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Computer use among older adults in a naturally occurring retirement community

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Abstract

Though computers and the Internet offer an opportunity to enhance the lives of older adults, rates of computer use among older adults are low relative to other age groups. This study examined patterns of computer use and barriers to use among 324 residents living in a suburban naturally occurring retirement community (NORC). One-third (36%) of the residents were actively using computers. Residents currently using computers were more likely to be younger, with more education, fewer functional impairments, and greater social resources. Results from a multidimensional scaling analysis suggested that common uses fell along two dimensions: a solitary–social dimension and an obligatory–discretionary dimension. Barriers to more frequent use included cost, complexity, ergonomic impediments, and a lack of interest. Results from this study could inform the development of services by taking into account how older adults prefer to use computers and their perceptions of the technology. We include practical recommendations for program developers.

Keywords: Aging; Computers; Internet; Utilization; Program development

1. Introduction

Computers and the Internet have the potential to enhance the quality of life for older adults in a number of ways (Chen & Persson, 2002; White et al., 2002). Computers provide ready access to information, such as facts about medical conditions, travel destinations,

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history, culture, and almost any other topic. They also offer opportunities for entertainment in the form of games, movies, and music. Computers can encourage cognitive stimulation as older adults learn to use new functions and navigate the world wide web, and through software applications specifically designed to challenge cognitive skills(www.realagegames.com, www.positscience.com). And computers can facilitate communication among family and friends via e-mail, instant messaging, and on-line chat.

Despite the potential good that computers, the Internet, and e-mail might bring older adults, a lag seems to exist in technology adoption by older adults. Selwyn, Gorard, Furlong, and Madden (2003), for instance, reported that approximately 20% of older adults compared to 65% of younger adults had used a computer in the past 12 months. Not all studies, however, have found lower rates of computer use in older adults (e.g., Matanda, Jenvey, & Phillips, 2004), with discrepancies across studies likely due to sample differences. Moreover, while some cross-sectional figures suggest fewer older adults use computers relative to younger adults, longitudinal trends reveal that the computer ownership and Internet use are increasing at the highest rates among older adults (Bucar, Renold, & Henke, 1999). In a national sample of people over age 55, Adler (1996) found a 43% increase in computer ownership in just one year, suggesting that "within a few years, penetration of PCs among older adults will be virtually indistinguishable from that in the general population" (p. 7). Meanwhile, access to the Internet increased by 47% from 2000 to 2004 among Americans over the age of 65 (Fox, 2004). Thus, given the right circumstances, a "digital divide" based on age may soon disappear (Frissen, 2005; Opalinski, 2001).

One framework for understanding why older adults may or may not use computers is *diffusion theory* (Atkin, Jeffres, & Neuendorf, 1998). Diffusion theory posits that whether an individual adopts a technological innovation (such as computers) depends on an interplay between contextual characteristics of the individual (e.g., income, health), beliefs about the technology (e.g., its complexity), and the perception of need for the technology (e.g., How will a computer help me?). Results from prior research have been consistent with this framework. For example, computer use in older adults appears to be impeded by functional deficits such as visual impairments that make reading a computer screen more difficult (Bitterman & Shalev, 2004) and dexterity problems that interfere with typing and mousing (Charness & Holley, 2004). Another barrier is monetary, as older adults may have limited income to invest in computer equipment, software, and service fees (Browne, 2000; Fisk & Rogers, 2002). In terms of beliefs about the technology, some studies have cited older adults' anxiety about their lack of knowledge (Czaja & Sharit, 1998; Ellis & Allaire, 1999) and lack of confidence in their ability to master the computer (Marquie, Jourdan-Boddaert, & Huet, 2002). A final impediment to use may be a simple lack of interest. Older adults may think computers are irrelevant to their daily lives, offer no advantages, and provide no benefits (Selwyn et al., 2003). Frissen (2005) highlighted the existence of "voluntary non-users," pointing out that some older adults are quite content without a computer in their lives.

1.1. Computer use in a NORC

The purpose of the current study was to examine elements of diffusion theory in relation to computer use among older adults in a naturally occurring retirement community (NORC). Broadly defined, a NORC is a community that includes a disproportionate percentage of older adults. Some NORCs consist of a large number of older adults living in

one apartment building, while other NORCs encompass a neighborhood or even small town (Hunt, 2001). NORCs come into existence for a variety of reasons. Some arise when older adults move into a neighborhood, others emerge when citizens who have lived for some time in a building or area "age in place" together, and still others are created by both processes simultaneously. In all their forms, NORCs arise for practical, psychological, and social reasons—the places provide older adults with what they need in order to live independent, fulfilling lives as they grow older.

Services and support systems arise in a NORC to help residents stay in their own homes for as long as possible. As older adults age in place, however, their independence, mobility, and social network are likely to decrease, leaving them more and more isolated. Computers, with their ability to deliver information and to facilitate communication, offer one tool for remediating some of the losses older adults experience and for keeping a NORC a vibrant, supportive place to live. Computers in a NORC can be used to (a) help maintain social contact with friends who are now more housebound, (b) promote new friendships with other NORC residents who may share experiences and concerns because of their shared community, (c) keep residents aware of programs and services available in the neighborhood, and (d) provide a focus for education and peer support in computer use and training. All of these benefits would be in addition to others related more generally to computer use (e.g., information access, entertainment). Moreover, all of this could take place with some efficiency in a NORC due to the concentration of service and support organizations.

In anticipation of developing computer-related programs in a NORC, we surveyed older residents to examine current patterns of computer use. In specific, we were interested in addressing the following questions:

1. Among NORC residents, who is currently using a computer and what differentiates them from non-users?
2. Among computer users, what do they use the computer for?
3. Among non-users, what are the barriers to use? And among users, what prevents them from using the computer as much as they would like?

Answers to these questions might help us market activities effectively, develop programs that respond to resident preferences, and address factors that could impede successful program implementation.

2. Method

2.1. Participants and procedure

Participants were drawn from a geographically defined NORC approximately 1 mile^2 in size in the St. Louis suburbs. The boundaries of the NORC included a group of apartment buildings, townhouse apartments, condominiums, single-family homes, senior congregate housing facilities, and the business and service organizations that sprang up around them as, historically, more and more older adults moved into this neighborhood. According to the U.S. Census Bureau (2000), this NORC neighborhood includes 4641 residents, of whom 47% (2172) are age 50 or older, and 32% (1487) are age 65 or older. The percentage of residents age 65 and older is substantially higher than in the county and state as a whole (14% and 13%, respectively).

Between January 2003 and October 2003, adults over age 65 in the NORC were invited to participate in an interview regarding their current service needs, recent service use, and preferences. Questions about computer use were embedded in this needs assessment. Recruitment efforts included door-to-door solicitation, announcements in the media, booths at health fairs and local grocery stores, presentations to community groups, and direct mailings. Potential participants were screened by phone to ensure that they met the residency and age requirements. Subsequent in-home interviews lasted approximately 2 h and included a broad range of biopsychosocial assessments, a portion of which are described in this report. At the conclusion of the interview, participants were debriefed and paid $20.

2.2. Measures

2.2.1. Demographic characteristics

Demographic data that were collected included age, gender, whether the resident was currently living alone, race/ethnicity, years of education, and household income. Respondents also indicated whether their residence was a single-family home, condominium, apartment, or congregate housing.

2.2.2. Physical health

Self-rated health was assessed with the question, "In general, would you say your health is…". Responses ranged from *poor* (1) to *excellent* (5). *Number of chronic conditions* was assessed with the 27-item Cornell Medical Index Health Questionnaire (Brodman, Erdmann, & Wolf, 1960), a checklist of common ailments, such as arthritis, hypertension, and diabetes, as well as more diffuse syndromes such as muscle aches and back pain. *Functional independence* was assessed with items from the Duke Older Americans Resources and Services survey (Fillenbaum, 1988). Seven items were used to measure activities of daily living (e.g., eating, bathing, basic self-care) and six items to measure instrumental activities of daily living (e.g., meal preparation, shopping). Most items were assessed with a 3-point Likert-type scale ranging from *completely unable to perform the task* (0) to *can complete the task without help* (2). Ratings on individual items were summed to yield a total score ($\alpha = 0.85$), with higher scores indicating greater functional independence. The 6-item blessed orientation–memory–concentration test (BOMC) (Katzman et al., 1983) was used to assess degree of *cognitive impairment*, with higher scores indicating more severe impairment.

2.2.3. Mental health

The short form of the Geriatric Depression Scale (Lesher & Berryhill, 1994) was used to assess *depressive symptoms*. Fifteen yes/no items yielded a total depression score ($\alpha = 0.79$), with higher scores indicating more depressive symptoms. One question about *loneliness* asked, "Do you find yourself feeling lonely?". Response options included *quite often* (0), *sometimes* (1), and *almost never* (2). An interviewer-rated assessment of overall *social impairment* was obtained with the OARS Social Resources Rating Scale Total Score (Fillenbaum, 1988). The interviewer used answers to nine questions (e.g., frequency of social contacts, presence of a confidant, subjective perception of available assistance) as a basis for a summary rating on a 6-point Likert-type scale ranging from *excellent social resources* (1) to *totally socially impaired* (6).

2.2.4. Computer use

Individuals were asked one dichotomous question about whether they currently use a computer. Participants who responded "yes" were then asked what they use the computer for, how often they use the computer to stay in touch with people, and who they stay in touch with the via computer. All respondents, regardless of their answer to the first question about computer use, were asked what prevents them from using the computer, or from using it more than they currently do.

2.3. Data analysis

Descriptive statistics were calculated and independent-samples *t*-tests were used to compare computer users with non-users. A Bonferroni-type correction was applied to account for the number of statistical tests ($0.05/14 = 0.004$) so that only comparisons when $p < 0.001$ were considered significant. A hierarchical logistic regression was performed to identify characteristics that differentiated computer users from non-users. Computer use versus nonuse was the dichotomous dependent variable. In Step 1, the demographic variables:age, gender, years of education, current coresidence, and income were entered. In Step 2, physical health variables including self-rated health, number of chronic conditions, functional independence, and degree of cognitive impairment were entered. In Step 3, mental health variables including depressive symptoms, loneliness, and social impairment were entered.

In the next analysis, ways in which residents were currently using computers were subjected to an unweighted nonmetric multidimensional scaling procedure (Stalans, 1995). A two-dimensional solution provided the best fit to the data after examining stress values (stress = 0.17, with numbers approaching zero representing a better fit) and the interpretability of variable positions on the configuration plot. Finally, descriptive statistics were calculated to examine social contacts maintained via computer and reasons for not using a computer at all or any more than the current use.

3. Results

Characteristics of the participants appear in Table 1, along with comparisons between computer users and non-users. In the total sample, 115 (36%) of the older adults reported that they currently use a computer. There were notable differences between users and non-users. Older adults currently using a computer tended to be younger, $t(322) = 7.24$, $p < 0.001$, with more education, $t(322) = -5.69$, $p < 0.001$, and higher average income, $t(322) = -5.48$, $p < 0.001$. People using computers were more likely to be living in a single-family home rather than a condominium, apartment, or congregate housing, $\chi^2(1) = 30.09$, $p < 0.001$. No significant differences were found regarding race/ethnicity, although the sample size was limited. Computer users also tended to have better self-rated health, $t(322) = -5.88$, $p < 0.001$, greater functional independence, $t(318) = -5.25$, $p < 0.001$, and better cognitive functioning, $t(322) = 3.62$, $p < 0.001$. In addition, computer users reported fewer depressive symptoms, $t(320) = 4.88$, $p < 0.001$, and less loneliness, $t(321) = -4.77$, $p < 0.001$. Finally, interviewers tended to rate the computer users as having better overall social resources than non-users, $t(318) = 6.40$, $p < 0.001$.

In the multivariate logistic regression used to identify what predictors differentiated computer users from non-users, the omnibus test of the coefficient was significant,

Table 1
Characteristics of the sample and comparison of computer users and non-users

Characteristic	Computer users ($n = 115$)				Computer non-users ($n = 209$)			
	M	SD	%	*n*	*M*	SD	%	*n*
Demographics								
Age***	75.0	6.7			80.5	6.4		
Education (years)***	14.4	2.2			12.9	2.4		
Income***	$31,443	$20,185			$20,449	$15,468		
Gender								
Female			63	72			76	158
Male			37	43			24	51
Race								
White			95	109			95	199
Other			5	6			5	10
Living alone								
Yes			49	56			66	137
No			51	59			34	72
Housing type***								
House			19	22			9	18
Condo			61	70			45	94
Apartment			14	16			16	35
Congregate			6	7			30	62
Physical health								
Self-rated health***	3.6	1.0			2.9	1.0		
No. of chronic conditions	4.5	2.5			5.5	2.9		
Functional independence***	25.4	1.1			23.8	3.2		
Cognitive impairment***	1.4	1.9			2.7	3.6		
Mental health								
Depressive symptoms***	1.6	1.8			3.0	3.0		
Loneliness***	1.6	0.6			1.2	0.7		
Social impairment***	1.6	0.9			2.4	1.3		

Note. Comparisons of means were performed with an independent-samples *t*-test in the case of continuous variables or chi-square test in the case of categorical variables.
***$p < 0.001$.

$\chi^2(4) = 65.89$, $p < 0.001$, $-2LL = 337.87$. Model coefficients, standard errors, and test statistics appear in Table 2. In the final step, the variables that accounted for unique explanatory variance in differentiating users from non-users included age (users tended to be younger), education (users tended to have more years of education), functional independence (users tended to be more independent), and social impairment (users tended to have more social resources). In total, this final model correctly classified 76% of the respondents.

3.1. Ways people use a computer

Results from the multidimensional scaling analysis appear in Fig. 1. Ways in which residents were using computers were mapped onto two broad dimensions. The first dimen-

Table 2
Summary of hierarchical logistic regression analysis for variables predicting computer use versus nonuse ($n = 324$)

Variable	Model 1		Model 2		Model 3	
	b	SE	*b*	SE	*b*	SE
Demographics						
Age	−0.10	0.02***	−0.07	0.02**	−0.07	0.02**
Gender	0.21	0.29	0.25	0.31	0.17	0.32
Education	0.18	0.06**	0.16	0.07*	0.15	0.07*
Income	0.00	0.00*	0.00	0.00	0.00	0.00
Coresidence	−0.19	0.32	−0.17	0.34	−0.29	0.36
Physical health						
Self-rated health			0.30	0.16*	0.18	0.17
No. of chronic conditions			0.01	0.06	0.04	0.07
Functional independence			0.38	0.13**	0.35	0.13**
Cognitive impairment			−0.12	0.06	−0.09	0.06
Mental health						
Depressive symptoms					−0.02	0.09
Loneliness					0.13	0.28
Social impairment					−0.40	0.17*
χ^2	65.89***		95.69***			103.66***
−2LL	337.87		308.07			300.10

Note. Current computer use: 0, no; 1, yes. Gender: 1, male; 2, female.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

sion, solitary–social, reflects the degree to which computer use involves maintaining contact with other people. At one end of the continuum are relatively self-focused, solitary activities such as playing games on the computer and managing finances, while at the other

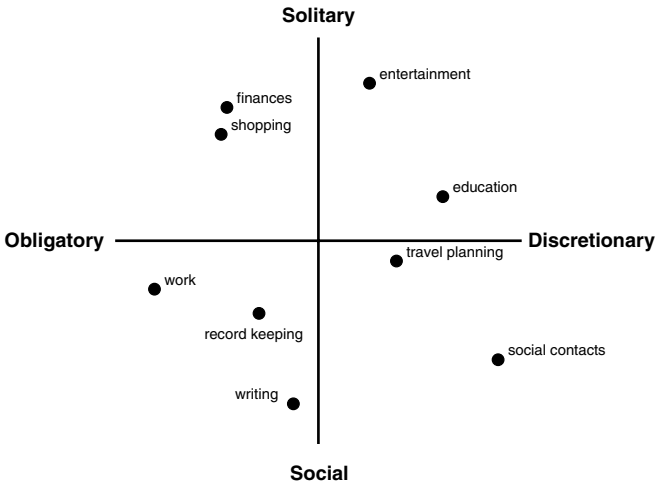

Fig. 1. Two-dimensional configuration of ways older adults use computers.

end are more other-focused, social activities such as sending e-mails and composing letters. The second dimension, obligatory–discretionary, reflects computer activities that are more purely pragmatic and functional versus those that are spontaneous and recreational. At the obligatory end of the continuum are tasks such as using a computer for work and shopping, while at the other end are activities such as using the computer to do travel-related research or other information gathering.

It is worth noting that the most common use for computers was staying in touch with people (81% of respondents used computers for this purpose). Among older adults who used the computer for staying in touch with people, the frequency of using the computer for social purposes was as follows: daily (34%), 2–3 times per week (23%), once per week (20%), 2–3 times per month (14%), once per month (5%), and every few months (4%). In terms of the type of contacts, a large percentage of residents said they use the computer to stay in touch with friends (62%). Contact also was maintained with children (56%), grandchildren (44%), siblings (23%), and other family members (43%). Less frequent was communication with community groups (29%), individual group members (26%), and exclusively on-line friends (13%). Individual respondents reported miscellaneous on-line social contacts including investment advisors, news editors, genealogical discussion groups, school alumni, and on-line advice columnists.

3.2. Reasons for disuse

Reasons for limited computer use are outlined in Fig. 2. Current computer users are separated from non-users because of significant differences between groups. Current non-users were more likely to cite financial reasons for their lack of computer use, specifically the cost of computer equipment and Internet access. Meanwhile, current users were more likely to say that the complexity of finding information, navigating, and using programs were significant impediments, as were concerns about security and privacy. Functional impairments such as arthritis that interferes with typing, visual deficits, and

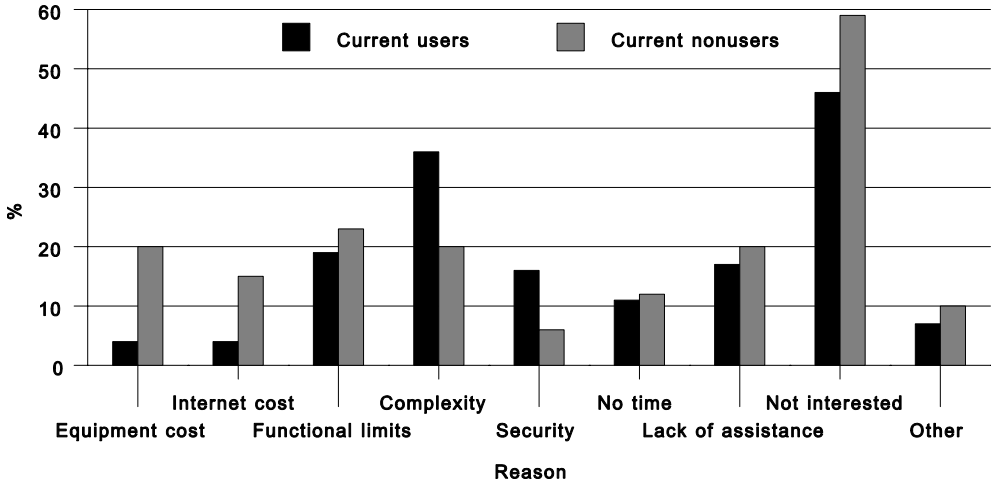

Fig. 2. Reasons older adults do not use computers or are not using them as much as desired.

ergonomic barriers (e.g., small font sizes) were described as limiting factors for both groups. Both groups also reported that a lack of technical assistance prohibited them from using computers. Other miscellaneous reasons for not using the computer were diverse and included a lack of computer knowledge ($n = 12$), having no room in their house or apartment ($n = 8$), and feeling too old to learn ($n = 5$). Other explanations offered by individual respondents included lacking patience with the machines, self-described laziness, a lack of typing skills, a lack of transportation to computer classes, and warnings about "radiation" from computers. A large percentage said they were simply not interested or were using the computer as much as they would like.

4. Discussion

This study examined patterns of computer use among a group of older adults living in a naturally occurring retirement community (NORC), where services and programs might be developed to counter impediments to computer use. Thirty-six percent of the NORC residents currently use a computer. That figure is similar to rates of computer use reported in other studies (Adler, 1996; Fox, 2004) and suggests the potential for enhancing use in the community. Also as in previous studies, computer users tend to be younger, with more formal education. These individuals are more likely to have had exposure to computers earlier in their life and in other contexts, making continued computer use more likely as they grow older. The greatest challenge may be introducing new users to a technology that may seem complex and beyond their grasp. Current computer users also tend to have better health, with fewer functional impairments that could interfere with computer use. User interfaces have been developed to accommodate some physical disabilities, yet accessing those features may require additional equipment or technical familiarity beyond the expertise of many older adults, who seem to have a hard enough time obtaining standard hardware and using basic software. Developing accessible technology is only the first step; getting it to older adults and getting them to use it are equal challenges.

Computer users also appear to differ from non-users in terms of their social embeddedness. Computer users have more extensive social networks, with more access to assistance, and are more satisfied with their social circumstances. Of course, with our cross-sectional data it is not possible to determine the direction of causality. Computer use may nurture social connections (Morrell, Mayhorn, & Echt, 2004), or social contacts may propel more computer use as older adults are encouraged by others to obtain the technology and are taught by others how to use it. Regardless of the direction of influence, what is clear from this study is that maintaining social contacts is the most frequent use older adults have for computers. And a NORC, with its concentration of older adults and service organizations, may be a fertile laboratory for helping older adults make and maintain social connections.

Older adults who we studied are using computers to maintain many different relationships, although the largest percentage were keeping in touch with friends. We do not know whether these friends are local neighbors in the NORC, friends outside the NORC but still nearby, or more distant friends. A direction for future research would be to examine the qualities of those networks, in much the same way as social support researchers have identified facets of traditional social networks (e.g., their structure, breadth, density, functions, etc.). For example, membership in an on-line network of eight individuals, all of whom know one another, may have different implications for well-being than knowing eight

unconnected individuals. The kinds of organic on-line communities frequented by younger individuals (e.g., www.myspace.com, www.facebook.com), in which people are able to see how their friends are connected and invite new people to join their community, may be a resource for encouraging on-line connections among older adults. A virtual community could exist in parallel to the geographic community of a NORC, encouraging contact among neighbors despite frailty, bad weather, or inconsistent access to transportation. At the same time, we should point out that many older adults also use computers to maintain ties with family members. And that communication appears to be both deep (for some people, spanning at least three generations) and broad (including children, grandchildren, siblings, and other family members).

Beyond maintaining social contacts, we learned that residents are using computers for a wide variety of activities, but their use tends to be segregated by function. That is, computer use by some older adults is isolated to noninteractive, pragmatic tasks such as storing information and managing finances. Meanwhile, other older adults appear to use a computer to do research or stay in touch with people, but their use also is relatively narrow. Older adults who take advantage of the broad array of computer functions are rare.

Of course our cross-sectional snapshot could not illuminate evolving patterns of use. An older adult might first get a computer for one use but then add other uses to their repertoire as they grow comfortable with the technology. For instance, a parent receives a computer from their children for e-mailing but then learns to surf the web or store recipes on their own. Another potential interpretation of our results is that older adults use their computer within a narrow range of applications because they are unaware of other ways a computer might benefit them. Without someone to show them the full array of available functions, older users may stay confined to a narrow range of applications. In this case it would be useful to develop educational programs to introduce older adults to the other functions.

Our findings related to perceived barriers to computer use echo the importance of education. One of the most common reasons for underutilization of computers is their perceived complexity. Older adults say they are confused by terminology, uncertain how to navigate around operating systems and applications, concerned about how to resolve problems they encounter, and fearful that they might break a relatively expensive machine. Programs that aim to encourage computer use among older adults need to take into account these training and support needs. It may not be enough to direct users to on-line help features. Even in-person support may need to be available at a more intense level of frequency and accessibility. Diffusion theory suggests that perceptions of the technology are critical in influencing technology adoption, and our results suggest that older adults may be wary of how computers work and insecure about their own competence to master the machine. Consequently, programs that try to encourage computer use need to address these concerns.

Our experience with these data also has made clear the need for longitudinal studies that examine the evolution of computer use and the idiosyncratic process of technology adoption, which could inform how programs can anticipate problems that might leave older adults frustrated and less likely to return to the keyboard. Older adults also mention functional impediments and security concerns, which could themselves be addressed with adequate equipment and training. The issue of cost is more problematic. One option is to make sure older adults are aware of low-cost computers that may be more limited in some respects (e.g., speed, storage capacity) but that offer the basic functions most desirable to

older adults. Another option is to make computers available to older adults in public locations, such as libraries, senior centers, and other gathering places. That option raises additional complications (e.g., transportation to these sites), however, that may undermine potential benefits.

4.1. Practical implications for program development

Service providers who see the benefits of computers for older adults and want to encourage computer use are likely to face a number of significant, but not insurmountable, obstacles. Many could be addressed by creative marketing and education that addresses older adults' preconceived ideas about computers. Our first suggestion is to help older adults learn all the ways that computers might be put to use in improving their lives. We suspect that some older adults are "voluntary non-users" because they really have no interest in computers, while others do not use computers because they are not aware what the technology can do for them. Describing functions in simple language, in terms of the needs that older adults have, would be most effective. The dimensions that appeared on our multidimensional scaling would be one framework for organizing a list of functions.

The second critical issue is adequate training. By "adequate" we mean training that is patient, paced, jargon free, accessible (e.g., on call), and long term. Training needs to address anxiety about using what older adults think of as a complicated, delicate machine. Training also needs to empower older users to feel confident in their ability to problem solve when they reach a roadblock or unexpected result. Making use of peer trainers would seem to offer benefits to both student and teacher, although intergenerational training has its own benefits, such as reducing bidirectional age stereotypes. Training also could focus on adapting the technology to make it easy to use, by taking advantage of larger fonts, high contrast lettering, specialized keyboards and mousing equipment, video applications, and voice recognition software.

The third issue is financial. While the cost of computer technology has been consistently decreasing, the cost of Internet access has not. Therefore, access remains a problem. We also learned that a sizeable number of older adults are living in homes where they could not fit a computer, even if they could afford one. One solution is to place computers in public spaces. Senior centers are one obvious location, but perhaps an even more useful place would be in the apartment or condominium common rooms or lobbies, which already tend to be gathering places for more frail residents. Competition for the equipment may then become an issue, but people waiting to use the computer might be able to provide technical assistance.

Finally, we recommend taking the time to understand what each individual user thinks about the computer (what it can be used for), about themselves as a user (perceived technology efficacy), and their history of computer use, which can be informative when determining what features and functions an older adult is ready to adopt next in their computer education.

5. Summary

Computers will play a role in the lives of older adults in generations to come, but the challenge now is to get the current cohort to use the technology in ways that can enhance

their quality of life. Barriers to use are contextual, ideological, and practical, but not impossible to overcome, given well designed education and training. The key is to develop programs and services that emerge from older adults' own concerns, wishes, and capabilities.

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