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Enhancing the Attitudes and Self-Efficacy of Older Adults Toward Computers and the Internet: Results of a Pilot Study

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Abstract

This pilot study explored whether a manualized computer and Internet training program could enhance older adults' computer self-efficacy and attitudes toward computers and the Internet. A total of 32 community-dwelling adults 65 years of age or older were randomly assigned to either an experimental or control group, with each group consisting of 8 women and 8 men. The experimental group received 6 weeks of training with 2-hour one-on-one sessions once per week. The same training was administered to the control group upon completion of the post-test, 6 weeks after the baseline assessment, to match the procedures on all counts with the exception of training administration. The results of two ANCOVAs indicated that participants within the experimental group improved significantly on both their computer self-efficacy ($p < .001$) and attitudinal scores ($p < .001$) at the post-training assessment. No improvements were found in the control group.

Keywords

Internet; computer; older adults; training; intervention; attitudes; self-efficacy

Internet use has become commonplace, but not necessarily among seniors. Older adults are generally able to use computers and the Internet, albeit not free of user difficulty. Indeed, seniors typically struggle with a greater number of user errors, require a greater amount of assistance, and consume more time accomplishing their goals on the computer than their younger counterparts (Charness & Bosman, 1992; Czaja, Sharit, Ownby, Roth, & Nair, 2001). During the 1990s, a low 3 to 5 % of people over the age of 65 were using the Internet (Cortese, 1997; Miller, 1996). In 2002, a still low 29.8% of this population reported ever using a computer (National Opinion Research Center, 2002). Learning the basics of computer operation enables seniors to prepare letters and myriad other documents for rapid distribution. Additionally, this vehicle allows them to engage in numerous activities and tasks online including socialization, shopping, money management, and health education (Henke, 1999).

The main objectives of the current study were to provide older adults with a successful, one-on-one computer training experience that would enable them to e-mail independently (i.e., the behavioral outcome variable) while cultivating an increased sense of computer self-efficacy and more positive attitudes toward computers and the Internet (i.e., the two psychological outcome variables). Computer self-efficacy and positive attitudes toward this technology are critical factors in the development of computer literacy (Delcourt & Kinzie, 1993). Both the social learning theory and the attitude theory supported the aims of this study. According to the social learning theory (Bandura, 1977a), the self-belief of older adults in their own capability to perform unfamiliar tasks, such as computer and Internet use, is critical to their

success with such endeavors. The self-confidence to perform needed skills effectively is far different from simply possessing the skills to perform a required task (Bandura, 1997b). In particular, computer self-efficacy refers to self-perceived competence and confidence in learning computer technology (Christian, 2000). Theorists have posited that attitudes are acquired through experience and can be changed as related experiences increase in number (Fishbein & Ajzen, 1975; McGuire, 1985). Computer training appears to positively affect seniors' attitudes toward computer instruction (McNeely, 1991) and intentions to use computers in the future (Eilers, 1989).

A few studies have investigated the effects of training on computer self-efficacy; however, it appears that none have been conducted with geriatric populations. Following an introductory computer course, Torkzadeh, Pflughoeft, and Hall (1999) found that participating business undergraduates exhibited enhanced computer self-efficacy. Another study, focused on African-American college students, administered the same measure as this current research – the Computer User Self-Efficacy Scale (Cassidy & Eachus, 2002) – and found that scores increased as students acquired computer experience. However, this outcome was only evident in participants with lower levels of computer experience (Christian, 2000). Research also shows that the attitudes of older adults toward computer technology can be successfully manipulated through training that provides direct and positive computer experience (Charness, Schumann, & Boritz, 1992; Danowski & Sacks, 1980; Dyck & Smither, 1994). Brief training sessions were found to be effective at such attitudinal enhancement (Jay & Willis, 1992; Morrell, Park, Mayhorn, & Echt, 1996). Within a nursing home setting, older adults exhibited not only improved attitudes toward computer use upon completion of training, but also a gradual progression in their functional skill levels (Groves & Slack, 1994). Furthermore, Kelley, Morrell, Park, and Mayhorn (1999) found that brief training on the ELDERCOMM, an electronic bulletin-board system, resulted in marked improvements in the perceptions of computers previously held by participating seniors.

Unfortunately, as they are witnessing others using the computer and the Internet, many older adults continue to avoid personal use of these technologies. Their alienation from the computer-based activities often enjoyed by younger cohorts is now likely to have significant effects on their quality of life. Many seniors interested in learning how to use computers and the Internet must master basic computer skills with no formal training via documented instructions designed for much younger populations (Morrell & Echt, 1996, 1997). In contrast, the educational intervention presented in this study was developed with consideration to relevant theoretical approaches within cognitive aging research. This was done to counteract possible age-related challenges including cognitive slowing (Salthouse, 1996), limited processing resources (Craik, 1986; Craik & Jennings, 1992), lack of inhibition (Hasher & Zacks, 1988; Zacks & Hasher, 1994), and sensory deficits (Baltes & Lindenberger, 1997; Fozard, 1990). The aforementioned factors were also considered in the development of the training manual as well as the intervention protocol and research procedures, to remain sensitive to the needs of older adults. The one-on-one instructional format is a unique feature that was spurred by the vast majority of the published research that instead employed a group-instruction format. Although much more economical, older adults do not typically prefer group instruction, as reported by the participants of the present study. Consequently, seniors will undoubtedly favor the attention and dedication of a personal trainer over group training.

Method

Research Design and Sample Population

The current study employed a randomized controlled design, with eligible participants randomly assigned to either the experimental or the “waitlist” group, both of which consisting of the same number of men and women. Those assigned to the latter group received computer

and Internet training upon completion of their follow-up assessment. The training program targeted positive changes in the two dependent variables – computer attitudes and self-efficacy. Upon completion of the training, controlling for baseline scores on these two variables, the intervention was expected to produce a positive psychological impact, conceptualized herein as significantly greater computer self-efficacy and attitudes than reported prior to the study training. Additionally, once all 6 training sessions were successfully completed, participants within the experimental group were expected to be able to send an e-mail independently, i.e., without assistance from their personal trainer/research assistant (RA). The positive changes were hypothesized to take place only for those participants who received the training; no improvements were expected in computer self-efficacy and attitudes toward computer technology for those in the control group.

The 32 participants in this study were 65 years of age and older, 16 men and 16 women, with 8 men and 8 women per group. Both convenience and snowball sampling procedures were employed, which involved recruitment through community contacts and advertising at strategic locations such as senior centers, meal-support programs, and apartment complexes for seniors (i.e., subsidized or unsubsidized). Data collection took place within Los Angeles County, primarily in the densely populated San Fernando Valley.

All of the following criteria needed to be met for participation in the study: 1. Sixty-five years of age or older; 2. Fluency in the English language; 3. Computer ownership or full access; and 4. For the experimental participants only, the ability and willingness to attend the 6 sessions of the one-on-one training. Criteria for exclusion from the study included any of the following: 1. Residence within an institutional setting; and 2. Inability to provide informed consent (to optimize the chances to obtain a cognitively high-functioning sample); as well as 3. Current ability to use computers, the Internet, and/or e-mail. No monetary compensation was awarded for participation in this study; however, as noted earlier, all within the total sample eventually participated in 6 one-on-one computer and Internet training sessions at no cost.

Procedures

Informed consent was obtained from each research participant prior to inclusion in the study. Training was conducted on an individual basis for 6 weeks with a desktop computer (i.e., 2 hours, one day per week). The study participants chose locations for the training sessions that were easily accessible to them such as a University Campus and local libraries.

Several RAs were extensively trained as personal computer trainers for the study participants. For quality assessment purposes, fidelity to the intervention was monitored by asking the assistants to maintain a detailed diary of the training experience while in the field and to record any noted anomalies or deviations from the manualized instructions. All RAs were strongly discouraged against deviation from the manual provided.

One-on-one assessment of all participants was conducted by each RA first at baseline. Administration of all paper-and-pencil measures listed below occurred upon determining eligibility via the first short tool that covered all inclusion and exclusion criteria. Participants within the experimental group were tested before and after 6 weeks of computer and Internet training. The waitlisted older adults were also assessed twice, before and after a 6-week period – but received no training until after their completion of the follow-up assessment. All participants were re-tested solely on the two psychological outcome measures. Experimental seniors were also asked to send an e-mail to their trainer without assistance (in his or her presence), as part of their final assessment following training. The trainers maintained a record identifying those trainees who accomplished this goal; all participants within the experimental group fulfilled this task.

Upon completion of the follow-up assessment, experimental participants met individually with their respective trainers for a debriefing interview of 5 to 10 minutes in duration. The interviewees were asked to (a) comment on the aspects of the intervention that they found either helpful or unhelpful, and (b) provide recommendations on how the intervention could be improved to better address their needs.

The development of the educational intervention presented in this study was based upon a review of related literature. The RAs followed an original training manual (developed by the author) that was tailored for use with older populations. Its creation was empirically grounded in the research findings of cognitive aging research focused on optimal computer and Internet training of older adults (Baltes & Lindenberger, 1997; Craik, 1986; Craik & Jennings, 1992; Fozard, 1990; Hasher & Zacks, 1988; Jones & Bayen, 1998; Salthouse, 1996; Zacks & Hasher, 1994). The manual contained instructions on many relevant training issues such as how to introduce such training to older adults; make arrangements for the assessment sessions; provide training at a pace appropriate to the unique needs of older adults; use the “Glossary of Computer Terms” within the manual; as well as how to teach trainees to effectively use software to write letters and messages, send e-mails, “surf” the Internet on topics of interest, and engage in interactional activities on the Web. Individualized instruction from the manual was scheduled to last 6 weeks, with each participant assigned the same trainer throughout the project. The role of the RAs was to facilitate learning of computer and Internet concepts and skills as they were introduced to each participant within the experimental group. The emphasis was placed on allowing each trainee to learn in his or her own way, while concurrently following the manual and remaining within the 6-session training model.

Measures

Inventory of Demographics and Internet-Related Variables—This original short tool assesses age, ethnic background, education, and income. It was used to determine research eligibility in addition to gathering demographic information, verifying, among other factors, prior computer experience, ability to send e-mail and computer ownership or full access. Only those with full access to a computer were included in the study.

Extremely minimal computer experience (e.g., having witnessed people using the computer) was allowed for research participation because computer ownership or full access was an important variable to guarantee equipment availability for continued use. The ability to e-mail or use the Internet, however, was not allowed to avoid confounding the outcomes of the intervention. The items of the tool assessing prior computer and Internet experience were kindly contributed by Morrell (personal communication, April 16, 2000), the author of many of the studies cited in the literature review. If an older adult qualified for participation in the study, the RA continued the assessment procedure by administering the two tools described below, i.e., the Computer User Self-Efficacy Scale and the Older Adults' Attitudes toward Computers and the Internet. An e-mail task was also assigned upon training completion if the respective participant was in the experimental group.

Computer User Self-Efficacy Scale—This scale assesses computer-self-efficacy (Cassidy & Eachus, 2002) by operationalizing three separate dimensions of self-efficacy – learning, confidence, and competence (Christian, 2000). This 30-item measure asks research participants to indicate their level of agreement or disagreement with each statement on a 6-point Likert scale. Cronbach's alpha for the instrument has been measured at .97 and test-retest reliability at .86 (Cassidy & Eachus, 2002). No revisions were necessary to adapt this tool for use with the sample of the current study, with the exception of the elimination of an introductory item (not included in the main body of the scale) requesting the specific course number(s) of the computer class(es) attended in college. Although this instrument has been previously used

in research conducted by Cassidy and Eachus, to the author's knowledge, the present investigation provides the first administration of the tool to a geriatric population, rendering this part of the research particularly innovative.

Older Adults' Attitudes toward Computers and the Internet—A new measure, created by the author specifically for this study, was entitled “Older Adults' Attitudes toward Computers and the Internet”. The testing of this instrument in the current research represents an original contribution to the psychometric literature within this field of study. The development of this measure adhered to the theoretical guidelines of dimensional analysis (Robrecht, 1995; Schatzman, 1991). The tool contains 22 items, with responses to each item coded on a 7-point Likert-type scale ranging from *strongly disagree* to *strongly agree*. It effectively facilitates investigation into a variety of aspects of seniors' possible reluctance to accept, learn, and use computer technology. To the author's knowledge, the development of an attitudinal scale tailored to the specific needs of this neglected research population is the first of its kind. Based upon relevant literature not discussed herein due to space limitations (e.g., Baltes & Lindenberger, 1997; Craik, 1986; Craik & Jennings, 1992; Fozard, 1990), this measure includes items assessing domains likely to be pertinent to seniors' attitudes toward computers and the Internet, i.e., computer manageability, affordability, attraction, and usefulness, as well as willingness to use computer and Internet technology in the future. Computer manageability in particular is thoroughly assessed via the instrument, with items investigating the comfort factor surrounding use of the computer mouse, keyboard, and screen. Another area of assessment covered by this tool is how older adults perceive e-mailing versus more familiar means of communication. Particular attention was given to minimizing the conceptual overlap of this measure with the computer self-efficacy tool.

E-mail task—This task was assigned upon completion of training within the experimental group. It was designed as a simple assignment to ascertain trainees' acquisition of basic computer and Internet skills and was scheduled to be completed at the end of the 6-week training. Each experimental participant was asked to perform the e-mail task with no guidance from his or her trainer. The content of the e-mail was an acknowledgement of having learned how to use the computer and the Internet. This simple educational outcome measure provided information clearly relative to the successful acquisition of basic computer and Internet skills.

Results

Table 1 illustrates the demographic characteristics of the sample in this study. The median age was 70. Approximately 3% of the participants self-identified as Black/African-American, 9.4% as Asian-American, 12.6% as Hispanic-American, 16% as Middle-Eastern, 21.5% as having a mixed ethnic background, and 37.5% as European-American. Approximately 44% of the sample reported high school as the highest level of education. Over one-third of the participants (37.4%) earned an annual income below \$20,000. Computer ownership was reported by 46.7% of the sample. Less than 10% of the 32 participants reported *very limited* computer experience, primarily in the form of witnessing its use by another individual. Conversely, over 90% of the sample had never used a computer, not even simply turned it on or off and, as dictated by the exclusion criteria, no research participant had any prior Internet experience. The extremely limited computer experience of three participants was not deemed significant enough to confound the research findings.

Preliminary data analyses tested the reliability of the new tool (i.e., the Older Adults' Attitudes toward Computers and the Internet) as a measure of attitudes toward the technology under study in the target population. The results indicated high internal consistency ($\alpha = .88$) and the test-retest Pearson correlation coefficient was $r = .87$. At pre-test, no significant between-group, pre-intervention differences were detected on either dependent variable, attesting to the

equivalence of the two groups on these critical factors. Table 2 displays the means and standard deviations of the two psychological outcome variables for the experimental and the waitlist groups, both at baseline and after 6 weeks (i.e., the training duration for the experimental participants). Two Analyses of Covariance (ANCOVAs), one per dependent variable, were performed to assess whether the training induced positive changes in the scores of experimental participants on the two measures. The baseline scores on each tool were entered as covariates. As predicted, from baseline to post-test, significant group differences were found on computer self-efficacy, $F(1,29) = 26.07, p < .001$; Partial $\eta^2 = .47$, and on attitudes toward computers and the Internet, $F(1,29) = 124.24, p < .001$; Partial $\eta^2 = .81$.

Discussion

After 6 weeks, participants within the control group did not exhibit significant change on either outcome variable. In support of the strength of the proposed intervention, experimental participants showed a significant difference in their attitudes toward the technology under study and in their computer self-efficacy following training. The findings of this research corroborate those reported by Charness and colleagues (1992), Danowski and Sacks (1980), and Dyck and Smither (1994) in regard to the positive impact of computer training on the attitudes of older adults toward computers and the Internet. Most of the published studies in this area implemented a group learning format, unlike the one-on-one intervention administered in the current research. The findings also corroborate those of Christian (2000) and Torkzadeh and colleagues (1999) on the feasibility of successfully manipulating computer self-efficacy through appropriate training. This study's outcome relative to computer self-efficacy extends those prior findings on younger populations to older adults.

It is noteworthy that, although approximately 50% of the sample in this research owned a computer, a low 10% reported very limited computer experience. Their minimal experience was acquired either because they resided in homes where other individuals owned computer and they witnessed the use, or they had purchased or were given computer equipment that they never used. This finding highlights the necessity to provide this type of training to older adults. Overall, the present research achieved promising results on both the reliability of the new attitude tool it introduced and on the feasibility of this intervention. However, several limitations are evident. The small size of the sample and related minimal statistical power do not allow for generalizability of the findings. Ideally, computers would have been provided to all research participants, including the controls (upon completion of the post-test session), to ensure equipment accessibility to all seniors by the end of the study. However, the cost would have been prohibitive, especially given the preliminary nature of this study. Had this been feasible, the recruitment requirement of "computer ownership" or "full access" could have been avoided, which served only to ensure that the research team was teaching computer technology to seniors who had access to the equipment in question, yet were still unfamiliar with it. This requirement strongly limited the sample size; it was difficult to locate seniors who qualified for study participation, since many older adults with computer access already possessed basic computer skills enabling Internet use. Additionally, the control group did not receive 2 hours of attention on a weekly basis, as did the experimental group. Consequently, it may be possible that the improvements demonstrated by the experimental seniors could have also been due to the additional attention in general. Moreover, due to the small sample size, not all ethnic/racial groups were represented; for instance, the sample was void of American-Indian participants. Furthermore, this research did not investigate important potential predictors of the two dependent variables such as physical or cognitive functioning. However, all seniors recruited appeared to be cognitively high-functioning, as reported by the RAs. Moreover, the study protocol did not include tracking the possible long-term effects of the training, thereby limiting data analyses to an immediate post-intervention assessment of the two dependent variables.

Future research with a larger sample should dedicate the same amount of weekly attention to both control and experimental groups of seniors. Monitoring changes in the outcome variables over a longer period of time is also recommended, as well as assessing whether trainees eventually become regular Internet users. Frequent use of computers and the Internet could be related to improvements in other areas such as mental health. The findings of this preliminary study should be viewed in light of the multiple methodological limitations described and the need for replication with more sizable samples. Nonetheless, the results are positive and provide further support for the need to implement one-on-one educational interventions of this kind with the goal of improving seniors' attitudes toward computer and Internet use, as well as self-confidence in their ability to successfully adopt computer and Internet technology. The next step could be the investigation of more clinically relevant outcome variables, such as the possible mental health benefits of such one-on-one educational programs.

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Table 1

Characteristics of the Sample (N = 32).

<i>Variable</i>	<i>Median</i>	<i>Percentage of Sample</i>
Age	70	
Ethnicity		
European–American		37.4
Hispanic–American		12.6
Middle–Eastern		16.0
Asian–American		9.4
African–American		3.1
Mixed Ethnicity		
Education		
Less than high school		9.4
Graduated from high school		34.4
Completed trade school		3.1
Some college		21.9
Bachelor's degree		18.8
Some graduate school		6.3
Master's degree		3.1
Ph.D., M.D., and/or J.D.		3.0
Household income		
Less than \$ 20,000		37.5
\$20,000–\$39,999		21.9
\$40,000 and above		34.4
No response		6.2
Computer ownership		
Yes		46.7
No		53.3
Computer experience		
Very limited		9.4
None		90.6

Table 2

Means and Standard Deviations (in parentheses) of Baseline and Post-Test Scores on the Two Outcome Variables for Intervention and Control Groups.

Attitudes toward Computers and the Internet			Computer Self-Efficacy	
Time of Assessment	Baseline	Post-Test	Baseline	Post-Test
Experimental Group	-9.19 (16.53)	14.06 (15.79)	76.19 (22.19)	108.94 (23.44)
Control/Waitlist Group	-8.00 (28.27)	-7.00 (29.12)	78.63 (37.45)	80.94 (38.54)