), 56–68. <https://doi.org/10.xxxx>

United Nations Department of Economic and Social Affairs, Population Division (2019) *World population prospects 2019*, <https://population.un.org/wpp/Data-Query/>.

United Nations. (2017). *World population ageing 2017*. Department of Economic and Social Affairs, Population Division. https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Report.pdf

Victor, C. R., Scambler, S. J., Bowling, A. N. N., & Bond, J. (2020). Loneliness in later life: A follow-up study. *Aging and Society*, 25(4), 461-484. <https://doi.org/10.1017/S0144686X04002568>

Weger, M.B. & Morley, J.E (2020). Loneliness And Social Isolation In Older Adults During The Covid-19 Pandemic: Implications For Gerontological Social Work *The journal of nutrition, health & aging* Vol,24(5):456-458

Welch, V., Ghogomu, E. T., Barbeau, V. I., Dowling, S., Doyle, R., Beveridge, E., Boulton, E., Desai, P., Huang, J., Elmestekawy, N., Hussain, T., Wadhwani, A., Boutin, S., Haitas, N., Kneale, D. Salzwedel, D. M., Simard, R., Hébert, P., Mikton, C. (2023). Digital interventions to reduce social isolation and loneliness in older adults: An evidence and gap map. *Campbell Syst Rev*.

World Health Organization. (2021). *Decade of healthy ageing: Baseline report*. <https://www.who.int/publications/i/item/9789240017900>

Xie, B., Watkins, I., Golbeck, J., & Huang, M. (2012). Understanding and changing older adults' perceptions and learning of social media. *Educational Gerontology*, 38(4), 282-296. <https://doi.org/10.1080/03601277.2010.544580>

Zaharia, G., Ibáñez-del Valle, V., Cauli, O., & Corchón, S. (2024). The long-lasting effect of multidisciplinary interventions for emotional and social loneliness in older community-dwelling individuals: A systematic review. *Nursing Reports*, 14(4), 3847–3863

Zhou, J., Li, Q., & Hong, X. (2021). Age-friendly technology design for social media platforms: A usability study. *Journal of Aging Science and Technology*, 16(2), 124–137.