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Strategies for enhancing success in digital tablet use by older adults: A pilot study

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B. Fletcher-Watson, C.J. Crompton, M. Hutchison, H. Lu. Strategies for enhancing success in digital tablet use by older adults. Gerontechnology 2016;15(3):....-....; doi:..... **Purpose** Building on recent digital literacy initiatives, three strategies were identified for exploration, relating to successful use of digital tablets by older adults who lacked previous experience. The questions under investigation were: What are the implications of one-to-one support for self-efficacy and promoting attendance at digital literacy sessions? Could free tablets assist in overcoming economic and social barriers to participation? By what means could age-related physical problems with digital technology be combated? **Method** Between June and July 2016, eight older adults (five men and three women aged 70 to 87) attended a six-week course in digital literacy, supported by four volunteer tutors. Tablets were loaned to participants who did not own a device. A variety of accessories, such as styluses and hard cases, were discussed and shared. **Results and discussion** Weekly attendance was almost 100%, with no participants withdrawing from the course, and only occasional absences due to other commitments. The group displayed a wide spectrum of ability, from complete beginners to regular computer users, although all participants initially rated themselves as unconfident in relation to tablets. By the end of the course, self-efficacy had increased from 44% to 71%. Accessories proved popular with a number of participants, particularly for those with fine motor control issues. **Conclusion** Teams of tutors may promote attendance in comparison to lone-tutor-led classes or peer learning scenarios, and have the potential to impact positively on perceptions of self-efficacy. For older adults, particularly those from areas of multiple deprivations, access to free or borrowed devices may be key to participation, although a lack of access to home broadband can reduce ability to practice new skills between sessions. Modern capacitive screens offer reduced haptic feedback by comparison with the resistive screens on older mobile devices, leading some older adults to require further accessories in order to engage successfully with tablet computers.

Keywords: digital education, mobile technology, tablet computers, metaliteracy

Digital literacy has traditionally centred on the acquisition of skills relating to desktop and laptop computer use, but the growth of mobile tablet computing since 2010 offers new possibilities for engaging ‘never’ users, such as older adults¹. In particular, internet-enabled touchscreens such as the iPad, Hudl, Kindle Fire, Samsung Galaxy and Microsoft Surface offer intuitive interfaces with greater ease of use², as well as being lightweight and portable. Like smartphones, tablets can be considered ‘gateway devices’³ which provide information literacy skills perhaps transferrable to other digital devices in the future. In keeping with the well-known phrase, ‘use it or lose it’, digital literacy initiatives for older people are often rooted in the belief that “*learning new things and keeping the mind engaged may be an important key to successful cognitive aging*”^{4p110}.

Research suggests that people aged over 60, particularly those from areas of multiple deprivations, may benefit from training in basic digital literacy, as they are less likely than younger cohorts to have used computers in their working lives⁵. In a culture where information and services are increasingly delivered digitally, there is a risk of digital exclusion, also known as the ‘grey digital divide’, which could further isolate older people over time⁶⁻⁸. Equally, if the risks of accessing the Internet are not understood, online activity can negatively impact upon users⁹.

Three strategies were identified for exploration, relating to successful use of tablets by older adults who lack previous experience. The questions under investigation were: what are the implications of one-to-one support, as opposed to tutor-led sessions, for enhancing self-efficacy and promoting attendance at digital literacy sessions? Could free tablets assist in overcoming economic and social barriers to participation? By what means could age-related physical problems with digital technology, such as reduced fine-motor skills, be combated?

Study design

In June and July 2016, an inter-generational intervention was delivered for eight older adults in central Edinburgh, aiming to improve digital literacy. Weekly two-hour sessions at a community centre were delivered by four volunteer tutors (aged 27 to 51, three women and one man), working one-to-one with eight participants aged between 70 and 87 (M=77, SD=6.0, five men and three women). The project delivery phase ran for six weeks from 16 June.

There are 98,838 older people (aged 60 or over) within Edinburgh, representing 19.8% of the population¹⁰. Four areas in the city-centre were highlighted as likely sites for project delivery. These areas all scored in the top four deciles of the Scottish Index of Multiple Deprivation (SIMD)¹¹, and were therefore considered more likely than other areas to contain 'never' users whose personal circumstances may have prevented them from accessing high-cost devices such as tablets. The areas were Canongate (3rd decile on 2014 SIMD), Dumbiedykes (2nd decile), Pleasance (3rd/4th decile), and Prestonfield (3rd/4th decile).

Participants were identified as those most in need of digital literacy training, based on a combination of age, economic circumstances and existing knowledge of computing. In particular, the project sought to recruit people who had not worked with computers in their working lives, and who did not currently have access to a tablet computer, being highly likely to reject or lack interest in the digital world, leaving them open to exclusion¹². At the start of the project, four participants owned tablets, and four did not. Participants were recruited in person at two coffee mornings and an Open Day at a community centre.

A recent digital literacy project for older people suffered from high dropout rates (63%)¹³, so in an effort to increase retention, it was decided to loan tablet computers to the four participants who did not own a device for the period of the training. This was intended both to support their learning between sessions, allowing them to practise newly acquired skills, and to give them a sense of investment in their learning. There were complex implications of instituting this scheme, most notably the impact upon participant numbers, as the devices had to be restricted to one user each. There was also a risk of loss or theft when not held in a secure location, and a need for participants to have access to broadband services at home in order to enjoy an optimal experience.

This model has resonances with the Ibirapitá Program in Uruguay, which centres on "*retired people with the lowest income, who are being provided with tablets, with Internet connection [in their homes] and training courses*"^{14p66}. Low-cost generic Android tablets have now been gifted to more than 50,000 older people throughout Uruguay. A 12-hour course is offered to new users. Ibirapitá emerged from a larger digital literacy project aimed at school pupils, known as Plan Ceibal. Taken together, these programmes provide learners at both ends of the life course with free ICT equipment, affordable Wi-Fi connectivity and free training. In societies where services are increasingly delivered online, which would include the UK as well as Uruguay, it has been argued that "*a strong and continuous investment in digital inclusion policies is the only measure to avoid the regressive externalities of e-government policies*"^{15p73}.

Digital literacy

Digital literacy has been defined as *“the acquisition of the technical competence for using information and communication technologies, understood in a broad sense, in addition to the acquisition of the basic practical and intellectual capacities for individuals to completely develop themselves in the Information Society”*^{8p4}. In addition, such projects often aim to develop skills in metaliteracy, helping participants to use computers and touchscreens when they encounter them in their daily lives, such as at general practitioner surgeries and supermarket check-outs, sat-nav [satellite navigation] devices in cars, or signing for deliveries to their home. Metaliteracy is defined within this context as *“an ordering of discrete skills to create a comprehensive framework that supports collaborative knowledge acquisition”*^{16p6}. The principles of metaliteracy¹³ of particular interest in this project were:

- Finger gestures – understanding the differing effects of pinching, swiping, tapping and so on, and the sensitivity of touchscreens;
- Distributing attention appropriately (e.g. being aware of auto-fill suggestions appearing above the keyboard, rather than typing out full URLs or Google searches every time); and
- Attaining identical goals via multiple different means (e.g. deleting by swiping, tapping the trash symbol or dragging items to trash).

The acquisition of new skills should be viewed as an educational process. Educational initiatives for older people *“should help to convey knowledge and skills that have lapsed in the elderly person's life; make active use of the elderly person's free time; encourage the acquisition of new roles for a new age that are different from those of the preceding life phases; encourage participation in the social life of the community”*^{17p249}. The project therefore observed principles of geragogy – *“the process involved in stimulating and helping elderly persons to learn”*^{18p13} – but also took account of the concept that *“one should not expect from geragogy some comprehensive educational theory for older adult learners, but only an awareness of and sensitivity towards gerontological issues”*^{19p105}. Geragogy provided a useful framework both for constructing a curriculum (user-led; adaptive; accessible) and for helping individual participants to achieve their maximum potential over the six weeks.

Key elements of geragogy in relation to digital literacy include:

- Nurturing awareness in the volunteer team that *“older persons experience situational circumstances that are different to those inhabited by younger peers”*^{19p105};
- Attending to the complexities of reduced sensory perception⁸, limited motor capabilities²⁰, loneliness and social isolation¹ and changes in cognitive processes, especially working memory¹³, as they relate to successful computer use, as well as an understanding that continuous conscious attention can be stressful²¹;
- Considering the heterogeneity within the cohort in terms of age, gender, life experience, etc.⁶⁶;
- Focusing on participant-led learning rather than an externally imposed curriculum or training schema¹⁸;
- Providing multiple explanations of a task (visual, oral, written), such as projecting the tablet onto a screen, demonstrating the task, and aiding memory with printed hand-outs¹³; a step-by-step format is usually favoured²²;
- Striking a balance between social and instructional activities¹³ while following the pace of the participant at all times¹⁸;
- Ensuring that skills are immediately transferrable and applicable in everyday life, and providing clear, intelligible, logical, rational instructions that avoid jargon^{18,22}; and
- Keeping participants stimulated with patience and encouragement²³.

Gerontechnology is now closely linked to digital inclusion and digital literacy, with increasing potential to reduce isolation, improve and maintain well-being in older adults²⁴.

Methods

Participants were assessed in week 1 with a Likert-type self-efficacy scale consisting of 19 items, derived from the Go ON UK Basic Digital Skills Framework²⁵. The framework was adopted in order to allow comparison with an ongoing UK-wide programme of digital literacy training based on the Go ON UK model, rather than using existing validated self-efficacy scales. This framework categorises 19 'actions for individuals' under five subject headings: Managing information; Communicating; Transacting; Problem-solving; and Creating. These can be considered comparable to Student Learning Outcomes (SLOs), which describe "... *what students should know and be able to do as part of their course work and educational experiences... [using] active verbs that capture the desired student learning or development*"^{26p9}.

It must be recognised when working with older adults that SLOs should be balanced against community education and geragogic principles of autonomous student-led learning. Nonetheless, the Digital Skills Framework provided a useful foundation for curriculum development, covering the core skills required to engage with the digital world, such as using search engines, using email and creating social media posts. As such, weekly sessions were tailored to fulfil the five overall subject headings: following an introduction to touchscreen technology in week 1, week 2 explored 'Managing information and Transacting'; week 3 covered 'Communicating'; Week 4 covered 'Creating' and Week 5 included 'Problem-solving'. Previous research has shown that older adults tend to prioritise communication and entertainment over transacting and banking²⁷, so the amount of time spent explaining online shopping was reduced accordingly.

Progress was monitored via informal discussion at the start and end of each session; this produced qualitative data in the form of brief statements and anecdotes captured by the project leader and volunteers. Photographs and short film clips were also used to capture moments of interaction and activity.

The Likert-type self-efficacy scale was revisited at the end of the course, to assess perceived changes in confidence over time. Two categories, managing a bank account online and managing a Universal Credit account, were not covered during the course, and excluded from final analysis. Quantitative data from the remaining 17 categories were then analysed using Microsoft Excel. For Bayesian analysis, data were analysed using JASP.

Results

Participants' mean self-efficacy rating as measured on a 1-4 scale across the 17 categories increased from 1.74 to 2.85 after six weeks. This can usefully be compared to a 2007 study showing an increase in computer self-efficacy from 0.6/5 to 3.3/5 after a single two-hour session, "*suggesting that participants felt empowered by the training to be able to do some basic things on the computer*"^{28p490}.

Table 1 shows descriptive statistics pre- and post-intervention for the subcomponent measures of the 17 self-efficacy categories that participants completed. These were presented as 4-point Likert-type scales. Not all participants self-reported for all categories, and overall means for each of the component measures were calculated using the sum of the data provided, divided by the number of categories completed within that component by each participant. One member of the group completed the course but chose not to complete the scale, hence the presentation of data for only seven participants.

Table 1: Mean and standard deviation for (sub)component measures of the Basic Digital Skills Go ON UK Framework²⁵ before and after intervention

(Sub)component	Intervention, mean±SD		n	
	Pre	Post	Pre	Post
MANAGING INFORMATION				
Search Engines	2.57±1.13	3.43±0.79	7	7
Comparison Websites	2.14±1.07	2.86±1.21	7	7
Bookmarking	1.14±0.38	3.00±1.00	7	7
Storing data	1.14±0.38	2.67±1.37	7	6
Overall Mean component	1.75±0.72	2.99±0.32	-	-
COMMUNICATING				
Email	3.00±1.41	3.29±1.25	7	7
Posting on Forums	1.14±0.38	2.00±1.41	7	5
Communicating with organisations	1.86±0.69	2.67±1.51	7	6
Online feedback	1.67±1.21	2.71±1.25	6	7
Social Media	1.57±0.98	2.33±1.37	7	6
Overall Mean component	1.85±0.69	2.60±0.48	-	-
TRANSACTIONING				
Online marketplaces	1.14±0.38	2.71±1.38	7	7
Shopping online	1.67±1.21	2.43±1.51	6	7
Booking travel	1.86±1.21	2.29±1.60	7	7
Overall Mean component	1.56±0.37	2.48±0.21	-	-
PROBLEM SOLVING				
Online Tutorials	2.00±1.15	3.14±1.07	7	7
Using feedback from others	1.71±0.95	2.17±1.25	7	7
Support Services	1.29±0.76	3.00±1.00	7	7
Overall Mean component	1.67±0.36	2.95±0.22	-	-
CREATING				
Text document	1.71±1.25	3.00±1.29	7	7
Photo album	1.43±1.13	3.00±1.29	7	7
Overall Mean component	1.57±0.20	3.00±0.00	-	-
Overall Mean total	1.68±0.12	2.80±0.25	-	-

When examined separately, as can be seen in Figure 1 below, several themes are apparent. Five participants had prior experience of search engines and email, producing high self-efficacy ratings from the outset. The final ratings in these areas, while the highest overall, may signify a transfer of pre-existing confidence from desktop use to tablet use, rather than engagement with a new skill. By contrast, areas such as bookmarking, data storage and accessing support services showed considerable increases, suggesting that new knowledge was gained that may be transferable back to desktop computer use. The areas resulting in the lowest self-efficacy ratings after completion of the course, such as posting on forums, booking travel and using social media, can perhaps be categorised as 'risky' behaviours from the point of view of participants, involving potential risk to personal and financial data.

[Figure 1]

Examining the data by participant produces a secondary trend that age correlates closely with perceived self-efficacy. As can be seen in Figure 2 below, the four participants born before 1941 showed notably lower final ratings than their younger peers. This may be due to their probable retirement from the workforce by the 1990s or early 2000s, before computer use was standard in workplaces. By contrast, more recent retirees were relatively comfortable with both digital skills such as email and functional interfaces such as keyboards. As time passes, increasing numbers of retirees will possess skills in computer use that may make their transition to tablets more straightforward. However, it is likely that a significant proportion of older adults will still lack these skills, requiring continuing support to access digital services post-retirement.

[Figure 2]

Data were then analysed using Bayesian paired samples t-tests in JASP²⁹ (Table 2). Bayesian analyses allow comparison of pre- and post-intervention scores in small datasets, by using the data to analyse the strength of evidence supporting either the experimental or null hypothesis. Bayes Factors (BF_{10}) of above 3 are considered 'moderate evidence', above 10 are considered 'strong' evidence, and above 30 'very strong evidence' in support of the experimental hypothesis compared with the null³⁰. The hypothesis tested was that self-efficacy ratings at post-intervention would be higher than self-efficacy ratings at pre-intervention. As there are no comparable previous studies to guide the size of prior to use in these analyses, a default Cauchy prior width of 0.707 was used in all these analyses, and sequential analysis robustness checks carried out to ensure that the default prior size was providing accurate results.

Table 2: Paired samples Bayesian t-test (prior width=0.707) of pre-intervention and post-intervention self-efficacy ratings; BF_{10} =Bayes Factor

Parameters	Intervention, mean \pm SD		BF_{10}	Error, %	Evidence strength
	Pre	Post			
Managing Information	1.75 \pm 0.54	3.04 \pm 0.89	195.4	$\sim 2.39e-6$	Very Strong
Communicating	2.00 \pm 0.72	2.90 \pm 1.33	7.72	$\sim 5.49 e-6$	Moderate
Transacting	1.71 \pm 0.91	2.48 \pm 1.44	9.59	$\sim 1.91e-5$	Moderate
Problem Solving	1.67 \pm 0.84	2.95 \pm 1.03	7.46	$\sim 4.87e-6$	Moderate
Creating	1.57 \pm 0.59	2.85 \pm 1.19	16.71	$\sim 5.31e-10$	Strong
Overall	1.74 \pm 0.56	2.85 \pm 1.10	23.83	$\sim 1.13e-5$	Strong

Though they should be interpreted with some caution given the small sample size, these results suggest evidence supporting the hypothesis that participants will have higher reported self-efficacy on completion of the course compared with pre-course ratings. A BF_{10} of 23.83 across all measures is a strong indicator of an overall change in self-efficacy, with moderate to strong evidence for the component measures (Table 2).

Discussion

The one-to-one model of support offered in this pilot study led to an increase in self-efficacy for all participants. The volunteer tutors were initially perceived as experts by most participants, although over time, this relationship shifted as the group worked through challenges together. Participants tended to work through suggested tasks in their own time with tutor guidance as necessary, asking for help as required. A participant noted that, "*it's so advantageous for us having you all here*". The same participant also brought in a PC laptop in weeks 2 and 3, with some specific queries about the transition to Windows 10. Since none of the volunteers were Windows 10 experts, the group engaged in a shared learning experience that resulted in solutions being found to most of the issues raised. Beginners also learned from more experienced peers, discussing problems or comparing devices: in week 5, a younger participant (female, 73) assisted a more elderly group member (female, 84) with setting up her iPad before the session, exclaiming "*I have become the expert now!*"

In contrast to recent findings that dividing users into separate groups on the basis of operating system can be beneficial¹³, the tutors were able to accommodate a range of devices and operating systems, including iPads, Windows laptops and Android tablets and smartphones. The presence of multiple tutors allowed for debate and discussion (for example regarding the merits of iOS versus Android), as opposed to a more didactic teaching style. The volunteers also had varying backgrounds, levels of knowledge and interaction styles and this contributed to an informal atmosphere. At most sessions, a digital projector was set up but in the event was not needed, functioning mainly to give a sense of occasion.

In general, the same pairs of tutors and participants worked together each week, allowing them to develop close relationships and shared understandings that may have enhanced

retention rates. The group members also had pre-existing relationships with one another, having attended the same community centre for some years. This social cohesion may be a positive factor not only in maintaining course attendance, but in the learning process itself. Recruitment of 'never' users via social non-digital networks already in existence could prove beneficial to the success of digital literacy projects.

Common barriers to ICT adoption include cost of devices, inappropriate design, attitude, self-efficacy, lack of experience, lack of awareness, or lack of interest in technology¹. The provision of loaned tablets may allow digital literacy projects to overcome the first of these barriers, but constant attention must be paid to the remaining factors, in particular lack of awareness or interest.

In terms of interface design, touchscreen devices have proven remarkably popular with older users, not least because these tend to be more intuitive and accessible than desktop computers running operating systems such as Windows. The use of first-generation iPads (manufactured 2010/2011) greatly enhanced the project, allowing the four participants who did not already own tablets to practise their new skills at home between sessions. However, while these tablets were more easily available for re-use within the project due to their age and relative obsolescence, they lacked certain features of particular interest to older people, namely a front-facing camera for Skype and VOIP calls. The front-facing camera was added to the iPad 2 and subsequent models, and has proved extremely popular with older users for keeping in touch with family and friends. The pilot project therefore did not include a session on Skype, but this is strongly recommended for future sessions. Fragmentation of families and subsequent isolation has been described as one of the *"key problems of old age [that] should be at the centre of any educational initiative"*^{31p249}.

In addition, the majority of apps available through the App Store are no longer compatible with iOS 5.1.1, the most recent operating system compatible with first-generation iPads, meaning that workarounds had to be developed to allow participants to access key sites such as YouTube, Facebook and BBC iPlayer. In most cases, this was achieved simply by means of placing a bookmark to the web version of the site onto the Home Screen of each tablet, giving the visual impression of a discrete app.

Due to this obsolescence, later generations of devices are recommended to deliver this model of training in the future. It is already known that "given the rapid technological advances of computers, older people are recipients of relatively obsolete machines"^{32p18} within informal intra-family recycling of technology. Perpetuation of this age-related imbalance of ICT provision seems likely to be a contributing factor to continuing low levels of digital engagement among the older population.

Age-related physical problems, such as a reduction in fine-motor skills, can also impact on effective tablet use. Accessories such as styluses and hard cases were therefore showcased and discussed during the course. While the first generation of stylus was designed to activate resistive screens, generally being made of hard plastic with a 1mm point, the post-2007 stylus tends to have a rubber tip of around 6mm in order to mimic the human finger on a capacitive screen, such as on the iPad. Studies of resistive stylus use by older people have described styluses as 'awkward', 'difficult' or 'problematic'^{33p927}, but there is relatively little research into capacitive stylus use by the same population. Anecdotally, however, many elderly users find them useful^{34,35}. One reason for the appeal of styluses is the clearer view of the target area provided by their slim shape, as opposed to a finger. A recent study of smartwatches found that while a finger can occlude up to 60% of the target, a capacitive stylus occludes only 31%³⁶. By the end of the course, four of the eight participants had begun to use styluses.

Hard cases were provided for four participants, who commented that the non-slip rubber edges made upright use of the tablet easier, as it would not slip on tables and flat surfaces, although the added weight was problematic for one user. By the end of the course, all participants were using protective cases or screen covers of varying designs. Other accessories voluntarily purchased by participants included a fabric sleeve for transporting the tablet and a generic folding case, which the user adapted to suit his tablet by drilling a hole for the camera. Protective storage of devices was a recurring issue for participants, perhaps concerned both about the high financial value of the object and the seeming fragility of the glass screen. For example, group members who had received tablets on loan continued to transport them in the full original packaging, despite discussions around portability and robustness.

Unexpectedly, most participants chose to write down the steps associated with specific actions in note form, as memory aids. This may suggest that transference and consolidation of new learning by expressing new concepts in one's own words should be considered as an explicit strategy along with demonstrations, repetition of tasks and provision of written handouts. Participant-led memory strategies are key to supporting individual practice outside group sessions. For example, a tutor noted that their participant *"who was using a borrowed tablet, did not have Internet access at home, but used several public spaces offering free Wi-Fi. In the course of the class, she bought a book, a stylus and discussed progress with her family, all of which would help consolidate learning"*.

A range of problems was encountered during the course. Participants experienced distress and difficulty in switching from one OS to another, difficulty re-learning previously associated information, problems dividing attention across similar tasks, and failure to transfer knowledge such as the Home Button always serving a 'close app' function. Some of these difficulties may have been exacerbated by executive function decline in ageing. Others, however, were affected by limitations of interface design¹³. For example, one member of the group using sat-nav was confused by the multiple means available of achieving the same goal – as the tutor noted, they *"found it difficult that you can either enter a postcode manually, or scroll through a list, and aren't entirely sure why there are so many ways to do one thing, which makes them feel unsure that they're doing it right"*.

These problems often led to suboptimal workarounds, such as not moving the device to avoid portrait/landscape toggling, or restricting tablet use to the home due to lack of knowledge about connecting to other Wi-Fi networks. These in turn resulted in frustration: *"in some cases the websites weren't loading and due perhaps to reduced visual field in older adults or executive function difficulties like an inability to switch from the given task (entering password) to other visual information (rotating circle to indicate loading), my participant assumed the computer had frozen"*. Visual attention had implications for understanding in other areas; participants would fail to notice progress bars moving across the top of a window, or ignore error messages appearing in the upper portion of the screen. Form fields were particularly problematic, as other scholars have identified³⁷, with participants repeatedly having difficulty recognising and using input fields. Reasons included over-subtle styling (lack of affordance), the small size of input text and cursor, and the purpose of the cursor not being understood. Password fields where characters are hidden as they are typed were particularly problematic. There are clear implications for online safety where form input is so difficult that a helper is needed to input personal details.

Reduced fine motor skills, for example due to arthritis, also caused difficulties for the oldest users. While apps such as Google Earth proved useful for demonstrating touch gestures such as pinch and swipe, small buttons elsewhere on the device were hard for some to use, particularly those with multiple actions: for example, on the iPad, pressing the power button lightly puts the screen to sleep whereas pressing and holding causes it to power off. One

participant at first confused the functions of the home button and the power button, pressing both, one after the other, after completing activities.

Nonetheless, despite these occasional difficulties and issues relating to the obsolescence of some devices, participants engaged with a wide range of media, gaining new skills in the process. By the end of the course, two members of the group had signed up for short MOOCs (Massive Open Online Courses) on topics of personal interest. This was unexpected, and a remarkable development from the session on YouTube tutorial videos a few weeks earlier. As one participant said, *"You've got to learn! You've just got to learn!"* [meaning keep on learning, at whatever age]. This statement is supported by claims in the literature that *"mentally-challenging activities may be neuroprotective and an important element to maintaining a healthy brain into late adulthood"*^{pr38p865}.

Conclusions

The digital literacy course in this study paired older adults with volunteer tutors to support their acquisition of new skills in the digital domain. Perceived self-efficacy increased from 44% to 71% across a six-week period. However it is important to note that these learners were highly motivated to improve their digital skills, having self-selected to participate, meaning that it is not possible to make definitive claims about the effect of one-to-one support on self-efficacy. However, by contrast with other studies of single-tutor led courses, attendance was extremely high, with no dropouts. It is possible that the supportive relationships formed when working in small groups and one-to-one may promote retention even in challenging circumstances. To facilitate this, tutors must strive to ensure that they are not seen as technology specialists, but as supporters and co-learners.

Free or recycled ICT equipment allows older adults from disadvantaged areas to engage with digital technology on a level playing field with more affluent users. However, it is important not to maintain or extend existing imbalances or even obsolescence by ensuring, where possible, that devices used are up-to-date models.

Our experience suggested that accessories are both necessary and ubiquitous for older adults, reflecting the heterogeneous population, with diverse age-related decline in memory, vision, hearing and motor skills. Despite this, few accessories are designed explicitly for older people. More research is needed into the usability of capacitive styluses by older people to understand how best they can be deployed.

Digital literacy courses for older people should also take into account the increasing presence of touchscreen technology in the daily lives of older people, from cars to supermarket check-outs. Courses can therefore provide metaliteracy skills, rather than simply information literacy skills. It is proposed that, once the most basic skills have been conveyed, course leaders should offer opportunities for participants to engage with real-world scenarios mediated by touchscreens, such as the following:

- Programming a sat-nav device for a specific journey;
- Checking in for an appointment at a hospital or general practitioner surgery;
- Using a self-checkout device in a supermarket, or a ticket machine at a railway station; and
- Getting information from touchscreens in museums and galleries.

These opportunities could be role-played within tutor-led sessions if a specific device is available, suggested as supplementary activities between sessions, or conducted as outings to the actual settings. They could also be presented as a social rather than an instructional activity, for example by visiting a local historical venue that uses touchscreens to display information about exhibits. In particular, the use of real-world settings may combat social isolation and reduce the need for continuous conscious attention, which can be tiring or stressful.

Finally, access to broadband services remains a primary concern for 'never' users from disadvantaged areas, as practice between sessions is vital for ensuring new skills are reinforced. A recent digital inclusion project in Glasgow saw broadband offered to council tenants for £5 per month³⁹, akin to the Ibirapitá project. However, it must be remembered that *"access alone cannot fix the digital divide if the targeted groups do not have the cognitive and technical skills to use these technologies, cannot afford them, do not find them relevant and useful, or are not empowered to use them"*^{23p109}. A combination of loaned tablets, subsidised broadband, appropriate accessories and one-to-one support may represent a new model for improving digital literacy among older adults, leading to greater engagement in society and family life irrespective of age.

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