

Comparison of older and younger adults' attitudes towards and abilities with computers: Implications for training and learning

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Abstract

Computers and associated technology have become central to modern life. In a society where the population is rapidly ageing, the acceptance and utilisation of developing technologies by an older population is becoming increasingly important. This review highlights similarities and differences between the attitudes and acceptance of technology by older and younger people, leading to the conclusion that similar factors influence both age groups—hence, older people could well be taught to use technology in a similar manner to younger people. While all learners, irrespective of age, should receive sufficient time for training in a positive and supportive environment, this review suggests that due consideration ought to be given to the amount of time allowed for older users to learn new skills and the manner in which learners are treated in a positive and valued manner.

Introduction

The manner in which computers and technology in general have become so prominent and central to modern society over recent years, coupled with our ageing population (Renaud & Ramsay, 2007), has led to a substantial amount of research conducted in the area of older people's interactions with computers. This research has focused on themes such as how older people respond to new technologies, their attitudes towards computers and their abilities to learn how to use them. Yet over the past two decades, many conflicting results about older users' computer attitudes and computer training outcomes have been found. Some researchers (eg, Laguna & Babcock, 1997; Timmermann, 1998) have found that older people's experiences with and attitudes towards computers are negative, particularly when compared with younger cohorts. This

observation seems to be a widely held assumption of the general population (Czaja & Sharit, 1998). However, other studies (eg, Ansley & Erber, 1988) suggest that age has very little to no impact on attitudes towards computers. Further still, older adults actually displayed more positive attitudes towards computers than younger adults (Dyck & Smither, 1994), and there are several other studies that indicate a general positive regard in which older people may hold computer and technology use (eg, Eisma *et al*, 2004; White & Weatherall, 2000).

These conflicting results, therefore, beg the question, what kind of conclusions can be drawn about older people's attitudes towards computers as opposed to those held by younger users? What are their implications for devising effective technology education strategies for the older population? This paper reviews the relevant literature to shed light on these issues. Moreover, the purpose of this paper is to systematically review the similarities and differences between the attitudes and experiences of older and younger users of computers and technology. Table 1 lists key studies in this area. This table highlights the age range of participants in these studies as well as the types of software applications and technologies used in the studies.

Older adults as technologically inadequate

There is a stereotypical view that older adults are technologically inadequate. Older people were observed participating in beginners' computer classes as a part of a project whereby a tutorial on computer usage was aimed at teaching older people concepts of file management (Hawthorn, 2007). The observations of the beginners' class displayed aspects of the view that older people are incapable of using modern technology (Czaja & Sharit, 1998; Ryan, Szechtman & Bodkin, 1992). Yet tutors in this class did not adapt the speed of teaching to the needs of their students. Older students were left feeling inadequate and incapable of using computers—something that the older users and their tutors both ascribed to their lack of learning ability, their being too old and their belief that there was just too much they did not know (Hawthorn, 2007). Being too old to learn to use computers is a belief held by many older people, even before attempting to use computers (Timmermann, 1998). However, the negative self-beliefs held by the older students may well be ascribed not solely to their poor performances (Hawthorn, 2007), but also to the negative stereotypical views held by their tutors, as well as the fact that the tutors expected them to learn new skills not commensurate with their existing skills and knowledge more rapidly than they were capable of doing.

There is empirical evidence that computer attitudes are negatively correlated with computer anxiety, suggesting that those with increased anxiety towards computers are more likely to have negative attitudes towards using them (Igbaria & Chakrabarti, 1990). In addition, computer-related anxiety appears to increase with age (Laguna & Babcock, 1997). This latter finding, together with Hawthorn's (2007) observations regarding older students' perceived lack of knowledge and experience about computers, suggests that older people's negative attitudes may be caused by their level of experience with computers.

Table 1: Summary of key studies in the area

Study	Cohorts	Application
Ansley and Erber (1988)	Older: 55–86 years (<i>M</i> = 70.7)	Franklin Ace 1200 computer—programs entitled <i>Vocabulary Quiz</i> (multiple choice quiz—respond by depressing corresponding key on standard alphanumeric keyboard) and entitled <i>What's For Lunch</i> (subjects required to enter personal information via standard keyboard)
Charness <i>et al</i> (2001)	Young: <i>M</i> age 25–30 years Middle: <i>M</i> age 44–48 years Old: <i>M</i> age 61–64 years	Microsoft Word for Windows 1.1 (running under Windows 3.0)—slightly modified, utilising both keyboard and mouse commands
Czaja and Sharit (1998)	Younger: 20–39 years Middle-aged: 40–59 years Older: 60–75 years	Three tasks performed on Microsoft Windows-based PC: (1) data entry—emphasis on speed and accuracy of data input; (2) database enquiry—requiring navigation through set of computer files corresponding to different categories of information; (3) accounts balancing
Dickinson <i>et al</i> (2005)	Older: 55–85+ years	Microsoft Word, Outlook Express, Internet Explorer with simplified interfaces and desktop
Gardner <i>et al</i> (1993)	Young: Fifth—ninth grade students	Questionnaire with focus on computer experience regarding programming in BASIC, Pascal and other programming languages; playing video games, playing educational games, writing stories/letters/reports, drawing pictures/graphs
Hawthorn (2007)	Older: 60–88 years (<i>M</i> = 69.8)	FileTutor—simplified, age-adapted version of Windows Explorer embedded within an interactive tutorial program
Jay and Willis (1992)	Older: 57–87 years (<i>M</i> = 75.06)	Apple IIe computer with graphics printer—software titled <i>The Print Shop</i> (menu-driven desktop publishing program utilising keyboard and mouse commands)
Laguna and Babcock (1997)	Young: 18–27 years (<i>M</i> = 20) Older: 55–82 years (<i>M</i> = 72)	Participants required to study figure on screen, then press any to display a second figure and determine whether the second figure was contained within the first (responded by pressing '/' for yes, or 'z' for no)
Mahar <i>et al</i> (1997)	Young: <i>M</i> age = 22.21 years	Data entry task on mock database application on IBM-PC—custom written for experiment, employing a CUA-like menu interface (Common User Access) which was navigated by single keystrokes

However, a survey study involving 384 people ranging from 20 to 75 years old with varying computer experience refuted this potential explanation (Czaja & Sharit, 1998). Of this sample, 27.0% of respondents had no prior computer experience, 21.7% had very little experience, 36.1% had some experience and just 14.9% rated themselves as having considerable experience. Older people reported feeling less comfortable and less competent in using a computer, and felt they had less control over the computer than did their younger counterparts, even after controlling for differences in participants' experience level. Taken together, these results suggest that attitudes are related to age, with the assumption that older people generally would have more negative attitudes towards computers than younger people.

The older person's difficulties in learning new technologies

There is considerable evidence suggesting that older adults find learning about computers more difficult than younger people do, are more likely to forget and take longer to reach a level of proficiency (eg, Dickinson, Arnott & Prior, 2007). For example, Laguna and Babcock (1997) compared the performance of 20 young people with that of 20 unmatched older people on a computer task, which involved deciding whether or not a stimulus figure was embedded within a separately presented figure. They found that decision time on the task was significantly different between older and younger users (with older users taking longer), suggesting that perhaps relieving these time constraints may result in comparable performance and experience between the two age groups. Botwinick (1967) found that older participants displayed more caution than their younger counterparts in responding to measures of cognitive ability, actively choosing to perform slower to increase their response accuracy. This finding may help to understand time differences in performance on computers between younger and older adults, in that perhaps older people prefer to take longer to ensure they do not make errors in completing any computer task.

These trends are also observed with novice computer users (Charness, Kelley, Bosman & Mottram, 2001). Older novices take longer to train and make more subsequent errors upon testing than young novice learners. These findings support earlier evidence of cognitive decay in the elderly (for the purposes of the discussion in this paper we define 'the elderly' as someone aged 60 years or more). For example, while crystallised mental abilities remained strong into old age, fluid intelligence (or learning ability) showed evidence of decline (Savage, Britton, Bolton & Hall, 1973). Therefore, when the elderly are put in a position to learn a completely new concept or skill, they are forced to rely on a learning ability that has weakened with age, rather than on their crystallised intelligence, which is sustained throughout the ageing process. Longer training requirements and a greater number of errors are characteristics typical of an individual with high levels of computer anxiety (Mahar, Henderson & Deane, 1997), possibly contributing to the stereotype that older people are anxious to use technology. However, no age effect is evident among experienced users (Charness *et al.*, 2001). The number of errors appears to be uniform across age groups, and although older experienced users perform slower than younger experienced users, the difference is smaller than that found for novice users. Similarly, positive observations were made by Ansley and Erber (1988) whose

sample of older people were able to use computers just as well as younger adults, and Ryan *et al* (1992), who found that older people were capable of overcoming others' negative expectations of their abilities and capabilities with computers by actively choosing to use them. In a context outside of computer usage, extensive practice on a task diminishes age differences in reaction time (Baltes, Staudinger & Lindenberger, 1999). These findings suggest that a lack of prior knowledge, rather than negative attitude, inhibits an older person from greater acquisition of computer related skills and use. In learning new skills, older people are more likely to call upon past experience (ie, crystallised intelligence) than are younger people (Renaud & Ramsay, 2007). Thus, not having prior experience with computers is likely to hamper an older person's attempts at learning to use one more than it will a younger person'.

Older adults' selective computer use

However, Hawthorn (2007) argues that older people are not necessarily avoidant of technology; rather they avoid making errors by limiting the tasks they attempt to perform. In a study of the computer usage behaviours of university faculty members, Rosseau and Rogers (1998) found that although staff regularly used computers in their line of work, older staff members used fewer software applications. There was no indication that older faculty members avoided using other applications—they simply used the programs they required, leading them to be labelled 'selective' users (Rosseau & Rogers, 1998).

Selective tendencies may, in part, explain why older people are stereotypically viewed as having negative views towards technology. Whereas younger people raised with computers may turn to the Internet or other computer programs to meet needs such as socialising, self-fulfilment, learning or relaxation, older people are more likely to meet these needs in more tradition manners, such as visiting friends, watching television, reading and gardening (Renaud & Ramsay, 2007). While the Internet and computers certainly have the potential to support some of these needs for older people, the potential benefits of these technologies need to be highlighted to the older user; otherwise, there is no incentive for behaviour change. Rather than be negatively disposed towards technology, older computer users are selective in what they see as beneficial and necessary for their way of life.

This concept of selectivity can be seen to parallel Baltes' (1987) concept of selective optimisation with compensation. Baltes argues that as a person's cognitive reserves are depleted (as in the case of continued ageing), he or she copes by narrowing the range of tasks he or she attempts, ie, by becoming selective. Taking this concept to the field of computers and technology, it is understandable that older people would selectively choose to use fewer applications than younger people, as their cognitive capabilities may be comparatively diminished because of natural ageing.

Older adults as equals to younger adults

Despite the previously discussed specific findings of older people feeling less comfortable and competent in computer use, Czaja and Sharit (1998) found that among their

sample, there were no age differences in overall attitude towards computers. Despite experiencing more difficulty in using computers, and having lower estimations of their abilities to use them, older adults were found to have attitudes that were equally positive to those of younger adults in relation to the use of computers.

This similarity between younger and older people's attitudes had previously been observed by Ansley and Erber (1988). Comparing the attitudes of community-living older adults with those of young university students, Ansley and Erber found that responses were similar on 10 computer attitude subscales, particularly those related to areas of using computers. Although the older adults had substantially less computer experience than the younger participants, their views and attitudes regarding potential uses for this technology were surprisingly similar. The number of young people in this study was relatively small ($n = 22$), but the results were found to be similar to those of a much larger sample ($n = 121$) who had been administered the same computer attitude test (Wagman, 1983). While it may be considered surprising that the older and younger cohorts were found to display very similar attitudes towards computers, it must be noted that this study was conducted at a time when computers were far less prominent in society than they are now, and at a time when computers were not viewed as universally positive by university students (Morrison, 1983; Smith & Oosthuizen, 2006).

It would appear then that a trend may have developed among older people, whereby there is a realisation of the pervasiveness of technology in modern society. Despite cognitive and/or physical factors that may hamper older adults from using this technology as effectively or proficiently as younger generations, they believe that there is a need for them to accept technological advancements, rather than avoid them and be left behind. White and Weatherall (2000) interviewed six older adults who rated themselves as moderately to reasonably proficient in computer usage. Participants were involved in a computer-training organisation; they reported using computers because they associated technology with modern life, and because of the realisation of what potential this technology had for them personally. This thought process led to them developing positive attitudes towards computers in general. These results may be biased, given that participants were members of a computer training organisation, so logically they would display highly positive attitudes. However, they voluntarily involved themselves in this organisation because of positive attitudes towards technology and the modern world prior to any experience with computers.

Eisma *et al* (2004) also found that older people would be willing to be more involved with technology provided they are made aware of the benefits such technology would offer them. Focus groups with older people revealed that not understanding how to use technology and not seeing any personal benefits from its use formed major barriers to using technology in older people's minds. However, should these concerns be alleviated, participants displayed a positive willingness and openness to computer technology.

Older adults' positive views towards computers

A study examining older people's attitudes towards computers showed that despite having less computer experience than their younger counterparts, the older participants (mean age = 67.7 years) were found to be less anxious about computers and have more positive attitudes and liking for them than the younger participants (mean age = 21.6 years) (Dyck & Smither, 1994). However, these results may be biased as the older participants (recruited from continuing education courses and senior citizens centres) participated voluntarily; would the participants volunteer to be in this if they held extremely negative views towards them? Dyck and Smither (1994) suggest that their findings may also be a result of the types of computer experience the respective age groups had, rather than simply the amount of experience. Whatever the cause for such observations, they support the notion that older people can develop positive attitudes towards computers if given encouragement.

Barriers to the older person's acceptance of technology and overcoming them

Lack of knowledge of the capabilities of modern technology and how to utilise them is a major influence on older people's apparent avoidance of technology. Without background knowledge of software conventions or general usage of computers, the elderly find it more difficult to attain competence in such areas (Dickinson, Eisma, Gregor, Syme & Milne, 2005). Other substantial barriers to older people's acceptance and use of technology include confusion regarding usage procedures, fear of the unknown (Hawthorn, 2007), lack of confidence (Marquie, Jourdan-Boddaert & Huet, 2002), lack of understanding of the value of products and services (Rice, Newell & Morgan, 2007).

However, research has also shown that several factors can counteract these barriers and lead older users to form positive attitudes towards technology, and, as a result, a readiness to accept and use appropriate forms of technological advancements (Turner, Turner & Van De Walle, 2007). Understanding the technology as being personally relevant and useful is an important factor in encouraging the elderly to make use of such available services (Selwyn, 2004; White & Weatherall, 2000; Zeithaml & Gilly, 1987). Once the initial fears or barriers are overcome, experience with computers, either direct or indirect, can further enhance positive attitudes and feelings towards computers (Ansley & Erber, 1988; White & Weatherall, 2000), in a somewhat cyclic manner—positive attitudes promote usage, and further use promotes positive attitudes.

External factors also influence the attitudes held by older users towards a particular technology. Attitudes and indeed utilisation of technology can be vastly influenced by others, particularly how one is viewed and treated by others (Sokoler & Svensson, 2007). This concept may well be the key to enabling older people to overcome many of the negative influences and barriers to technology use and acceptance and to embrace the positive factors.

Younger adults' attitudes towards technology

By way of comparison, research focusing on younger people's attitudes towards computers has shown more consistent results. Literature shows a uniform positive attitude towards computers, whereby younger users regard computers as useful tools and important for everyday life (Bovee, Voogt & Meelissen, 2007; Pektas & Erkip, 2006; Teo, 2006), as well as having a positive view of their own technology-related capabilities (Houtz & Gupta, 2001). These findings occurred across a range of contexts and cultures.

The uniformity of these results when compared with the vast contradictions found in older adult literature leads to the question—what causes these differences? It seems clear that as general age groups, children, adolescents and young adults display positive attitudes towards and pattern of usage with computers, yet there remains some doubt as to older people's views.

Influences on younger adults attitudes towards technology

Interestingly, research shows that many factors influencing young people's attitudes and usage patterns are similar to those influencing older people. Levels of confidence (Gardner, Dukes & Discenza, 1993), computer exposure (Levine & Dontisa-Schmidt, 1998) and experience with computers (Bovee *et al.*, 2007; Teo, 2006) are major influences on attitudes of young people, just as they are for older people. Despite the comparative findings being congruent, there is reason to suggest that should early experiences with computers be negative, young people may well still develop negative attitudes (Gardner *et al.*, 1993). Further, a young person's attitude is influenced by the amount of computer experience and the nature of that experience (Garland & Noyes, 2005). Given the similarities between the influences on younger and older people's attitudes towards computers, it is reasonable to expect that these findings could extrapolate to the experiences of older people. Having not been raised in such a technologically centred age, older people generally have less prior knowledge than younger people, and as such, are more likely to have negative initial experiences with computers. However, if the older person is given a more positive initial experience, and the nature of further experience follows suit, then positive attitudes are just as likely to develop as they are for younger users.

Just as the manner in which the elderly are viewed and treated can impact upon their acceptance and utilisation of technology, so too does the social environment have a substantial impact upon young people's attitudes. For example, the attitudes of parents towards computers, and the encouragement they give their children in learning to use technology, can have a profound effect on the children's attitudes, particularly in high school years (Shashaani, 1994). Given that computers and technology are becoming such a prominent part of culture, most young people have high expectations of themselves in terms of being able to understand and enjoy using computers (Robertson, Calder, Fung, Jones & O'Shea, 1995). Peer and social influences are well known to have strong impacts on young people. It follows that cultural pressures can also oblige young people to have positive attitudes towards technology. Perhaps one reason behind older

users' varying attitudes is their potential variation in adherence to social norms. Do older people have less positive attitudes simply because they do not feel such strong pressure to conform to cultural pressures? Do they perhaps feel that they are no longer a significant part of the culture and thus refrain from making themselves a part of it?

Overcoming older people's negative attitudes

The use of positive role models may overcome negative attitudes in older computer users. Good role models can promote positive attitudes towards computers among secondary students (Downes, 1993). Further, at a time when females were widely regarded as having less positive attitudes towards computers and also being less technically capable, Janssen Reinen and Plomp (1997) showed that women working confidently with computers served well as role models, encouraging similar behaviour among other women—particularly female school teachers acting as role models for female students. Extrapolating from this finding, we argue that older people who are computer literate and have positive computer attitudes could be used as role models for older computer novices, and thus build on techniques that have worked with younger people, towards a format of computer instruction that will enhance older people's chances of accepting and utilising any forms of technology that may benefit them.

Changes in age-related attitudes over time

General attitudes towards computers have been changing over the last 20 years. For example, Smith and Oosthuizen (2006) compared research findings from 2004 with a similar study conducted in 1997. They found that university students had a greater appreciation of the benefits of computers, less fear of computer power and a more realistic view of computers—trends that had developed over just 7 years.

While Smith and Oosthuizen (2006) found a very positive acceptance of computers among their sample, a comparable study conducted at an earlier time found that a total acceptance of computers by university students had not taken place. (Morrison, 1983). This observation may be understood in the context of the central role that computers and technology increasingly play in educational contexts in more recent times. It is now very difficult for university students to excel at their studies without some level of computer proficiency. While technology has also become more pervasive across most aspects of modern culture, it can be argued that older people are more likely to avoid these technological advancements. For instance, retirees can, in their selective use of technology, choose to spend more time in activities that do not require utilising the technology available to them in forms such as television and computers. Based on literature that suggests people's attitudes towards computers tend to improve with experience (eg, Ansley & Erber, 1988; Czaja & Sharit, 1998; Jay & Willis, 1992), it follows that any change in older people's computer attitudes over time generally would be slower and less positive than that for younger people, particularly students.

Yet research tends to show a different trend. To again use sex differences research as a parallel, Mitra *et al* (2000) found that, throughout the 1990s, as computers become more prominent and more popular, more studies began to find no significant gender

differences in computer-related attitudes and behaviours, whereas males were significantly more positive about the use of computers. Similarly, the attitudes and behaviours of older people in regard to computers and technology have become increasingly positive, to the point where recent research is generally finding fewer differences between age cohorts.

As an early example, Igarria and Parasuraman (1989) studied a group of business managers of a wide age range ($M = 33.5$ years, $SD = 8.37$) to find that age was negatively correlated with computer attitudes. Zeithaml and Gilly (1987) found that older people were also less likely to use other common forms of technology (eg, ATMs) than younger people—a finding that was replicated 9 years later by Rogers, Cabrera, Walker, Gilbert and Fisk (1996). These types of findings are more than likely a major influence behind those widely held stereotypical views initially reported by Czaja and Sharit (1998) and Ryan *et al* (1992) that older adults have more negative attitudes and are less capable of using modern technology than younger people. And while it appears that older people experience greater difficulty in learning to use computers, recent research shows that over time, as computers and technology have become more prominent in our modern society, so too have older users' attitudes towards this technology become more accepting and overall positive. This trend has been illustrated in Eisma *et al* (2004) and White and Weatherall (2000), whose research showed that as older people establish for themselves the personal benefit of technology, they are more than willing to adopt it in their everyday lives—a concept that Ryan *et al* earlier alluded to in finding that older people can overcome the negative stereotypes about their computer abilities and attitudes by making a conscious choice to involve themselves with the technology.

What is particularly interesting over time is that research is beginning to more regularly support the early findings of Ansley and Erber (1988) that older and younger adults have very similar attitudes towards computers. While it has been recognised for some time that older people take more time to fully absorb new information (Jay & Willis, 1992), current literature often regards older people as being on a more level playing field. This point is demonstrated in current research that has noted the apparent lack of attention paid to older populations in technology development, and makes a deliberate effort to find the factors influencing their technology use (eg, Dickinson *et al*, 2007; Rice *et al*, 2007). The general finding of this body of research is that the factors influencing older people in regard to their use and attitudes towards technology are quite similar to those influencing younger people, only translated to the context of the older person's situation.

Conclusion

A review of literature indicates there are marked similarities between attitudes and experiences of young and older adults in using computers and technology. This finding goes counter to some common myths held about older adults' usage of, experiences with and attitudes towards computers and technology. Hence, factors likely to enhance or hinder an older person's experience with computers are just as likely to have the same impact on a younger person. What can be taken from this observation is an under-

standing that older people could well be taught to use technology in much the same way as younger people are taught. However, the literature also suggests that at least two additional considerations are necessary in designing computer and technology education for older learners. First, consideration must be given to allow ample time for older people to master new skills. Second, care must be taken to treat any person learning to use technology in a positive manner that makes them feel like they are valued and that success is the expected outcome. While it is true that these two points ought to be considered for all learners, they nonetheless particularly pertain to older users.

Research has shown that negative stereotypes of older people being avoidant of technology and incapable of its use are outdated. With proper encouragement, clear explanations of the personal benefits and an appropriate time schedule, older people certainly have the potential to become equally effective in using technology and computers as younger age groups.

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