Digital Exclusion Among Older Adults

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Preface

As I complete this bachelor thesis, I am filled with a sense of accomplishment and gratitude for the enriching three-year journey studying psychology at the University of Stavanger. I am indebted to my teachers for their excellent academic support and guidance. They have helped me acquire new knowledge, develop critical thinking and analytical skills, and gain confidence in my abilities. This thesis represents the culmination of my academic efforts and the skills I have developed, and I am eager to apply the knowledge gained to make a meaningful contribution in my future pursuits.

I am grateful to my supervisor, Tore Tjora, for guidance and support throughout the whole process. Not only did he provide insightful feedback on my work, but he also made the process enjoyable with a sense of humour amidst all the frustration and inspired me with interesting and insightful conversations over cups (or coffeepots) of coffee. Thank you for teaching me the invaluable skill to always "blame"/refer to others in my research.

I would also like to thank my former professor, Simone Grassini, who made everyone in his class believe they can be researchers. Prior to his class, reading research articles felt like deciphering a foreign language, but thanks to his instructions and patience, I now comprehend and enjoy that language.

To my fellow students, you have been the best part of this journey. I have had the pleasure of learning alongside some of the most brilliant and inspiring people during these three years. Your insights and perspectives have taught me more than any textbook ever could. Your levity, jokes, and support have made the hard work and struggles so much more bearable. Thank you for being my study partners, my confidantes, and my friends. I am grateful for the memories we have created together, and I am excited to see what we will accomplish in the future.

And last, but not least, I want to thank my family who believed in me and supported me throughout this whole process. Without you, I would not have started on this journey. Thank you to my wonderful children for cheering me on through every word of this thesis, and most of all, to my husband who enabled me to pursue my aspirations by putting everything else on hold.

Abstract

The trend of demographic ageing is a great concern in many developed countries. As societies continue to undergo digitalization around the globe, the growing population of elderly risks being left behind due to digital exclusion, highlighting the need for increased attention and support towards digital inclusion initiatives. The digital divide has the potential to sustain social and economic inequalities as individuals who are excluded from digital technologies may not have access to essential services. The aim of this systematic literature review is to examine recent quantitative research that has addressed the issue of digital exclusion among older adults and synthesise relevant findings. A systematic literature search was conducted in four databases in March 2023. A full-text evaluation was performed on 31 articles. Fourteen articles were included in the review. The results identified three factors contributing to digital exclusion among older adults: socioeconomic status, lack of digital literacy, and barriers to the use of new technologies. Not being able to access a variety of services, with healthcare services being specifically mentioned, and having a higher risk of mental health issues were identified as some of the effects of digital exclusion among seniors. Although older adults generally exhibit lower levels of digital skills compared to the general population, this study reveals differences in digital skills within the older adult age group itself. It is therefore important to understand how older adults vary in their ability to participate in the digital society. The findings further suggest that training and educating instructors of digital technology may improve the delivery of technology education for older adults, thereby reducing digital exclusion.

Keywords: digital exclusion, digital divide, grey digital divide, digital inequality, digital inclusion, digital non-users, age-based digital divide, older adults, socioeconomic status, mental health.

Abstrakt

En stadig aldrende befolkning er et problem i mange i-land. Mens verdenssamfunnet digitaliseres, risikerer en økende eldre befolkningen å bli utelatt. Dette underbygger behovet for økt oppmerksomhet til initiativer for digital inkludering. Det digitale skillet opprettholder sosiale og økonomiske ulikheter ved at eldre som er digitalt ekskludert mister tilgang til viktige tjenester. Hensikten med denne systematiske litteraturstudien er å undersøke nyere kvantitativ forskning som har adressert temaet digital ekskludering blant eldre, og sammenfatte relevante funn. Et systematisk litteratursøk ble gjennomført i fire databaser i mars 2023. 31 artikler ble vurdert i full tekst. 14 artikler møtte inkluderingskriteriene. Studien identifiserte tre faktorer som bidrar til digital ekskludering blant eldre: sosioøkonomisk status, digital kompetanse og barrierer for bruk av ny teknologi. Manglende tilgang til ulike tjenester, spesielt helsetjenester, samt økt risiko for psykiske helseproblemer, ble identifisert som noen av effektene av digital ekskludering blant eldre. Selv om eldre generelt viser lavere nivåer av digitale ferdigheter sammenlignet med den generelle befolkningen, tydeliggjør denne studien forskjeller i digitale ferdigheter også innenfor aldersgruppen 60+. Det er derfor viktig å forstå variasjonen i den eldre befolkningens evner til å kunne delta i det digitale samfunnet. Funnene tyder videre på at opplæring og utdanning av instruktører i digital teknologi kan forbedre teknologiopplæring for eldre, og dermed redusere digital ekskludering.

Nøkkelord: digital ekskludering, digitalt skille, digital utenforskap, digital inkludering, ikke-digitale, eldre, sosioøkonomisk status, psykisk helse.

Content

Digital Exclusion Among Older Adults

Technology offers numerous advantages as innovative new technologies are constantly emerging and becoming integral to our daily lives (Harris et al., 2022). The advancement of technology has altered how we live, work, and communicate. It offers individuals easy and convenient access to information, as well as providing advantages for education, healthcare, and workplaces (Harris et al., 2022). Concurrently, the aging of the population is a significant global trend (Cheng et al., 2020). With people living longer than ever before, a greater proportion of the population is reaching old age (Ageing and Health, 2022; World Social Report, 2023). The advancement of technology can assist with several of the future challenges. However, technology also has its drawbacks, particularly for those not able to use it. Therefore, the research question of this paper is: what does research indicate about digital exclusion among older adults?

Background

As technology advances, often older analogue solutions to services are being replaced by digital ones in increasing numbers. If analogue solutions are kept, they are often expensive and hard to access. This has resulted in the digital divide, where parts of the population experience digital exclusion. Digital exclusion can be defined as the failure to engage a substantial part of the population in the use of Internet technologies (Bunyan & Collins, 2013).

Older adults are especially at risk of being digitally excluded and face several obstacles in their daily lives by not being able to use available technology (Robinson et al., 2015). This occurs in both in the public and private sectors. Often, digital services are possible solutions or tools, but sometimes it is offered as the only option. Many seniors struggle with basic tasks, such as online banking, renewing bus cards or claiming old-age benefits, due to the increasing digitization of these systems (Mubarak & Suomi, 2022).

Mubarak & Suomi (2021) suggest that the most severe consequences of the digital divide for seniors are healthcare related, as this population is unable to benefit from mobile health services. Additionally, a lack of digital skills often leads to social exclusion, preventing elderly individuals from connecting with both family and peers through digital networks (Mubarak & Suomi, 2022). Social isolation is more common among older adults and has a negative effect on their physical and psychological health (Pinquart & Sorensen, 2001). Technology interventions have shown a potentially reducing effect on social isolation (Chen & Schulz, 2016), as well as depression (Cotten et al., 2012). Digital exclusion presents a significant challenge for the elderly to participate fully and benefit from the ongoing digital revolution. This issue is not limited to developed countries, as it is also observed in developing countries (Mubarak & Suomi, 2022). It is essential to find a balance between maximizing the potential of technology and at the same time finding solutions for those excluded from it.

According to Arroyo-Menéndez et al. (2022), 54.9% of Spanish seniors (aged 65 and above) are digitally excluded, which implies that they lack the ability to use the Internet and do not possess digital skills. The results from the study indicate that, in Spain, digital exclusion is primarily a phenomenon that affects seniors, with more than half of this demographic being impacted (Arroyo-Menéndez et al., 2022). Seniors represent a significant majority of the digitally excluded population in the country, accounting for 86.3% of the total number of individuals excluded (Arroyo-Menéndez et al., 2022).

The Internet is widely acknowledged as a tool that promotes communication, information sharing and global connectivity (Mikołajczyk, 2022). An accessible Internet allows for an active and engaged cultural, social, and political life (Mikołajczyk, 2022). Moreover, it impacts the standard of living by enabling access to e-health and innovative assistive technologies that support independent living for as long as possible (Mikołajczyk,

2022). Age is one of the most significant factors determining digital use (Arroyo-Menéndez et al., 2022). This is concerning since this demographic may stand to benefit the most from these technologies. The pervasiveness of the problem and the different issues associated with digital exclusion highlights the importance of finding practical resolutions to address this matter. There is limited research on the non-use of digital technology (Kebede et al., 2022). However, numerous studies confirm the existence of an ongoing grey digital divide, which refers to the digital divide related to older adults (Mubarak & Suomi, 2022).

Objective

The objective of this systematic literature review is to examine recent quantitative research that has addressed the issue of digital exclusion among older adults and synthesise relevant findings.

Method

To answer the research question, a systematic literature review of quantitative research was conducted. This systematic review was reported according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 Statement guidelines to ensure transparency and accuracy (Page et al., 2021).

Inclusion and Exclusion Criteria

The articles had to satisfy the following criteria detailed in Table 1 to be included in this review:

Table 1

Inclusion Criteria

Study characteristic	Inclusion criteria
Publication date	January 2018 – March 2023
Study design	Quantitative methods, review articles
Language	English
Population	Populations in Western countries
	Older adults (age 60+)
Subject	Addressing the subject of digital exclusion among
	older adults or subject related to this
Quality	Peer-reviewed

The minimum age limit of 60+ years was set according to the definition of old age provided by the World Health Organization in 2022 (Ageing and Health, 2022). The definition for the Western world used in this context was countries of Western Europe, as well as countries shaped by Western European culture, also known as the Latin West (World Population Review, n.d.). Studies from other populations were excluded. Because the digital environment has changed considerably over the last few years (Mubarak & Suomi, 2022), this review concentrates on research studies published in the past five years. Studies older than five years were excluded.

Since digital exclusion is a global issue that affects large parts of the world population, quantitative research was selected for this systematic literature review as it provides data that is typically more generalizable to broader populations (Creswell & Creswell, 2018). During the screening process, population sample sizes were also taken into consideration. The use of standardized measurement tools and statistical analyses in quantitative research improves the

rigour and reliability of the results (Neugebauer et al., 2021). The data obtained from

quantitative studies are often more easily replicable and verifiable, which adds to the

credibility of the finding in this systematic literature review.

It may not be ideal to select review articles for a systematic literature review when

using thematic analysis, since the data from primary studies has already been analysed by

others. However, it can provide some benefits. Review articles can help answer the research

question and provide a broader picture by capturing a wider range of themes and concepts

than primary studies alone. Additionally, review articles are subject to rigorous quality

assessment and peer-review processes, which supports the quality of the literature. Finally,

review articles can help identify key themes and concepts that have been reported across

multiple studies.

Research articles limited to the following criteria were excluded: Covid-19, social

media, geragogy, health technology, a specific group within the demographic of "older

adults" such as minorities, people with specific illnesses, ethnic groups etc. or a specific area

that will not be generalizable to the rest of the world.

Search Strategy

A search was carried out using the following electronic databases: Web of Science,

SCOPUS, Cochrane Library, and Medline. Relevant keywords were found by examining

existing articles on the subject of digital exclusion. In the search, the following keywords

were used: digital exclusion, digital divide, grey digital divide, digital inequality, digital and

social exclusion, digital inequalities, digital inclusion, digital non-users, age-based digital

divide, older adults, and seniors. Boolean operators were used in the search to combine and

exclude keywords. All searches incorporated the subsequent terms: "digital exclusion" or

"digital divide" or "grey digital divide "or "digital inequality" or "digital and social exclusion"

or "digital inequalities" or "digital inclusion" or "digital non-users" or age-based digital

divide AND "older adults" or seniors AND NOT Covid-19. The search query was restricted

to the title, abstract, and keywords. Further, to journal articles and review articles published

between 2018 and 2023 (detailed above). The search terms were modified to align with the

search engines of the various databases.

(Detailed in Table 2).

Screening Process

  A screening was conducted of the records retrieved from the databases by reviewing

the title and abstract. All prospective studies were exported to Microsoft Excel (version 2303)

to facilitate the removal of duplicates. Subsequently, the articles chosen were read in full text

to confirm that the studies fulfilled all the inclusion and exclusion criteria. The screening

process is detailed in Figure 1.

Figure 1

Screening Process (Adapted from Watts & Robertson, 2011)
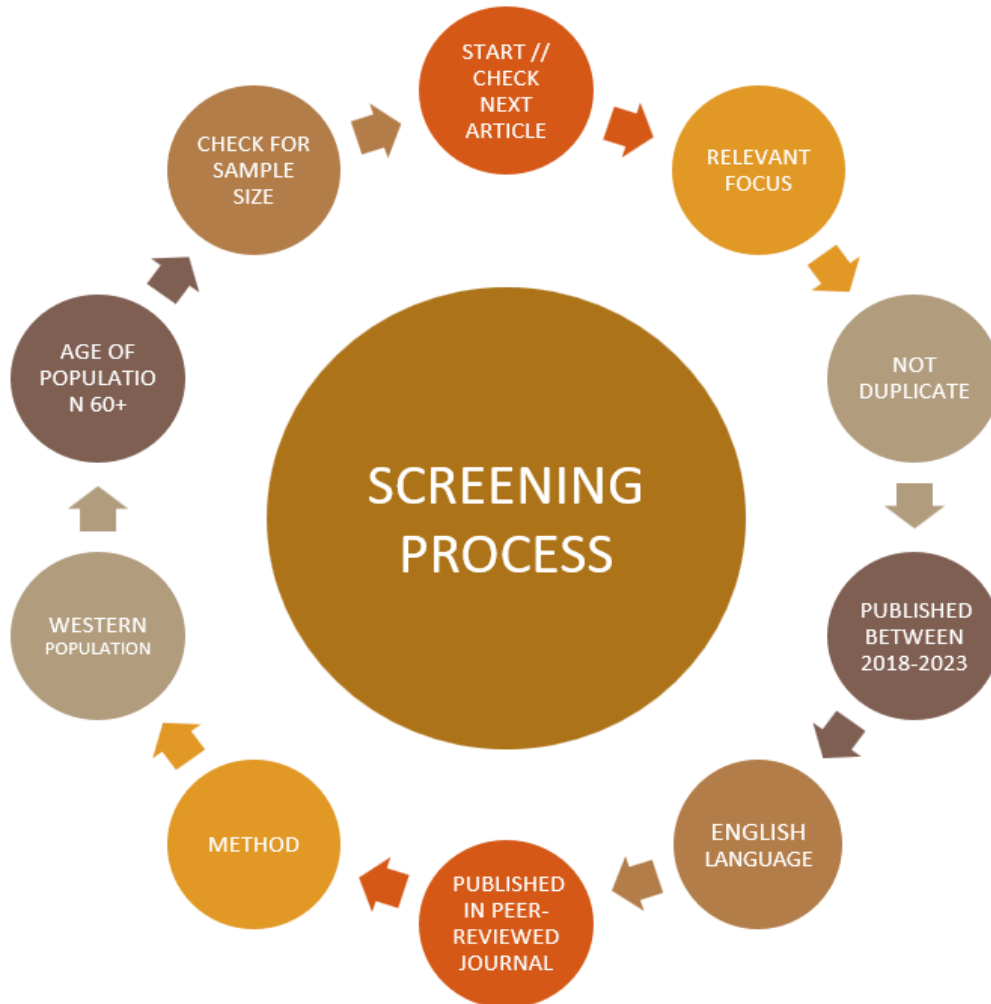
Data Collection and Data Analysis

The review protocol of Kebede et al. (2020) was used as a template for data extraction, although all variables were not used here. Author(s), year of publication, study location, study population, and theme from all included articles were entered into Table 3 in Microsoft Word (version 2303). A thematic analysis was conducted on data extractions from the result- and conclusion sections from all included articles, using the approach developed by Braun and Clarke (2006). The results were then categorized into themes relevant to digital exclusion among older adults (detailed in Table 4). General themes were established based on the

similarity of their content. Factors not relevant to the issue of digital exclusion were not included in the analysis.

Although the collected data were quantitative, a qualitative method was used to analyse the research findings in this systematic literature review. While meta-analysis can be an effective method for synthesising and summarising data (Shorten & Shorten, 2012), it was not selected in this study due to a high degree of variability in the methods used, the variables measured, the population, and the outcome of the research articles identified in the systematic database searches. Using thematic analysis permits a more in-depth examination of what research indicates (Braun & Clarke, 2006) about digital exclusion among older adults, as well as the identification of research gaps and suggestions for future study. This method for analysis provides a way to identify patterns and themes within the data that were not initially apparent. Additionally, it can reveal complex and nuanced relationships between various data elements. (Braun & Clarke, 2006). The use of thematic analysis when analysing quantitative data themes enables a better understanding of the factors that may be influencing the results.

Ethical Approval

Ethical approval was not requested for this systematic literature review as all the data used were collected from published articles.

Results

A total of 14 articles from the four databases met the inclusion criteria (detailed in Table 2) and were selected for the analysis. The research topics discovered during the searches were extremely diverse, making it challenging to find articles that aligned with the objectives of this review (detailed in Table 3). Thematic analysis, as suggested by Braun and Clarke (2006), was employed to identify relevant themes in the research. Upon completion of the analysis, several subjects relating to the research question emerged (detailed in Table 4).

PRISMA Flow Chart

PRISMA 2020 guidelines were followed to ensure transparent and accurate reporting. These guidelines provide a comprehensive checklist of items that should be included in the reporting of systematic reviews. Identification of studies are detailed in Figure 2.

Figure 2

Flowchart of the screening process according to PRISMA.
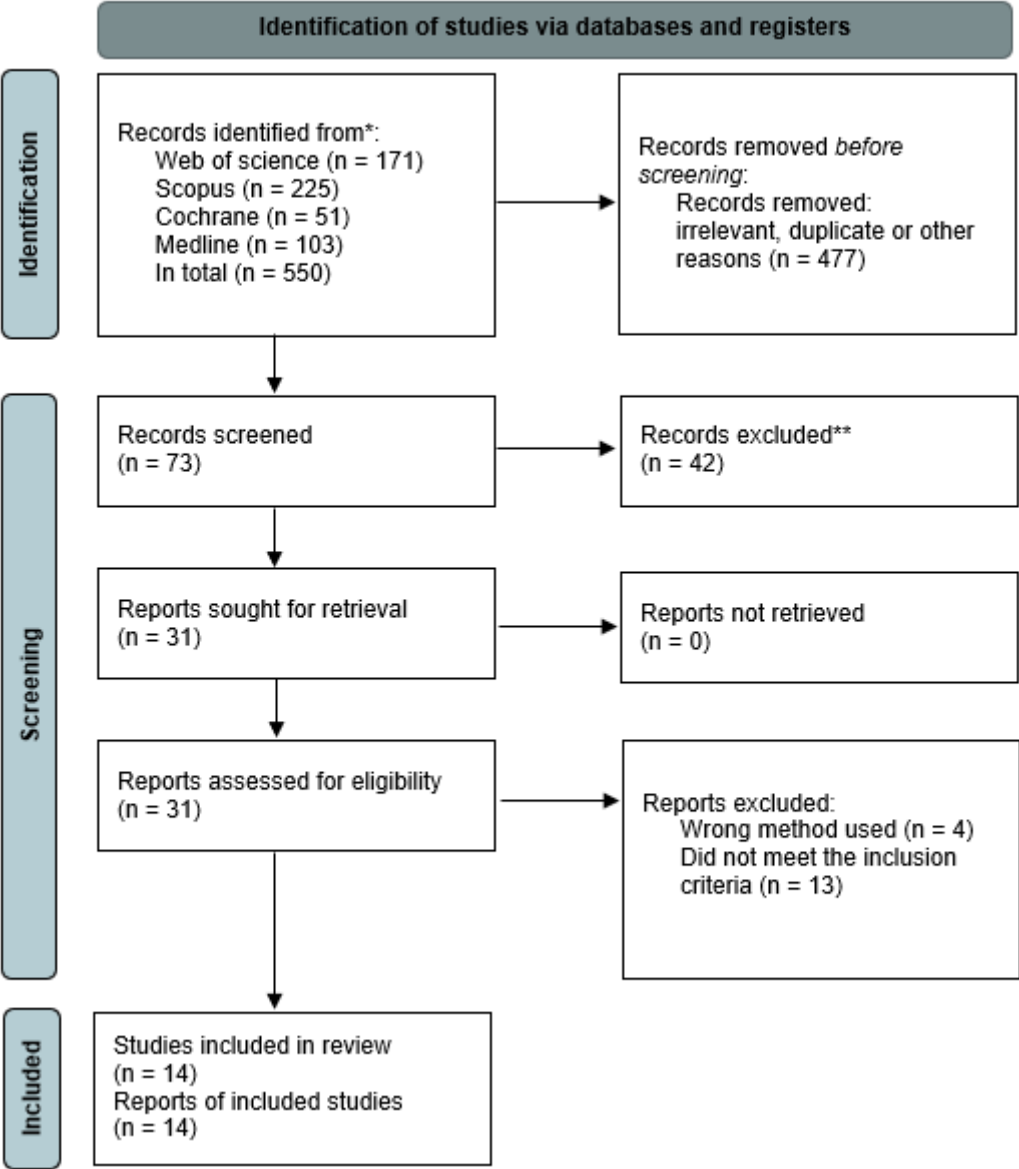
Factors Contributing to Digital Exclusion Among Older Adults

Thirteen of the studies included in the review addressed factors contributing to the digital divide or digital exclusion of older adults.

Socioeconomic Status

The findings indicate that socioeconomic status (SES) is a significant factor in the digital divide. People who have lower incomes or belong to marginalized communities may not have the resources to access or use digital technologies (Vulpe & Crăciun, 2019). There is a disparity in household Internet access across European countries. The majority of countries with household Internet access rates exceeding 90% are situated in Northern and Western Europe, whereas those in Eastern and Southern regions of Europe exhibit the lowest rates of household Internet access (Vulpe & Crăciun, 2019). Developing countries often have lower rates of household Internet access compared to their developed counterparts (Mubarak & Suomi, 2022). This is largely due to limited financial resources, which must first be allocated towards meeting basic human needs. Unfortunately, millions of people in underdeveloped countries still lack access to these necessities. As a result, income inequality is a major contributor to the digital divide in developing countries. (Mubarak & Suomi, 2022). Education and income are important elements in digital exclusion and the grey digital divide. Several studies find education and income as predictors of digital use and skills (Hargittai et al., 2018; Arroyo-Menéndez et al., 2022; Schlomann et al., 2020; Nguyen et al., 2020; Rosenberg & Taipale, 2022). Research suggests that individuals with higher levels of education and income are more likely to have access to digital technologies and use them more frequently and effectively (Blažič & Blažič, 2019; Mubarak & Suomi, 2022; Kebede et al., 2022). Higher levels of education can contribute to greater digital literacy skills and familiarity with technology, while higher income levels can provide more resources to purchase and maintain digital devices and services (Mubarak & Suomi, 2022).

The results also indicate that those with the highest level of education tend to be the most skilled (Augner, 2022; Nguyen et al., 2020). As the grey digital divide is characterized by unequal access to digital technologies and skills, this can exacerbate existing social and economic inequalities (Hargittai et al., 2018). Individuals with lower levels of education may lack the necessary skills to use the Internet and social media effectively, which can limit their autonomy and access to opportunities that rely on digital technologies (Hargittai et al., 2018). Higher levels of general Internet skills and social media skills are linked to greater autonomy of use. (Hargittai et al., 2018). According to Hargittai et al., (2018), older generations may have lower levels of education and income compared to younger generations, which could increase their vulnerability to digital exclusion. Arroyo-Menéndez et al. (2022) found that seniors have notably lower levels of education and income than the general population, particularly among women and those living in rural areas.

Digital Literacy

Lack of digital literacy is another factor contributing to the grey digital divide and digital exclusion. Digital literacy refers to the ability to use digital technologies, such as smartphones, computers, and the Internet. Without this ability the likelihood of experiencing digital exclusion increases. Digital literacy allows individuals to access a wide range of technologies, and benefit from their opportunities.

Digital literacy is often linked to socioeconomic status. Hargittai et al. (2018) found that older adults with lower autonomy of use are likely to have lower levels of Internet skills and lower levels of income. They also reported that participants with the highest level of education were the most skilled, strengthening existing inequalities (Hargittai et al., 2018). According to Leukel et al. (2021), the breadth of Internet use is tied to perceived behavioural control (PBC), age and education. Seniors with greater PBC in digital technology use engaged in a wider variety of online activities (Leukel et al., 2021). Testing for digital media use

among older adults, Arroyo-Menéndez et al. (2022) found that those who possess greater digital skills and use digital media more frequently are typically younger seniors with higher education levels, higher incomes, and residing in urban areas. Older seniors with lower education levels, lower incomes, and residing in rural areas typically possess the lowest digital skills and use digital media the least.

In addition to lower digital use, older adults possess lower digital skills compared to the general population (Arroyo-Menéndez et al., 2022). In a Spanish study, Arroyo-Menéndez (2022) found that the majority of seniors are concentrated in the lower range of digital use and completely lack digital skills. Education was the primary factor that explained the level of digitization among Spanish seniors, closely followed by age and income (Arroyo-Menéndez et al., 2022).

Barriers to the Use of New Technologies

Older adults may face several barriers when it comes to adopting new technologies. Kebede et al. (2022) identified three barriers to learning new technology after reviewing 96 publications on barriers and facilitators for technological non-use: capability, opportunity, and motivation. Regarding capability, physical and psychological changes as well as skills were mentioned. Opportunity refers to technological features, environmental context, and resources. Motivation is the perceived usefulness of the technology and beliefs about their own capability.

Participants from four European countries participated in an experiment learning how to use smartphones and tablets to play games in a study conducted by Blažič & Blažič (2019). The aim of the study was to identify difficulties for seniors adopting new technology. Blažič & Blažič (2019) found that all the participants were capable of doing simple tasks such as drawing figures and changing colours. Although for some it, took several attempts to touch the correct location on the screen and perform the intended action (2019). Blažič & Blažič

(2019) emphasize that this should not inhibit the benefits of the development of new skills. Participants with motor weaknesses experienced more problems when tasks required fast reactions. Overall, however, the participants expressed positive emotions toward new challenges and the opportunity to learn while having fun. (Blažič & Blažič, 2019).

As we age, our cognitive abilities may decline, making it more difficult to learn and use new technologies. Hence, learning new skills requires higher effort. According to Schlomann et al. (2020), people from the age of 80+ face various barriers when trying to adopt new technologies due to limited cognitive, physical, financial, and social resources. These barriers include changing capability requirements, cost, access to technology, safety and privacy concerns, and consequences of stereotypes and assumptions (Schlomann et al., 2020).

Another barrier facing older adults in the world of digital technology is stereotype threat. This refers to the fear of confirming negative perceptions about their social group (Mariano et al., 2020). Not only do older adults have lower rates of technology adoption than the general population, but they are also stereotyped as having fewer technological skills than younger age groups. The prospect of stereotypes discourages seniors from using computer technology. Members of this age group may be hesitant to engage in new or unfamiliar tasks because they are afraid of validating their supposed lack of competence (Mariano et al., 2020). This could result in an unwillingness to use technology in the future (Mariano et al., 2020).

Effects of Digital Exclusion (And Benefits of Digital Inclusion)

Eight of the included studies addressed the effects of digital exclusion on older adults. According to Arroyo-Menéndez et al. (2022), a majority of the excluded population consists of seniors. Digital exclusion in Spain is primarily limited to seniors, with over half of this demographic group being affected. The Internet and digital media are becoming the primary

means of accessing services and benefits (Arroyo-Menéndez et al., 2022). Older adults who

do not use these platforms may experience a decline in their social status. (Arroyo-Menéndez

et al., 2022). There are several effects of being digitally excluded in a digitalized society

identified.

Digitally excluded older adults may be unable to access a wide range of services that

require Internet access or digital skills. This raises the risk of older adults encountering more

challenges, such as problems with accessing health-related information and services,

establishing and sustaining social connections, as well as accessing employment and training

prospects (Mariano et al., 2020). Many healthcare services can be accessed online, such as

scheduling appointments, communicating with medical professionals, and making payments

(Mubarak & Suomi, 2022). Older adults who are digitally excluded can face ongoing

difficulties in accessing effective healthcare due to the growing prevalence of electronic

healthcare, which is set to become the predominant mode of delivering healthcare services

(Mubarak & Suomi, 2022). As the population continues to age, those who lack digital literacy

or has limited access to technology may find it increasingly challenging to receive the

necessary care they require. Mubarak & Suomi (2022) state that the grey digital divide is

compromising the effective healthcare of older adults, and that the health issues associated

with ageing will continue to contribute to digital exclusion.

Recent studies have linked the digital exclusion of older adults with mental health

disorders (Mubarak & Suomi, 2022). While the evidence is not yet conclusive, the studies

suggest that older adults who are digitally excluded are at a far higher risk of experiencing

mental health issues compared to those who are digitally included (Mubarak & Suomi, 2022).

According to Augner (2022), self-rated computer skills are associated with mental health and

quality of life. Schlomann et al. (2020) discovered a correlation between ICT use and well-

being. Participants who used web-connected ICT reported lower levels of loneliness and

anomie, as well as higher levels of autonomy. However, Hofer & Hargittai (2021) report that some specific online activities are linked to anxiety and depression. They specify that there was no connection between perceived health and general Internet experiences.

The results from this review show several advantages of using digital technology that are not accessible to individuals who are digitally excluded. Computer skills are linked to self-efficacy, which is further linked to a variety of positive health and life quality outcomes (Augner, 2022). According to Rosenberg & Taipale (2022), there is a relationship between the social uses of smartphones and subjective well-being. The use of instant messaging, SMS, and email among their participants showed a positive association with life satisfaction. Nguyen et al. (2020) discovered a link between online social activities and social capital. Schlomann et al. (2020) also report a positive association between ICT use and different domains of subjective well-being.

Group Differences

Seven of the included articles mentioned differences among age groups of older adults. The level of Internet skills among older adults varies considerably depending on their age (Hargittai et al., 2018). This variation is found both within and across age groups. Hargittai et al. (2018) and Leukel et a. (2021) emphasize the importance of skill differences among older adults who have already begun using the Internet, highlighting that differences are not solely observed between users and non-users. A study by Augner (2022) supports these statements. Hargittai et al. (2018) claim that the gap between older adults who are digitally connected and those who are not will likely diminish over time. However, Arroyo-Menéndez et al. (2022) could not identify this diversity within senior groups despite a large sample size. They argue that only a minority of seniors have digitization levels above the mean for the Spanish population, indicating that there are few segments with such high levels (Arroyo-Menéndez et al., 2022).

Gender Differences

Gender differences were mentioned in six of the articles included in the review. According to the results of Schehl et al. (2019), gender is not a factor in social online activity. Arroyo-Menéndez et al. (2022) state that gender has no explanatory power on digitalization among older adults, contradictory to other literature. Although their research initially showed a connection between gender and digitalization, they discovered that controlling for other more explanatory variables removed the association between gender and digitization (Arroyo-Menéndez et al., 2022). Augner (2022) also found no significant relationship between gender and computer skills. When it comes to specific ICT use, on the other hand, Rosenberg & Taipale (2022) discovered that older women were more likely to use instant messaging than older men. Schlomann et al. (2020) furthermore found that females use web ICT less than men. Leukel et al. (2023) found a relationship between gender and the number of online activities used, but they claim these findings are of little practical significance.

Learning Technology

Five of the articles included in this review mention factors in learning technology. Schlomann et al. (2020) state that the process of learning new technologies requires a significant amount of effort, and the oldest members of the population (80+) face additional barriers due to limited cognitive, physical, financial, and social resources. According to Mariano et al. (2020), programs that aim to improve technology skills in older adults should be carefully designed because they could reinforce the stereotype that seniors are incapable. Learner-centered approaches for older adults are important for acquiring digital skills (Kebede et al., 2022). This suggests that instructors need to be aware of and respect that seniors need more time to get used to digital technologies (Mubarak & Suomi, 2022). According to Mubarak & Suomi (2022), teaching techniques must be adapted to the age group, as they need patience, repeated reminders, slower learning, and sympathy from their instructors. The

training of instructors is highlighted as being of significant importance. This suggestion is

also supported by Blažič & Blažič (2019), who claim that instructors should receive proper

education and training to effectively work with older adults.

Discussion

The aim of this systematic literature review was to find out what research indicates

about digital exclusion among older adults. The results highlight that there is little research on

the non-use of digital technology, as pointed out by Kebede et al. (2022), and few research

articles mention digital exclusion specifically. The subject of digital exclusion is often raised

in the context of the grey digital divide or digital technology use (themes are detailed in Table

3). There is also little research summarising the different consequences of the digital

exclusion of older adults.

Through the analysis of the included articles in the study, three factors contributing to

digital exclusion among older adults are identified: socioeconomic status, lack of digital

literacy, and barriers for the use of new technologies. Arroyo-Menéndez et al. (2022) state

that age is one of the most significant factors determining digital use. The results of this study

suggest that socioeconomic status is of more significance than age when it comes to digital

use and digital skills. Seniors with lower education levels, lower incomes, and residing in

rural areas are more vulnerable to digital exclusion. Arroyo-Menéndez et al. (2022) found that

seniors have lower levels of education and income than the general population, which could

explain why they are at a greater risk of experiencing digital exclusion. Older adults with

higher levels of education and income, on the other hand, are more likely to possess and use

digital technologies more frequently and efficiently. This could be due to easier access to

digital technology, stronger cognitive abilities, better familiarity with technology through

exposure and formal training, and being more informed of the benefits of technology use. The

results show that access to technologies and the Internet is unequal, which may worsen pre-existing social and economic inequalities (Hargittai et al., 2018). Digital literacy, which is the second factor identified contributing to digital exclusion, is found to be connected to socioeconomic status. In order to reduce digital exclusion, socioeconomic status and digital literacy are crucial factors to address according to these findings. Further study of these factors could assist in the development of targeted interventions.

Barriers encountered in the use of new technologies is identified as a third factor contributing to digital exclusion. As cognitive abilities decline with age, learning new skills requires more effort for older adults. As well as cognitive, physical, financial, and social barriers (Schlomann et al. 2020), older adults also face a stereotype threat when adopting new technologies (Mariano et al., 2020). This can result in an unwillingness to use technology in the future (Mariano et al., 2020) and contribute to digital exclusion among older adults. Design stereotypes and assumptions can create barriers to adoption (Schlomann et al., 2020). Therefore, it is important for designers to consider the needs of older adults and to create technology that is user-friendly and accessible to this population. This can reduce barriers to technology use.

A majority of the excluded population consists of seniors (Arroyo-Menéndez et al., 2022). These older adults face several effects of digital exclusion, such as difficulties accessing a broad range of services that require Internet access or digital skills. The healthcare industry is experiencing a significant shift towards digitalization, with technology playing an increasingly important role in the delivery of healthcare services. Mubarak & Suomi (2022) suggest that that the most severe consequences of the digital divide for seniors are healthcare related. Digital exclusion can therefore significantly impact a person's ability to access healthcare services and information. As healthcare increasingly relies on technology and digital platforms, those who are digitally excluded may experience difficulties in accessing

important health information, managing their health, and engaging with healthcare professionals. Addressing digital exclusion in healthcare is essential to ensure that all individuals have adequate access to the care they need to manage their health and well-being. This may be why much of the research addressing the digital divide focuses on healthcare. However, research focusing specifically on health technology was excluded from this review as it was outside the scope of the study. Overall, there is a gap in research regarding crucial everyday services that become unavailable for digitally excluded older adults.

The results reflect that there are several benefits of using digital technology. The results show a relationship between digital exclusion among older adults and mental health. Evidence suggests that older adults who are digitally excluded may be at a higher risk of experiencing mental health issues (Mubarak & Suomi, 2022). Self-rated computer skills have also been found to be associated with mental health and quality of life. In addition, the results show a connection between digital technology use and self-reported well-being and life satisfaction. However, some specific online activities have been linked to anxiety and depression. Overall, using technology has been associated with lower levels of loneliness and anomie, as well as higher levels of autonomy. As loneliness is a known issue among older adults, including them in the opportunities of the digital world could reduce this problem. Based on the findings of this review, further research should be conducted regarding digital use and mental health to identify types of technology use that may be more beneficial than others for improving mental health outcomes in older adults. The results also highlight the importance of digital inclusion initiatives for older adults to be able to enjoy the benefits of new technologies.

The results of the study found no significant gender differences when it comes to digital use or digital skills. Group differences, however, were found to be of importance. While older adults as a group have lower digital skills compared to the general population, the

results of this study suggest that there are also significant differences in digital skills within the older adult (60+) age group itself. One study could not identify such differences in their population (Arroyo-Menéndez et al., 2022), but the overall trend shows these group variations. Consequently, it is essential to move beyond merely determining whether older adults use digital technology or not, and instead focus on understanding how older adults vary in their ability to participate in the digital society (Hargittai et al., 2018).

The focus of technology education has primarily been on theoretical knowledge with limited practical application (Mubarak & Suomi, 2022). According to the findings of this study, one way to decrease digital exclusion among older adults is by helping them to adopt new technologies. As the results show, providing training and education for instructors of digital technology may enhance the delivery of technology education for older adults while reducing digital exclusion. By equipping technology instructors with the necessary skills and knowledge to provide practical training, they can help bridge the gap between theoretical knowledge and practical application, enabling older adults to adopt and use new technologies more effectively.

Limitations

According to Mubarak & Suomi (2022), most researchers examining grey digital divide have used qualitative research. Choosing exclusively quantitative research for this paper may be a limitation, as it could present only parts of the complete picture. Review articles might not be an ideal source of data for a systematic literature review since the results from these articles have already been extracted and analysed by other researchers, which could lead to the oversight of crucial information. However, as mentioned in the method section of this paper, there are also numeral benefits of including review articles in such an analysis. Subjectivity is also known to be a limitation of thematic analysis, as it can lead to diverse interpretations of the same data (Brown & Clarke, 2006).

Conducting a systematic review and thematic analysis on a broad topic with an open research question poses a challenge. Given that the articles often approach different perspectives and sometimes focus on narrow and specific aspects of digital exclusion, or areas related to it, the process of identifying common themes was challenging. Furthermore, some of the studies included the possibility of bias towards more proficient and skilled users due to online data collection (i.e., Hargittai et al., 2018), and may have led to inaccurate assessments of digital skills within the wider elderly population. As always when conducting a systematic literature review, it is probable that more relevant research on the topic of digital exclusion exists, even though it was not discovered during the search conducted for this systematic literature review. Due to the limitations of the research scope, some interesting articles were not included in the present study. It is therefore recommended to exercise caution when interpreting the outcomes. This is, however, a typical challenge in literature reviews (Mubarak & Suomi, 2022).

Conclusion

This systematic literature review aimed to explore what research indicates about digital exclusion among older adults. The study identified three factors contributing to digital exclusion among this population: socioeconomic status, lack of digital literacy, and barriers to the use of new technologies. Not being able to access a variety of services, with healthcare services specifically mentioned, and having a higher risk of mental health issues were identified as some of the effects of digital exclusion among older adults. The results of the study found no significant gender differences when it comes to digital use or digital skills. Although older adults generally exhibit lower levels of digital skills compared to the general population, this study reveals differences in digital skills within the older adult age group itself. It is therefore important to not only concentrate on differentiating users of technology from non-users but to also understand how older adults vary in their ability to participate in

the digital society. The findings further suggest that training and educating instructors of

digital technology may improve the delivery of technology education for older adults, thereby

reducing digital exclusion.

Future research

Additional research is needed to address the issues caused by digital exclusion. Based

on the findings of this systematic literature review, further research is required to understand

differences in skills and use within the population of older adults who already use digital

technology. Future studies focusing on the design of digital devices may contribute to making

this equipment more user-friendly for older adults, and thereby promoting digital inclusion.

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Appendix

Table 2

Search Strategy

Database	Time of Search	Search Query	Applied Filters
Web of Science	March 21, 2023	"digital exclusion" or "digital divide" or "grey digital divide "or "digital inequality" or "digital and social exclusion" or "digital inequalities" or "digital inclusion" or "digital non-users" or age-based digital divide AND "older adults" or seniors AND NOT Covid-19	English language, publication year: 2018-2023, article and review, citation topics meso: management, communication, political science, education & educational research, economics, social psychology (N=171)
SCOPUS	March 28, 2023	"digital exclusion" or "digital divide" or "grey digital divide "or "digital inequality" or "digital and social exclusion" or "digital inequalities" or "digital inclusion" or	English language, publication year: 2018-2023, article and review (N=225)

		"digital non-users" or age-based digital divide AND "older adults" or seniors AND NOT Covid-19	
Cochrane Library	April 10, 2023	"digital exclusion" or "digital divide" or "grey digital divide" or "digital inequality" or "digital and social exclusion" or "digital inequalities" or "digital inclusion" or "digital non-users" or "age-based digital divide" AND "older adults"	Publication date from Jan 2018 to Mar 2023, in Cochrane Reviews, Cochrane Protocols and Trials (Word variations have been searched) (N=51)
Medline	March 29, 2023	"digital exclusion" or "digital divide" or "grey digital divide "or "digital inequality" or "digital and social exclusion" or "digital inequalities" or "digital inclusion" or "digital non-users" or age-based digital divide AND "older adults" or seniors AND NOT Covid-19	English language, publication year: 2018-2023, peer-reviewed, journal article, review, systematic review (N=103)

Table 3

Description of Included Studies

	Author(s)	Year of publication	Study location and time of data collection	Study population (sample size, age, gender)	Theme	Design/method
1	Farooq Mubarak & Reima Suomi	2022	Last five years	Elderly with disparities in using the digital technologies	Grey digital divide	Literature review, exploratory and interpretive,
2	Hargittai et al.	2018	U.S. 2018	505 people from the U.S Age: 60+ Average age: 65 Female 63%, male 37%	Internet access and skills among older adults	Survey via email
3	Leukel et al.	2023	Germany 2017	1302 older adults (65+) living in Germany 49,2% male, 50,8% female	Digital inequality among older Internet users and the breadth of their Internet use	Survey via mail (also online option to respond)
4	Blažič & Blažič	2019	Slovenia, UK, Macedonia, Austria.	Age: 57-85 Slovenia N=60 UK N=60 Austria N=26 Macedonia N=24	Overcoming the digital divide with a modern approach to learning digital skills	Experiment
5	Hofer & Hargittai	2021	2018	N=1026 Older adults in the U.S Age: 60+	Associations between older adults' online social engagement and their mental health	Survey
6	Schehl et al.	2019	Mönchengladbach, Germany 2017	Age: 65+ N=1222 final sample Urban areas in Western Europe	Factors explaining specific online activities	Survey

7	Arroyo-Menéndez et al.	2022	Spain 2020	65+ years N=5247	The effects of age, gender, income and education on the digital divide.	Survey
8	Augner	2022	Israel, Switzerland	Age: 65+ N=26525 55,6% female Mean age: 74,57	ICT and mental health	Survey
9	Mariano et al.	2020	Senior centers in Lisbon, Portugal	N=114 62 male 24 female Age: 60+	Stereotype threat and computer use by older adults	Longitudinal, questionnaire
10	Rosenberg & Taipale	2022	Austria, Canada, Finland, Israel, Netherlands, Romania and Spain	Age: 62+ Retired older internet users N=5713	Social uses of mobile phone and subjective well-being	Cross-national longitudinal survey, online and by telephone
11	Nguyen et al.	2020	U.S. 2018	Older adults in the US Age: 60+ N=1026	How variations in older adults' online social engagement and Internet skills contribute to building social capital	Survey
12	Vulpe & Crăciun	2019	28 country members of the European union	Age: 65+ European seniors N=4404	Seniors' experience with technology and Internet communication	Survey

| 13 | Schlomann et al. | 2020 | the federal state of North Rhine-Westphalia in Germany | Age: 80+ N=1698 | Relationship between ICT use and subjective well-being in oldest old | Survey |
| 14 | Kebede et al. | 2022 | Past 5 years | 96 publications included | Older adults' perspective on digital engagement - barriers and facilitators for technological non-use | Scoping review |

Table 4

Results of Thematic Analysis

General theme	Sub-themes identified	Article number according to Table 2														Articles mentioning sub-theme
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	(Number of mentions in total)
Ageing population	Ageing population	1														1 (1)
Contributing factors	Attitude towards tech.			2												1 (2)
Contributing factors	Barriers												1	2		2 (3)
Effects of d.e.	Benefits of ICT use							1		4	3		5			4 (13)
Contributing factors	Cause for divide	5	1	1						6	1	2				6 (16)
Effects of d.e.	Effect of digital exclusion	5					1		1							3 (7)
Contributing factors	Culture	2														1 (2)
Differences	Developing countries	2														1 (2)
Contributing factors	Digital access												2			1 (2)
Digital divide	Digital exclusion						1									1 (1)
Digital divide	Digital inclusion	2												1		2 (3)
Contributing factors	Digital literacy	1	9	4	2		1	9	7		3	1				9 (37)
Differences	Digital use			2			3	1		1	2	6	2	2	1	9 (20)

Differences	Gender difference			1			1	3	1	1		1		6 (8)
Differences	Group-differences		3	1				1	1		3	2	1	7 (12)
Independence	Independence	1												1 (1)
Interventions	Interventions	1	2					1						3 (4)
Learning technology	Learning technology	7			11				1			1	1	5 (21)
Effects of d.e.	Mental health	2				7		1				1		4 (11)
Policy	Policy	1												1 (1)
Productivity	Productivity	1												1(1)
Contributing factors	Socioeconomic status		5				4	6	4	2	1	2	1	8 (25)
Learning technology	Teaching	1			2									2 (3)
Tech design	Tech design and development		2		2			1		2				4 (7)
Digital divide	Digital divide		1								1			2 (2)