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Elderly and their barriers to accepting and learning to use technology: A scoping review

Lansia dan hambatan mereka untuk menerima dan belajar menggunakan teknologi: Tinjauan pelingkupan

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Abstract

As the rate of technology development is concurrently increasing with the number of elderly people, it is necessary for people to be digitally literate and be able to use technology to its full capacity. However, research has found that the digital divide is still happening within the community, as not everyone has fully accepted technology in their daily life routines. With the aim of identifying barriers and challenges of elderly learning technology, and mitigating efforts used by past researchers to cater to the barriers, a scoping review following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) guideline was conducted, and 19 eligible articles have identified having low self-confidence, lack of knowledge, cognitive and physical limitations, as well as psychological and socioeconomic challenges as the common barriers associated with elderly learning. Recognizing what the elders can and cannot do, alongside having intervention programs that promote digital inclusion, could be taken as measures to mitigate the barriers faced by the elders in learning to use technology.

Keywords: digital literacy; elderly learning barriers; learning strategies; technology acceptance; scoping review

Abstrak

Seiring dengan lajunya perkembangan teknologi yang semakin meningkat, dan seiring dengan bertambahnya jumlah lansia, tentunya masyarakat harus melek digital agar dapat menggunakan teknologi secara maksimal. Namun, penelitian menemukan bahwa kesenjangan digital masih terjadi di masyarakat, karena tidak semua orang menerima sepenuhnya teknologi dalam rutinitas kehidupan sehari-hari mereka. Dengan tujuan mengidentifikasi hambatan dan tantangan teknologi pembelajaran lanjut usia, dan upaya mitigasi yang digunakan oleh peneliti sebelumnya untuk memenuhi hambatan, tinjauan pelingkupan mengikuti pedoman Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR) dilakukan, 19 artikel yang yang diidentifikasi telah memenuhi syarat yaitu, memiliki kepercayaan diri yang rendah, kurangnya pengetahuan, keterbatasan kognitif dan fisik, serta tantangan psikologis dan sosial ekonomi sebagai hambatan umum yang terkait dengan pembelajaran warga emas. Menyadari apa yang dapat dan tidak dapat dilakukan oleh para lansia, di samping menganjurkan program intervensi yang mempromosikan inklusi digital dapat diambil sebagai langkah-langkah untuk mengurangi hambatan yang dihadapi oleh para warga emas dalam belajar menggunakan teknologi.

Kata kunci: *literasi digital; hambatan belajar lansia; strategi pembelajaran; penerimaan teknologi; tinjauan pelingkupan*

Introduction

Mobile devices, including smartphones and tablets, have enabled people to conduct daily activities and tasks in a much easier way over the past decades (Czaja et al. 2006, Baric et al. 2019), due to the vast development of technologies happening throughout the world (Álvarez-García et al. 2019, Kim et al. 2022). The vast development would then encourage what usually was the face-to-face routines to be done digitally. This would include routines such as paying bills, contacting people, and other service-providing tasks to be carried out through virtual outlets. The impact migration of service methods would bring an impact on the members of society, as they, without any other option would have to engage progressively with technologies in order to carry out their daily activities (Betts et al. 2019).

Following a report by the United Nations (2017), the number of elderly people, which is defined as people that are aged 60 and above, in the year 2017 is estimated to be more than 962 million people, which is equivalent to 13% of the whole world's population. The increasing number of the elderly population is believed to be a result of the evident decrease in birth rates, paired with the increasing longevity (Padilla-Góngora et al. 2017). In reference to the 2013 report on the elderly population by the World Health Organization (WHO), the elderly population can be divided into three categories according to their age group, which would be young-elderly, middle-elderly, and also old-elderly (Güner 2017). A study by Álvarez-García et al. (2019) stated that the demographic aging phenomenon happens when there are obvious signs that elderly people dominate the counts within the community.

As the elders are taking over the percentage of the population in the world, numerous innovations have been introduced with the aim of enabling the elders to keep their tasks ongoing despite doing them virtually (Masterson et al. 2016, Vaportzis et al. 2017, De Regge et al. 2020). Gerontechnology is a term used for technology that has been tailored to fit the needs of an elderly individual (De Regge et al. 2020). Although there have been many advantages brought by the gerontechnologies in enabling independent living and the improvement of the elders' well-being (Schmitter-Edgecombe et al. 2013), the elders have been found to adopt and accept technological devices at a lower rate compared to the younger age group of people (Friemel et al. 2014, Ahmad et al. 2022).

Various studies from the past have reported the happenings of the digital divide among the population (Hunsaker & Hargittai 2018), which refers to a certain population having lower access to technology, or when a certain population has a relatively lesser understanding and lower abilities to utilize said technological devices (De Regge et al. 2020, Zaid et al. 2021). Past studies have also reported that age could also be another factor contributing to the digital divide, as it has been found that the likeliness of the elderly people to use devices such as the computer and the internet is less than those who are younger (Zickuhr & Smith 2012, Anderson & Perrin 2017, Kim et al. 2022).

According to Li & Luximon (2019), elderly people are often faced with numerous challenges when using technologies that are considered new to them; Blažič et al. (2018) reported that general reluctance is one of the challenge factors. Many recent studies are also aware of the many barriers and hindrances that the elders would typically face when adopting new technologies, and what could be done to help and assist them to successfully adopt and use said technologies in their lives (Colombo et al. 2018, Vulpe & Crăciun 2019, Castleton et al. 2020). As important as it is in selecting strategies to be implemented in elderly education, it is equally crucial to recognize the limitations of the elderly especially in learning in an effort to be able to select suitable strategies to be implemented the in the elderly learning process (Martínez-Alcalá et al. 2018).

Some of the most recognized limitations of elderly learning include physical and mental challenges, the decline in cognitive abilities, which includes the ability to memorize, focus and attention span, comprehension abilities, and finally, their individual life experiences (Martínez-Alcalá et al. 2018). Since not all elderly people have adopted and used technologies, it is thus important to take into

consideration the factors of their reluctance to do so (Rasi 2018). This study thus aims to identify and recognize the common barriers associated with the elderly in their learning process, thus improving their ability to utilize technological devices to their full extent, especially for the elders in Malaysia.

This scoping review also hopes to contribute to the ever-growing literature resources in seeking to discover the barriers of the elderly to learning and accepting technology use in their daily lives, and the reason behind their reluctance to do so (Haight et al. 2014, Quan-Haase et al. 2016, Castleton et al. 2020). This current review paper also seeks to provide suggestions and ideas that can be used in developing the digital skills among elderly people, thus making them more capable to use modern devices and being able to carry out daily tasks efficiently with little to no reluctance (Blažič et al. 2018).

Research Method

The scoping process conducted for this study was done by following the scoping review framework by Arksey & O'Malley (2005), which consisted of five stages, which are: (1) identifying the research question; (2) identifying relevant studies and published reports; (3) study and publication selection; (4) charting the data; and (5) summarizing the data. The scoping procedure was conducted with the main aim being to find data and literature regarding the elderly and their barriers to technology acceptance.

In order to identify relevant literature to be scoped and included in this study, the first stage of the scoping process is to construct and determine the research questions in accordance with the aims and objectives of this study. In referring to Aromataris & Munn (2020), constructing the research questions following the Population-Concept-Context (PCC) framework enables the research questions to be broken down and categorized into separate components, thus formulating a search strategy that can be used to obtain suitable literature for this study. The research questions will also act as the base and foundation of the whole paper.

As mentioned previously, the aim of this scoping review was to identify the barriers that are commonly associated with the elders regarding the acceptance of technology. With that in mind, the research questions formulated are: (1) what are the barriers faced by the elderly people regarding technology? (2) what are the mitigating efforts used by past researchers upon the elders and the barriers? and (3) what were the key findings that have been obtained by past researchers regarding the topic of the hindrance of technology acceptance among the elderly?.

The process of identifying literature and data for the current study was done with the utilization of two research databases, which are Scopus and Web of Science (WoS). A string search was established for each of the databases, consisting of a number of keywords and terms related to the barriers, elderly, acceptance and technology. Once a complete search string was established, it was then included in the advanced search option available in the databases, along with the suitable prompts required by the respectful databases.

Table 1 shows the formulated search strings that were used to identify the relevant studies to be scoped and included in this current study. The search from the databases resulted in an ample number of publications. In an effort to obtain fitting and eligible studies to be included in this review, a process for literature search following the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews) guidelines was adopted. The process involved four major stages, which are identification, screening- which includes removing duplicates, screening the titles and abstracts of the literature, eligibility, and finally the total number of pieces included in the study.

In order to obtain eligible and relevant data to be included in this scoping review paper, a set of inclusion and exclusion criteria was determined and was referred to as an effort to minimize and specify the result of literature findings, so as not to be left with a broad selection. The inclusion and exclusion criteria determine the specification range of literature that will be included and reported. Table 2 shows the set of criteria for the inclusion and exclusion of literature.

Table 1.
The search strings

Search Directory	Search String
Scopus	TITLE-ABS-KEY((“elder*” OR “old*” OR “adult*” OR “senior citizen*” OR “age*”) AND (“learn*” OR “education*”) AND (“barrier*” OR “difficult*” OR “drawback*” OR “hindrance*” OR “limit*”) AND (“accept*” OR “adopt*” OR “practic*”) AND (“technolog*” OR “digital device*” OR “application*” OR “smartphone*” OR “gadget*” OR “digital technolog*”) AND (“old* adult*” OR “old* learn*” OR “elder* learn*” OR “senior learn*” OR “senior citizen*”) AND (“learn*” OR “education*”)) AND (LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019)) AND (LIMIT-TO (SUBJAREA,”SOCI”)) AND (LIMIT-TO (LANGUAGE,”English”))
Wos	((((((((((((((((((((((((TS=(elder*))) OR TS=(old*)) OR TS=(adult*)) OR TS=(senior citizen*)) OR TS=(age*)) AND TS=(gerontology))) OR TS=(gerontechnology)) AND TS=(learn*)) OR TS=(education*)) AND TS=(barrier*)) OR TS=(difficult*)) OR TS=(drawback*)) OR TS=(hindrance*)) OR TS=(limit)) AND TS=(accept*)) OR TS=(adopt*)) OR TS=(practic*)) AND TS=(technolog*)) OR TS=(digital device*)) OR TS=(application*)) OR TS=(smartphone*)) OR TS=(gadget*)) OR TS=(digital technolog*)) AND (publication year 2019 OR 2020 OR 2021)) AND (categories education special OR geriatrics gerontology OR gerontology)) AND (language english))

Source: Primary data

Table 2.
Inclusion and exclusion criterion

Inclusion criteria	Exclusion criteria
1. Published between the years 2019 – 2021	1. Too medical-centerd
2. Article and review article publication	2. Do not touch on elderly learning barriers
3. English language	3. Focusing more on students’ learning barriers instead of barriers to elderly learning
	4. Too technology-focused literature

Source: Primary data

After obtaining a definite number of eligible literature that fits the inclusion and exclusion criteria for the current study, every piece of the literature will be analyzed under the process of data abstraction and any information that is relevant and that answers the research questions formulated earlier will be recorded and tabulated, as a way of reporting the findings (Arksey & O’Malley 2005). The table, which includes the author(s) and year of publication, the title of the article, barriers faced by elders, mitigating efforts, and the key findings can be seen in Table 3.

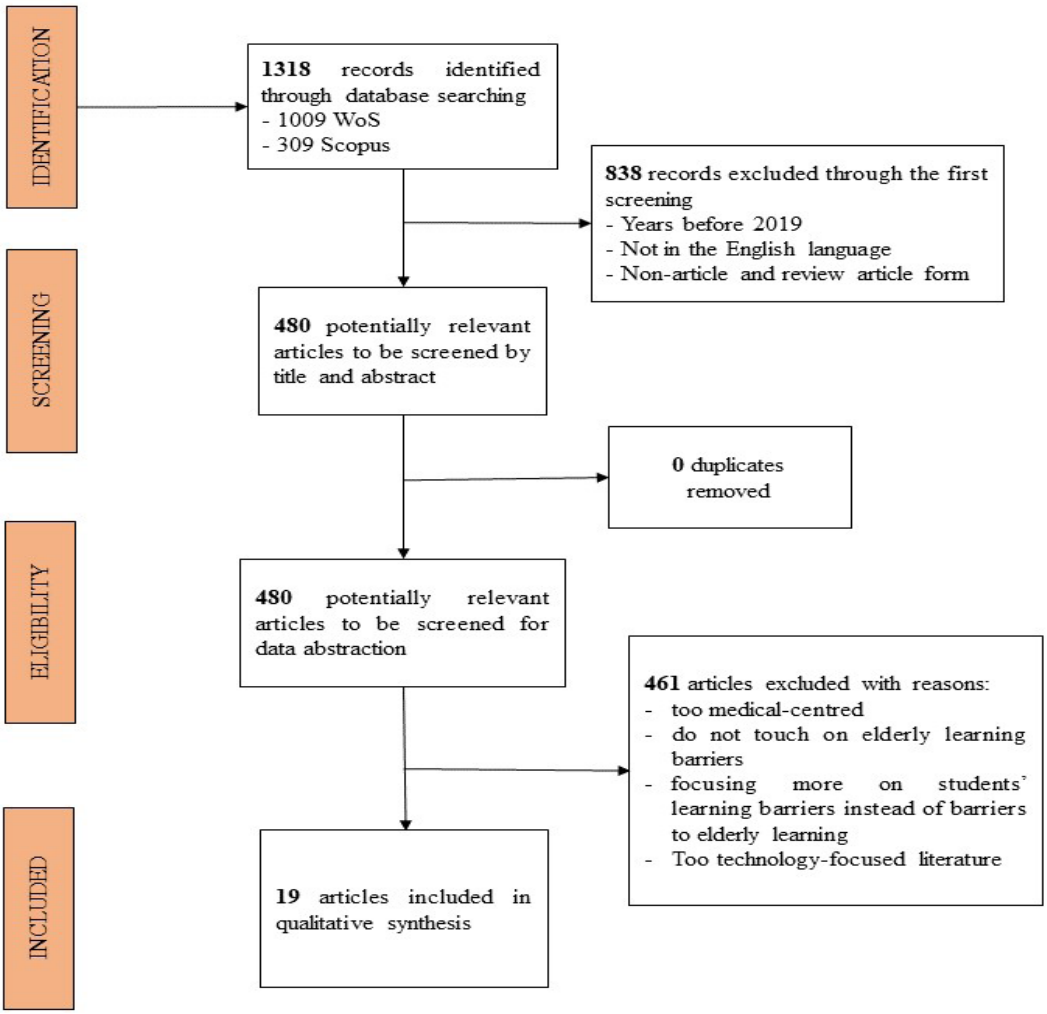

Figure 1.
Flow diagram of scoping review
Source: Primary data

Results and Discussion

The search conducted using the two databases resulted in the identification of a total number of 1318 pieces of literature, where 1009 of them were from the Web of Science database and the remaining 309 pieces of literature from the Scopus database. The next stage was the screening stage, where the first part of the screening was to eliminate any pieces of literature that did not fit into the inclusion criteria list that had been determined earlier. This process removed 838 pieces of literature, as they were published before the year 2019, were not in the English language, and were published in forms other than articles and review articles. The second part of the screening stage was to remove any duplicated literature that emerged from the two databases. No articles were removed as there was no duplicated literature.

This leaves a total number of 480 pieces of literature to be brought to the next stage, the eligibility stage. Here, the articles shortlisted were skimmed by reading through their title and abstract as an attempt to determine whether the literature piece contained the relevant answers to the research question for this study. This stage removed a total number of 461 articles, due to a number of them being too medical-centered, did not touch on elderly learning barriers, focused more on students' learning barriers instead of barriers to elderly learning, and also were too technology-focused literature. This resulted in having 19 pieces of literature eligible for the scoping process, thus being included in this study. Figure 1 shows the flow diagram summarizing the search for literature process for this scoping review paper.

Table 3.
Literature matric of accepted articles

References	Title of article	Place	Barriers of learning	Mitigating efforts	Key findings
(D'Onofrio et al. 2019)	Assistive robots for socialization in elderly people: results pertaining to the needs of the users	- Italy - Japan	- Reduced mobility - Chronic pain - Cognitive declining - Low socioeconomic statusw	- Consider the special needs of the elders - Involve the elders in the design and developing process of strategies and instruments that will be used by the elders	- Digital inclusion can improve the elders' cognitive, physical and also mental health, besides allowing them to live independently
(Xu & Huang 2021)	Chinese Middle-Aged and Older Adults' Internet Use and Happiness: The Mediating Roles of Loneliness and Social Engagement	- China	- Bad memory in learning internet skills - Lower levels of internet self-efficacy - Low socioeconomic status	- Implement internet training sessions - Implement computer training and intervention programs	- There is a growing need for the elders to learn to use technology - Promoting technology use to the elders can be very useful in terms of social support, enriching daily life activities, besides reducing loneliness
(Wu et al. 2019)	Cognitive Function and Digital Device Use in Older Adults Attending a Memory Clinic	- N/A	- Have low access to and usage of various forms of digital technology - Cognitively challenged	- Encourage learning digital technology - Use various forms of technology to increase familiarization - Exercising interventions to help the elders to use technology	- Using digital devices can lead to the development and stimulation of cognitive abilities, thus decreasing cognitive and brain decline
(Calhoun & Lee 2019)	Computer usage and cognitive capability of older adults: Analysis of data from the Health and Retirement Study	- Michigan	- Apprehensive about participating in activities on the internet - Fear of having their privacy leaked on the internet - Lack of confidence in learning to use technology - Low socioeconomic status	- Provide computer/ technology training programs for the elders - Develop a more diverse and innovative method of instruction for the elderly learners	- Frequent engagement with technologies can improve cognitive abilities among the elders

(Gallistl et al. 2020)	Configuring the older non-user: Between research, policy and practice of digital exclusion	- Austria	- Higher prevalence of computer anxiety - Frustrationon with user interfaces - Negative attitudes toward technology - High concerns about security issues - Socioeconomic factors - Health-related barriers	- Implement learning and educational programs for the elderly to use technology - Design interventions and support strategies to ease elders' access to technology	- Lifelong learning, including training sessions is considered a crucial intervention to cater the evident digital divide
(Gallistl et al. 2021)	Doing digital exclusion – technology practices of older internet non-users	- Austria	- Being/ experiencing technophobia - Low technology acceptance - Socio-economic impediments - Feeling too old to learn digital devices - Technologies do not fit with the everyday lives of the elders	- Encourage formal and informal training sessions for the elders	- Barriers to using technology are often because of the limited training opportunities where the elders are trained and taught to use the devices correctly
(Zaman et al. 2022)	Exploring Barriers to and Enablers of the Adoption of Information and Communication Technology for the Care of Older Adults With Chronic Diseases: Scoping Review	- N/A	- Altered/ decline in cognitive abilities - Visual and hearing difficulties - Lack of trust in devices - Lack of willingness to adopt new skills - Low level of confidence - Lack of skills to operate technology	- Implement a personalized training method - Provide encouragement and motivation - Involve the elders in the design and development process of digital learning - Improve elders' awareness and training	- Technology intervention programs can act as a big help in supporting the elderly in accepting and using technology
(Kim et al. 2022)	Exploring Older Adults' Adoption and Use of a Tablet Computer During COVID-19: Longitudinal Qualitative Study	- New York	- Socioeconomic status - Not familiar with new technologies - Lack of self-efficacy - Have fear of making mistakes	- Incorporate collaborative activities (peer support, etc) - Encourage interpersonal communication - Emphasize demonstration and in-life tutorials instead of printed manuals - Exercise step-by-side instructions - Use devices that the elders are already familiar with	- Increased and frequent usage of technology can help improve the digital literacy of the elders

(Castleton et al. 2020)	'For older folks like me, these things are over us horizontal ellipsis ': The challenge of embedding tablet computers in everyday life within a geriatric hospital in Uruguay	- Uruguay	- Lack of support system - elders not finding the technology useful in their daily life activities - unfamiliarity with new and developing technologies	- Provide computer training courses - Enhance familiarity	- It is important to consider the elders' attitudes, experiences of using technology, and perceptions as key variables of them learning technology
(Blažič et al. 2018)	Learning digital skills for elderly people by using touch screen technology and learning games: A case study	- Slovenia	- Elders think that learning is a difficult task - Elders are not comfortable learning in a 'classroom' setting - Fear of making errors and mistakes - Age-related cognitive and physical changes	- Create an enjoyable environment and experience for the elders (integrate games, etc.) - Motivate and encourage the elders' engagement in the learning activities	- Knowing how to use technological devices is crucial for the elders in order to experience active aging
(Airola et al. 2020)	Older people as users and non-users of a video conferencing service for promoting social connectedness and well-being – a case study from Finnish Lapland	- Finnish, Lapland	- Physical and cognitive decline - Lack of interest in technology - Not yet ready to adopt technology - Concerned about their privacy - Negative attitude toward technology - Memory disorder - Insufficient support from surrounding people - Slowness in learning - Does not know how to use technology	- Selected technologies should be kept simple - Providing adequate support and training	- Selection of appropriate technological devices is important to ensure the participation of elders in learning technologies
(De Regge et al. 2020)	Personal and Interpersonal Drivers that Contribute to the Intention to Use Gerontechnologies	- Belgium	- Not being able to and not wanting to use technologies - Not feeling comfortable about using technology - Not fully trusting technology - Lacking of support or encouragement from family members	- Families should be encouraging and show their trust in technology (lead by example) - Providing access to technology - Convince elders to use technology - Teach the elders to trust technologies	- Enhancing and increasing the elders' trust in technological devices is a crucial action in encouraging technology adoption among the elderly

(Gell et al. 2021)	Technology Support Challenges and Recommendations for Adapting an Evidence-Based Exercise Program for Remote Delivery to Older Adults: Exploratory Mixed Methods Study	- Washington	- Feels anxious - Have low confidence - Have little experience with technologies	- Use technology that could cater to the elders' preferences - Create an environment that exercises collaboration work and cooperation - Understand learning preferences preferred by the elders	- Elders are willing and are enthusiastic to learn technology when there is appropriate support from their surroundings
(Kim et al. 2022)	The Impact of an Internet Use Promotion Programme on Communication, Internet Use, and the Extent of Social Networks among Low-Income Older Adults	- US	- Lack of access to and skill with digital technologies - Own negative attitude and acceptance of technologies - Cognitive decline - Concerns about the risks of being online - Less access to the internet - Low literacy	- Computer and internet training for older adults - Expanding the elders' social network - Improve social connectedness	- Increased digital communication, besides learning in a group setting collaboratively can improve the usage of communication technology among elderly
(Martínez & Olsson 2022)	The warm expert—A warm teacher? Learning about digital media in intergenerational interaction	- Sweden	- Have a 'defence against learning' attitude - Lack of self-confidence	- Provide support from family and friends - Learning intergenerationally - Establish potential learning situations - Exercising hands-on practice - Emphasizing memory techniques - Provide motivation and technical support from family and friends - Providing step-by-step instructions	- Interacting with people who provide support for the elders establishes great learning opportunities for the elders - Learning situations that are made of strategies that cater to the elders' specific needs can create a more effective learning session
(Betts et al. 2019)	There's Not Enough Knowledge Out There: Examining Older Adults' Perceptions of Digital Technology Use and Digital Inclusion Classes	- UK	- Uncomfortable with the growth of digitalization - Have a limited range of devices and knowledge - Have little to no training and experience in using technology - Lacking skills to use technology	- Enhance the elders' skill set - Provide supportive learning environments - Utilize social support - Provide digital technology training - Understand the needs of the elders	- It is important to clarify with the elders regarding the safety and security of using technology during the training sessions - Individualized learning and contexts that can cater to the elders' specific needs are very

				- Encourage engagement with devices - Implement peer tutoring among the elders - Teach appropriate skills to the elders	- It is important to clarify with the elders regarding the safety and security of using technology during the training sessions - Individualized learning and contexts that can cater to the elders' specific needs are very
(Cunnah et al. 2021)	Training people with dementia/ cognitive impairment and their carers in the use of web-based supportive technologies (Innovative practice)	- UK	- Limited access to technology - Little to no interest or motivation - Lack of skills and knowledge on how to use technology	- Provide appropriate and tailored support - Enhance digital skills training	- Group-based training activities can boost the engagement of the elderly in learning sessions
(LaMonica et al. 2021)	Understanding technology preferences and requirements for health information technologies designed to improve and maintain the mental health and well-being of older adults: Participatory design study	- Sydney	- Lack confidence in their abilities to use technologies - Will only adapt technologies when there is apparent usefulness and usability - Age-related changes in cognition, vision, hearing and perception	- Involving the elders in the process of designing methodologies for elders to learn technology better	- Personalized learning and access to more up-to-date technological devices increase the chances of the elderly accepting and adopting technology into their daily lives
(Baric et al. 2019)	Using an interactive digital calendar with mobile phone reminders by senior people – a focus group study	- Sweeden	- Lack of familiarity - Discomfort asking for support - Issues of trust, privacy, ease of use - Having difficulties handling a device due to visual and/or physical impairments	- Providing training and support - Having memory aids and prompting/ reminder systems - Motivate and support the use of technology - Developing strategies to enable technology to be incorporated into elders' daily life activities	- Encouraging and motivating the elders to accept and use technological devices can help them become more confident in using said devices

Source: Primary data

Common barriers faced by elderly people

Among the 19 literature pieces that have been reviewed, psychological challenges such as having low-self efficacy and low confidence in themselves to use technology, apprehensive and defensive about learning and exploring technology which is a relatively new thing for the elders, being technophobic, feeling as if they are too old to be learning new things such as technology, fearing that they might make mistakes when operating technological devices, and feeling uncomfortable about the growth, fast-expanding and having to use technological devices in their daily lives are among the many psychological barriers mentioned in 17 literature pieces.

Another common barrier identified based on the scoping of literature conducted was found in terms of cognitive and physical challenges that are commonly associated with people as they grow older. As reported in 11 of the literature pieces, some prevalent cognitive challenges include declining cognitive skills, such as having bad memorization skills, slow learning, and also low comprehending abilities. As for the physical aspect, the elders claim to experience declining mobile ability, as they are not able to operate their psychomotor abilities and move around as much compared to their younger days.

The next barrier discovered is related to the elders having low socioeconomic status, as reported by 15 of the literature pieces. This would mean that the elders do not have the right access to technological devices due to their social aspect, such as support from their surrounding people, and also from the economic aspect, which mainly is because of not being able to afford to have updated and new digital devices, thus causing a barrier between them learning and accepting said devices.

The fourth barrier, as reported by six of the reviewed literature, is the elders lacking necessary and adequate skills to use technological devices. Having low confidence in themselves created a great hindrance for the elders to gaining the opportunity to learn and adopt technological devices. When they feel as if they are lacking in the skills to use such technologies, they tend to refrain from even trying to learn as they feel as if it is pointless and does not bring any advantages in their lives, which leads to the next barrier for elderly learning and accepting technology, their perceives and perceptions.

Castleton et al. (2020), Gallistl et al. (2021), and LaMonica et al. (2021) reported that the elders that participated in their research stated that they will only adapt and learn to use technological devices when the items can benefit their daily life activities. Studies by Baric et al. (2019), Calhoun and Lee (2019), Airola et al. (2020), De Regge et al. (2020), Gallistl et al. (2021), Kim et al. (2022) and Zaman et al. (2022); on the other hand mentioned how one of the factors that hinder the elderly from accepting technology is due to their perceived trust of the devices. This would mean that the elders are often concerned with their privacy if they go on their digital devices, and whether their private information stored is secured or not.

Strategies and efforts to mitigate the barriers

Along with the many barriers reported by the eligible pieces of literature, a number of suggestions to mitigate the hindrance of elderly learning and accepting technological devices are offered. Ten of the literature pieces suggested implementing technological-based training sessions for the elders to help them lessen the barriers, especially in terms of their efficacy in using said devices. According to Bertera et al. (2007), Woodward et al. (2011) and Kim et al. (2022), implementing training sessions especially for the elders can actually enhance their willingness to adapt to the devices, thus decreasing the digital divide present.

The second suggestion for mitigating the barriers is to understand the specific needs and requirements that can cater to the needs of elders. Following the training sessions for the elders, implementing teaching methods that are more personalized and individualized may help to cater to the different needs of the

themselves. Hultberg et al. (2018) found that, when learners are involved in the process of designing their lessons, it can create a more effective and impactful lesson, which would be very beneficial for the elders.

Seven studies provided suggestions on appropriate teaching strategies that they have implemented in their own research regarding elderly learning to use technology. Betts et al. (2019), Gell et al. (2021) and Kim et al. (2022) suggested collaborative learning activities and emphasized step-by-step instructions to be exercised upon the elders. As for Blažič et al. (2018), a method suggested was integrating games into the training session, which has been found to alleviate the learning process of the elders. Finally, strategies suggested by Martinez & Olsson (2022) emphasize more on cognitive-strengthening activities for elderly learners.

One of the barriers mentioned earlier is related to their social aspects, where they lack support from their environments. According to the scoped literature, providing ample support, which includes supportive learning environments, support from their family and friends, and also providing encouragement and motivation to the elders, can help mitigate the emotional barriers faced by the elders (Blažič et al. 2018, Baric et al. 2019, Betts et al. 2019, De Regge et al. 2020, Martinez & Olsson 2022, Zaman et al. 2022).

Key findings from the scoped literature

Based on the scoped literature, the elders seem to be ready to accept technology and integrate them into their daily lives, with appropriate and aiding measures, that is. As mentioned by Xu & Huang (2021), there is indeed a growing need for the elders to be equipped with knowledge regarding technology in current days. They also added that promoting technology use among the elders has been found to bring many advantages to the elders as it could be very useful for them in terms of social support and connectedness, besides enriching their daily life activities. To help the elders to gain knowledge regarding technology, training and intervention programs could be very useful in supporting the process of accepting and using technology among the elders (Gallistl et al. 2020, Zaman et al. 2022).

D'Onofrio et al. (2019) reported that digital inclusion has been found to improve the elders' cognitive, physical and also their mental health, besides also allowing the elders to live a more independent life. In order to enhance digital inclusion, training sessions that emphasize individualized and personalized learning should be widely implemented, as an effort to cater to the elders' specific needs in learning (Betts et al. 2019, Castleton et al. 2020, LaMonica et al. 2021, Martinez & Olsson 2022). Learning collaboratively or in a group setting, as suggested by Cunnah et al. (2021), Kim et al. (2022) and Martinez & Olsson (2022) is one of the efficient methods of activities that could encourage the elders to use technology, also increasing their confidence in using said devices as their social surrounding is also learning with them at the same time.

Increasing the frequency of use of technological devices is also one of the methods of training suggested, as found in the scoped literature. Wu et al. (2019) mentioned that the practical use of devices can help develop and stimulate elders' cognitive abilities. Blažič et al. (2018), Baric et al. (2019), Airola et al. (2020), De Regge et al. (2020), Callhoun & Lee (2021) and Kim et al. (2022) all mentioned how frequent usage of devices among the elders could not only enhance the elders' cognitive abilities but also could improve the rate of digital literacy among the elders, besides helping build their self-efficacy, thus making them more confident in using technological devices.

Identifying the hindrance and what causes the reluctance of the elderly in pursuing learning, especially in terms of technological devices could be a great start to designing a lesson or learning program that utilizes strategies that can cater to the needs of the elderly learners. Taking into account previous researchers' methods of mitigating the challenges of elderly learning, a more structured lesson could be created to increase the interest of the elderly to pursue learning technological devices to stay connected and not be engulfed in the digital gap. Future researchers could use the results presented in this review paper as a guide to design a lesson that could cater to elderly learners' barriers and create a more effective knowledge-sharing session involving the elders.

Conclusion

The results obtained from this scoping review highlight the barriers and limitations that are often associated with the elderly and them learning to use technological devices, as well as the mitigating efforts or what measures could be taken by those in authority to help the elders learn in a more conducive and effective way, besides catering to their capabilities and limitations.

The progressive aging that is currently happening in the world goes along with the rapid development and invention of new and updated technological devices. Digital technology has been found to provide many advantages to the ones utilizing them, and this includes elderly people. Although there have been many known benefits and advantages of advanced technologies for the well-being of the elders, they are still reluctant and are still slow in accepting and using said devices in their daily lives. This study focused on identifying common barriers that are associated with the elders, especially pertaining to them accepting and using technology.

From the 19 pieces of literature reviewed, the barriers and challenges that are commonly faced by the elderly when learning technological devices are in terms of psychological challenges, which relate to their confidence in their own ability to pursue learning, besides deterioration in their cognitive and physical abilities due to their increasing age. Other than the aforementioned, they also face socioeconomic challenges where the elders do not have access to current devices, besides not having support from their surrounding people. Another barrier is perceived by the elders themselves, where they do not feel motivated to learn unless they are able to see the perceived usefulness and security of the devices introduced to them.

Along with the identification of the barriers faced by the elders in learning to use technology, the eligible pieces of literature are also scoped for methods and suggestions that could be taken by the body of authorities as an effort to mitigate the barriers to elderly learning. One of the strategies is to have intervention and training programs specialized for the elders. Other than that, recognizing what the elders can and cannot do is also an important step in encouraging them to participate in learning. Methods of learning were also highlighted based on the scoped literature, where integrating collaborative learning activities along with step-by-step instructions would help mitigate the learning barriers of the elders. Finally, providing a supportive environment and motivating the elders to pursue learning could also be a strong measure to cater to their reluctance in learning at their age.

Besides acknowledging the barriers to elderly learning and strategies to cater to the said barriers, there is also some key information that should be looked into, as it could also aid the efforts to increase the acceptance of technology among the elders. One of the measures to take in encouraging the elders to learn how to use technology is constant exposure and promotion of devices to them as it would excite and familiarize them with the device. Other than that, digital inclusion efforts such as intervention programs have been proven to improve the state of cognitive abilities among the elders, thus increasing theit acceptance of modern technology.

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