

A rapid review of the effectiveness of interventions for addressing digital exclusion in older adults

Authors: Alesha Wale¹, Jordan Everitt¹, Toby Ayres¹, Chukwudi Okolie¹, Helen Morgan¹, Hannah Shaw¹, Rhiannon Tudor Edwards², Jacob Davies², Ruth Lewis³, Alison Cooper⁴, Adrian Edwards⁴

1 Public Health Wales, United Kingdom

2 Centre for Health Economics and Medicines Evaluation, Bangor University, United Kingdom

3 Health and Care Research Wales Evidence Centre, Bangor University, United Kingdom

4 Health and Care Research Wales Evidence Centre, Cardiff University, United Kingdom

Abstract

Older adults constitute the largest proportion of non-users of the internet. With the increasing digitalisation of services, in particular those provided in social care in Wales, it is important to understand how best to support older adults to overcome the challenges they face with accessing or engaging with the digital world (for personal use). This rapid review aimed to assess the effectiveness of interventions to address digital exclusion in older adults (aged 60 years and above). Digital exclusion can occur due to issues with motivation (if people do not see why the internet might be beneficial), accessibility (unable to physically access to the internet), ability (lack of skills to use the internet) or affordability (unable to afford access to the internet) of digital technology.

Research Implications and Evidence Gaps

The majority of studies included in this review were of low quality. It is unclear whether study findings would be generalisable to the UK. Outcome measures were heterogeneous across studies making it difficult to compare findings directly. Only one study assessed the cost-effectiveness of a digital education intervention. No study reported on interventions to address language barriers, for example, that may be experienced by people whose first language is not English. No study focused specifically on interventions to improve access to, or affordability of the internet and digital technologies to overcome digital exclusion. Further high-quality UK-based research is needed to better understand the effectiveness and cost-effectiveness of interventions for addressing digital exclusion in older adults.

Policy and Practice Implications

This rapid review highlighted the **potential benefits of a range of complex multi-component educational interventions**, particularly with regards to improving digital literacy, and suggests that older adults are accepting of these interventions. To reduce digital exclusion in older adults, evidence suggests it may be important to ensure structural barriers, such as access to the internet and affordability of devices are removed. However, the cost of provision should be considered and assessed. Educational interventions may help to reduce perceptual barriers regarding digital technologies that contribute to digital exclusion including lack of confidence, fear and anxiety, or perceived lack of abilities. It is important to consider that older adults should be equipped with the skills to make an informed choice to interact with essential services physically (offline) or digitally. With the increasing digitalisation of services, it is important that older members of the community who do not wish to use digital technologies, are not left behind or disadvantaged.

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NOTE: This preprint reports new research that has not been certified by peer review and should not be used to guide clinical practice.



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A rapid review of the effectiveness of interventions for addressing digital exclusion in older adults

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Report Contributors

Review Team

Alesha Wale, Jordan Everitt, Toby Ayres, Chukwudi Okolie, Helen Morgan, Hannah Shaw

Economic Considerations

Rhiannon Tudor Edwards and Jacob Davies

Methodological Advice

Ruth Lewis

Evidence Centre Team

Ruth Lewis, Adrian Edwards, Alison Cooper, Elizabeth Doe involved in stakeholder engagement, review of report and editing

Public Partners

Beti-Jane Ingram and Mel (Melanie) McAulay

Stakeholders

Aimee Twinberrow, Eleanor Johnson, Emma Taylor Collins, Gareth Ashman, Stephen Thomas

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Report Number: RR0023 (March 2024)

EXECUTIVE SUMMARY

What is a Rapid Review?

Our rapid reviews (RR) use a variation of the systematic review approach, abbreviating or omitting some components to generate the evidence to inform stakeholders promptly whilst maintaining attention to bias.

Who is this Rapid Review for?

The above question was suggested by Social Care Wales (SCW).

Background / Aim of Rapid Review

Older adults constitute the largest proportion of non-users of the internet. With the increasing digitalisation of services, in particular those provided in social care in Wales, it is important to understand how best to support older adults to overcome the challenges they face with accessing or engaging with the digital world (for personal use). This rapid review aimed to assess the effectiveness of interventions to address digital exclusion in older adults (aged 60 years and above). Digital exclusion can occur due to issues with motivation (if people do not see why the internet might be beneficial), accessibility (unable to physically access to the internet), ability (lack of skills to use the internet) or affordability (unable to afford access to the internet) of digital technology.

Results

Recency of the evidence base

- The review included evidence available up until November 2023. Included studies were published between 2018 and 2023.

Extent of the evidence base

- 21 comparative primary studies were included in the rapid review: 3 randomised controlled trials, 10 non-randomised controlled studies, and 8 uncontrolled before and after studies.
- Studies were conducted in the USA (n=6), Korea (n=3), Canada (n=2), Mexico (n=2), Australia (n=1), China (n=1), the Netherlands (n=1), Peru (n=1), Portugal (n=1), Singapore (n=1), and Spain (n=1). One study was conducted across multiple countries including the UK, Latvia, Poland and Portugal.
- Intervention approaches varied considerably however, all contained an educational component. Approaches included those with an intergenerational component (n=4), those that were incorporated into existing services (n=3), and those that created tailored computer software (n=2). One intervention incorporated an online game, and one intervention specifically aimed to teach participants to detect online deception. The remaining 10 studies were classified as more traditional educational interventions.
- Outcome measures included: technology adoption, digital literacy (including proxies for digital literacy), participants' perceptions of technology use (including own abilities), acceptability of interventions and cost-effectiveness.

Key findings and certainty of the evidence

- **Overall, all studies reported findings in favour of the interventions.**
- There is low certainty evidence to suggest that digital literacy interventions including interventions that are incorporated into existing services can **increase uptake in the use of digital technologies in older adults.**

- There is low certainty evidence to suggest that traditional digital literacy interventions and interventions incorporating gamification, tailored computer software, intergenerational approaches, or teaching specific digital literacy skills (deception detection), can **improve digital literacy as a standalone outcome, and a range of proxies for digital literacy.**
- There is very low certainty evidence **that intergenerational interventions can improve E-health literacy and reduce technophobia** in older adults.
- There is low certainty evidence indicating a **range of interventions such as those using tailored computer software, intergenerational approaches, those incorporated into existing service and traditional digital literacy interventions are effective in improving participants' self-perceptions.**
- There is low certainty evidence to suggest that **older adults are accepting of educational interventions.**
- There is very low certainty evidence to suggest that **educational interventions may be cost-effective.**

Research Implications and Evidence Gaps

- The majority of studies included in this review were of low quality.
- It is unclear whether study findings would be generalisable to the UK.
- Outcome measures were heterogeneous across studies making it difficult to compare findings directly.
- Only one study assessed the cost-effectiveness of a digital education intervention.
- No study reported on interventions to address language barriers, for example, that may be experienced by people whose first language is not English.
- No study focused specifically on interventions to improve access to, or affordability of the internet and digital technologies to overcome digital exclusion.
- Further high-quality UK-based research is needed to better understand the effectiveness and cost-effectiveness of interventions for addressing digital exclusion in older adults.

Policy and Practice Implications

- This rapid review highlighted the **potential benefits of a range of complex multi-component educational interventions**, particularly with regards to improving digital literacy, and suggests that older adults are accepting of these interventions.
- To reduce digital exclusion in older adults, evidence suggests it may be important to ensure structural barriers, such as access to the internet and affordability of devices are removed. However, the cost of provision should be considered and assessed.
- Educational interventions may help to reduce perceptual barriers regarding digital technologies that contribute to digital exclusion including lack of confidence, fear and anxiety, or perceived lack of abilities.
- It is important to consider that older adults should be equipped with the skills to make an informed choice to interact with essential services physically (offline) or digitally. With the increasing digitalisation of services, it is important that older members of the community who do not wish to use digital technologies, are not left behind or disadvantaged.

Economic considerations

- It is important that the relative cost-effectiveness and acceptability of digital versus traditional in-person social care solutions is investigated further.
- There is a larger existing evidence base concerning reducing digital exclusion in healthcare solutions than social care solutions.
- Technological solutions to improve patient data flows between health and social care in England have been found to provide monetary benefits and benefits to patients.

Disclaimer: The views expressed in this publication are those of the authors, not necessarily Health and Care Research Wales. The Health and Care Research Wales Evidence Centre and authors of this work declare that they have no conflict of interest.

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Abbreviations

Acronym	Full Description
CAS	Computer Anxiety Scale
C&C	Digital Communication and Collaboration
CI	Confidence Interval
COVID-19	Coronavirus disease 2019
CPQ	Computer Proficiency Questionnaire
CTN	Community Tech Network
D-AI	Dutch Activity Inventory
DILE	Digital Literacy Evaluation Tool
eHEALS	The 8-item eHealth Literacy Scale
GSE	General Self-Efficacy Scale
GTF	Good Things Foundation
HSL-12	12-question Health Literacy Scale
ICER	Incremental Cost-Effectiveness Ratio
I-CHATT	Individualized Community and Home-based Access to Technology Training
ICT	Information and Communication Technology
I&DL	Information and Data Literacy
IF	Intergenerational Forum
IMU	Intergenerational Mentor-up
JB	Joanna Briggs Institute
LBFE	Little Brothers – Friends of the Elderly
LMS	Learning Management System
Madj	Adjusted Mean Confidence Score
MDPQ-16	16-question Mobile Device Proficiency Questionnaire
ND	Motivation
OITO	Oficinas de Inclusão Tecnológica Online, “Workshops for Online Technological Inclusion”
OR	Odds Ratio
PC	Personal computer
PRISM	Personal Reminder Information and Social Management system
QALY	Quality-Adjusted Life-Year
RCT	Randomised Controlled Trial
RR	Rapid Review
SD	Standard Deviation
SDLE	Senior Digital Literacy Evaluation
SES	Socio-Economic Status
SOTU	Survey Of Technology Use
UK	United Kingdom
USA	United States of America
WRAT	Wide Range Achievement Test

1. BACKGROUND

1.1 Who is this review for?

This Rapid Review was conducted as part of the Health and Care Research Wales Evidence Centre Work Programme. The above question was formulated by Social Care Wales.

1.2 Background and purpose of this review

Digital exclusion refers to when sections of the population are unable to exploit the benefits that using digital technologies might make available to them (Honeyman 2020). This occurs due to issues with motivation (those who do not see why the internet might be beneficial) (NIHR 2022), accessibility (those who physically do not have access to the internet), ability (those who do not have the skills to engage with an online environment) or affordability (those who cannot afford access to the internet) of digital technology (Ofcom 2022). Digital divide refers to the gap between those who are excluded and those who are able to benefit from technology (Honeyman 2020). Digital inclusion is an approach for overcoming the barriers to opportunity, access, knowledge and skills for using technology (Gann 2018).

In Wales, 7% of the population (over 16 years) are not online (Welsh Government 2023a). A lack of digital skills and access in terms of device and connectivity can lead to poorer health outcomes, increased loneliness and social isolation, as well as less access to information, learning and essential services (Good Things Foundation 2024). Older adults constitute the largest proportion of non-users of the internet worldwide (Lu et al 2022). While internet use is increasing among older adults, they remain a group at risk of being digitally excluded, with older adults being more likely to lack confidence online (Ofcom 2023). In Wales between 2022-2023 32% of adults aged 75 years and over reported they were not using the internet with 29% not having internet access in their household (Welsh Government 2023b).

Older adults may face a range of barriers when considering or attempting to use digital technologies. Physical barriers include aging-related barriers such as poor eyesight and lack of dexterity, and individual/personal barriers such as living alone, lower income, lack of knowledge around how to use digital technologies and difficulty understanding digital terminology (Vassilakopoulou 2023; Moroney 2020; Schirmer 2023, Yazdani-Darki et al 2020). Perceptual barriers include internalised negative perceptions and stereotypes of aging, fear and anxiety, and lack of confidence of using and/or in digital technologies (Gates 2022; Vassilakopoulou 2023; Schirmer 2023). This highlights the need to support older adults in developing the necessary skills required to navigate the rapidly evolving digital landscape and address the current digital divide.

Preliminary work focused on exploring the effectiveness of interventions to support older adults accessing social care services online. With the increasing digitalisation of services, it is important to understand how best to support older adults to overcome the challenges they face with accessing or engaging with the digital world. However, the initial searches did not identify any studies specifically aimed at supporting older adults to access social care services online. As such, it was agreed with stakeholders that the scope of this rapid review would be broadened to explore the effectiveness of interventions to support older adults to access and engage with digital technologies for personal use. Increasing digital inclusion may help to reduce inequalities and ensure equal access to these services (King's fund

2023). Our work aims to support this by identifying interventions that are effective at reducing digital exclusion among the older aged population.

This rapid review focuses on primary studies assessing the effectiveness of interventions aimed at addressing digital exclusion in older adults (aged 60 years or over). Interventions aimed at supporting access to health-related services or improving work-related digital skills were excluded from this RR. There are various ways to measure digital literacy that are used in research. For the purposes of this review, digital literacy is defined as the capabilities that allow someone to live, learn, work, participate and thrive in a digital society (NHS Health Education England 2016).

2. RESULTS

2.1 Overview of the Evidence Base

A total of 21 comparative primary studies were included in the review (see section 5.1, Table 4 for full eligibility criteria). Study designs were either randomised controlled trials (RCT) (n=3) or quasi-experimental (n=18). Of the 18 quasi-experimental studies, eight were uncontrolled before and after (pre-post) studies while 10 were non-randomised controlled studies. Included studies were conducted in a range of countries including USA (n=6), South Korea (n=3), Canada (n=2), Mexico (n=2), Australia (n=1), China (n=1), Netherlands (n=1), Peru (n=1), Portugal (n=1), Singapore (n=1), and Spain (n=1). One study was conducted across multiple countries including the UK, Latvia, Poland and Portugal. Sample sizes were generally small, ranging between 5 and 381 participants in total. Seven of the studies included more than 100 participants.

Data collection methods utilised self-report methods such as surveys and questionnaires, but also included quizzes, focus groups and interviews. The majority of data collection methods included validated tools and measures.

Many of the studies contained complex multi-component interventions, and often had overlapping features making it difficult to categorise the interventions for synthesis. We grouped the studies based on some of the more novel features that could be incorporated or considered when designing interventions to address digital exclusion in the future. This included studies that contained an intergenerational component (n=4), studies that were incorporated into existing services (n=3), studies that created tailored computer software (n=2), one study that incorporated an online game into the intervention, and one study that specifically aimed to teach participants to detect online deception. The remaining 10 studies were classified as more traditional educational interventions. A range of outcomes were reported including digital literacy, technology use and adoption, confidence and self-reported independence, acceptability, and cost-effectiveness. Digital literacy was assessed independently as an outcome, but also included proxy measures for digital literacy including computer proficiency, mobile device proficiency, digital competence, online deception detection and E-health literacy.

The methodological quality of included studies was assessed using the appropriate Joanna Briggs Institute (JBI) critical appraisal tool (for quasi-experimental studies and RCTs). The three RCTs were judged to be of moderate quality while all 18 quasi-experimental studies were determined to be of low quality due to the absence of a control group in eight studies, and uncertainty regarding the reliability of outcome measures used in 13 studies. Of the 10

non-randomised controlled studies, three did not report any between-group analysis and only provided within-group differences (pre-post). The output of the quality assessment can be seen in sections 5.6 and 6.3.

Intervention components

The majority of interventions included were diverse, complex and multi-component. All were educational, aimed at training older adults to improve their digital literacy skills. Many incorporated innovative elements such as utilising existing services to deliver the intervention, involving gamification and tailoring the intervention to the specific needs of the participant. Others were single component, focussing on digital skills education more broadly. The various elements and components utilised within each intervention can be seen in the matrix (Table 1). Details of the interventions can be seen in Table 2; a summary of the findings can be found in Table 3 and a summary of the included studies can be seen in section 6.2 (Table 5).

Of the 21 included studies, eleven focused on evaluating interventions among specific subgroups, such as older adults from small or rural towns (n=4), older adults of low socio-economic status (SES) (n=3), older adults at risk of social isolation (n=2), older adults who are homebound (n=1), and visually impaired older adults (n=1).

Interventions were commonly conducted solely within the community (public settings) (n=10), conducted solely in-person at the participants' homes (n=7) either held virtually (n=2), on a one-to-one in-person (n=4) basis, or a mixture of both (n=1). Three studies included interventions that were conducted across both home and community settings and one home-based intervention involved a mix of in-person and remote teaching. Study authors indicated home-based training may be deemed to be most meaningful and an anxiety free space to learn in. It was also considered convenient in terms of scheduling and transportation (Arthanat et al., 2022). Six interventions were self-directed and the remaining involved a tutor of some sort.

Seven interventions were tailored to participant needs, by using an individualised or tiered curriculum approach, enabling those with varying baseline skills to be taught at an appropriate level to ensure they could gain the most out of the intervention (Ngiam et al., 2022). Patty et al. (2018) also varied the duration of the intervention to ensure all participants completed the programme, whilst accounting for the differing capabilities of participants. Six interventions involved personal computer (PC) equipment, five involved tablet devices, two involved smartphones and three involved the use of both tablet devices and smartphones and five did not specify a device. Five interventions enabled participants to retain digital equipment indefinitely after the intervention had finished, one of which required participants to pay for the device and internet access (Ngiam et al., 2022). Devices provided included tablets in three studies, smartphones in one study and PCs in one study. Seven interventions involved the use of participants own equipment.

Table 1. Interventions matrix

Study	Vulnerable group ¹	Delivery method								Setting			Intensity		Devices & provision				Additional intervention features		
		One-to-one	Group	Tailored	Self-directed	Part of existing service	Intergenerational	Delivered by a peer	Gamification	Home (in-person)	Home (remote)	Community	≥8 sessions ²	≥12 weeks ³	Device (T/S/C) ⁴	Provided for sessions	Provided to keep	Own equipment	Peer support	Bespoke hardware	Bespoke software
Randomised controlled trials																					
Arthanat (2021)	X	X		X		X				X				X	T		X		X		
Czaja et al. (2018)	X	X			X					X	X			X	C		X		X		X
Fields et al. (2021)	X	X				X				X			X		T		X				
Non-randomised controlled studies																					
Choi & Park (2022) ⁵			X						X			X	X	U	U	X					X
Lee et al. (2022a) ⁵	X		X									X			S	U		U			
Martínez-Alcalá et al. (2021) ⁵				X							X	X	U	X	C	X		X			
García et al. (2022)			X				X	X			X	X	X	U	C	X		X			
Holguin-Alvarez et al. (2020)	X		X									X	X	U	U	U		U			
Lee et al. (2022b)		X	X	X			X					X	U	X	T/S/C			X	X		

Martínez-Alcalá et al. (2018)			X		X							X		X	C	X					
Moore & Hancock (2022)					X						X				U			X			
Ngiam et al. (2022)	X	X		X						X				X	S		X [£]				
Ma et al. (2020)					X		X	X				X			T	X					
Pre-post studies																					
Castilla et al. (2018)	X		X									X	X		C	X				X	X
Elbaz et al. (2023)			X								X		X		C			X	X		
Gadbois et al. (2022)	X	X				X				X			U	X	T		X				
Lee & Kim (2019)	X	X	X	X			X			X		X		U	U	U		U			
McCosker et al. (2020)				X	U							X	X	U	U	U		U			
Patty et al. (2018)	X			X								X	X	U	T/S	U		U			
Quialheiro et al. (2023)			X									X	X	U	T/S			X			
Seaton et al. (2023)	X				X						X	X	X	U	T			X			

1. Studies that involve a particular subgroup within the older adult population
 2. Above the average number of sessions that interventions were delivered over
 3. Above the average number of weeks that interventions were delivered over
 4. T=Tablet, S=smartphone, C=computer
 5. Controlled studies that did not provide between group comparisons
- U=unclear
£=At a cost

2.2 Effectiveness of educational interventions on digital technology use

A total of five studies explored the effect of educational interventions on the adoption or use of digital technology (Arthanat., 2021; Fields et al., 2021; Gadbois et al., 2022; Lee et al., 2022a; Seaton., 2023). All studies explored intervention effectiveness among vulnerable population group including those living in rural areas (n=3), those who are socially isolated, (n=1) or homebound (n=1). This outcome was measured using a pre-post study design in two studies (Gadbois et al., 2022; Seaton et al., 2023), a non-randomised controlled study design in one study (Lee et al., 2022a) and a RCT study design in two studies (Arthanat., 2021; Fields et al., 2021). Study findings appeared to show effects in favour of the interventions.

Interventions incorporated into existing services

- Gadbois et al. (2022) conducted a pilot study to assess the impact of the Talking Tech intervention, a 14-week, one-to-one, home-based, technology training intervention on technology use. The intervention was incorporated into a home-delivered meals programme for homebound older adults. **A trend towards increased technology use (measuring 10 activities) was reported after the intervention, however the increases were not statistically significant.** Out of 18 participants **who completed baseline and follow-up surveys**, seven (38.89%) reported increased internet use for activities including shopping, prescriptions, social media, and health-related activities, while three (16.67%) reported less use and eight (44.44%) participants reported the same use after the intervention had concluded.
- Arthanat (2021) conducted an RCT to assess the effectiveness of a home-based, individualised inter-generational ICT training programme called the Individualised Community and Home-based Access to Technology Training (i-CHATT) on technology use (measuring 56 activities related to use) for older adults living in rural towns. The intervention formed part of an occupational therapy programme. While no significant change in the frequency of ICT use was reported at the six-month follow-up, **technology use in the intervention group sustained an increasing trend during the remaining follow-up points (12, 18, and 24 months) ending at 36 activities each month compared to about 30 by the control group.**
- Fields et al. (2021) conducted an RCT to assess the impact of a one-to-one, home technology training intervention on technology use for socially isolated older adults. Participants were provided with a tablet and internet access. The intervention was incorporated into a volunteer-based programme that provides home visits for lonely older adults. **Technology use was found to increase statistically significantly in the intervention group between baseline and two months post intervention (baseline: 33% no internet or email use, two-month: 0% no internet or email use, p=0.004). There was no change over time within the control group (baseline: 53% no internet or email use, two-month: 60% no internet or email use, p=0.63). There were significantly higher rates of technology use within the intervention group compared to the waitlist arm (OR: 91.20; 95% CI: 11.02 to +Infinity; no p value given).**

Traditional digital literacy interventions

- Seaton et al. (2023) explored the impact of the Gluu Essentials digital skills training programme on technology use in older adults living in rural communities. **The results showed that the frequency of going online for shopping ($p=0.01$) and accessing government services ($p=0.02$) statistically significantly increased after the intervention. Technology use for accessing online banking ($p=0.10$), and emergency services ($p=0.42$) also increased after the intervention, although these improvements were not statistically significant. No differences were found in how frequently technology was used to send and receive emails ($p=0.47$), or searching for information ($p=0.96$) after the intervention. However, the frequency of going online for COVID-19 related information statistically significantly decreased after the intervention ($p=0.01$).** According to the study authors, this may have been due to the easing of COVID-19 restrictions in Canada towards the end of the study period.
- Lee et al. (2022a) assessed the impact of a six-session, community-based, digital literacy education programme to increase the use of smartphones in older adults living in rural areas. **No significant increases were reported in taking photos for either group after the intervention period** (experimental group: $p=0.087$; control group: $p=0.176$). **However, the frequency of phone calls made using smartphones increased significantly in the intervention group by 8.5% after the intervention** ($t: 1.934, p=0.026$). **No changes were observed in the control group. A statistically significant increase in ability to video record using a smartphone was also found in the intervention group** ($t/x2: 4.493, p=0.049$). **Similarly, no improvement was found in the control group** ($t/x2: 0.522, p=0.527$). No between group differences were reported.

2.2.1 Bottom line results for effectiveness of educational interventions on digital technology use

There is evidence to suggest that educational interventions are effective at improving digital technology use in older adults from vulnerable contexts including those living in rural areas, those who are socially isolated, or homebound. However, the evidence is mostly of low quality. Evidence suggests that uptake can be increased using traditional digital literacy interventions ($n=2$) and interventions that are incorporated into existing services ($n=3$).

While each study reported some outcome improvements for the intervention group, not all were statistically significant when compared to baseline or a comparator. Various forms of technology use were assessed among the studies (such as smartphone use, accessing services such as banking and shopping), but not all were found to improve following the intervention. However, this could be due to the individual digital needs of the participants, rather than the intervention itself.

2.3 Effectiveness of educational interventions on digital literacy

Fifteen studies explored the impact of a range of interventions on digital literacy (Choi and Park., 2022; Czaja et al., 2018; Elbaz et al., 2023; Garcia et al., 2022; Holguin-Alvarez et al., 2020; Lee and Kim., 2019; Lee et al., 2022b; Martínez-Alcalá et al., 2018; Martínez-Alcalá et al., 2021; McCosker et al., 2020; Moore and Hancock., 2022; Ngiam et al., 2022; Patty et al., 2018; Quialheiro et al., 2023; Seaton et al., 2023). Three focused on digital literacy as a standalone outcome (Choi and Park., 2022; Garcia et al., 2022; Martínez-Alcalá et al., 2021;

Ngiam et al., 2022), two on E-health literacy (Lee and Kim., 2019; Lee et al., 2022b), and ten used proxies for digital literacy (Czaja et al., 2018; Elbaz et al., 2023; Holguin-Alvarez et al., 2020; Martínez-Alcalá et al., 2018; McCosker et al., 2020; Moore and Hancock., 2022; Patty et al., 2018; Quialheiro et al., 2023; Seaton et al., 2023). Study findings appeared to show positive effects in favour of the interventions.

Effectiveness of educational interventions on digital literacy as a standalone outcome

Digital literacy was assessed as a standalone outcome in three studies using a non-randomised controlled study design (Choi and Park., 2022; Martínez-Alcalá et al., 2021; Ngiam et al., 2022). A broad range of questionnaires and tools were used to measure digital literacy. See data extraction in section 6.2 (Table 5) for full details of the tools used.

Gamification

- Choi and Park. (2022) assessed the impact of a 10-session, community-based, educational IT programme using an educational game called 'Save the Titanic using the decision tree', compared with general IT educational sessions. No between group differences were reported. However, within group differences identified **digital literacy statistically significantly improved in the intervention group ($p < 0.05$) after receiving the intervention and while digital literacy also improved in the control group** (after receiving general internet and digital use education), **this improvement was not statistically significant ($p > 0.05$)**. More specifically, when looking at recognition and behaviour domains the intervention group statistically significantly improved after the intervention (mean recognition score 2.45, SD:0.55 vs 3.02, SD:0.64; $p = 0.012$; mean behaviour score 3.16, SD:0.66 vs 3.67 SD:0.59; $p = 0.001$). Improvements were also made in the control group however these were not statistically significant (mean recognition score 2.34, SD:0.47 vs 2.51, SD:0.35; $p = 0.102$; mean behaviour score 3.10, SD:0.81 vs 3.32, SD:0.34; $p = 0.84$).

Traditional digital literacy interventions

- Martínez-Alcalá et al. (2021) assessed the impact of digital literacy workshops delivered in different formats in response to the COVID-19 pandemic. This study contained three different delivery methods as the intervention moved from blended learning (pre-pandemic), to transition treatment, and then a fully digital intervention. The study analysed data from two groups of older adults with varying levels of baseline digital literacy (basic and intermediate) as they progressed through the workshops and workshop formats. **Both groups, regardless of initial skill level, exhibited statistically significant improvements in digital literacy scores ($p < 0.001$) across all delivery formats**. No between group differences were reported.
- Ngiam et al. (2022) explored the impact of a home-based, volunteer-led, one-to-one digital literacy programme, compared with no intervention, in older adults of lower SES. Older adults were equipped with smartphones and internet connection. The study findings showed **statistically significant improvements in mean digital literacy scores of the intervention group after the programme, compared to the control group** (2.42, 95% CI: 1.71 to 3.11 vs 0.13 95% CI: -0.48 to 0.75 mean difference: 2.28, 95% CI: 1.37 to 3.20; $p < 0.001$). This difference remained after adjusting for baseline digital literacy scores and differences in age, gender, education, living arrangement, housing type and baseline social connectivity and loneliness status (β : 1.90, 95% CI: 0.91 to 2.90, $p < 0.001$).

Effectiveness of educational interventions on proxy outcomes for digital literacy

Ten studies assessed the impact of interventions on a number of proxy outcomes for digital literacy (computer/mobile device proficiency, digital competence, digital/ICT skills and online deception detection) (Czaja et al., 2018; Elbaz et al., 2023; Garcia et al., 2022; Holguin-Alvarez et al., 2020; Martínez-Alcalá et al., 2018; McCosker et al., 2020; Moore and Hancock., 2022; Patty et al., 2018; Quialheiro et al., 2023; Seaton et al., 2023). This outcome was measured using a pre-post study design in five studies (Elbaz et al., 2023; McCosker et al., 2020; Patty et al., 2018; Quialheiro et al., 2023; Seaton et al., 2023), a non-randomised controlled study design in four studies (Garcia et al., 2022; Holguin-Alvarez et al., 2020; Martínez-Alcalá et al., 2018; Moore and Hancock., 2022) and a RCT study design in one study (Czaja et al., 2018). Digital literacy proxy outcomes were measured using a range of self-reporting tools including the Computer Proficiency Questionnaire (CPQ) and the Mobile Device Proficiency Questionnaire (MDPQ). See section 6.2 for full details.

Interventions that incorporated tailored computer software

- Czaja et al. (2018) conducted an RCT and assessed the impact of a specially designed computer system, the Personal Reminder Information and Social Management (PRISM) system for older adults at risk of social isolation on computer proficiency. PRISM included: Internet access (with vetted links to sites such as NIHSeniorHealth.Gov), an annotated resource guide, a dynamic classroom feature, a calendar, a photo feature, E-mail, games, and online help. Users can also be listed as a “PRISM Buddy” to enable them to have contact with people who had similar interests. Participants in the intervention group (PRISM) were provided with a Personal Computer (PC), monitor, mouse, keyboard, printer and access to the internet to complete the intervention at home. Participants in the comparator group were provided with a notebook with printed content similar to that within the PRISM system. **Participants in the intervention group were found to show a greater increase in CPQ scores at six months ($b = -6.37$; effect size 1.11; 95% CI: -7.39 to -5.35 ; $p < 0.001$) and twelve months ($b = -7.06$; effect size 1.23; 95% CI: -8.08 to -6.03 ; $p < 0.001$) compared to the comparator group.**

Interventions with an intergenerational component

- Garcia et al. (2022) analysed the impact of three different educational approaches (intergenerational, peer-to-peer and online) in improving older adults’ digital skills. The author’s assessed digital literacy by looking at the effectiveness on a range of outcomes including information and data literacy (I&DL), digital communication and collaboration (C&C) and safety, all of which statistically significantly improved compared to the baseline findings for all groups showing all delivery methods to be effective ($p \leq 0.01$). However, motivation was not reported to have improved for any of the groups. **Statistically significant differences in I&DL, C&C, and safety were identified in the peer-to-peer delivery method when compared to the online approach ($p = 0.001$). Statistically significant differences in I&DL, C&C, and safety were identified in the intergenerational delivery method compared to the online approach ($p = 0.002$).** No significant differences were reported between the peer-to-peer and intergenerational methods.

Interventions to improve online deception detection

- Moore and Hancock (2022) assessed the impact of a self-directed online course to improve deception detection online. Participants who received the intervention statistically significantly improved their ability to determine fake news after the intervention while participants in the control group also improved their ability after the intervention. However the improvement was not statistically significant (probability of accurately judging the veracity of a headline) 64% (95% CI: 61 to 67%) to 85% (95% CI: 82 to 88%) vs 55% (95% CI: 53 to 58%) to 57% (95% CI: 55 to 60%); respectively; $p < 0.001$). **Participants in the intervention group were reported to have a statistically significantly greater improvement in deception detection compared to the control group** (B: 1.073, SE: 0.159, $p < 0.001$).

Traditional digital literacy interventions

- Elbaz et al. (2023) conducted a pilot study to assess the impact of a four-week, online, digital literacy programme on computer proficiency, and found that the **mean Computer Proficiency Questionnaire (CPQ) scores were statistically significantly higher after the intervention compared to before the intervention** (CPQ score: 17.72 ± 1.94 vs. 13.24 ± 2.40 ; $t(4) = -8.910$; $p < 0.001$). More specifically, significant improvements were reported for computer basics (CPQ score 3.97 ± 0.45 vs. 3.23 ± 0.60 ; $t(4) = -5.880$; $p = 0.004$), communication (CPQ score 3.36 ± 0.38 vs. 2.40 ± 0.48 ; $t(4) = -8.353$; $p = 0.001$), and using the Internet (CPQ score 3.63 ± 0.16 vs. 2.71 ± 0.48 ; $t(4) = -4.257$; $p = 0.013$). No significant differences were reported for printing, scheduling online, and using multimedia ($p > 0.05$).
- Seaton et al. (2023) explored the impact of the Gluu Essentials digital skills training programme on mobile device proficiency and confidence in going online in older adults living in rural communities. This included 12 lessons delivered either in person or over the phone. The study findings reported a statistically significant improvement in **mobile device proficiency after the intervention** (mean mobile device proficiency questionnaire (MDPQ) score 3.93, SD:0.91 vs 4.13, SD:0.79; $p < 0.001$).
- Quialheiro et al. (2023) measured the impact of an eight-workshop digital inclusion programme - the OITO (Oficinas de Inclusão Tecnológica Online, "Workshops for Online Technological Inclusion") project on digital literacy of older adults at three time points – before, immediately after, and at one month after completing the programme. **The results showed statistically significant improvements in MDPQ score after the intervention and at one month follow-up compared to before the intervention** (mean MDPQ increase 2.49; 95% CI: 1.80 to 3.18; $p < 0.001$), but without a statistically significant difference between the post-intervention times.
- McCosker et al. (2020) assessed the impact of an online, community-based national digital inclusion programme (Be Connected) on digital skills, which consisted of 12 modules. **Participants improved in all 11 operational and strategic digital skills measured after the intervention, but this improvement was only statistically significant for 10 of the skills reported.** This included statistically significant changes to their ability to: make basic changes to others content ($p = 0.007$), bookmark a website ($p < 0.001$), create something new from existing online images music or video ($p = 0.001$), install apps ($p < 0.001$), understand which licenses apply to online content ($p = 0.005$), to open a tab in a browser ($p = 0.031$), to open downloaded files ($p = 0.048$), to

download/save a photo ($p=0.036$), use shortcut keys ($p<0.001$), keep track of mobile app costs ($p<0.001$). No significant change was found in participants abilities to create a website ($p=0.016$).

- Patty et al. (2018) explored the impact of a community-based Information and communication technology (ICT) training intervention (provided as part of standard rehabilitative eye care) on a range of ICT skills for visually impaired older adults. Using an adapted version of the Dutch Activity Inventory (D-AI) to evaluate the effects of training, authors found **ICT skills statistically significantly improved (perceptions of difficulty decreased) after the intervention and continued to improve three months after the intervention** (D-AI sum score: 22.98 (at baseline) vs 13.13 (after the intervention) vs 12.97 (three-month follow-up); $p=0.01$). The most notable improvements were in computer skills, using the internet and using hotkeys. This study also reported cost-effectiveness outcomes (summarised in section 2.6).
- Holguin-Alvarez et al. (2020) assessed the impact of a 50-session, community-based, social media programme to increase digital competence for older adults of lower SES. The programme supported participants to engage with social media sites and to communicate online. **The experimental group statistically significantly improved their digital competence compared to the control group** (average digital competency score M:119.1; SD:0.24 vs M:45.1; SD:1.06; $p<0.001$).
- Martínez-Alcalá et al. (2018) assessed the impact of digital literacy workshops for older adults on digital competence. Two different delivery methods were assessed; a face-to-face approach and a blended approach (which included multimedia learning activities and materials as well as face-to-face). **The workshops statistically significantly improved digital competence in both groups** (face-to-face approach: $z:-6.79$, $p<0.0001$ and blended approach: $z:-5.30$, $p<0.0001$). The findings show that **participants in the blended workshop group reported a statistically significant greater improvement in digital competence compared to the face-to-face group** (difference in competence $U:810.5$, $p<0.01$).

Effectiveness of educational interventions on E-health literacy

Two studies (Lee and Kim., 2019; Lee et al., 2022b) assessed the effectiveness of interventions for improving E-health literacy in older adults. Interventions in both studies incorporated both educational and mentorship approaches. A pre-post study design was used to measure E-health literacy in Lee and Kim 2019, while a non-randomised controlled study design was used in Lee et al 2022b. Study findings appeared to show effects in favour of the interventions.

Interventions with an intergenerational component

- Lee and Kim (2019) explored the impact of a community-based group, intergenerational programme on E-health literacy. The programme included six group sessions in the community where older adults were paired with student mentors. E-Health literacy was measured before the intervention and found to be neutral (defined as undecided), however, **after the intervention participants showed a statistically significant improvement** ($t:-5.89$, $d:-0.79$; $p<0.001$).

- Lee et al. (2022b) assessed the impact of a 12-week, community-based, intergenerational, group, educational programme where older adults were paired with student mentors and found that E-health literacy **statistically significantly improved for individuals who received the intervention compared to the control group** (who received no intervention) ($t(49)=-4.23$, $d=-0.60$; $p<0.001$).

2.3.1 Bottom line results for the effectiveness of educational interventions on digital literacy

There is evidence to suggest that educational interventions are effective at improving digital literacy in older adults. The results suggest that interventions that incorporate gamification, tailored computer software, intergenerational approaches, or aim to teach specific digital literacy skills such as deception detection are effective at improving digital literacy as were the traditional digital literacy interventions.

Evidence of improvements were also seen for older adults in vulnerable contexts including those at risk of social isolation, lower SES groups, those living in rural areas and visually impaired older adults. However, the evidence in support of these interventions is of low quality, so we cannot be certain of the true effect.

Improvements were reported regardless of whether the intervention was delivered in the community, at home or online. While all delivery methods identified within the included studies improved participants digital literacy, there is limited evidence to suggest peer-to-peer or intergenerational training may be more effective than online training, and that blended training involving multimedia activities and materials may be more effective than face-to-face training.

2.4 Effectiveness of educational interventions on participants' perceptions of technology use

A total of nine studies reported participant perceptions of technology use (Arthanat., 2021; Castilla et al., 2018; Czaja et al., 2018; Fields et al., 2021; Lee and Kim., 2019; Lee et al., 2022a; Lee et al., 2022b; Ma et al., 2020; Quialheiro et al., 2023). This outcome included self-perceptions of abilities when using digital technologies (Castilla et al., 2018; Czaja et al., 2018; Fields et al., 2021; Lee and Kim., 2019; Lee et al., 2022a; Ma et al., 2020; Quialheiro et al., 2023), technophobia (Lee and Kim., 2019; Lee et al., 2022b) and acceptability of technology (Arthanat., 2021; Castilla et al., 2018; Czaja et al., 2018; Lee and Kim., 2019). Study findings appeared to show effects in favour of the interventions.

Effectiveness of educational interventions on participants' self-perceptions of abilities

Seven studies explored the impact of interventions on participants' perceptions of their own abilities to use new technologies, this included perceptions of capabilities, self-efficacy, self-autonomy and confidence as a standalone outcome (Castilla et al., 2018; Czaja et al., 2018; Fields et al., 2021; Lee and Kim., 2019; Lee et al., 2022a; Ma et al., 2020; Quialheiro et al., 2023). This outcome was measured using a pre-post study design in three studies (Castilla et al., 2018; Lee and Kim., 2019; Quialheiro et al., 2023), a non-randomised controlled study design in two studies (Lee et al., 2022a; Ma et al., 2020) and a RCT study design in two studies (Czaja et al., 2018; Fields et al., 2021).

Interventions that incorporated tailored computer software

- Castilla et al. (2018) assessed the effectiveness of an eight-session, community-based, group, social network (Butler 2.0) training programme on attitudes to using new technologies in older adults living in rural areas. **Statistically significant improvements were reported in participant perceptions of their capability to use new technologies after receiving the intervention** (score from 1-4; mean: 2.3; SD:0.92; to mean 2.74; SD:0.80; $p=0.012$).
- Czaja et al. (2018) assessed the impact of the PRISM system (home-based) on attitudes towards computer self-efficacy for older adults at risk of social isolation. Participants in the intervention group reported a greater **increase in computer self-efficacy at 6 months** ($b:-1.29$; effect size: 0.41; 95% CI: -2.01 to -0.57 ; $p<0.001$) **and 12 months** ($b:-0.94$; effect size: 0.30; 95% CI: -1.67 to -0.22 ; $p<0.02$) follow-up **compared to the comparative group** and these increases were statistically significant.

Interventions with an intergenerational component

- Lee and Kim (2019) assessed the impact of a community-based, group, intergenerational programme on a range of attitudes including perceived self-efficacy and found that participants perceptions of **self-efficacy statistically significantly improved after receiving the intervention** ($t:-8.36$, $d:-1.13$; $p<0.001$).
- Ma et al. (2020) explored the impact of a three-session video tutorial-based intervention in the community on perceived digital self-efficacy. The intervention was delivered to three separate intervention groups that differed according to the model used in the videos (a child model, young adult model, or older adult model). The results found that digital **self-efficacy increased significantly ($p<0.001$) after training regardless of the delivery method. However, the older adult model group contributed to the highest improvement in self-efficacy** ($F:3.878$; $p<0.05$). **No significant difference was found between the child model group and the young adult model group.**

Interventions incorporated into existing services

- Fields et al. (2021) assessed the impact of an at home technology training intervention on participants self-reported confidence for socially isolated older adults. The intervention was incorporated into a volunteer-based programme that provides home visits for lonely older adults. Although not statistically significant, **the intervention group reported higher levels of self-confidence in their digital skills** (baseline: 52% little to no confidence searching for information online and using email vs two-months: 35% little to no confidence, $p=0.13$). No change was reported for the control group (baseline: 76% little to no confidence vs 77% little to no confidence at two months, $p=1.0$). **Those in the intervention group reported higher levels of confidence** (OR: 8.99; 95% CI: 1.55 to 96.57, at two months follow-up) **compared with those in the waitlist group.**

Traditional digital literacy interventions

- Quialheiro et al. (2023) assessed the impact of an in-person digital inclusion programme (OITO project) on perceptions **of self-reported autonomy** when it comes to using a mobile phone or tablet with a touchscreen and found a **statistically significant**

improvement one month after the intervention, increasing from 4.5 at baseline to 6.7 points, with a possible score ranging from 0 to 10 ($t(40)=-7.3$; $p<0.001$).

- Lee et al. (2022a) assessed the impact of a community-based, digital literacy education programme on perceived self-efficacy and found that those in the **intervention group reported improved self-efficacy after the intervention, however this was not statistically significant** (57.1-58.1 $p=0.530$), **whereas the self-efficacy of the control group was reported to significantly increase after the intervention** (55.6-60.1 $p=0.025$). **However, when compared, no significant difference was reported between groups** ($t=-1.382$; 95% CI: -8.499 to 1.494; $p=0.169$).

Effectiveness of educational interventions on technophobia

Two studies assessed the impact of interventions incorporating both education and mentorship on technophobia (using measurements of confidence and anxiety) (Lee and Kim., 2019; Lee et al., 2022b). This outcome was measured using a pre-post study design in one study (Lee and Kim 2019) and a non-randomised controlled study design in one study (Lee et al 2022b).

Interventions with an intergenerational component

- Lee and Kim (2019) found that participants who took part in the community-based, group intergenerational programme reported **a statistically significant increase in their perceived confidence about their skills when using computers/Internet** ($t=-3.69$, $d=-0.50$; $p<0.001$) **and that anxiety toward technology statistically significantly decreased after receiving the intervention** ($t=2.65$, $d=0.36$; $p<0.01$).
- Lee et al. (2022b) found that participants who took part in a 12-week, community-based, group, intergenerational educational programme **reported a statistically significant increase in confidence in using technology** (mean confidence score 2.59 vs 2.87; $t(49)=-5.05$, $d=-.71$; $p<0.001$) **and a statistically significant decrease in anxiety** (mean anxiety score 2.88 vs 3.07; $t(49)=-2.77$, $d=-.39$; $p<0.01$) **after receiving the intervention**. However in the control group, anxiety was also significantly reduced (mean anxiety score 2.82 vs 3.00; $t(53)=-2.04$, $d=0.28$; $p<0.05$), and an insignificant increase in confidence was reported (mean confidence score 2.50 vs 2.58; $t(53)=-1.48$, $p=0.15$). **Confidence was the only outcome reported to have differed among the two groups with a statistically significant increase being reported for the intervention group compared to the control** (mean confidence score $M:2.87$, $SD:0.47$, $M_{adj}:2.84$ vs $M:2.58$, $SD:0.56$, $M_{adj}:2.61$; $F(1,101):9.99$; $\eta^2p:0.09$; $p=0.002$).

Effectiveness of educational interventions on acceptability of technology

Four studies explored the impact of interventions on participants' acceptability of technology (Arthanat., 2021; Castilla et al., 2018; Czaja et al., 2018; Lee and Kim., 2019). This outcome was measured using a pre-post study design in two studies (Castilla et al., 2018; Lee and Kim., 2019) and a RCT study design in two studies (Arthanat., 2021; Czaja et al., 2018).

Interventions that incorporated tailored computer software

- Castilla et al. (2018) assessed the effectiveness of an eight-session, community-based, group, social network (Butler 2.0) training programme on attitudes towards new technologies for older adults living in rural areas. **Participants' attitudes toward new**

technologies were found to improve after receiving the intervention. Statistically significant improvements were reported in participants level of interest in using new technologies ($p=0.003$). Improvements were also reported in how participants felt when using new technologies however this difference was not statistically significant ($p>0.500$).

- Czaja et al. (2018) found that **compared to the comparative group, participants at risk of social isolation who received the home-based PRISM intervention reported statistically significant increases in computer comfort at six months** ($b: -1.68$; effect size: 0.39; 95% CI: -2.57 to -0.78 ; $p<0.001$) **and 12 months** ($b: -2.32$; effect size: 0.53; 95% CI: -3.22 to -1.41 ; $p<0.001$); **and in computer interest at six months** ($b: -1.52$; effect size: 0.46; 95% CI: -2.26 to -0.79 ; $p<0.001$) **and 12 months** ($b: -0.99$; effect size: 0.30; 95% CI: -1.74 to -0.25 ; $p<0.01$).

Interventions with an intergenerational component

- Lee and Kim (2019) found that participants who participated in the community-based, group, intergenerational programme **showed a statistically significant improvement in their interest towards computers after the intervention** ($t: -9.24$, $d: -.25$; $p<0.001$).

Interventions incorporated into existing services

- Arthanat (2021) found that participants living in rural areas who received the ICT training programme (i-CHATT) at home as part of an occupational therapy programme, **reported more positive responses about technology when compared to the control group, across the six, 12, 18, and 24- month follow-up.** Statistically significant differences in favour of the intervention were reported for perceiving technology experiences as satisfying ($F(4,1): 3.5$, $\eta^2: 0.04$; $p=0.007$), seeing technologies as encouraging ($F(4,1): 2.4$, $\eta^2: 0.01$; $p=0.05$), comfort with technology ($F(4,1): 3.6$, $\eta^2: 0.04$; $p=0.009$), and feeling good around technology ($F(4,1): 2.3$, $\eta^2: 0.02$; $p=0.05$).

2.4.1 Bottom line results for effectiveness of educational interventions on participant perceptions of technology use

There is evidence to suggest that educational interventions can improve a range of perceptions among older adults including their own perceived abilities, increased acceptability of technology, and reduced technophobia. However, the evidence in support of these interventions is mostly of low quality. Perceived abilities improved in all studies reporting outcomes included in this category, irrespective of the setting or mode of delivery of the interventions. Various methods were used to assess participant perceptions making it difficult to compare studies directly.

A range of intervention approaches were found to be effective in improving participants' perceptions of own abilities including those using tailored computer software, those with intergenerational components, those incorporated into existing service and traditional digital literacy interventions. Technophobia was found to decrease in the two studies reporting this outcome, both of which utilised an intergenerational approach. Acceptability of technology was also seen to improve regardless of the intervention method, including interventions that incorporated tailored computer software, that had intergenerational components or interventions that were incorporated into existing services.

When delivery methods were compared among an older population, one study suggested that using an older adult model in video tutorials improved participants' self-efficacy more than when using the child or young adult model, suggesting a peer-to-peer approach was preferred over an intergenerational approach. However, as only one study reported this finding firm conclusions cannot be made.

While all studies had methodological limitations, there is evidence to suggest that educational interventions can improve perceptions of technology and perceived ability to engage with the digital world with two studies showing improvements for older adults living in rural areas.

2.5 Acceptability of educational interventions

A total of nine studies reported participants' acceptability of the interventions (Castilla et al., 2018; Choi and Park., 2022; Czaja et al., 2018; Elbaz et al., 2023; Fields et al., 2021; Gadbois et al., 2022; Lee and Kim., 2019; Martínez-Alcalá et al., 2018; Seaton et al., 2023). This outcome was measured using a pre-post study design in five studies (Castilla et al., 2018; Elbaz et al., 2023; Gadbois et al., 2022; Lee and Kim., 2019; Seaton et al., 2023), a controlled study design in two studies (Choi and Park., 2022; Martínez-Alcalá et al., 2018), and a RCT study design in two studies (Fields et al., 2021; Czaja et al., 2018). Study findings appeared to show effects in favour of the interventions. Acceptability of the intervention was obtained through focus groups or questionnaires.

Interventions that incorporated tailored computer software

- Castilla et al. (2018) found that 96% of older adults living in rural areas who participated in the eight-session, community-based, group, social network (Butler 2.0) training programme **expressed the intention to continue to use the Butler 2.0 social network** in future, compared to 2% who expressed no intention to use it, and 2% who were unsure.
- Czaja et al. (2018) found that most participants at risk for social isolation who received the PRISM system at home, **found the software useful in their daily life (82%)**, indicated that it made their life easier (80%), improved their daily life (84%), and enabled them to accomplish tasks more quickly (73%). They also found PRISM easy to use (88%) and easy to become skilled at using PRISM (80%). Participants found it easier to communicate with family and friends compared to controls (82% vs. 47%) and engage in hobbies and play games (82% vs. 52%). Participants in both conditions reported that it was easier to look up community information (78% vs. 73%) and health information (82% vs. 80%). **However, those in the comparative group were more satisfied with the in-home training they received (90% vs. 82%).**

Interventions incorporated into existing services

- Fields et al. (2021) found that participants who received the at home technology training (incorporated into a volunteer-based programme providing home visits for lonely older adults), **would have liked to receive more sessions, specifically with the volunteer instructors and that some participants appreciated the personalised approach.**

- Gadbois et al. (2022) found that almost all of the homebound participants who received the pilot talking tech intervention incorporated within a home-delivered meals programme **described having a positive experience**. A few participants suggested including more training sessions to accommodate participants with a slower learning pace or for those starting with limited technology knowledge. Alternatively, others with more computer experience felt aspects of the module content were too basic.

Interventions with an intergenerational component

- Lee and Kim (2019) found that participants who participated in the community-based, group, intergenerational programme **reported multiple benefits after receiving the intervention**. Benefits emerged into four major themes: communication tools, independent living, leisure activities, and intergenerational learning.

Gamification

- Choi and Park (2022) found that **participants who received the community-based, educational IT programme with the educational game ‘Save the Titanic using the decision tree’, reported high levels of satisfaction** (mean satisfaction score (on a 5-point likert scale) 4.13 (± 0.65). More specifically, satisfaction with the educational content, educational activity and educational material was all reported to be high (mean satisfaction score; 4.22 (± 0.64); 3.94 (± 0.76); 4.05 (± 0.69); respectively).

Traditional digital literacy interventions

- Elbaz et al. (2023) found that some participants who received the pilot four-week, online, digital literacy programme described being confused as to why certain applications appeared different (i.e., had a different name compared to what the trainer was showing, different icons, or the user interface was not the same). **However, overall, all participants appreciated the digital literacy training as well as the accessibility, and patience of the trainer and facilitators.**
- Seaton et al. (2023) found that participants’ (living in rural areas) **acceptability of the Gluu Essentials digital skills training programme was high after the intervention**. Participants’ recommendations included the need for providing ongoing programmes for support and training because technology constantly changes, reducing costs for technology and internet access, and keeping learning resources simple and easy to access.
- Martínez-Alcalá et al. (2018) found that of those who received the blended workshops (37 participants), **13 participants indicated a positive agreement stating that the interaction with the system was clear and understandable and even the menu was easy to use**. A total of 16 participants stated that it was useful to implement this type of workshop to improve the populations digital literacy skills, 15 older adults were enthusiastic about using the platform, 15 older adults indicated a positive agreement stating that they will use the system to reinforce their knowledge during and after the workshop.

2.5.1 Bottom line results for the acceptability of digital education interventions

There is considerable evidence to show that participants had positive perceptions of the educational interventions. This included interventions that incorporated tailored computer software, interventions that were incorporated into existing services, intergenerational interventions, interventions that incorporate gamification and traditional digital literacy interventions.

The evidence in support of this is generally of low quality. Positive perceptions of the interventions were also found for some sub-populations including participants living in rural areas, being at risk of social isolation or being homebound, and the findings do not appear to be dependent on the delivery method used (at home, online, in groups).

2.6 Cost-effectiveness of educational interventions

One study assessed the cost-effectiveness of an educational intervention (Patty et al., 2018). This outcome was measured using a pre-post study design (at 3-months follow-up). The study findings appeared to show effects in favour of the intervention.

Traditional digital literacy interventions

- Patty et al. (2018) assessed the cost-effectiveness of a community-based ICT training intervention for visually impaired older adults in the Netherlands and found that the intervention was cost-effective but under the assumption that the effects of the training remain consistent for 10 years. This would result in an incremental +effectiveness ratio (ICER) of € 11,000 per quality-adjusted life-year (QALY) and € 8000 per year of well-being gained, when only the costs of ICT training are considered. Furthermore, when the willingness-to-pay threshold is € 20,000 per year of well-being, the probability that ICT training will be cost-effective is 91% when including only the costs of ICT training).

2.6.1 Bottom line results for cost-effectiveness of educational interventions

There is very limited, low-quality evidence to suggest that educational interventions for visually impaired older adults are cost-effective. However, as this outcome was reported by only one study firm conclusions cannot be made.

Table 2: Summary of interventions

Citation (Country)	Name and type of intervention/control	Intervention characteristics
Arthanat (2021) (USA)	Intervention: The i-CHATT program. An individualised inter-generational ICT training programme to facilitate ICT use in older adults from rural areas. Control: No ICT intervention.	Setting: Home-based Mode of delivery: Three home visits each lasting about 90 minutes to two hours Duration/intensity: 3 months Intervention details: - Participants received hands-on one-to-one support from a coach (an undergraduate student) - An ICT priority checklist was given to participants to choose their priorities and set goals for the programme. This was used by coaches to inform sessions and track progress throughout the programme - A community Facebook group with trainees and coaches was created to promote peer-to-peer learning and share achievements - Participants were loaned an iPad for the course and the duration of follow-up - The intervention formed part of an occupational therapy programme - Data were collected at baseline and in six-month intervals for 24 months
Castilla et al. (2018) (Spain)	Intervention: Coaching older adults in rural areas to use a social network (Butler 2.0) consisting of multiple applications to improve digital literacy and increase digital inclusion. Comparator: No control, comparisons with baseline scores.	Setting: Elderly Leisure Centre Mode of delivery: 8 sessions delivered weekly in groups of up to 6 people at an elderly leisure centre. Duration/intensity: 8 weeks. Intervention details: - Session 1 to 5 covered the basics aspects of the Butler 2.0 website. This included, user registration, creating a profile and information about each resource. - Session 6 to 8 included internet searching and independent exploration of the system's resources - After completing the eight sessions, all the participants were invited to a focus group - The intervention used accessible software and hardware to assist elderly participants - Butler 2.0 is a system aimed at improving the social support network and quality of life of the elderly population through the use of new technologies that help to remove the digital barrier for this sector of the population, encouraging their e-inclusion. - Data were collected 1) before the use of the system; 2) after the first contact with the system (post session 1); 3) after session 5; and 4) after the last session of use
Choi & Park (2022) (South Korea)	Intervention: Educational decision tree and game to improve IT knowledge. Comparator: General Internet and digital device use education.	Setting: Education centre Mode of delivery: 10 sessions delivered in groups Duration/intensity: Not stated. Intervention details: - The intervention combines a decision tree with a game and allows the elderly to acquire IT knowledge while playing a game naturally. - The educational programme was largely divided into 'Understanding the decision tree' and 'Applying the decision tree.' - The educational game was called 'Save the Titanic using the decision tree', researchers introduced a Titanic movie, historical events related to the Titanic, and the causes of the sinking. By incorporating a humanities approach into IT education, it was possible to increase the understanding of unfamiliar IT and to feel how to apply IT to real-life problem-solving.

		- The researchers designed the education program for the elderly in their 60s or older, and it can be used at lifelong education centers or universities for the elderly. - Data were collected pre- and post-intervention
Czaja et al. (2018) (USA)	Intervention: A specially designed Personal Reminder Information and Social Management (PRISM) system for older adults at risk of social isolation, with training and instructional support. PRISM included features that provided easy access to resources and information sources, and opportunities for engagement and communication. Comparator: Provision of a notebook that contained paper content similar to that contained in the intervention.	Setting: Home-based Mode of delivery: 4 initial home sessions, telephone check-ins, and home and telephone follow-ups. Duration/intensity: 12 months. Intervention details: - PRISM included: Internet access (with vetted links to sites such as NIHSeniorHealth.Gov), an annotated resource guide, a dynamic classroom feature, a calendar, a photo feature, E-mail, games, and online help - Participants in the intervention group were provided with a PC, keyboard, mouse, printer, and internet access and were compensated \$25 per assessment. They were allowed to keep the hardware after completing the programme - Participants were given the opportunity to be listed as a “PRISM Buddy” that would allow them to have contact with people who had similar interests - Data were collected at baseline and at 6 and 12 months post-randomisation
Elbaz et al. (2023) (Canada)	Intervention: A brief online digital literacy intervention (pilot study) covering a range of skill-based topics including safety and security. Comparator: No control, comparisons with baseline measures.	Setting: Online (During the COVID-19 pandemic) Mode of delivery: 8 × 1.5 h group intervention sessions delivered weekly by a trainer and two co-facilitators remotely via Zoom. In-person meetings on a request basis. Duration/intensity: 4 weeks. Intervention details: - Sessions aimed to equip participants with basic digital literacy skills. The topics of sessions targeted their ability to use email, Zoom, tablet and smartphone, Facebook and WhatsApp, browsing online, shopping online and browsing for entertainment - Data were collected pre- and post-intervention
Fields et al. (2021) (USA)	Intervention: Tech Allies. One-to-one digital training sessions for isolated older adults. Control: A 2-month waitlist group.	Setting: Home-based Mode of delivery: 8, one-to-one sessions delivered weekly by volunteers Duration/intensity: 2 months. Intervention details: - Tech Allies was a partnership among Little Brothers - Friends of the Elderly (LBFE), a volunteer-based organisation that provides home visits for isolated and lonely older adults; Community Tech Network (CTN), a digital literacy training organisation - Participants were given a tablet and broadband access which they could keep after completing the programme. - CTN created a learner booklet for each participant, outlining curriculum topics by week, including step-by-step visual guides and practice exercises. The eight sessions covered (a) getting to know the iPad (hardware, touch screen, typing, voice dictation); (b) using the iPad (operating system, getting online, searching for information); (c) online safety (passwords, phishing, viruses); (d) email (creating an account, sending email, using the camera); (e) email safety (opening and replying to emails, identifying spam); (f) communicating via apps and FaceTime; (g) online communities (social media); and (h) having fun and wrap-up (entertainment, learning, shopping) - Data were collected pre- and post-intervention

Gadbois et al. (2022) (USA)	Intervention: Talking Tech (pilot study). Technology training and assistance to promote digital literacy, with the primary aim of reduce loneliness and social isolation in homebound older adults. Participants received one-to-one support and were provided with self-directed learning materials. Comparator: No control, comparisons with baseline measures.	Setting: Home-based Mode of delivery: One-to-one in-home training for the first 4 weeks, scheduled telephone support for the following 8 weeks, for the final 2 weeks of the programme support was available if the participant reached out by phone with questions Duration/intensity: 14 weeks. Intervention details: - The Talking Tech intervention was embedded within and delivered by a home-delivered meals program, and provided training and assistance to participants using trained volunteers, called TechMates - Participants were paired with a TechMate and given a tablet and a hotspot connection for 1 year (if they did not already have in-home internet access). While the intervention lasted 14 weeks, participants were encouraged to keep their tablets and maintain internet connection permanently - Training and support focused on how to use a tablet, access the internet, and participate in a virtual senior center program, called Well Connected. Well Connected is a national phone- and internet-based program, which provides over 70 sessions per week on topics including virtual travel, support and conversation groups, bingo, and language learning, among others. - Relationships between participants and TechMates and between participants and the home-delivered meal provider staff were not severed upon completion of the 14 weeks, in case of participant questions or challenges - Data were collected pre- and post-intervention (week 15)
Garcia et al. (2022) (Latvia, Poland, Portugal and the UK)	Intervention: Erasmus+ project ICTskills4All. Different educational delivery approaches to improve digital skills, 1) intergenerational approach, 2) peer-to-peer approach, 3) online learning Comparator: Three different methods of delivery	Setting: Classroom based (intergenerational and peer-to-peer groups) and virtual (online group) Mode of delivery: 8, 2-hour sessions in groups of 12 (intergenerational), 18 (peer-to-peer), and 9 (online). Duration/intensity: Not stated. Intervention details: - Main objectives of all interventions: preparation and motivation for self-continued training, using e-learning + support overcoming the fear of technology and gaining skills to independently use a computer strengthening trust in success - The learning assistants could be young people between 12 and 26 years old (intergenerational approach) or adults over 55 years old (peer-to-peer). The online approach occurred due to the COVID-19 pandemic, which prevented face-to-face meetings during 2020. - Data were collected pre- and post-intervention
Holguin-Alvarez et al. (2020) (Peru)	Intervention: Social media programme designed to increase digital skills in communities in vulnerable contexts (Low SES). The educational activities were based on the use of Facebook, WhatsApp, Twitter and Gmail. Control: No intervention.	Setting: Elderly centre Mode of delivery: 50 sessions lasting 30 minutes each Duration/intensity: Not stated. Intervention details: - The programme used a graded approach which was divided into 4 phases: 1) a familiarisation phase, 2) introduction activities, 3) network registration, and 4) digital interactivity - Data were collected pre- and post-intervention
Lee & Kim (2019) (USA)	Intervention: Intergenerational Mentor-Up (IMU). Guided learning opportunities for	Setting: Senior centres or housing facilities Mode of delivery: 6 sessions in groups of 6-8

	undergraduate students to teach older adults from low income areas IT skills and reduce their social isolation. Comparator: No control, comparisons with baseline measures.	Duration/intensity: Not stated. Intervention details: - In each class, youth mentors and senior mentees sat around long tables or in a big circle during the initial part of class before breaking into smaller groups to work on individualised tasks. Seniors were asked to state their learning goals for the sessions. The subsequent discussion centered on what the older adults wanted to learn about technology, and the ways in which they currently use technology. Each youth was paired with a senior mentee to help them with their particular issues - Youth mentors were students. The programme gave opportunity to refine their interpersonal skills and receiving community service learning credits in return - Data were collected pre- and post-intervention
Lee et al. (2022a) (South Korea)	Intervention: Social prescribing through digital literacy education for older adults in Wonju-si. A digital literacy education programme to improve smartphone usage competency in older adults from rural areas. Control: No intervention.	Setting: 5 locations including Y University Healthy City Research Center, the Wonju Senior Center and small libraries. Mode of delivery: One 60 minute session per week Duration/intensity: 6 weeks. Intervention details: - Education topics included: Basic smartphone operation, sending text messages, taking and sharing photos, using social apps, search engine applications and internet banking - Data were collected pre- and post-intervention
Lee et al. (2022b) (South Korea)	Intervention: The Intergenerational Forum (IF). Class educational programme providing guided instruction and intergenerational exchange between youths (mentors) and older adults (mentees). Control: No intervention.	Setting: 2 large elderly centres Mode of delivery: Six cohort of classes of 8-10 Duration/intensity: 12 weeks. Intervention details: - The programme was based on collaborative learning theory, each IF class is structured where by older mentees come together to complete their learning goals. - During the first half of class, basic instruction was given to provide older mentees the opportunity to learn about the Internet and their own unique computerised devices. Based on skills and interests, each youth mentor was paired with an older mentee to assist with their particular issues. The second half of classes focused on participants' individualised digital technology needs and interests - Data were collected pre- and post-intervention
Ma et al. (2020) (China)	Intervention: A video tutorial-based intervention which aimed to enhance technology acceptance in older adults. The video tutorials provided demonstrations of how to complete basic tasks using a tablet. Comparator: Three intervention groups that differed according to the model in the videos (a child model, young adult model, or older adult model).	Setting: Senior citizen centre Mode of delivery: Each intervention delivery method consisted of 3 short sessions conducted on the same day Duration/intensity: Not stated. Intervention details: - The videos included a simple introduction of a tablet's physical appearance, buttons, hand gestures, and scenario demonstrations by the three models. There were four scenarios simulated in the video: (1) route-planning using the transportation information app, (2) playing a movie with the video player on the tablet and enjoying it, (3) having a conversation with family members using with communication app, and (4) heart rate measurement using the health monitoring app. After demonstrations, participants were given time to practice what they had been shown. - Other than different role models, each participant in the three groups received the same training content and procedure. Models in three

		generations were recruited for video recording, including a child aged 10, a young adult aged 23, and an older adult aged 68 - Video clips were no longer than 15 minutes - Data were collected pre- and post-intervention
Martínez-Alcalá et al. (2018) (Mexico)	Intervention: A digital literacy workshop for older adults delivered either face-to-face by a tutor, blended workshops based on a learning management system Comparator: Comparisons within and between the face-to-face and blended delivery models.	Setting: Face-to-face workshop: classrooms and blended workshops used a learning management system that could be accessed via mobile device from anywhere at any time. Mode of delivery: Face-to-face workshop: 3 face-to-face sessions delivered by a tutor to groups of 15-25 in computer rooms with internet connection. The blended intervention used a learning management system for participants to work through. Duration/intensity: 4 months. Intervention details: - Both intervention groups content consisted of three lessons namely, Introduction to ICT, Computer Programs and Getting to Know the Internet, with a total of 16 topics. - Face-to-face workshop: Regarding learning methods, each student had a printed manual with the topics that would be studied in the workshop. For the instruction of digital skills, the tutor used digital presentations and a projector as support material. At the beginning of each class, the tutor asked random questions to each student so that they could remember the concepts and topics seen in the previous classes. - Blended Workshops Based on a Learning Management System: regarding learning methods, the lesson sequence was organised in initiation, development and closure activities. - Data were collected pre- and post-intervention
Martínez-Alcalá et al. (2021) (Mexico)	Intervention: Digital literacy programme delivered either as a blended, transition (part digital), and fully digital format. The workshops consisted of five levels of digital literacy which have been designed according to the needs and characteristics of the elderly, so that they can increasingly acquire more sophisticated digital skills. Comparator: Comparisons within and between the different delivery models.	Setting: Blended learning: community classroom setting, Transition treatment and Digital treatment: remote Mode of delivery: Blended participants interacted face-to-face and accessed the digital literacy course online through a learning management system. Participants attended the computer classrooms twice a week for 2-hours. Transition participants took classes as per the blended protocol, but this stopped due to COVID-19 restrictions, so were introduced to remote learning modalities, using Zoom for the delivery of classes. Digital participants attended a completely online modality. Duration/intensity: 3-4 months. Intervention details: - The intervention changed from blended delivery to digital delivery in response to the COVID-19 pandemic - The five levels of workshop were Basic 1, Basic 2, Intermediate, Upper Intermediate, and Advanced. Participants were able to progress through the levels - Personalised advice and telephone assistance was offered to participants enrolling onto the workshops in the digital treatment so that they could set up and use the device to complete the course - Personal counselling was offered across all delivery methods. This was in-person during the blended learning phase and via WhatsApp during the digital treatment - Data were collected pre- and post-intervention
McCosker et al. (2020) (Australia)	Intervention: Be Connected. A national digital inclusion programme to provide older learners with personalised, face-to-	Setting: Face-to-face sessions were offered by community-based organisations as well as online learning through a government Web portal Mode of delivery: 12 online learning modules with face-to-face support from a network of community-based organisations. Duration/intensity: Not stated.

	face and self-paced learning across Australia. Comparator: No control, comparisons with baseline measures.	Intervention details: - The two core components to the programme's design were: online learning modules presented through a government Web portal, and face-to-face support provided by a network of community-based organisations - A national network of community organisations (Network Partners) offering personalised and face-to-face support for older learners, coordinated and supported by the DSS funded National Network Manager, Good Things Foundation (GTF). GTF has provided Network Partners with professional development, up-skilling, one-on-one coaching - Modules cover a variety of topics covering, for example, device and operating systems, online safety, email, social media, and some interest areas such as online videos and genealogy - Sessions were targeted for very basic users as well as more experienced users - Data were collected after one month of registration to the portal, and then again four months after that
Moore & Hancock (2022) (USA)	Intervention: The MediaWise for Seniors course. A self-directed online course which taught digital media literacy skills and techniques helpful for verifying the credibility of information online, to improve resilience to fake news. Control: no intervention.	Setting: The course was completed virtually Mode of delivery: A self-directed online course which took approximately 1-hour to complete at participant's own pace. Duration/intensity: Participant's completed the course at their own pace, no set timeframe stated. Intervention details: - The contents of the course were highly multimodal. Information was presented as text, in photos and infographics, through instructional videos, and through interactive examples where participants were walked through examples of encountering online misinformation. - Data were collected pre- and post-intervention
Ngiam et al. (2022) (Singapore)	Intervention: Project Wire Up. A volunteer-led, one-on-one, and home-based digital literacy programme for older adults in vulnerable contexts (Low SES) Control: Older adults on a waitlist (no intervention).	Setting: Home-based, one-to-one support Mode of delivery: 6, 1-2-hour sessions Duration/intensity: Typically 3 months Intervention details: - Digital skills training was conducted during the home visits by trained volunteers, who guided older adults through a tiered curriculum of increasing difficulty that could be tailored to the needs of older adults. - Older adults were equipped with smartphones and internet connection - At the base level, older adults were taught the basic use of the phone, such as making calls and sending messages, before progressing to other social telecommunication platforms (e.g. WhatsApp) or entertainment platforms (e.g. YouTube). More digitally savvy older adults were taught advanced smartphone functions such as accessing government websites, making purchases, or paying bills on the web. At the end of the program, older adults would be connected to existing formal and informal networks through platforms such as mobile communication apps. - Data were collected pre- and post-intervention
Patty et al. (2018) (The Netherlands)	Intervention: Information and communication technology (ICT) training (including computer, iPhone, iPad and digital assistant devices training) in visually impaired adults.	Setting: Unclear. Patients undergoing rehabilitative eye care at two large eye care providers were enrolled between July 2014 and January 2015. Mode of delivery: Not clear. Duration/intensity: Training was tailored to each individual's needs which meant training durations varied between participants Intervention details:

	Comparator: No control, comparisons with baseline measures.	- The ICT training included computer training (e.g. use of Word, the Internet and email) and training sessions on the use of iPhones, iPads and digital assistant devices. - At the rehabilitative eye care centres ICT training was a part of standard rehabilitative care - Data were collected pre training, post training and three months post training.
Quialheiro et al. (2023) (Portugal)	Intervention: The OITO (Oficinas de Inclusão Tecnológica Online, “Workshops for Online Technological Inclusion”) project. A digital and health literacy digital inclusion project Comparator: No control, comparisons with baseline measures.	Setting: In-person workshops, locations varied according region and workshop provider Mode of delivery: 8 group workshop sessions delivered on 2 alternate days of the week lasting 1.5 hours per session Duration/intensity: Not stated. Intervention details: - Sessions were divided into 45 minutes of digital activity, 10 minutes of physical activity, 30 minutes of digital activity, and 5 minutes of exchanging experiences in a “conversation circle - Participants used a mobile device, smartphone, or tablet, according of their choice The workshops were led by an experienced trainer in teaching older adults how to use technology. One or two monitors further aided in assisting the OITO project participants - A brief physical activity moment consisted of standing exercises to stimulate circulation and balance training. - Data were collected pre- and post-intervention, and at 1-month follow-up.
Seaton et al. (2023) (Canada)	Intervention: The Gluu Essentials digital skills training program. A digital skills training programme to support tablet use in older adults from rural areas. Comparator: No control, comparisons with baseline measures.	Setting: Session were mainly provided from a distance (self-directed with telephone support) however some organisations delivered in-person support in small groups Mode of delivery: 12 lessons delivered either in-person or remotely, e.g. via telephone. Duration/intensity: No set duration, providers were free to deliver the programme how it worked best for participants and staff. Intervention details: - Twelve lessons were included in the Gluu Essentials training program, beginning with (1) the basic features of the tablet followed by (2) an introduction to the touch screen and gestures, (3) settings and tablet care, (4) the camera app, (5) email as well as Gmail or email app, (6) managing contacts, (7) find what is needed online, (8) how to download apps, (9) using the calendar app, (10) digital security basics, (11) Facebook basics, and (12) Zoom basics - The printed workbooks included a 96-page Gluu Essentials Student workbook tailored to each specific device - Sessions were delivered by volunteer coaches who were free to deliver the programme in the way that worked best for their learners - The Gluu Essentials training was provided free of charge; however, the devices were not provided by Gluu - Data were collected pre- and post-intervention.

Table 3. Summary of findings

Intervention Outcome [No. of studies]	Direction of effect ¹	Study design	Limitations	Inconsistency	Certainty
			Risk of bias from critical appraisal checklist	Variation in findings across studies (eg CIs don't overlap)	
Technology use/adoption					
Use/Uptake/Adoption of technology [5]	Favours intervention (Arthanat., 2021; Fields et al., 2021; Gadbois et al., 2022; Lee et al., 2022a; Seaton et al., 2023)	3 Quasi-experimental 2 RCT	3 Low Quality 2 Moderate Quality	Results appear to be positive however two studies reported no effect for some individual outcomes, however this could be a results of differing personal needs. Outcome measures also varied across studies.	Low certainty
Digital literacy/skills					
Digital literacy [3]	Favours intervention (Choi and Park., 2022; Martínez-Alcalá et al., 2021; Ngiam et al., 2022)	3 Quasi-experimental	3 Low quality	Results appear to be consistently positive however outcome measures varied	Low certainty
Proxies for digital literacy (includes computer/mobile device proficiency, digital competence, digital/ICT skills and online deception detection) [10]	Favours intervention (Czaja et al., 2018; Elbaz et al., 2023; Garcia et al., 2022; Holguin-Alvarez et al., 2020; Martínez-Alcalá et al., 2018; McCosker et al., 2020; Moore and Hancock., 2022; Patty et al., 2018; Quialheiro et al., 2023; Seaton et al., 2023)	9 Quasi-experimental 1 RCT	9 Low quality 1 Moderate quality	Results appear to be consistently positive but may depend on specific competences measured.	Low certainty
E-health literacy [2]	Favours intervention (Lee & Kim., 2019; Lee et al., 2022b).	2 Quasi-experimental	2 Low Quality	Results appear to be positive however the outcome was only reported by two studies.	Very low certainty
Participant perceptions of technology use					

Self-perceptions of abilities [7]	Favours intervention (Castilla et al., 2018; Czaja et al., 2018; Fields et al., 2021; Lee & Kim., 2019; Ma et al., 2020; Quialheiro et al., 2023) Neutral (Lee et al., 2022a)	5 Quasi-experimental 2 RCT	5 Low Quality 2 Moderate Quality	Results appear to be mostly positive however one study reported no significant improvement in self-efficacy following the intervention.	Low certainty
Technophobia [2]	Favours intervention (Lee & Kim., 2019; Lee et al., 2022b)	2 Quasi-experimental	2 Low Quality	Results appear to be positive but limited by number of studies.	Very low certainty
Acceptability of technology [4]	Favours intervention (Arthanat., 2021; Castilla et al., 2018; Czaja et al., 2018; Lee & Kim., 2019).	2 Quasi-experimental 2 RCT	2 Low Quality 2 Moderate Quality	Results appear to be consistently positive.	Low certainty
Acceptability of interventions					
Acceptability of intervention(s) [9]	Favours intervention (Choi & Park., 2022; Castilla et al., 2018; Czaja et al., 2018; Elbaz et al., 2023; Fields et al., 2021; Gadbois et al., 2022; Lee & Kim., 2019; Martínez-Alcalá et al., (2018); Seaton et al., 2023)	7 Quasi-experimental 2 RCT	7 Low Quality 2 Moderate Quality	Results appear to be consistently positive even when constructive criticism was provided.	Low certainty
Cost-effectiveness					
Cost effectiveness [1]	Favours intervention (Patty et al., 2018)	1 Quasi-experimental	1 Low Quality	Results appear to be positive however only one study reported this outcome.	Very low certainty

Footnotes:

1. Positive findings indicate where the results are in favour of the intervention(s), however this is not dependent of statistical significance.

3. DISCUSSION

3.1 Summary of the findings

The aim of this rapid review was to identify primary research addressing digital exclusion in older adults. While none of the included studies specifically aimed to address digital exclusion, 21 primary studies were identified that indicate educational interventions have the potential to improve digital literacy, digital use, perceptions of technology and participant acceptability among older adults. This included interventions that were incorporated into existing services, intergenerational interventions, interventions that incorporated tailored computer software or gamification, those teaching specific skills such as deception detection and more traditional digital literacy interventions.

The review findings indicate that educational interventions have the potential to improve digital literacy among this population. While most of the evidence demonstrated positive results in the general older adult population, improvements were also observed in various sub-populations, particularly older adults in vulnerable contexts such as individuals living in rural areas, those at risk of social isolation, homebound, visually impaired, or belonging to lower SES groups. Improvements in digital literacy were reported in both community and home-based settings. Findings also suggest ICT training interventions may be cost-effective, however this was only from one study, which was conducted in a population of visually impaired older adults.

The review findings indicate that educational interventions may improve digital use among older adults. Positive outcomes were reported in studies involving rural and homebound population groups, as well as the general older adult population. Furthermore, this rapid review shows that educational interventions may enhance positive perceptions of technology and the perceived ability to engage with the digital world. This is an important aspect in addressing established barriers to digital inclusion, such as the fear and anxiety associated with the use of technologies highlighted previously. Improvements in perceived abilities were consistently reported across all studies that reported this outcome, irrespective of the intervention delivery format or location.

Regarding participant acceptability, positive perceptions were reported by participants irrespective of country, population group or intervention delivery method/approach. Despite some participant feedback suggesting areas to improve interventions, participants largely reported the education and training provided were valued and beneficial.

A small number of the included studies evaluated an intervention that included providing participants with digital devices and internet access. Providing devices and access to the internet may increase online engagement and address the affordability and accessibility issues related to digital exclusion. Qualitative feedback also highlighted the need for continued support with technology and internet access after the intervention, to facilitate sustained use of digital devices and services.

3.2 Strengths and limitations of the available evidence

The available evidence included a range of vulnerable population groups. This included rural, visually impaired, lower SES and homebound older adults. However, the majority of studies were focused on older adults in general. Twenty-one studies published within the previous 5-years were identified, indicating the recency of internationally published evidence available to inform future policy and practice.

An additional strength of the evidence is the use of a range of intervention delivery methods, such as online, in-person, community- and home-based approaches. Furthermore, several different aspects of digital inclusion, such as proficiency, competence, technology use and uptake, and several others, were investigated across the included studies, providing a range of outcomes. This enables a more comprehensive and wide-ranging assessment of intervention effectiveness.

Several evidence gaps were identified in the evidence base, notably an absence of studies conducted within the UK in the past five years. There was also a lack of research focused specifically on interventions to improve access to, or affordability of the internet and digital technologies to overcome digital exclusion. None of the included studies specifically aimed to address digital exclusion as such. Due to the paucity of UK-based research on this topic area, and the absence of qualitative data to assess participant acceptability, we cannot be certain that the interventions, irrespective of location or delivery method, would be applicable to the UK context.

The stakeholders involved in this rapid review initially expressed a desire for the review team to identify interventions to improve access to digital services in social care. However, no research in this area was identified, which highlights a further evidence gap.

Although the findings suggest that ICT training and education interventions can improve digital inclusion in a range of older adult population groups, only a small number of studies performed longer-term follow up to assess whether the intervention effects were sustained over time. Furthermore, no studies specifically addressed language barriers, for example, that may be experienced by people whose first language is Welsh, revealing a further evidence gap.

In addition, there is gap in the evidence due to the paucity of cost-effectiveness analyses. Only one study included in this rapid review analysed intervention cost-effectiveness, which investigated an ICT training intervention in the Netherlands. Despite reporting positive outcomes however, we cannot comprehensively assess the cost-effectiveness of such interventions due to insufficient evidence.

The evidence is limited by low quality research with a high risk of bias. Of the 21 included studies, most (n=18) were quasi-experimental, employing either control or comparator groups, or pre-post measures to assess intervention effectiveness. The majority of these studies evaluated the effectiveness of interventions using a pre-post design. Of those that utilised more robust methodology, those with an intervention and control group, few undertook between group comparisons and only investigated within group differences. Only three studies were RCTs, highlighting a paucity of studies utilising robust experimental methods to determine the effectiveness of interventions address digital exclusion in older adults. In addition, follow-up data was rarely collected, so sustainability of the intervention effectiveness is largely unknown.

Critical appraisal of included studies identified the quasi-experimental studies were limited by the absence of a control in several studies (n=8), and by uncertainty regarding the reliability of outcome measurement (n=13). Study quality of RCTs was limited by insufficient reporting on concealed allocation of participants and loss to follow up as well as uncertainty regarding the reliability of outcome measures used. Therefore, given the quality of the evidence base, it is not possible to draw definitive conclusions regarding the effectiveness of the educational interventions included in this rapid review.

3.3 Strengths and limitations of this Rapid Review

The studies included in this rapid review were systematically identified through an extensive search of electronic databases and grey literature. We also used a variation of the systematic review approach, abbreviating or omitting some components following established guidelines in an attempt to capture all relevant publications with minimal risk of bias in a timely manner. However, it is possible that additional eligible publications may have been missed, which may bias the rapid review findings. Digital Communities Wales have conducted a range of case studies to support digital inclusion (Welsh Government 2022), for example providing digital devices to care homes across Wales (Welsh Government 2020). However, as they were not published within peer-reviewed journals and often lacked full evaluations, our ability to quality appraise the methodology and findings was limited and made them ineligible for inclusion in this rapid review.

Every effort was made to conduct a robust synthesis of study findings; however, the evidence is limited by poor reporting of intervention methods and results in several studies, which made interpretations challenging. However, each stage of the review was consistency checked for accuracy, and issues were discussed within the team.

We used a broad definition of digital literacy to inform our inclusion eligibility, a strength as it enabled the identification and inclusion of a wide range of research addressing various facets of digital literacy. However, this broad approach limited the comparability of findings across studies due to the varied terminology, definitions and measurements used to assess different outcomes. Study findings were also commonly self-reported and were not obtained using objective measures, limiting our ability to make firm inferences relating to intervention effectiveness.

3.4 Implications for policy and practice

Overall, the evidence identified suggests educational interventions broadly support improved digital inclusion among the older population. Findings identified here could inform the development and delivery of future interventions. However, it is important to consider the context in which the included interventions were used and the lack of certainty of the findings.

Lower income and SES, as well as costs of acquiring and using technology are established barriers to digital inclusion (Chen et al, 2022 & Moroney et al, 2020). To achieve improved and sustained digital inclusion in older adults, evidence suggests it may be important to ensure structural barriers, such as access to the internet and affordability of devices are removed. However, it is unclear what the cost implications may be to deliver this, or if these barriers could be reduced by raising awareness of social tariffs available in the UK for those receiving pension credit (Ofcom 2024). In practice, providing ICT education and training to older adults without considering these barriers may exacerbate existing inequalities. In addition, it is also important to consider that digital devices and services are continually evolving, which suggests education and training may need to be ongoing to ensure sustained digital literacy and technology use.

Although study participants generally reported that they appreciated and benefitted from the educational interventions, it is important to consider that older adults retain the right to choose whether or not to interact with essential services physically (offline) or digitally. The Digital Strategy for Wales highlights the need to equip individuals of all ages with the motivation, access, skills and confidence to engage with digital technologies when they want to (Welsh Government 2021). There are also several barriers to engaging with the digital world that are particularly pertinent within the older adult population, including fear, anxiety, stereotypes, and stigmas, as well as costs or disabilities. The different age groups within the

older adult population should also be considered for example working older adults may have different need to older adults who have retired. Services undergoing digitisation may need to find ways to encourage and support older adults to engage. However, alternative methods of accessing these services should remain available where possible or it may exacerbate exclusion by leaving some people behind.

3.5 Implications for future research

Our rapid review identified a paucity of UK based research in this area, indicating a need for future investigations within the UK to comprehensively assess the effectiveness and generalisability of interventions, particularly within the Welsh context. Most studies identified were quasi-experimental in design, and the paucity of RCTs shows more, higher-quality research is possible and also needed to further advance this topic area. The review identified a number of multi-component, complex interventions developed to address the many inter-related aspects of supporting elderly people (or vulnerable subgroups) and increase digital inclusion. However, these were mainly evaluated using pre-post study design and further well designed research is needed to rigorously evaluate their effectiveness and identify which components are most impactful.

It may be beneficial for researchers to adopt standardised definitions and measurement tools, promoting greater consistency and comparability in study findings in relation to digital inclusion. If future research is conducted within the Welsh context, consideration should be given to the Welsh Minimum Digital Living Standard set out by the Welsh Government (MDLS) (Welsh government 2023c). This standard highlights the need to support individuals not only to access the internet or digital devices and develop digital skills, but also to improve their ability to engage online safely and confidently. Future research should consider how improving older adults' digital skills such as learning how to use email may not necessarily improve their ability to identify risks such as phishing emails potentially putting them at increased risk.

Further research is needed to strengthen the evidence base of digital inclusion in vulnerable older adults to better understand the effectiveness of educational interventions in these population groups. This is important because certain population groups are likely to be at greater risk of digital exclusion than others. Furthermore, there is a need for greater research which focuses on overcoming language barriers when addressing digital exclusion in older adults; a key challenge highlighted by stakeholders in the Welsh context.

There is also a need for more research specifically aimed at improving access to digital devices and services. Additionally, UK based research focussing on digital inclusion in older adults accessing social care services is needed, as no such research was identified. Without this, the digital transition of social care services may be hindered and could potentially exacerbate digital exclusion among those who need to access it without careful consideration of it's users.

Lastly, further evidence is needed to determine if digital exclusion can be addressed in a cost-effective way and to determine potential cost savings in both the general older adult population as well as the vulnerable sub-populations within it.

3.6 Economic considerations*

- It is important that the relative cost-effectiveness and acceptability of digital versus traditional in-person social care solutions continue to be investigated. With a particular focus given to older people in which digital exclusion is more prevalent than in other age groups.
- There is a larger existing evidence base concerning reducing digital exclusion in healthcare solutions than social care solutions.
- There is some systematic review evidence since 2020 that simple, text-based interventions enabling communication with social care services for older adults is cost-effective (Ghani et al., 2020).
- Further research is required that considers the role of family/informal carers assisting older individuals accessing social care through digital means.
- Technological solutions to improve patient data flows between health and social care in England have been found to provide monetary benefits over and above the initial investment. Benefits to patients through the introduction of improved data linkages and comprehensive digital health records included promotion of self-care/independent living, improved management of long-term conditions and supporting the reduction of long-term care needs (NHS Digital, 2021). There exist significant barriers to older people regarding the use of digital solutions at a whole system level (Basis Research, 2022).
- £2.4 billion** is spent on adult social care each year in Wales (Social Care Wales, 2018). Demographic changes including greater life expectancies and increases in individuals presenting with complex care needs have increased pressures on adult social care sector resources (UK Parliament, 2024).

**This section has been completed by the Centre for Health Economics & Medicines Evaluation (CHEME), Bangor University*

***Figure inflated from 2016 prices to 2024 prices using the Bank of England Inflation Calculator (<https://www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator>)*

4. REFERENCES

Basis Research. (2022). Increasing motivation to use digital health and social care services: a behavioural science perspective. Available at: <https://www.basisresearch.com/nhs-england-digital-inclusion>

Gann B. (2018). Digital inclusion in healthcare and care in Wales. Available at: <https://wales.coop/digital-inclusion-report-2018/>

Gates JR, & Wilson-Menzfeld G. (2022). What role does geragogy play in the delivery of digital skills programs for middle and older age adults? A systematic narrative review. *Journal of Applied Gerontology*, 41(8), 1971-1980. Available at: <https://journals.sagepub.com/doi/full/10.1177/07334648221091236>

Ghani Z, Jarl J, Sanmartin Berglund J, et al. (2020). The Cost-Effectiveness of Mobile Health (mHealth) Interventions for Older Adults: Systematic Review. *International Journal of Environmental Research and Public Health*.17(15):5290. <https://doi.org/10.3390/ijerph1715529>

Good Things Foundation. (2024). Digital Divide. Available at: <https://www.goodthingsfoundation.org/the-digital-divide/>

Honeyman M, Maguire D, Evans H, et al. (2020). Digital technology and health inequalities: a scoping review (2020). Cardiff: Public Health Wales NHS Trust

The King's Fund. (2023). Moving from exclusion to inclusion in digital health and care. Available at: <https://www.kingsfund.org.uk/publications/exclusion-inclusion-digital-health-care>

Lu X, Yao Y, Jin Y. (2022). Digital exclusion and functional dependence in older people: findings from five longitudinal cohort studies. *EClinicalMedicine*, 54. Available at: <https://www.thelancet.com/action/showPdf?pii=S2589-5370%2822%2900438-2>

Million-Lawson S. (2023). Successful bids for Adult Social Care Technology Fund announced. Available at: <https://beta.digitisingsocialcare.co.uk/news/successful-bids-adult-social-care-technology-fund-announced>

Moroney M, Jarvis A. (2020). Loneliness and Digital Inclusion: A Literature Review. Middlesbrough, UK: Aging Better Middlesbrough. Available at: <https://www.tnlcommunityfund.org.uk/media/insights/documents/Loneliness-and-Digital-Inclusion-AJ.pdf>

National Institute for Health and Care Research. (2022). Older people's access to digitalised services. Available at: <https://arc-gm.nihr.ac.uk/media/page-images/ARC/Healthy%20Ageing/DI%20Briefing%20Note%2006%20Jan%202022.pdf>

NHS Digital. (2021). Social Care Programme Evaluation Overarching Report. Available at: <https://digital.nhs.uk/binaries/content/assets/website-assets/services/social-care-programme/case-studies/social-care-programme-evaluation-overarching-report-29.03.21.pdf>

NHS Health Education England. (2016). Digital Literacy: Towards a definition. Available at: <https://digital-transformation.hee.nhs.uk/building-a-digital-workforce/digital-literacy/what-is-digital->

literacy#:~:text=We%20define%20digital%20literacy%20as,person%2Dcentred%201st%20century%20care.

Ofcom. (2022). Digital exclusion. A review of Ofcom's research on digital exclusion among adults in the UK. Available at:

https://www.ofcom.org.uk/_data/assets/pdf_file/0022/234364/digital-exclusion-review-2022.pdf

Ofcom. (2023). Adults' Media Use and Attitudes report. Available at:

<https://www.ofcom.org.uk/research-and-data/media-literacy-research/adults/adults-media-use-and-attitudes>

Ofcom. (2024). Social tariffs: Cheaper broadband and phone packages. Available at:

<https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/costs-and-billing/social-tariffs>

Older People's Commissioner for Wales. (2023). Annual report and financial statements 2022-2023. Available at: [Annual Reports - Older People's Commissioner for Wales](#)

Schirmer M, Dalko K, Stoevesandt D, et al. (2023). Educational Concepts of Digital Competence Development for Older Adults—A Scoping Review. *International Journal of Environmental Research and Public Health*, 20(13), 6269. Available at:

<https://www.mdpi.com/1660-4601/20/13/6269>

Social Care Wales. (2018). The Economic Value of the Adult Social Care sector - Wales Final report. Available at: https://socialcare.wales/cms-assets/documents/The-Economic-Value-of-the-Adult-Social-Care-Sector_Wales.pdf

UK Parliament. (2024). Funding for adult social care in England. Available at:

<https://commonslibrary.parliament.uk/research-briefings/cbp-7903/>

Vassilakopoulou P, Hustad E. (2023). Bridging digital divides: A literature review and research agenda for information systems research. *Information Systems Frontiers*, 25(3), 955-969. Available at: <https://link.springer.com/article/10.1007/s10796-020-10096-3>

Weightman A, Lifford K, Mann M, et al. (2022). A rapid review of what is known about the effectiveness of strategies to address challenging and disruptive behaviours in students in a classroom setting. *Health and Care Research Wales*. Available at:

<https://doi.org/10.35542/osf.io/u57ac>

Welsh Government. (2020). Care homes benefiting from digital devices roll-out. Available at:

<https://www.digitalcommunities.gov.wales/blog/care-homes-roll-out/>

Welsh Government. (2021). Digital strategy for Wales. Available at:

<https://www.gov.wales/digital-strategy-wales-html>

Welsh Government. (2022). Digital Communities Wales: Digital Confidence, Health and Well-being. Available at: <https://www.gov.wales/digital-communities-wales-digital-confidence-health-and-well-being>

Welsh Government. (2023a). Digital inclusion in Wales. Available at:

<https://www.digitalcommunities.gov.wales/digital-inclusion-in-wales-2/>

Welsh Government (2023b) National Survey for Wales: results viewer. Available at:

<https://www.gov.wales/national-survey-wales-results-viewer>

Welsh Government (2023c) Towards a Welsh Minimum Digital Living Standard: Summary. Available at: <https://www.gov.wales/sites/default/files/publications/2023-02/towards-a-welsh-minimum-digital-living-standard-final-report-summary.pdf>

Yazdani-Darki M, Rahemi Z, Adib-Hajbaghery M, et al. (2020). Older Adults' Barriers to Use Technology in Daily Life: A Qualitative Study. *Nursing and Midwifery Studies* 9(4):p 229-236, Oct–Dec 2020. | DOI: 10.4103/nms.nms_91_19

5. RAPID REVIEW METHODS

We searched for primary sources to answer the review questions: What evidence exists on the effectiveness of interventions to address digital exclusion in older adults?

5.1 Eligibility criteria

Table 4: Eligibility criteria

	Inclusion criteria	Exclusion criteria
Participants	Older adults aged 60 years or over as defined by the Older People's Commissioner for Wales (Older People's Commissioner for Wales 2023) Carers of older adults aged 60 years or over	Adults less than 60 years of age Children
Settings	Any setting except health interventions	Hospital settings
Intervention / exposure	Interventions to address digital exclusion	Interventions to assess the use of telemedicine or to improve health literacy
Comparison	If applicable, no intervention or alternative interventions	
Outcomes	Outcomes(s): - Effectiveness of interventions to address digital exclusion (in relation to access, ability or affordability) - Digital literacy skills - Technology use - ICT acceptance - Views and perceptions of the intervention - Technological knowledge - Self-efficacy	
Study design	Any primary studies that: Assess the effectiveness of interventions to address digital exclusion (comparative)	Secondary/Tertiary research
Countries	All countries	
Language of publication	English	
Publication date	2018-2023	
Publication type	Published	Commentaries, editorials, letters, conference abstracts, preprints

5.2 Literature search

A search of electronic bibliographic databases including Social Policy and Practice (Ovid), Scopus and Sociology Collection was conducted, as well as supplementary searches performed in Google Scholar, SCIE and The King's Fund. Citation tracking from secondary sources identified during the preliminary stages was also undertaken. All searches were conducted between 21st and 23rd November 2023. Search concepts and keywords included digital inclusion, digital exclusion, digital skills, elderly, older adults.

5.3 Study selection process

All studies were uploaded to the systematic reviewing platform Rayyan and were screened by two independent reviewers. Any conflicts were resolved within the review team.

5.4 Data extraction

Data extracted was conducted by a single reviewer and was consistency checked by a second reviewer. Information extracted includes:

- Citation
- Study design
- Intervention
- Comparator
- Study aim
- Data collection methods and dates
- Outcomes reported
- Sample size
- Participants
- Setting
- Key findings
- Observations/Notes

5.5 Study design classification

The included studies were classified as quasi-experimental studies or RCTs.

5.6 Quality appraisal

The JBI critical appraisal checklists for quasi-experimental studies and RCTs were used to assess the methodological quality of each included study. These checklists are not designed to assign an overall score to each study. For the purposes of this review, a pragmatic system devised and used in a previous rapid review (Weightman et al 2022), was used to assess each study as being of high, moderate, or low quality.

High quality: RCT plus a score of 8 or more YES on the JBI RCT check list, plus, no concerns suggesting a medium or high risk of bias in any aspect of the study design.

Moderate quality: RCT plus a score of 6 or more YES on the JBI RCT check list OR a score of 8 or more YES on the JBI quasi experimental study checklist, plus, no concerns suggesting a very high risk of bias in any aspect of the study design

Low quality: Others

Quality assessment was undertaken in duplicate by two independent reviewers. Any discrepancies were discussed and resolved between reviewers. The quality assessment of individual studies can be seen in section 6.3.

5.7 Synthesis

Data was synthesised narratively to provide a collective interpretation of the evidence.

5.8 Assessment of body of evidence

An assessment of the overall body of evidence was made based on the relevance of the available evidence in addressing the review question, the amount and quality of the evidence, the magnitude and direction of effects and consistency in the findings. This information is provided for the differing outcomes in Table 3, and was used to classify the body of evidence for each outcomes as: Very low quality; Low quality; Moderate quality; and High quality.

6. EVIDENCE

6.1 Search results and study selection

A total of 1,540 records were retrieved which were managed in Endnote 20. Following deduplication, 1,307 records remained. The search strategy used to search Social Policy and Practice is available in Appendix 1. A total of 68 articles were screened at full text by two independent reviewers, and any conflicts were discussed and resolved within the team. A visual representation of the flow of studies throughout the review can be found in Figure 6.1.

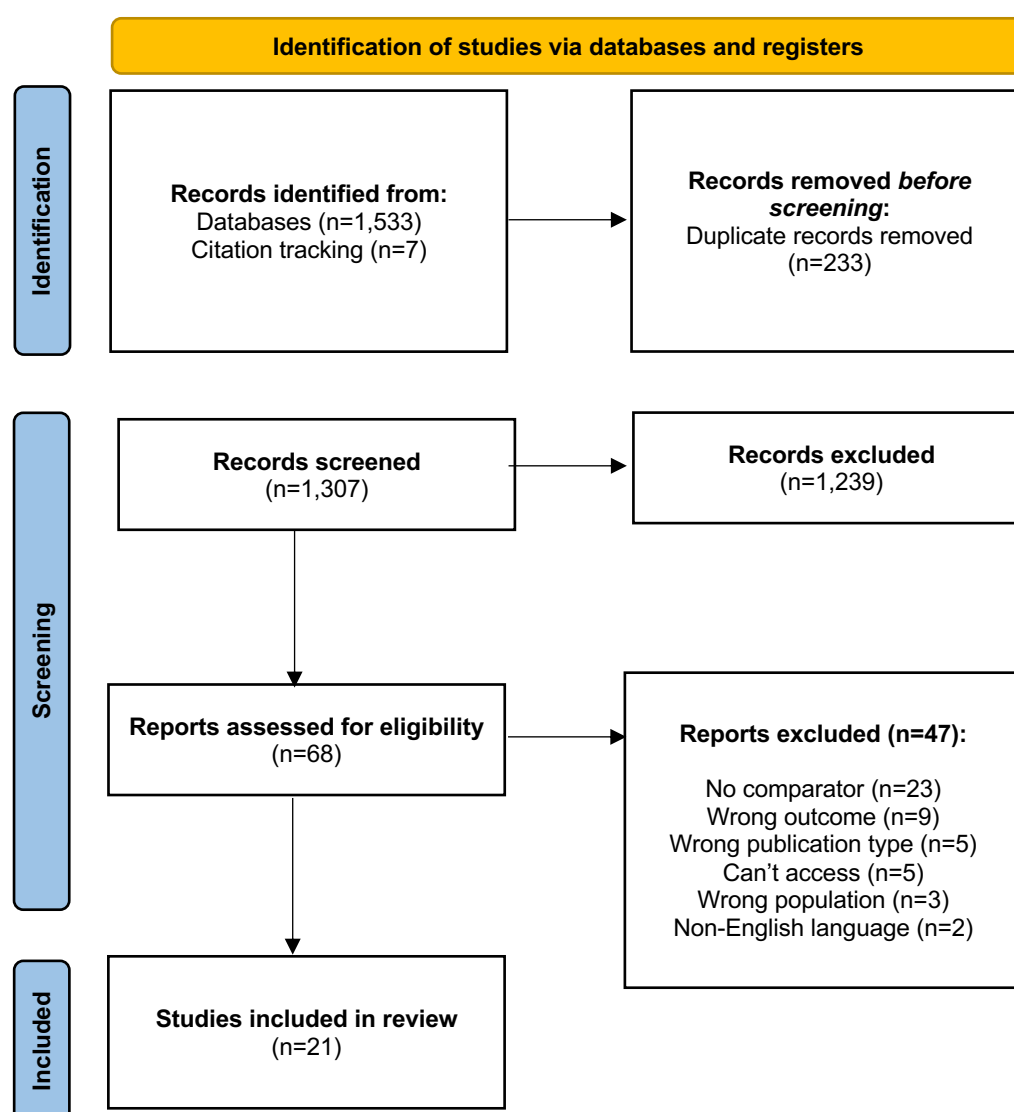


Figure 1. PRISMA flow diagram

6.2 Data extraction

Table 5: Summary of included studies

Citation (Country)	Study Details	Participants & setting	Key findings	Observations/notes
Arthanat. (2021). <u>Promoting Information Communication on Technology Adoption and Acceptance for Aging-in-Place: A Randomized Controlled Trial</u> . <i>J Appl Gerontol</i> . 40(5): 471–480. USA	Study Design: Randomised controlled trial (RCT). Intervention: Home-based individualised inter-generational ICT training programme called the Individualised Community and Home-based Access to Technology Training (i-CHATT) Comparator: Control participants were older adults that did not receive any ICT training and participated in scheduled data collection under the premise of a longitudinal study on trends with ICT use. Study aim: To verify and report on the effect of a home-based individualised inter-generational ICT training program to facilitate ICT use and adoption, and self-reported independence among older adult trainees.	Sample size: 97 participants (48 in intervention and 49 in the control group). Participants: Older adults (65 years and older) in demographic cohorts known to underutilise ICT, from small and rural towns. Setting: Delivered at participant's homes.	Primary Findings: Technology adoption Both the training and control groups performed around 28 activities each month on average at the six-month follow-up almost the same as in baseline (27). The training group maintained a more increasing trend during the remaining follow-up points ending at 36 activities compared to about 30 by the control group. The group X time interaction for the overall range of ICT use was found to be significant [F (4, 1) =2.5, p=0.04, η^2=0.03]. Changes in the range of activities in specific categories were also analysed. No distinct trend or group X time interactions were evident for the range of five activities for family connections [F (4, 1)=0.36, p=0.8, η^2=0.004]. For the nine activities on social participation, the training group sustained an increasing linear trend higher than the control group, but the interaction was not statistically significant [F (4, 1)=1.75, p=0.6, η^2=0.007]. Nevertheless, there were significant group X time interactions with a steadily increasing trend for participants in training group for 17 IADLs [F (4, 1)=3.4, p=0.02, η^2=0.04], 11 health management activities [F (4, 1)=3.8, p=0.006, η^2=0.04] and the 12 leisure activities [F (4, 1)=2.6, p=0.04, η^2=0.03]. The training group performed 27 activities at a higher frequency trend in comparison to the control group across the five time points from baseline to two years, but the group X time interactions were not significant for all of them. Findings on the group X time interactions for the top	

	Data collection method and dates: Data were collected using questionnaires which measured technology adoption, social participation, health and wellbeing. To measure changing attitudinal dispositions (acceptance) toward ICT, the Survey of Technology Use (SOTU) was used. To verify participants' self-reported independence in activities relevant to ICT, the authors developed a 22- item questionnaire. No dates were stated, however, data were collected in 6-month intervals at 6-, 12-, 18- and 24-months. Outcomes reported: • Technology adoption (56 activities for ICT use and 10 outcomes for frequency of use measured) • Self-reported independence (10 activities measured) • Technology acceptance (9 questions about attitudes)		ten activities that the training group performed at a higher frequency than the control group showed that seven out of the ten activities have significant interactions and the rest were approaching significance ($p < 0.1$) the effects were small to medium. The control group performed better on frequency on six activities with none being significantly higher than the training group. Self-reported independence For 11 out of the 15 activities, the training group maintained higher trend in ratings over the control group following the ICT training. Significant group X time interactions were found in six of these activities: shopping [$F(4, 1) = 2.9, p = 0.02, \eta^2 = 0.036$], engaging in volunteer activities [$F(4, 1) = 4.4, p = 0.002, \eta^2 = 0.05$], finding new leisure activities [$F(4, 1) = 4.2, p = 0.002, \eta^2 = 0.05$], maintaining connections with family [$F(4, 1) = 2.8, p = 0.03, \eta^2 = 0.03$], staying connected with your extended family [$F(4, 1) = 2.7, p = 0.03, \eta^2 = 0.03$] and initiating contacts and friendships [$F(4, 1) = 2.8, p = 0.02, \eta^2 = 0.03$]. Technology acceptance For the nine questions on predisposition to technology from the Survey of Technology Use (SOTU), the responses of the participants in the training group were noticeably positive compared to those in the control. Following the ICT training, older people in the training group (compared to those in the control) expressed that "technology experiences are satisfying" [$F(4, 1) = 3.5, p = 0.007, \eta^2 = 0.04$], "technologies are encouraging" [$F(4, 1) = 2.4, p = 0.05, \eta^2 = 0.01$], "I'm comfortable with technology" [$F(4, 1) = 3.6, p = 0.009, \eta^2 = 0.04$], and "I feel good around technology" [$F(4, 1) = 2.3, p = 0.05, \eta^2 = 0.02$].	
Castilla et al. (2018). Teaching	Study Design: Observational, uncontrolled study with repeated measures.	Sample size: 46 participants.	Primary Findings: Regarding the differences between users with low and high ICT experience, there were differences in only one	

<u>digital literacy skills to the elderly using a social network with linear navigation: A case study in a rural area.</u> <i>International Journal of Human-Computer Studies.</i> 118, 24-37. Spain	Intervention: Eight standardised sessions focused on an online social network (Butler 2.0), delivered in person in groups of up to 6 people. Comparator: Baseline measures (pre-post). Study aim: To test a social network consisting of multiple applications with linear navigation as a digital literacy method for the elderly in rural areas. Data collection method and dates: Validated surveys, focus groups, dates not stated. The questionnaire on opinions about ICTs in general was designed ad hoc for this experiment, and consists of three items with a 5-point Likert scale. Modified questionnaires were used to measure usability and acceptability (the system usability scale). Outcomes reported: • Opinion about ICTs in general • Usability and acceptability items • Satisfaction with use	Participants: 60-76 years old from rural areas with heterogeneous previous experience with ICTs. Setting: Delivered at an Elderly Leisure Centre.	variable, perceived usefulness of Butler, $t(44)=2.12$, $p=0.040$. After the first session using the system, users with less experience with ICTs rated a lower perceived usefulness than users with high experience. We then conducted repeated-measures ANOVAs in order to find out whether participants who were low and high on previous experience with ICTs behaved differently while using Butler. Again, the interaction effect was statistically significant only for perceived usefulness of the system $F(1, 44)=4.277$, $p=0.045$. Users with low ICT experience began with a lower score on perceived usefulness than users with high ICT experience, and the use of the system resulted in increased perceived usefulness for low ICT experience users. After session 5, perceived usefulness was equal in both groups (A t-student test revealed no differences in perceived usefulness after session 5; $t(44)=1.150$, $p=0.257$). Because no other differences were found due to previous experience with ICTs, the remaining analyses were performed with the entire sample. After the first session, all usability and acceptability items exceeded the midpoint of the scale (i.e., 2), placing Butler in the positive area of the scale on all variables, i.e. between "Neither agree nor disagree" and "Strongly agree". Regarding the way users felt when interacting with the system, we found that all the items also exceeded the midpoint of the scale, placing Butler in the positive area of the scale on all the variables. In addition, after the first use of the system, 83% of the users said they would recommend Butler to other people of the same age, 2% said they would not, and 15% said they did not know if they would recommend it. No significant differences were found between the first and fifth sessions on perceived ease of use and usefulness and how the users felt while using the system. That is, users perceived the same ease and usefulness of the system, and they felt the same way as they did in the first lesson. The repeated use of the system significantly improved confidence, interest, and satisfaction with the system, and the sense of self-efficacy with regard to computer use. The effect size for these	
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	• Recommendation of the system • Intended Use • Preference • Qualitative outcomes from focus groups		variables was small to medium. After five sessions of Butler use, the number of users who would recommend the system increased to almost the entire sample. Regarding the users' attitude toward new technologies in general, after the eight sessions of using the Butler 2.0 system, there was an improvement in all variables: Improvements in response to "How do you generally feel when using new technologies?" were not statistically significant ($p>0.5$). Answers to "To what extent do you feel capable of using new technologies?", did improve significantly ($p=0.012$), as were they to "To what extent are you interested in using new technologies?" ($p=0.003$). After completing the eight sessions of Butler use, 96% of the users expressed the intention to continue to use the system in the future, compared to 2% who expressed no intention to use it, and 2% who were unsure. 82.6% of the sample had received some kind of training in the use of ICTs. Given that previous experience was with hypertextual navigation systems, we asked about their preference regarding previous systems and Butler as a learning ICT method. 60.5% preferred the Butler method. Perceived ease of use was one of the major reasons they preferred Butler as their ICT learning method. However, this variable was not important when choosing other ICT learning methods. The main reasons to prefer other systems were: "Other systems are more open" or "more realistic".	
Choi and Park (2022). <u>IT Humanities Education Program to Improve Digital</u>	Study Design: Quasi experimental study Intervention: An educational programme which combines a decision tree with a game that allows the elderly to	Sample size: 42 participants (23 intervention 19 comparative group). Participants: Older adults (60 and older) who directly participated in	Primary Findings: Digital literacy, recognition and behaviour Digital literacy capabilities improved in the experimental ($p<0.05$). The digital literacy capability was improved in the comparative group, but it was not statistically significant ($p>0.05$).	<i>The educational program developed in this paper was delivered to the experimental group and the general Internet and digital device use education</i>

<u>Literacy of the Elderly.</u> <i>Journal of Curriculum and Teaching</i> 11,5, 138-145. South Korea	acquire IT knowledge. Consisted of 10 sessions in groups. Comparator: General Internet and digital device use education (no detail about this intervention provided). Study aim: To test the effectiveness and evaluate satisfaction of an educational IT programme to improve digital literacy in the elderly (60+). Data collection method and dates: Satisfaction was assessed using a 15-question Likert survey, digital literacy was assessed using an edited version of the digital literacy competency self-diagnosis evaluation tool. Dates not stated. Outcomes reported: - Digital literacy, recognition & behaviour - Satisfaction with educational programme	the educational programme. Setting: Delivered at an education centre.	The pre-average of the experimental group in recognition was significantly improved from 2.45(±0.55) to 3.02 (±0.64) (p=0.012) after the intervention. The recognition area of the comparison group increased by 0.17 from a prior average of 2.34(±0.47) to 2.51(±0.35), but it was not statistically significant (p>0.05). In the behavioural area, the experimental group increased statistically significantly from a pre-average of 3.16(±0.66) to a post-average of 3.67(±0.59) (p=0.001). The comparison group increased from a pre-average of 3.10(±0.81) to a post-average of 3.32(±0.34), but it was not significant (p>0.05). Satisfaction Overall satisfaction was 4.13(±0.65). In detail, educational content was 4.22(±0.64), educational activity was 3.94(±0.76), and educational material was 4.05(±0.69). Male satisfaction (4.15±0.67) was higher than women's (3.98±0.77). In addition, the average satisfaction score of subjects aged 60 to 65 was 4.23(±0.59), and those aged 65 to 69 were lower at 3.58(±0.85).	<i>was conducted with the comparative group.</i>
Czaja et al. (2018). <u>Improving Social Support for Older Adults Through Technology:</u>	Study Design: RCT Intervention: The Personal Reminder Information and Social Management (PRISM) system is a specially designed computer	Sample size: 300 participants (150 in intervention, 150 in the Binder group) Participants: English speaking older adults (65 and older) who	Primary Findings: Relative to those in the Binder condition, PRISM participants reported greater increases in computer comfort at 6 months (b=-1.68; p<0.001; effect size = 0.39; 95% CI: -2.57 to -0.78) and 12 months (b=-2.32; p<0.001; effect size = 0.53; 95% CI: -3.22 to -1.41); greater increases in computer interest at 6 months (b=-1.52; p<0.001; effect size = 0.46; 95% CI: -2.26 to -0.79) and 12 months (b=-0.99, p<0.01, effect size =	<i>The secondary outcomes reported appear to address the research question</i>

<u>Findings From the PRISM Randomized Controlled Trial.</u> <i>Gerontologist</i> 58,3, 467–477. USA	system for older adults, which includes a software application and a robust support system with training and instructional support. PRISM participants received a Lenovo “Mini Desktop” PC with a keyboard, mouse (or trackball for those who were unable to control a mouse), a 19” LCD monitor, the PRISM software application, and a printer. They were provided with access to internet. It also included an annotated resource guide, a dynamic classroom feature, a calendar, a photo feature, E-mail, games, and online help. Resources included information on local and national organisations, services such as transport and meals, and educational offerings. Participants also received home visits, check-in calls, a help card and access to a technical help line. Comparator: Participants in the comparator (Binder) group received a notebook that contained paper content similar to that contained in the intervention. Study aim: To evaluate the impact of a specially designed computer system for older adults. Data collection method and dates:	had at least 20/60 vision with or without correction, and could read at the 6th grade level, at risk for social isolation who lived independently in the community; minimal computer/internet use, not employed or volunteering more than 5 hr/week, or spending more than 10 hr/week at a senior centre or formal organisation. Setting: Delivered at participant’s homes.	0.30; 95% CI: –1.74 to –0.25); and had greater increases in computer efficacy at 6 months ($b=-1.29$; $p<0.001$; effect size = 0.41; 95% CI: –2.01 to –0.57) and 12 months ($b=-0.94$; $p<0.02$; effect size = 0.30; 95% CI: –1.67 to –0.22). Those assigned to PRISM also demonstrated a greater increase in computer proficiency at 6 months ($b=-6.37$, $p<0.001$; effect size = 1.11; 95% CI: –7.39 to –5.35) and 12 months ($b=-7.06$, $p<0.001$; effect size = 1.23; 95% CI: –8.08 to –6.03). Technology Acceptance Questionnaire and System Evaluation Most PRISM participants found PRISM useful in their daily life (82%), indicated that PRISM made their life easier (80%), improved their daily life (84%), and enabled them to accomplish tasks more quickly (73%). They also found PRISM easy to use (88%) and easy to become skilled at using PRISM (80%). In fact, 60% indicated that they felt comfortable using PRISM within 1 week. Most found the E-mail feature valuable (85%), using the Internet valuable (82%), the Classroom feature valuable (80%), and the Games as valuable (77%). Only 57% found the Photo feature valuable and 51% found the Calendar valuable. Of those who received the Binder, 89% found the information and tips valuable and 87% found the community resource information valuable and about half (58%) found the Calendar valuable. In contrast to those who received PRISM, only 61% thought the games were valuable. PRISM participants found it easier to communicate with family and friends relative to those who received the Binder (82% vs. 47%) and engage in hobbies and play games (82% vs. 52%). Participants in both conditions reported that it was easier to look up community information (78% vs. 73%) and health information (82% vs. 80%). Almost all of the PRISM participants (93%) found PRISM enjoyable to use and 88% of those receiving the Binder found it enjoyable to use. However, those in the Binder condition were more satisfied with the in-home training they received (90% vs. 82%).	
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	Data were collected using the Life Space Questionnaire, the Test of Functional Health Literacy in Adults, Wide Range Achievement Test (WRAT), and measures of cognitive abilities such as working memory and processing speed, System Evaluation questionnaire. Data were collected at baseline, 6- and 12-months, dates not stated. Outcomes reported: Primary outcomes included: • Social isolation • Loneliness • Perceived social support • Social Network Size • Perceptions of quality of life • Perceived vulnerability • Changes in health-related quality of life and wellbeing Secondary outcome measures include: • Computer proficiency • Attitudes toward technology • Perceptions of the usefulness and usability of PRISM (the intervention)			
Elbaz et al. (2023). <u>Evaluation of a virtual 4-</u>	Study Design: Quasi-experimental (Pilot study). Intervention:	Sample size: 5 participants Participants:	Primary Findings: Computer proficiency score The scores of participants mean CPQ scores were higher after the 4-week intervention, compared to pre-intervention	

<u>week digital literacy program for older adults during COVID-19: a pilot study.</u> Educational Gerontology, Canada	Four-weekly digital literacy intervention programme offered through the Zoom conferencing platform. Sessions were delivered by a trainer and two co-facilitators and covered a range of skill-based topics, including digital safety and security. On a handful of occasions (3–4 times), the trainer met with the participants in one-on-one meetings to go over concepts on a request basis. Comparator: Baseline (pre-post) Study aim: To evaluate the effectiveness of a 4-week digital literacy programme to train older adults on key skills related to navigating their computer (e.g. sending e-mails or traversing the web). Data collection method and dates: Data were collected using the Computer Proficiency Questionnaire (CPQ). Dates of data collection not stated. Outcomes reported: • Average computer proficiency score • Participant perceptions	A convenience sample of elderly adults (65 years and older, 1 male and 4 females) from a large-scale telehealth program. All older adults were required to have an Internet connection and a digital device that could connect to the Internet (e.g. a computer, mobile phone or tablet with an Android or iOS operating system). Setting: Delivered remotely online via Zoom.	scores [17.72 (± 1.94) vs. 13.24 (± 2.40), $t(4)=-8.910$, $p<0.001$], suggesting that overall digital literacy seemed to improve over the intervention period. Mean CPQ scores post intervention were also significantly higher compared to pre-intervention for the computer basics [3.97 (± 0.45) vs. 3.23 (± 0.60), $t(4)=-5.880$, $p=0.004$], communication [3.36 (± 0.38) vs. 2.40 (± 0.48), $t(4)=-8.353$, $p=0.001$], and Internet subscales [3.63 (± 0.16) vs. 2.71 (± 0.48)], $t(4)=-4.257$, $p=0.013$], suggesting that participants may have gained added knowledge and confidence regarding these aspects after the intervention. No significant differences were found between pre and post intervention scores in printing, scheduling, and multimedia subscales ($p>0.05$), indicating that the intervention had no effect on these topics. Overall, the findings indicate that participants perceived digital literacy seemed to improve through the 4-week intervention. Participant perceptions General feedback from the participants were initially related to the speed in which the trainer discussed the concepts. Additionally, at times some participants mentioned being confused as to why certain applications appeared different (i.e., had a different name than what the trainer was showing, different icons, or the user interface was not the same). Overall, participants all mentioned appreciating the digital literacy training as well as the accessibility, and patience of the trainer and facilitators.	
Fields et al. (2021). <u>In-Home</u>	Study Design: RCT	Sample size: 83 participants, 44 in the intervention arm (27 with	Primary Findings: Technology use	

<u>Technology Training Among Socially Isolated Older Adults: Findings From the Tech Allies Program.</u> <i>Journal of Applied Gerontology.</i> 1-11. USA	Intervention: Tech Allies Eight-weekly one-to-one digital training sessions incorporated into the Little Brothers - Friends of the Elderly (LBFE) volunteer-based friendly visitor programme. Participants each received a tablet, broadband access and a certificate of completion at the end of the programme. Volunteers provided eight weekly, in-home iPad lessons. Participants each received a learner booklet, outlining curriculum topics by week, including step-by-step visual guides and practice exercises. Comparator: A 2-month waitlist group served as the control group Study aim: To evaluate the effect of providing digital devices (tablets), internet access (through a discounted senior broadband program), and in-home 1:1 technology training to isolated older adults, on participants' loneliness, perceived social support, and technology use. Data collection method and dates: Data were collected using questionnaires and interviews. To measure technology use,	complete post-training survey data) and 39 in the waitlist arm (30 with complete 2-month waitlist survey data). Participants: Older adults (65 and older or 60 and older with a disability), who received fewer than two social visits each month, (socially isolated) were English-speaking, and expressed a need for in-depth technology training. Setting: Delivered at participant's homes.	There were significant improvements in technology use from baseline to 2 months within the intervention arm (baseline = 33% no internet or email use, 2-month = 0% no internet or email use, $p=0.004$). There was no change over time within the waitlist arm (baseline = 53% no internet or email use, 2-month = 60% no internet or email use, $p=0.63$). Confidence Within the intervention arm, there was improvement in confidence in digital skills (baseline = 52% little to no confidence searching for information online and using email, 2-month = 35% little to no confidence, $p=0.13$) and no change in the waitlist arm (baseline = 76% little to no confidence, 2-month = 77% little to no confidence, $p=1.0$). Results from logistic regression: Participants had greater odds of reporting technology use, OR 91.20 the (95% CI: 11.02 to +Infinity) and odds of reporting confidence in their technology skills OR 8.99 (95% CI: 1.55 to 96.57) compared with those in the waitlist group. Results were adjusted for baseline technology use and e technology confidence in searching for information and email use. Participant perceptions: Many participants expressed feeling more confident navigating technology and less scared of digital devices. Participants also provided feedback on the program. This included a desire for more total sessions and more frequent sessions with their volunteer instructors to provide additional opportunities for repetition and practice as well as more time to progress to advanced topics. While some participants did not regularly use the written materials provided as part of the program, others felt that more detailed visual and written instructions would be helpful. Participants also highly valued having someone to guide them and answer their questions about the tablet. Some expressed a desire for more structure from their	
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	participants were asked whether or not they used the internet at least occasionally and participants self-reported confidence. Data collection dates not stated but sample recruited between July 2017 and December 2018. Outcomes reported: • Self-reported loneliness • Social support • Technology use • Confidence at baseline and follow-up		volunteer instructor, while others appreciated the highly customised, participant-driven approach. For many participants, their personality match with their instructor was central to their program experience.	
Gadbois et al. (2022). <u>Findings From Talking Tech: A Technology Training Pilot Intervention to Reduce Loneliness and Social Isolation Among Homebound Older Adults</u>. <i>Innovation in Aging</i>. 6;5, USA	Study Design: Quasi-experimental (Pilot study). Intervention: The Talking Tech intervention was a 14-week, volunteer-delivered programme whereby participants were provided training and assistance by “TechMates”, delivered one-to-one and embedded within and delivered by a home-delivered meals programme. Comparator: Baseline (pre-post). Study aim: To report findings from a pilot intervention designed to reduce loneliness and social isolation among homebound older adults by providing one-on-one, in-home technology training to promote	Sample size: 21 participants Participants: Older adults (60 and older) who were homebound or had difficulty leaving their homes independently. Setting: Delivered at participant’s homes.	Primary Findings: Technology use There was a trend towards some increased use of technology, but none of the results were statistically significant. Sent email or text messages most days in past month: At baseline, 14 (78%), post intervention, 13 (72%) p=1.0. Used internet in past month: At baseline, 11 (61%), post intervention 13 (72%) p=0.27. Online activity engagement score: At baseline, 1.44 (1.69), post intervention 1.89 (1.84) p=0.44. Shopping in past month, at baseline 4 (22%), post-intervention 4 (22%). Order or refill prescriptions in past month, at baseline 3 (17%), post-intervention 5 (28%). Pay bills or banking in past month, at baseline 6 (33%), post-intervention 2 (11%). Social networking sites in past month, at baseline 7 (39%), post-intervention 9 (50%) Contact medical provider in past month, at baseline 2 (11%), post-intervention 6 (33%). Health insurance matters in past month, at baseline 2 (11%), post-intervention 3 (17%). Sought health information in past month, at baseline 9 (50%), post-intervention 10 (56%).	

	digital literacy and participation in a virtual senior centre. Data collection method and dates: Data were collected using questionnaires and interviews. Questions modelled after the Technological Environment section from Round 7 of the National Health and Aging Trends Study were used to assess technology use. No data collection dates stated, however, the Talking Tech programme ran between October 2019 and May 2020. Outcomes reported: • Loneliness • Social isolation • Technology use (internet use, email and text messaging use, smartphone, tablet, and computer ownership, and well as online information-seeking behaviour) • Health satisfaction • Quality of life • Self-rated health • Activities of daily living • Independent activities of daily living needs • Depression		Participant perceptions: Nearly all participants reported having a positive experience with Talking Tech. TechMate reports indicated that 15 of the 16 participants for whom reports were received were “very interested” in the program and “excited” to learn how to use the tablet. A few participants and TechMates suggested including more training sessions to accommodate participants with a slower learning pace or for those starting with limited technology knowledge. Alternatively, others with more computer experience described that aspects of the module content were too basic.	
Garcia et al. (2022).	Study Design: Quasi-experimental study.	Sample size: 39 participants (30 for the two in-person delivery	Primary Findings: There was no significant difference comparing pre and post scores in the ND (motivation) domain in any of the approaches, which showed that none	At baseline, each group were comparable for

<u>Impact of an educational program to improve older adults' digital skills.</u> <i>Egitania</i> <i>Sciencia</i>, 9-31 Multiple countries including Latvia, Poland, Portugal and the United Kingdom.	Intervention: The Erasmus+ project ICTskills4All examined three different educational approaches (intergenerational, peer-to-peer and online) for improving digital skills in older adults were compared. Comparator: Three different intervention delivery methods were compared (see above) Study aim: To analyse the impact of three different educational approaches (intergenerational, peer-to-peer and online) on older adults' digital skills in different European countries (Latvia, Poland, Portugal and the United Kingdom) participating in the Erasmus+ project ICTskills4All. Data collection method and dates: Data were collected using the Digital Skills Self-Assessment Questionnaire and interviews. Outcomes reported: Digital literacy: • Information and data literacy (I&DL) • Communication and collaboration (C&C) • Digital content creation (DCC)	formats, 9 in the online group) Participants: Older adults aged 55 years and above from Latvia, Poland, Portugal and the United Kingdom, 66.7% of participants across the countries were aged 65-74. Participants had their own computers. Setting: Delivered in-person and online.	of the formats was effective in improving participants' motivation. The online course was more effective in improving digital content creation skills, being the only one that showed a significant difference in this domain. The intergenerational and peer-to-peer groups did not show significant differences between them. Both groups, however, showed a difference when compared to the online approach in the information and digital literacy, communication and collaboration, and safety domains. Regarding the questions of the four identified domains, the peer-to-peer and intergenerational programs were effective in improving the skills evaluated in 45 questions: all 23 competences in I&DL (100%); all 9 competencies in C&C (100%); and 13 of the 14 competences (93%) in S. In the online format, the course proved to be effective in improving the skills evaluated in 35 (71.4%) questions: 14 out of 23 (61%) in I&DL; 5 out of 9 (56%) in C&C; all 14 skills (100%) in S; and all 2 skills in DCC (100%). Peer-to-peer and intergenerational courses were more effective in improving I&DL and C&C skills (100% effective in both domains, compared to 61% and 56% effective, respectively, in online courses). Peer-to-peer Information & data literacy: Significant improvements from baseline (2.09 to 3.72, $p=0.0001$) Communication and collaboration: Significant improvements from baseline (1.78 to 3.22, $p=0.0001$) Safety: Significant improvements from baseline (1.93 to 3.29, $p=0.0001$) Motivation: No significant change from baseline (4.0 to 4.5, $p=0.606$) Digital content creation: No significant change from baseline (3.25 to 4.0, $p=0.501$) Intergenerational	motivation (ND), and digital content creation. However, there were baseline differences in I&DL, C&C and S domains, online participants had more skills at the beginning of the course than the peer-to-peer and intergenerational participants.
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	• Safety (S)		Information & data literacy: Significant improvements from baseline (2.41 to 3.91, $p=0.001$) Communication and collaboration: Significant improvements from baseline (2.06 to 3.44, $p=0.01$) Safety: Significant improvements from baseline (2.0 to 3.43, $p=0.012$) Motivation: No significant change from baseline (4.0 to 4.0, $p=0.755$) Digital content creation: No significant change from baseline (4.0 to 3.75, $p=0.977$) Online Information & data literacy: Significant improvements from baseline (4.13 to 4.83, $p=0.019$) Communication and collaboration: Significant improvements from baseline (3.67 to 4.78, $p=0.05$) Safety: Significant improvements from baseline (3.50 to 4.57, $p=0.0001$) Motivation: No significant change from baseline (4.0 to 5.0, $p=0.387$) Digital content creation: Significant improvement from baseline (3.0 to 4.0, $p=0.004$) P1. Comparison between peer-to-peer and intergenerational No significant differences in outcomes for any domain. P2. Comparison between peer-to-peer and online Significant differences in information & digital literacy, communication and collaboration, and safety (appear in favour of peer-to-peer but not very clearly reported). No significant differences in ND (motivation) or digital content creation. P3. Comparison between intergenerational and online Significant differences in information & digital literacy, communication and collaboration, and safety (appear in favour of intergenerational but not very clearly reported). No significant differences in ND (motivation) or digital content creation.	
Holguin-Alvarez et al. (2020).	Study Design: Quasi-experimental study	Sample size: 40 participants (20 in	Primary Findings: The results regarding the digital competences variable before the application of the program (pre-test	This paper contains limited methodological information. Also, the

<u>Digital competences in the social media program for older adults in vulnerable contexts.</u> <i>International Journal of Scientific and Technology Research</i>, 9 (5), 228-232. Peru	Intervention: Social media programme designed to increase digital skills in communities at risk of social exclusion. The experimental pedagogical program was developed during 50 learning activities, based on the use of Facebook, WhatsApp, Twitter and Gmail were applied as essential elements of virtual communication. Session lasted 30 minutes. The experimentation was manipulated in four stages for each activity: 1) Dynamic familiarisation; 2) Thematic introduction; 3) Network Registries; and 4) Digital interactivity. Comparator: No intervention Study aim: To verify the effects of imparting activities of a program based on Social Networks in the digital competences of the elderly. Data collection methods and dates: The instrument used to gather information on digital competences was the Questionnaire on Digital Competencies of University Students and for Non Students (adapted version); which consisted of 31 items, with four scales dedicated to the evaluation of the effectiveness in digital competence. This questionnaire	intervention and 20 in the control group) Participants: Older adults in vulnerable contexts (Low SES) (81 -92 years) who regularly attended The House of the Elderly, located in a central district of the city of Lima, in Peru. Setting: Delivered in the community.	measurement), reported equitable measures between the control group ($M(y)=31,5$; $SD. (y)=0.42$) and experimental group ($M(x)=46,3$; $SD. (x)=1.03$). In this analysis, the comparison of group averages did not report statistical significance ($t(34)=-1,264$; $sig.=2,56$; $p>0.001$). In relation to the digital competencies in post-test measurement (after the application of the program), average scores were obtained that differed from each other. The measures of the experimental group ($M(x)=119,1$; $SD. (x)=0.24$) and the control group ($M(y)=45,1$; $SD. (y)=1.06$). Regarding the statistical analysis, the differences were corroborated with a degree of success of 99% ($t(39)=-2,146$; $sig.=0.000$; $p<0.001$).	study has been poorly translated in areas, these factors make it difficult to definitively extract all key details of the study.
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	was administered before and after the intervention. Also, an open response form was used to record the opinions of some participants regarding the usefulness they felt in their digital competences after participating in the experimental program. Dates of data collection not stated. Outcomes reported: Digital competencies			
Lee and Kim (2019). <u>Bridging the digital divide for older adults via intergenerational mentor-up</u>. <i>Research on Social Work Practice</i>, 29(7), pp.786-795. USA	Study Design: Quasi-experimental study Type of intervention: The Intergenerational Mentor-Up (IMU) programme contained guided learning opportunities for undergraduate students to teach older adults IT skills and reduce their social isolation. Six group IMU sessions were held where mentees were paired with student mentors who provided one-to-one support based on the specific needs of mentee. At the end of each session, everyone came together, so that the seniors could share their accomplishments with the entire group. Comparator: Pre-post intervention comparisons Study aim: To examine the effectiveness of Intergenerational Mentor-Up (IMU), an innovative	Sample size: 55 participants Participants: Older adults (65 and older), 63.6% were female and 36.4% were male. In addition, 56.4% were non-Hispanic Black and 38.2% were non-Hispanic White. The majority lived alone for a mean of 11.39 years. They had a mean of 2.65 chronic illnesses (SD=1.65). Judging from the number of life stressors, the IMU participants reported low level of stress. Setting: Half of the sessions were offered at senior centres, and the half in housing facilities. The study took place in a South-eastern city that was ranked lowest for social	Primary Findings: <i>eHealth literacy:</i> at pre-test, eHEALS scores suggest that self-rated eHealth literacy, on average, was at a neutral (i.e., “undecided”) level, and the IMU senior mentees, on average, showed significant improvement at post-test ($t=-5.89$, $p<0.001$, $d=-0.79$). Senior mentees’ views about the Internet’s usefulness in helping them to make decisions about their health were significantly changed from pre- to post-test ($t=-4.6$, $p<0.001$, $d=-0.62$), as was their opinion about the importance of being able to access health resources on the Internet ($t=-4.35$, $p<0.001$, $d=-0.59$). At pre-test, IMU senior mentees expressed a lower level of willingness to use online health information (if someone taught them how to use the computer/Internet). By post-test, their levels of willingness ($t=-7.99$, $p<0.001$, $d=-1.08$) significantly increased. <i>Attitudes:</i> attitudes toward computers/Internet were measured with the efficacy and interest subscales. IMU senior mentees showed significant improvement in their self-efficacy ($t=-8.36$, $p<0.001$, $d=-1.13$) and interest ($t=-9.24$, $p<0.001$, $d=-.25$) in using computers/Internet at post-test. <i>Technophobia:</i> Following the IMU training, senior mentees also felt confident about their skills in utilising	Most participants (n=40) were internet and daily technology (n=30) users before the program commenced. The programme was part of a university project aimed to improve undergraduates ability to mentor and communicate with older adults.

	intervention that engages college students in tutoring older adults, with regard to E-Health literacy and social isolation. Data collection methods and dates: Data were collected using semi-structured face-to-face interviews administered by five research assistants prior to and after participating in the IMU. The interview used established questionnaires to determine eHealth literacy (eHEALS scale), attitudes towards computers/internet (Computer Efficacy subscale), technophobia (computer anxiety scale) and social isolation. The results of each scale were compared to pre-test measures. Dates of data collection not stated. Outcomes reported: • eHealth literacy • Technophobia • Self-efficacy • Social isolation • Interest in technology	mobility (low income areas).	computers/Internet ($t=-3.69$, $p<0.001$, $d=-0.50$). As a consequence, their anxiety toward technology decreased ($t=2.65$, $p<0.01$, $d=0.36$). Participant perceptions: Qualitative data revealed that individualised training, modifications, adaptations, and intergenerational interactions can decrease older adults' anxiety and boost their confidence. Benefits perceived by IMU senior mentees were emerged into four major themes: communication tools, independent living, leisure activities, and intergenerational learning. Communication tools Following their IMU lessons, many of the older adults reported accomplishments, including sending a "first" text to a daughter and sharing photos with a grandchild via Facebook. Independent living Although the IMU senior mentees were not afraid of or unwilling to use technology and were able to acquire the necessary skills, many reported usability problems (e.g. difficulty with reading small fonts, difficulty of navigation) and associated frustration with the computer system due, in part, to the cognitive, perceptual, and motor skill demands that they required. Youth mentors were helpful in pointing out options for assistive technology, such as magnifiers, flashlight, and speech-to-text software as well as enlarging fonts. Leisure activities Youth mentors also helped a few of the older adults to explore online dating sites. Other popular activities were to search recipes and to get directions, the weather, and travel information.	
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			Intergenerational learning Both the senior mentees and students expressed that mutual learning was occurring in terms of technology skills, life experiences, and shared interests. The words used to describe this intergenerational experience included “awesome,” “happy,” “inspiring,” and “a real joy.” Almost all IMU senior mentees felt that working with their youth mentors made them “feel young.”. As the IMU program was winding down, several senior mentees asked whether they could have more technology classes. Almost all senior mentees asked for “more classes like this.”	
Lee et al. (2022a). <u>Effect of a digital literacy program on older adults’ digital social behavior: A quasi-experimental study</u>. <i>International Journal of Environmental Research and Public Health</i>, 19(19), p.12404. South Korea	Study Design: Quasi-experimental study Type of intervention: A digital literacy education programme to improve smartphone usage competency. Sessions ran once a week for six weeks and included topics such as, basic smartphone operation, sending text messages, taking and sharing photos, social app, search engine applications, and internet banking. Comparator: A no intervention control was used. Statistical comparisons were made pre- vs post-intervention Study aim: To assess the effects of digital literacy education on digital device usage and evaluate the positive effects of digital literacy education	Sample size: 144 participants (62 in intervention and 62 in the control group). Post-intervention data was only record from 45 people in the experimental group and 36 people in the control group responded to the survey Participants: Older adults (65 years and older) living in rural areas Setting: Delivered across a total of five locations including Y University Healthy City Research Center, the Wonju Senior Center and small libraries.	Primary Findings: The frequency of phone calls made using smartphones by the older adults in the experimental group increased significantly by 8.5% after education ($t=1.934$, $p=0.026$). In contrast, no changes were observed in the control group. No significant increase in taking photos was observed in either group after the intervention period (experimental group: $p=0.087$; control group: $p=0.176$) A significant increase in ability to video record using a smartphone was observed in the experimental group ($t/x^2=4.493$, $p=0.049$, no improvement was shown for the control group ($t/x^2=0.522$, $p=0.5277$)) Self-efficacy Experimental group improved after the intervention but not significantly ($57.1-58.1$ $p=0.530$), the control group increased significantly ($55.6-60.1$ $p=0.025$). However when compared no significant difference was reported between groups ($(t)-1.382$ 95%CI $[-8.499, 1.494]$; $P=0.169$).	This intervention also evaluates the effects of digital literacy education on depression, happiness, quality of life, self-efficacy and cognitive function. In relation to the discrepancy between the number of participants undergoing the program and the number of participants completing the final survey: the remaining participants were unable to participate on the last day due to COVID-19, and hence, the survey was not conducted.

	Data collection methods and dates: Data were collected using questionnaires to assess participant characteristics, happiness, subjective health, depression, quality of life, self-efficacy and a cognitive function test. Self-efficacy was assessed using the 10-item General Self-Efficacy Scale (GSE) Dates of data collection not stated, however, the programme ran from 25 October 2021 to 3 December 2021. Outcomes reported: • Digital device usage • Depression • Happiness • Quality of life • Self-efficacy • Cognitive function			
Lee et al. (2022b). <u>Information communication technology use to improve eHealth literacy, technophobia, and social connection among community</u>	Study Design: Pre-test-post-test non-equivalent control group design Type of intervention: The Intergenerational Forum (IF). A 12-week, class educational programme providing guided instruction and intergenerational exchange between youths serving as mentors and older adults serving as mentees. Classes consisted of 8–10 mentees. Mentees shared learning goals and IT issues, and were given	Sample size: 104 participants (50 in intervention group and 54 in the control group). Participants: Older adults (65 years and older) attending one of two senior centres, interested in learning about computers and the internet. Setting: Two large senior centres in metropolitan Seoul, Korea	Primary Findings: The results did not show a significant difference in the mean scores for the intervention and comparison groups in all study outcome variables (e-Health literacy, technophobia, social isolation, etc.). <i>E-Health literacy:</i> Following the 12-week IF classes, older mentees improved in their eHealth literacy ($t(49)=-4.23$, $p<0.001$, $d=-.60$). The IF participants also reported perceived greater usefulness of Internet during this period ($t(49)=-3.50$, $p<0.001$, $d=-.49$). <i>Technophobia:</i> Considering two dimensions of technophobia, anxiety toward technology was significantly reduced in IF group participants throughout the study	<i>Baseline differences in internet use was apparent between groups ($\chi^2(2)=27.34$, $p<0.001$). While all IF participants identified as current users of Internet, only slightly over half of the comparison group identified as current users (57.4%). More males were represented in the IF group, whereas more</i>

<u>dwelling older adults</u>. <i>Educational Gerontology</i>, 48(10), pp.445-457. South Korea	group tutorials and individualised support. Comparator: No intervention control group. Within-group pre-test and post-test comparisons were made Study aim: To examine the outcome of a 12-week class focused on encouraging intergenerational exchange and mutual aid between college students and older adults. Data collection methods and dates: For each participant, a pre-test was conducted by the research team a week prior to the IF classes and a post-test was done a week following the IF classes. Surveys were used to examine the participants' e-Health literacy The e-Health Literacy Scale (e-HEALS), technophobia, adapted from the Computer Anxiety Scale (CAS) social isolation, and social capital in relation to older mentees' processes of learning and mastering the ICT skills via IF classes. Study participants' prior experiences of using the Internet were assessed, including frequency of Internet use, challenges faced, issues of accessibility, types of devices, and individual use patterns. Data	(t(49)=-2.77, p<0.01, d=-.39). Consequently, IF group participants reported an overall increase in the level of confidence in using technology (t(49)=-5.05, p<0.001, d=-.71). Within the comparison group, significant changes were observed during the study period in the two outcomes of technophobia. Comparison group participants' anxiety toward technology was reduced (t(53)=-2.04, p<0.05, d=0.28). Additional Findings: Results of ANCOVA indicated that there was no statistically significant difference between the grouping conditions on the adjusted post-test means at the p<0.05 level for all variables, except for confidence. The effect size partial eta squared measures for the variables with non-significant differences were 0.04 or below, which are considered small. The adjusted mean confidence post-test score for the intervention group (M=2.87, SD=0.47, M_{adj}=2.84) was significantly different from the comparison group (M=2.58, SD=0.56, M_{adj}=2.61) (F(1,101)=9.99, p=0.002, η^2 p=0.09), and the effect size partial eta squared of 0.09 (90% CI: 0.02 to 0.19) indicated a small effect.	females were represented in the comparison group (χ^2 (1)=10.9, p<0.001).
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	collected between 2017 and 2019. Outcomes reported: • eHealth literacy • Technophobia • Usefulness of the internet • Importance of internet • Anxiety			
Ma et al. (2020). <u>Bridging the digital divide for older adults via observational training: Effects of model identity from a generational perspective. Sustainability</u>, 12(11), p.4555. China	Study Design: Quasi-experimental study Type of intervention: A video tutorial-based intervention. Participants were divided into three intervention groups that differed according to the model in the videos (a child model, young adult model, or older adult model). The groups received the exact same content, albeit delivered by a different model, which aimed to familiarise them with digital technology and allow them to perform essential tasks. Comparator: Between groups assessment to examine the effect of different observational models and pre-post intervention comparisons Study aim: To investigate the effectiveness of observational training through behaviour modelling in enhancing	Sample size: 59 participants (21 in the child model group, 19 in the young adult model group, and 19 in the older adult model) Participants: Community-dwelling Chinese older adults (60 and older) with little or no experience of using a tablet Setting: The Salvation Army Chuk Yuen Centre for Senior Citizens, in Hong Kong	Primary Findings: <i>Pre vs post findings:</i> For meta-cognitive outcomes (i.e., self-efficacy, outcome expectation, and social connectedness), when considering the whole sample, all scores significantly increased after the training. Comparing the scores of the three meta cognitive outcomes of the child model group, this study found that only self-efficacy significantly increased ($p < 0.001$) after training. Social connectedness and outcome expectation also improved, but not at a significant level ($p > 0.05$) In the young adult model group, again, only self-efficacy significantly increased after the training. Similar to the results in the child model group, social connectedness and outcome expectation improved slightly, but not at a significant level ($p > 0.05$). In the older adult model group, both self-efficacy and social connectedness significantly increased after training. Outcome expectation improved, but not at a significant level ($p > 0.05$). <i>Between groups findings:</i> Self-efficacy improvement after training was significantly different among the three groups ($F = 3.878$; $p < 0.05$). In addition, recommendation willingness after training was also significantly different	

	technology acceptance in older adults. Data collection methods and dates: Data were collected using a pre and post-intervention survey, and a technical quiz and post-training questionnaire. Data collection dates not stated. Outcomes reported: • Self-efficacy • Outcome expectation • social connectedness		across the three groups ($F=6.031$; $p<0.01$). No significant difference emerged with respect to the cognitive knowledge quiz scores of the participants across the three training groups ($F=0.029$; $p>0.05$). For self-efficacy improvement, the older adult model group contributed to the highest improvement, and no significant difference between the child model group and the young adult model group emerged. As for recommendation willingness, no significant difference was found between the child model group and the older adult model group; however, both groups were significantly better, when compared with the young adult model group ($p<0.05$).	
Martínez-Alcalá et al. (2018). <u>Digital inclusion in older adults: A comparison between face-to-face and blended digital literacy workshops</u>. <i>Frontiers in ICT</i>, 5, p.21. Mexico	Study Design: Quasi-experimental study Type of intervention: This study consisted of two groups both receiving an intervention. Workshops were delivered to groups of 15-25 older adults and lasted ~ 4 months. They were carried out in computer rooms equipped with All-One computers connected to Internet. Every older adult was provided with a printed manual with information on the modules and topics addressed during the workshops. A tutor led every workshop, and they determined the topics to be developed. <i>Face-to-face workshops:</i> Regarding learning methods, each student had a printed	Sample size: 98 participants (61 in face-to-face group and 37 in the blended workshop group) Participants: Older adults (60 years and older) Setting: Not stated, however, the interventions were carried out by The Academic Area of Gerontology at the Instituto de Ciencias de la salud (ICSa) of the Universidad Autónoma del Estado de Hidalgo.	Primary Findings: The workshops ameliorated the older adult digital competence in both groups ($z=-6.79$, $p<0.0001$; $z=-5.30$, $p<0.0001$, for the FFG and the BLG, respectively). Participants in the blended workshop group reported a significantly greater post-intervention improvement in Senior Digital Literacy Evaluation (SDLE) scores compared to the face-to-face group ($U(61, 37)=810.5$, $p<0.01$). Additional Findings: Perceived ease of use In the analysis of the first variable, ease of use, 13 of the older adults indicated a positive agreement stating that the interaction with the system is clear and understandable and even the menu is easy to use. Perceived usefulness In the variable of perceived usefulness, favourable results were obtained from older adults, where 16 stated that it is useful and indispensable to implement this type of	This study also measured participants experiences and perceptions of the blended workshop, however this data is non-comparative so not extracted.

	manual with the topics that would be studied in the workshop. For the instruction of digital skills, the tutor used digital presentations and a projector as support material. <i>Blended workshops:</i> Learners had guides, activities, multimedia learning materials (digital presentations, videos, web pages) and resources that allowed them to acquire the necessary knowledge. Some materials could be viewed within the platform and others were distributed through links or they could even be downloaded for local reproduction on the equipment. In this workshop both the teacher and the student worked together to build knowledge, generate learning and develop digital skills more easily. Comparator: Between-group comparisons were made as well as within group comparisons made pre- vs post-intervention Study aim: To show a blended workshop based on a Learning Management System (LMS) as a supporting tool for older adults' digital literacy. Data collection methods and dates: A modified "Senior Digital Literacy Evaluation (SDLE)"		workshops so that the population acquires digital literacy skills. Attitude toward using The evaluation of attitude toward using showed that 15 older adults were enthusiastic about using the platform Intended use In the intention to use variable, 15 older adults indicated a positive agreement stating that they will use the system to reinforce their knowledge during and after the workshop	
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	instrument was used to assess digital literacy of participant before and after the intervention. Dates of data collection: Workshops started in 2014. Outcomes reported: • Digital competence and digital literacy • Perceived ease of use • Perceived usefulness • Attitude toward using • Intended use			
Martínez-Alcalá et al. (2021). <u>The effects of Covid-19 on the digital literacy of the elderly: norms for digital inclusion.</u> <i>In Frontiers in Education</i> (V ol. 6, p. 245). Frontiers. Mexico	Study Design: Quasi-experimental/longitudinal study Type of intervention: This study contains three different intervention modalities that occurred as the COVID-19 pandemic caused the digital inclusion service to adapt. The intervention moved from blended learning (pre-pandemic), to transition treatment (start of the pandemic) and then a fully digital intervention (during the pandemic once the service had adapted). The service offered multiple courses for different skill levels of participants. These course pathways were Basic 1 to Basic 3 (B1 to B3) and Intermediate 1 to Intermediate 3 (I1 to I3). Courses ran for 3 to 4 months and participants could progress through the courses to develop their digital literacy skills.	Sample size: 20 participants were considered for longitudinal analyses and 251 for pooled analyses. Participants: Older adults (aged around 60) living mainly in the state of Hidalgo and its surroundings. Setting: • Blended learning: community setting • Transition treatment and Digital treatment: remote	Primary Findings: <i>Longitudinal analysis (n=20):</i> for the comparison among the scores of the three pre-treatments and the three post-treatments of each course for each group, the three scores of the pre-treatments and the three scores for the post-treatments, were statistically significant. Wilcoxon non-parametric tests were used as post-hoc tests and revealed differences for the G1 on the DILE scores over the pre-treatments in all cases: between the blended learning treatment and the next treatment before the pandemic was evident ($z=-2.36$, $p=0.01$); between the DILE scores of the blended pre-treatment and that of the digital modality ($z=-2.89$, $p=0.003$); and between the DILE scores for the transition to pandemic to the digital modality ($z=-2.90$, $p=0.003$). For the post-treatments in the above-mentioned modalities, $z=-2.75$, $p=0.005$; $z=-2.98$, $p=0.003$; $z=-2.89$, $p=0.003$, respectively. For the G2, in the pre-treatment condition and the above mentioned types of treatments, post-hoc tests between the DILE scores were, respectively: $z=-0.14$, $p=0.88$; $z=-2.61$, $p=0.009$; $z=-2.61$, $p=0.009$. For the post-treatments in the G2, DILE scores were, respectively for the blended to the transition to pandemic, $z=-1.70$, $p=0.08$; $z=-2.61$,	This intervention assesses the effects of the COVID-19 pandemic, specifically the transition of digital literacy services from face-to-face to fully digital, on digital literacy. A small number of participants ($n=20$) were included for longitudinal analysis Pooled analysis was conducted for the whole sample ($n=251$) however statistical comparisons were not performed This study includes participants who already possessed

	Comparator: Pre vs post intervention comparisons as well as comparisons between different treatments (e.g. blended learning vs transition treatment). Participants were divided into two groups (G1 and G2) based on their entry level digital literacy ability. G2 started the course at intermediate level and G1 at basic. Study aim: To analyse the level of Digital Literacy with the Digital Literacy Evaluation (DILE) of two groups of elderly adults with different levels of literacy during three stages: Blended learning, Transition and Digital. Data collection methods and dates: The “Digital Literacy Evaluation (DILE)” (formerly SDLE) tool was implemented pre- and post-intervention for participants when undertaking a course. The DILE is an instrument that was designed to measure the digital literacy level. Dates of the different treatments are as follows: • Blended learning: Aug to Dec 2019 • Transition treatment: Feb-Jun 2020 • Digital treatment: Aug-Dec 2020		$p=0.009$; $z=-2.61$, $p=0.009$. Therefore, only in the G2, both the pre-treatment and the post-treatments were not statistically significant between the blended and the transition to pandemic, however the learners requested to repeat a course rather than progress to the next level so this may explain the non-significant change. To further explore how the differences between groups were along treatments, differences between the post minus pre scores were calculated with a mixed ANOVA. Therefore, the two groups constituted the independent factor, and the repeated measure factor was the type of treatment (blended, transition to pandemic and digital). For the G1, the post minus pre differences within the semester for the blended treatment were 54.63 ± 14; for the transition to pandemic 43.90 ± 20; and for the digital treatment, 47.72 ± 17. For the G2, the post minus pre differences were: for the blended treatment 45.88 ± 7; for the transition to pandemic 49.11 ± 9; and for the digital treatment, 33.77 ± 5. Only the independent factor was significant ($F=4.69$, $df=1,58$; $p=0.04$). The repeated measures factor was not statistically significant ($F=1.85$, $df=2,58$; $p=0.17$) and there were not interaction effects ($F=1.97$, $df=2,36$; $p=0.15$). <i>Comparisons Within Different Treatments of the Same Digital Level:</i> Two extra comparisons using DILE scores were performed between modalities of treatments (blended or digital) within the same level (B1 or I1) in different groups and semesters. The first comparison comprising B1 was not significant (blended group from August to December, 2019 ($n=69$); pre: 128.37 ± 17; post: 184.59 ± 19; digital group from August to December, 2020 ($n=41$): pre: 132.39 ± 23; post: 194.19 ± 30; for the pre-pre comparison, $t=0.96$, $p=0.33$; for the post-post comparison, $t=1.79$, $p=0.07$). Instead, for the intermediate level, I1, the digital group was certainly more digitally literate than the	digital literacy skills as well as those with limited skills.
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	Outcomes reported: Digital literacy		blended one both for the pre and the post comparisons (digital group from August to December, 2020 (n=11); pre: 215.18 ± 12; post: 262.91 ± 18; blended group from August to December, 2019 (n=13): pre: 199.08 ± 13; post: 246.85 ± 14; for the pre-pre comparison, t=2.99, p=0.006; for the post-post comparison, t=2.36, p=0.02). Additional Findings: <i>Dropouts:</i> There was a great rate of dropouts before the pandemic occurred. For the first group, the percentage of the dropout—from the blended course (Aug Dec 2019) to the beginning of the transition to pandemic course (Feb June 2020) had been of 57.97% (G1: n=69 for the first semester and n=29 for the second semester). For the second group, the dropout was 23.52% (G2: n=17 for the first semester and n=13 for the second semester). The dropouts of the courses for the subjects that at least had assisted continuously during two semesters from the blended to the transition to pandemic- and then, withdrew from the digital course were obtained. The dropout between these periods were, for each group, 62.0 and 30.76%, respectively (G1: n=29 for the first semester, n=29 for the second semester and n=11 for the third semester; G2: n=13 for the first semester, n=13 for the second semester and n=9 for the third semester). When only the semester of the pandemic is considered, a great dropout occurred especially for B1: only five older adults could complete the entire course and filled the pre and post DILEs, and 19 older adults abandoned the course (they only filled the DILE on the pre-treatment), therefore, the dropout reached 79.16%.	
McCosker et al. (2021). Accounting for diversity in older adults' digital inclusion and literacy: the	Study Design: Quasi experimental (mixed methods) Intervention: A national digital inclusion programme (Be Connected) with the stated aim of improving the confidence, skills and online safety of people aged	Sample size: 337 Participants: Older adults age 50 to 94 years Setting: Online and face-to-face, community based	Primary findings: <i>Changes to operational and strategic skills:</i> participants significantly improved ten operational and strategic skills post-intervention. This included positive changes to their ability to: install apps, keep track of mobile app costs, using shortcuts, saving photos and more. No significant change was found for ten skills including sharing information online, and keyword searching on websites.	Data from related paper from same author (McCosker et al (2020). <u>Improving the digital inclusion of older Australians: the social impact of Be Connected.</u>

impact of a national intervention. Ageing & Society, pp.1-21. Australia	50 years and over. There are two core components to the programme's design: online learning modules presented through a government Web portal, and face-to-face support provided by a network of community-based organisations. Comparator: Pre vs post intervention comparisons Data collection methods and dates: Data were collected between Aug 2018 (1st wave) and May 2019. (2nd wave). This study used a mixed methods approach that involved a pre- and post-survey with semi structured interviews (N=58) with learners (N=38) and digital mentors (N=20) conducted in person or by phone to accommodate geographical diversity. The survey instrument was designed to combine measures of participants' online confidence, attitudes, digital skills and digital activities in a way that would provide holistic indicators of digital participation, and pinpoint key aspects of situated digital literacies. Outcomes reported: Surveys included outcomes related to: • Changes to operational and strategic skills • Changes to digital confidence		<i>Changes to digital confidence:</i> participants significantly improved their digital confidence in 5/12 areas including, using email, being safe online, using search engines and using a smartphone or tablet. No significant improvement was found for 7/12 areas such as, using a computer, buying and selling things online, using social media, online banking, video calling and streaming music or TV. <i>Changes to digital participation:</i> One out of 21 outcomes showed a significant post-intervention for digital participation changes. Watching online videos/TV programs increased, however no other significant improvements were evidenced.	Swinburne University) has been utilised for this review. See appendix B for full results table
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	Changes to digital participation			
Moore and Hancock (2022). A digital media literacy intervention for older adults improves resilience to fake news. <i>Scientific reports</i>, 12(1), p.6008. USA	Study Design: Controlled before and after study Intervention: The MediaWise for Seniors intervention - a self-directed online course which taught digital media literacy skills and techniques helpful for verifying the credibility of information online, such as lateral reading and reverse image searching Comparator: No intervention Study aim: To examine the effect of a digital literacy intervention in improving older adults' resilience to fake news Data collection method and dates: Data were collected via the use of pre- and post-course surveys. No dates were provided, however intervention group participants were recruited from September 24 to December 2, 2020, while control group participants were recruited from October 1 to November 6, 2020 Outcomes reported: - Deception detection - Comprehension and use of digital media literacy techniques	Sample size: 381 participants (143 in intervention and 238 in the control group) Participants: Intervention group: older adults (mean age 67.2 years, 67.4% female, 86.8% White) completed the MediaWise for Seniors course (intervention) and both the pre- and post-course surveys. Control group: older adults (Mean age = 63.8 years, 60.5% female, 89.5% white) recruited from online survey purveyor Lucid also completed both the pre- and post surveys, without taking MediaWise's course or being exposed to any other control stimuli Setting: Online	Primary Findings: There was a significant improvement in the ability to accurately judge the veracity of news headlines among the intervention group from pre-intervention to post-intervention compared to the control group ($p < 0.001$). Older adults in the treatment condition ($N=143$) significantly improved their likelihood of accurately discerning fake from true news from 64% (95% CI: 61 to 67%) pre-intervention to 85% (95% CI: 82 to 88%) post-intervention. In contrast, older adults in the control condition ($N=238$) did not significantly improve - from 55% (95% CI: 53 to 58%) pre-intervention to 57% (95% CI: 55 to 60%). Older adults in the treatment condition showed significantly greater understanding and use of skills and techniques important for identifying misinformation online after the course compared to before. There was a positive and significant interaction between the Intervention Group and Post-intervention variables ($B=4.436$, $SE=0.505$, $p < 0.001$), indicating that the increase in the likelihood of reporting doing research to inform a headline veracity judgment among the intervention group from pre-intervention to post-intervention was significantly greater than change in the likelihood of doing research among the control group. The intervention group rose from a pre-intervention probability of doing research to inform their headline judgments of 4% (95% CI: 1 to 6%) to a post-intervention probability of 71% (95% CI: 64 to 78%). This pattern was not observed in the control group (their pre-intervention researching probability=3% (95% CI: 1 to 4%), post-intervention probability=2% (95% CI: 1 to 3%).	The focus of this study was on improving the ability of older adults to detect misinformation online. However, this was done by the use of a digital media literacy intervention.

Ngiam et al. (2022). <u>Building Digital Literacy in Older Adults of Low Socioeconomic Status in Singapore (Project Wire Up): Nonrandomized Controlled Trial</u>. <i>Journal of Medical Internet Research</i>, 24(12), p.e40341. Singapore	Study Design: Non-randomised controlled study Intervention: Project Wire Up, a volunteer-led, one-on-one, and home-based digital literacy programme. Comparator: Older adults awaiting participation in the programme (i.e., no intervention) Study aim: To examine the impact of a volunteer-led, one-on-one, and home-based digital literacy programme on digital literacy and health-related outcomes such as self-reported loneliness, social connectedness, quality of life, and well-being for older adults of low socio-economic status (SES). Data collection method and dates: Data were collected from participants either in person or via telephone through standardised self-reported questionnaires in participants' preferred language. Participants recruited from July 2020 to November 2020 were assigned to the intervention arm, whereas participants recruited from November 2020 to July 2021 were assigned to the control arm. Data collection was completed in November 2021. Outcomes reported:	Sample size: 138 participants Participants: Digitally excluded community-dwelling older adults (55 and older) of lower SES residing in Singapore Setting: Home-based	Primary Findings: The intervention group observed a statistically significant difference in the change in their mean digital literacy score before and after programme, as compared to those in the control group (mean difference: 2.28, 95% CI: 1.37 to 3.20; $P < 0.001$). Through multiple linear regression analyses, this change in digital literacy scores remained independently associated with group membership after adjusting for baseline digital literacy scores and differences in age, gender, education, living arrangement, housing type and baseline social connectivity and loneliness status (Model 2, $\beta = 1.91$, 95% CI: 0.93 to 2.89; $p < 0.001$ and Model 3, $\beta = 1.90$, 95% CI: 0.91 to 2.90, $p < 0.001$). The domain-level analyses showed that the greatest gain was in the Instrumental domain (obtaining news and information and accessing health, government, and banking services), where the participants in the intervention arm learned, on average, approximately 1 more new function than the control arm, followed by the Reassurance, Social, and Pastime domains. The before and after program difference in all domains except for the Pastime domain remained statistically significant after controlling for covariates.	Participants were assigned to either the intervention or control arm using convenience sampling based on the referral timing to the programme. In this study, digital literacy was defined as the knowledge of the functional use of smartphones
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	Primary outcome - Digital literacy score (To measure digital literacy, a 13-item self-reported digital literacy scale was constructed based on 4 domains of smartphone usage) Secondary outcomes - Lubben Social Network Scale-6 (LSNS-6) - University of California, Los Angeles 3-item loneliness scale (UCLA-3) - EQ-5D - Personal Wellbeing Score (PWS)			
Patty et al. (2018). <u>A cost-effectiveness study of ICT training among the visually impaired in the Netherlands</u>. <i>BMC ophthalmology</i>, 18(1), pp.1-10. The Netherlands	Study Design: Before and after study Intervention: Information and communication technology (ICT) training (this included computer training and training sessions on the use of iPhones, iPads and digital assistant devices) Comparator: No intervention (pre-post) Study aim: To assess the cost-effectiveness of ICT training among visually impaired adults from a societal perspective, using primary data from two large rehabilitative eye care providers in the Netherlands.	Sample size: 45 participants Participants: Visually impaired clients of two large rehabilitative eye care providers in the Netherlands who were enrolled in ICT training between July 2014 and January 2015 (mean age 63). Setting: Two large rehabilitative eye care providers in the Netherlands.	Primary Findings: Of the 45 participants who completed the questionnaire pre - training and post - training, 58% (26) were women. The mean age was 63 years (range 27–90 years). Impact of the ICT training The effect of ICT training on ICT skills and participants' well-being was positive and persisted three months after the last training session. The health-related quality of life measured with the EQ-5D improved slightly after the ICT training, from 0.70 to 0.73. Furthermore, an increase in well-being (ICECAP-O) was observed immediately after the training, with a mean score of 0.81 compared to 0.77 before the training. The mean D-AI score (ICT skills) decreased from the initial outcome by 9.9 points, to 13.1, indicating a positive effect on ICT skills. The most noteworthy changes were observed in the areas of computer skills, the Internet and use of hotkeys.	This study was targeted at visually impaired individuals, however, during the course of the study, it was noted that the majority of participants were elderly (60 and older). Adjustments were then made to the outcome measures and instruments so that these were specifically aimed at measuring outcomes in the elderly. The study authors stated that as the ICT training was a part of

	Data collection method and dates: Data were collected using pre – and post – training questionnaires. No dates were provided, however, the ICT training was conducted between July 2014 and January 2015 Outcomes reported: • Health-related quality of life and well-being (measured using the EQ-5D and the ICECAP-O) • Healthcare consumption and productivity losses - measured using the Medical Consumption Questionnaire (iMCQ) and the Productivity Cost Questionnaire (iPCQ) respectively. • Care-related Quality of Life and rehabilitation needs of visually-impaired persons – measured using the CarerQol and an adapted version of the Dutch Activity Inventory (D-AI) respectively. • Cost-effectiveness		Cost-effectiveness ICT training appears to be cost-effective under the assumption that the effects of ICT training on well-being remain constant for five or 10 years. Assuming these effects remain constant for 10 years, this would result in an incremental cost-effectiveness ratio (ICER) of € 11,000 per quality-adjusted life-year (QALY) and € 8000 per year of well-being gained, when only the costs of ICT training are considered. When the total costs of medical consumption are included, the ICER increases to € 17,000 per QALY gained and € 12,000 per year of well-being gained. Furthermore, when the willingness-to-pay threshold is € 20,000 per year of well-being, the probability that ICT training will be cost-effective is 75% (91% when including only the costs of ICT training).	standard rehabilitative care, the use of a control group without such training was considered impossible and unethical.
Quialheiro et al. (2023). <u>Promoting Digital Proficiency and Health Literacy in</u>	Study Design: Non-randomised Quasi-experimental study design Intervention: The OITO (Oficinas de Inclusão Tecnológica Online, “Workshops for Online Technological Inclusion”) project.	Sample size: 87 Participants: People aged 55 and older that owned mobile devices with an internet connection in 3 cities in northern Portugal	Primary Findings: At baseline, participants had low baseline scores in digital literacy, but medium-high baseline scores in health literacy. Analysis over time indicated a significant improvement in digital literacy, both immediately after the conclusion of the workshops (T2) and 1 month afterward (T3) compared to baseline (T1), but without significant	A convenience sample of participants was recruited for this study

<u>Middle-aged and Older Adults Through Mobile Devices With the Workshops for Online Technological Inclusion (OITO) Project: Experimental Study. <i>JMIR Formative Research</i>, 7, p.e41873.</u> Portugal	Comparator: No intervention (pre-post) Study aim: To develop, conduct, and measure the impact, on digital and health literacy, of an in-person 8-workshop guided digital inclusion project aimed at community dwellers aged 55 years or older in 3 northern Portuguese cities. Data collection method and dates: Data were collected using questionnaires at baseline (T1), immediately after completing the intervention (T2), and at 1 month after the intervention (T3). The intervention took place between May 2021 and January 2022. Outcomes reported: Primary outcome - Digital literacy – measured using the 16-question Mobile Device Proficiency Questionnaire (MDPQ-16) Secondary outcome - Health literacy – measured by the 12-question Health Literacy Scale (HLS-12) Self-reported autonomy	Setting: Not specified but data were collected at workshops locations varied based on specific project partners.	differences in digital or health literacy scores between the post-workshop times (T2 and T3), regardless of sex, age, or schooling. A significant improvement in self-reported autonomy was observed at T3 compared with baseline, increasing from 4.5 to 6.7 points, with a score range from 0 to 10 ($t_{40} = -7.3$; $P < 0.001$). In longitudinal analysis of digital literacy over time, adjusted by sex, age, and education level, both women and men showed positive growth in both types of literacy. All age categories showed improved post-intervention scores, and the overall change in the performance of the participants was similar for all education levels. There was an average increase of 2.49 points in the digital literacy score in the raw analysis and an average increase of 2.46 points in the analysis adjusted for sex, age, and education level. None of these variables revealed a significant interaction with time, meaning that the different subgroups varied similarly across the 3 time points.	
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Seaton et al. (2023). <u>Gluu Essentials Digital Skills Training for Middle-Aged and Older Adults That Makes Skills Stick: Results of a Pre-Post Intervention Study</u>. <i>JMIR aging</i>, 6(1), p.e50345. Canada	Study Design: Before and after study (Pre-post cross-sectional survey design) Intervention: The Gluu Essentials digital skills training program. A digital skills training programme developed by Gluu Society and delivered in partnership with local community organisations and volunteer coaches. Comparator: No intervention (pre-post) Study aim: To examine the effectiveness and programme acceptability of a digital skills training programme among middle-aged and older adults (aged ≥50 years) and to gather participants' recommendations for lifelong digital skills promotion. Data collection method and dates: Data were collected using pre – and post – test questionnaires. No dates provided, however surveys were completed in 2021 and 2022. Outcomes reported: Self-report measures of mobile device proficiency and confidence - Mobile Device Proficiency Questionnaire (MDPQ), and the frequency of	Sample size: 264 participants (145 completed the follow up survey) Participants: Middle-aged and older adults (50 and older) in rural and urban communities in Canada Setting: Sessions were mainly provided from a distance (self-directed with telephone support) however some organisations delivered in-person support in small groups	Primary Findings: Mobile device proficiency improved significantly from baseline to follow-up: MDPQ total score =3.93 (SD=0.91) – 4.13 (SD=0.79); $p<0.001$. Confidence in going online ($p=0.66$) and in avoiding frauds and scams ($p=0.54$) did not change significantly from baseline to follow-up. The comparison of the groups showed the frequency of going online for shopping ($p=0.01$) and accessing government services ($p=0.02$) increased, whereas the frequency of going online for email ($p=0.47$), banking ($p=0.10$), information ($p=0.96$), and emergency services ($p=0.42$) did not change significantly. The frequency of going online for COVID-19–related information significantly decreased ($p=0.01$). Additional Findings: Programme engagement varied considerably, but programme acceptability was high. Participants' recommendations included the need for providing ongoing programmes for support and training because technology constantly changes, reducing costs for technology and internet access, and keeping learning resources simple and easy to access.	Although this study included participants aged 50 years and older, the mean age of the participants was 72.93 years.
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	engaging in online activities were collected at both baseline and follow-up. Programme engagement, acceptability, and suggestions were completed at follow-up only.			
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Abbreviations:

6.3 Quality appraisal

Table 6. Quality appraisal results for quasi-experimental studies

Study	JBI Appraisal Items – Quasi-experimental studies									Overall quality
	Q1.	Q2.	Q3.	Q4.	Q5.	Q6.	Q7.	Q8.	Q9.	
Castilla et al. (2018)	Y	Y	Y	N	N	N/A	Y	U	Y	Low
Choi and Park (2022)	Y	U	Y	Y	N	Y	Y	U	Y	Low
Elbaz et al. (2023)	Y	Y	Y	N	N	N/A	Y	U	Y	Low
Gadbois et al. (2022)	Y	Y	Y	N	N	N/A	Y	U	Y	Low
Garcia et al. (2022)	Y	U	Y	Y	N	N	Y	U	Y	Low
Holguin-Alvarez et al. (2020)	Y	Y	Y	Y	N	N	Y	U	U	Low
Lee and Kim (2019)	Y	Y	Y	N	N	N/A	Y	Y	Y	Low
Lee et al. (2022a)	Y	N	Y	Y	N	N	Y	U	Y	Low
Lee et al. (2022b)	Y	N	Y	Y	N	N	Y	Y	Y	Low
Ma et al. (2020)	Y	Y	Y	N	N	N/A	Y	Y	Y	Low
Martínez-Alcalá et al. (2018)	Y	Y	Y	Y	N	N	Y	U	Y	Low
Martínez-Alcalá et al. (2021)	Y	U	Y	N	Y	N	Y	U	Y	Low
McCosker et al. (2020)	Y	Y	Y	N	N	N/A	Y	U	Y	Low
Moore & Hancock (2022)	Y	U	Y	Y	N	Y	Y	U	Y	Low
Ngiam et al. (2022)	Y	Y	Y	Y	N	Y	Y	U	Y	Low
Patty et al. (2018)	Y	Y	Y	N	Y	N/A	Y	U	Y	Low
Quialheiro et al. (2023)	Y	Y	Y	N	Y	N/A	Y	Y	Y	Low
Seaton et al. (2023)	Y	Y	Y	N	N	N/A	Y	Y	Y	Low

Key: Y=Yes, N=No, U=unclear, N/A=not applicable

1. Is it clear what is the cause and what is the effect?
2. Were the participants included in any comparisons similar?
3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?
4. Was there a control group?
5. Were there multiple measurements of the outcome both pre and post the intervention/ exposure?
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?
7. Were the outcomes of participants included in any comparisons measured in the same way?
8. Were outcomes measured in a reliable way?
9. Was appropriate statistical analysis used?

Table 7. Quality appraisal results for randomised controlled trials

Study	JBI Appraisal Items – Randomised Controlled Trial													Overall quality
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	
Arthanat (2021)	Y	U	Y	U	U	U	Y	N	Y	Y	U	Y	Y	Moderate
Czaja et al. (2018)	U	U	Y	U	U	Y	Y	N	Y	Y	U	Y	Y	Moderate
Fields et al. (2021)	U	U	Y	U	U	U	Y	Y	U	Y	U	Y	Y	Moderate

Key: Y=Yes, N=No, U=unclear, N/A=not applicable

- Q1. Was true randomisation used for assignment of participants to treatment groups?
- Q2. Was allocation to treatment groups concealed?
- Q3. Were treatment groups similar at the baseline?
- Q4. Were participants blind to treatment assignment?
- Q5. Were those delivering treatment blind to treatment assignment?
- Q6. Were outcomes assessors blind to treatment assignment?
- Q7. Were treatment groups treated identically other than the intervention of interest?
- Q8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?
- Q9. Were participants analysed in the groups to which they were randomised?
- Q10. Were outcomes measured in the same way for treatment groups?
- Q11. Were outcomes measured in a reliable way?
- Q12. Was appropriate statistical analysis used?

Q13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomisation, parallel groups) accounted for in the conduct and analysis of the trial?

6.4 Information available on request

The following are available on request: protocol; search strategies.

7. ADDITIONAL INFORMATION

7.1 Conflicts of interest

The review team declare no conflicts of interest.

7.2 Acknowledgements

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8. APPENDIX

APPENDIX 1: Search strategy used for Social Policy and Practice

1 ("Digital exclusion" or "Digital inclusion" or "Digital divide*" or "Digital division*" or "Digital disparit*" or "Digital gap*" or "Digital inequalit*" or "digital training" or "Technostress" or "Digital literacy" or "Digital skills" or "Computer literacy" or "ICT literacy" or "computer skills" or "ICT skills" or "information and communicat* technolog*").ti,ab. 1696

2 (elder* or old* or ageing or aging or senior or seniors or carer* or geriatric* or Centarian* or centenarian* or eldest or frail* or geriatri* or nonagenarian* or octagenarian* or octogenarian* or "old age*" or "older adult*" or "older age*" or "older patient*" or "older people" or "older person*" or "older population" or "older subject*" or oldest or senium or septuagenarian* or supercentenarian* or "older female*" or "older male*" or "older man" or "older men" or "older woman" or "older women").ti,ab. 95831

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