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Public library computer training for older adults to access high-quality Internet health information

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Abstract

An innovative experiment to develop and evaluate a public library computer training program to teach older adults to access and use high-quality Internet health information involved a productive collaboration among public libraries, the National Institute on Aging and the National Library of Medicine of the National Institutes of Health (NIH), and a Library and Information Science (LIS) academic program at a state university. One hundred and thirty-one older adults aged 54–89 participated in the study between September 2007 and July 2008. Key findings include: a) participants had overwhelmingly positive perceptions of the training program; b) after learning about two NIH websites (http://nihseniorhealth.gov and http://medlineplus.gov) from the training, many participants started using these online resources to find high quality health and medical information and, further, to guide their decision-making regarding a health- or medically-related matter; and c) computer anxiety significantly decreased ($p < .001$) while computer interest and efficacy significantly increased ($p = .001$ and $p < .001$, respectively) from pre- to post-training, suggesting statistically significant improvements in computer attitudes between pre- and post-training. The findings have implications for public libraries, LIS academic programs, and other organizations interested in providing similar programs in their communities.

1. Introduction

The American population is aging rapidly. By July 2008, approximately 38.7 million Americans were age 65 or older, accounting for 12.7% of the total U.S. population (Central Intelligence Agency, 2008). In 2011, the baby-boom generation will begin to turn 65. It is projected that by 2030, one in five, or 70 million people in the United States will be age 65 or older (U.S. Census Bureau, 2000). The aging of the population presents serious challenges for public libraries, in that older adult patrons tend to have different information needs and preferences than their younger counterparts. In particular, older adults typically have a greater need than younger adults for health and medical information. Yet, older adults' health literacy, or "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (U.S. Department of Health and Human Services, 2000), is also the lowest among all American adult

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age groups, and only 3 percent of older adults have proficient health literacy (Kutner, Greenberg, Jin, & Paulsen, 2006).

The Internet holds great potential for helping individuals access health information and services and thus improving health literacy (Fox, 2006). In recent years, as government agencies like the National Institutes of Health (NIH) are increasingly putting health information and services online, the Internet has already become an important source of such information (Bylund, Sabee, Imes, & Sanford, 2007; Fox, 2007; Huntington, Nicholas, Jamali, & Russell, 2007). Unfortunately, older adults are at risk of being left behind, given that their general adoption of the Internet still lags behind other age groups (Fox & Madden, 2005). In particular, while the potential of the Internet in meeting health information needs has begun to be realized by some older adults (Fox, 2005, 2006; Kaiser Family Foundation, 2005), the overall percentage of older adults taking advantage of the Internet for health-related purposes lags behind younger age groups (Bundorf, Wagner, Singer, & Baker, 2006; Fox, 2006). Even among the small number of older adults who are beginning to use the Internet for health information, the majority lack sophisticated online search skills and strategies that can help them to make maximal use of online resources (Fox, 2006; Xie, 2008). The situation is even worse among older adults who have lower incomes and/or belong to ethnic minority groups, who typically cannot afford to have computer equipment and Internet access at home and lack opportunities to learn to use the technology (Brodie et al., 2000; Carlson et al., 2006; Fox, 2005, 2006).

For several reasons (Xie & Jaeger, 2008), public libraries have the potential to be an ideal site for providing both Internet access and training for older adults including those who are socially and economically disadvantaged. First, the mission of public libraries is to provide free or low-cost services to meet the information needs of the public. Second, public libraries are typically located in every community and their locations are often accessible using public transportations. And third, the vast majority of American public libraries already have the necessary computer and Internet infrastructure in place (Bertot, Jaeger, McClure, & Ryan, 2006).

2. Problem statement

These converging trends all point to a need for effective interventions that can help older adults to learn necessary online health information seeking skills and strategies so that they can truly take advantage of the rich – and rapidly growing – online health information resources. The American Library Association (ALA) recognizes the challenges of the aging population and the special needs and preferences of older adult patrons, and has developed the "Guidelines for Library and Information Services to Older Adults" to promote better library services for older adults (ALA, 2008). In particular, theALA Guidelines (2008) takes into consideration the widespread adoption of computer technology in American libraries and individuals' daily lives, and explicitly asks that libraries should "consider providing computer and Internet courses specifically designed for older adults" to accommodate age-associated changes in cognitive, physical, and sensory abilities (Guideline 5.7, p. 211). While these general guidelines can be useful in helping library administrators to see the big picture, still, more specific, exemplary programs along the lines of these general guidelines will need to be developed to help libraries better adhere to these general guidelines.

Public libraries need to address both the health "illiteracy" problem of the older population and the generational digital divide; yet, they have limited resources. To date most public libraries simply provide *access* to computers and the Internet, primarily due to lack of sufficient staff to provide computer training for patrons (Bertot et al., 2006). A promising approach to address these problems is to develop innovative programs that organically integrate and maximize the resources and expertise of local, state, and national organizations. This paper reports such an

innovative program, which involves strategic and productive collaboration among public libraries, senior centers, the National Institute on Aging (NIA) and the National Library of Medicine (NLM) of the NIH, and a LIS academic program at a state university – the University of Maryland. This innovative program can be easily adapted to other communities, thus providing a valuable new approach to integrate Library and Information Science (LIS) research, education, and practice to improve the health and computer literacy of the rapidly aging population in the nation.

3. Research questions (RQs) and hypotheses (Hs)

The present study examined the following key research questions (RQs):

RQ1: What are older adults' perceptions of a public library computer training program specifically designed for older adults (key features of this program will be described in detail in the following section)?

RQ2: To what extent do older adults use the two NIH websites (http://nihseniorhealth.gov and http://medlineplus.gov) that they have learned from the training to find health and medical information and to guide their decision making regarding a health- or medically-related matter?

RQ3: Are there differences in older adults' attitudes toward computers (including computer anxiety, interest, and self-efficacy) before and after the training?

Two hypotheses (Hs) were developed and tested in connection with RQ3:

H1: Computer anxiety decreases from pre- to post-training

H2: Computer interest and efficacy increase from pre- to post-training

4. Literature review

Research has generated substantial evidence that, due to age-related changes in sensory, psychomotor, and cognitive abilities (Birren & Warner, 1990), older computer learners typically make more errors than their younger counterparts when performing computer tasks (Charness, Schumann, & Boritz, 1992; Elias, Elias, Robbins, & Gage, 1987; Zandri & Charness, 1989), and require more time, practice, and technical assistance to acquire computer skills (Charness & Bosman, 1990; Charness et al., 1992; Czaja, Hammond, Blascovich, & Swede, 1989; Elias et al., 1987; Hartley, Hartley, & Johnson, 1983; Morrell, Park, Mayhorn, & Kelley, 2000; Zandri & Charness, 1989).

Lack of age-appropriate computer training has consistently been identified as a major obstacle to older adults' learning and use of computers and the Internet (Eilers, 1989; Morrell, Mayhorn, & Bennett, 2000; Namazi & McClintic, 2003; Opalinski, 2001; Saunders, 2004). Age-appropriate training is of critical importance to older adults' IT adoption because there is rich evidence that, while age-related changes have negative effects on technology learning (Czaja et al., 2006), these negative effects can be at least partly compensated for through training materials (Echt, Morrell, & Park, 1998; Morrell & Park, 1993; Morrell, Park et al., 2000; Palmiter & Elkerton, 1993) and training methods (Charness et al., 1992; Czaja & Drury, 1981; Czaja et al., 1989; Gist, Rosen, & Schwoerer, 1988) designed to accommodate age-related changes. In fact, there is empirical evidence that the success of a computer training program for older adults is primarily determined by the quality of the design of a training program (that is, how well the training accommodates the special needs and preferences of older adults), rather than age or personality (Charness et al., 1992; Hollis-Sawyer & Sterns, 1999).

Research to date has identified a few general principles that can be used to guide the design of successful computer training programs for older adults. In particular, it is important to promote computer self-efficacy and reduce computer anxiety, as computer self-efficacy and anxiety are important predictors of older adults' use of technology (Czaja et al., 2006). Also of importance is ensuring the perceived usefulness or personal relevance of the training, which is also predictive of computer use (Bean, 2003; Czaja et al., 2006; Selwyn, 2004). Specific recommendations along the lines of these general principles have also been identified. These include:

- providing step-by-step, detailed instructions (Mayhorn, Stronge, McLaughlin, & Rogers, 2004);
- providing hands-on practice (Van Fleet & Antell, 2002)
- using instructor- or video-based instead of online manual-based training (Czaja et al., 1989; Gist et al., 1988);
- providing assistance from a trained demonstrator (Danowski & Sacks, 1980);
- encouraging questions (Van Fleet & Antell, 2002);
- providing multiple sources of instruction and assistance including class presentations, individual lessons, functional "cue cards," manuals, expert peers, and periodic meeting (K. L. Bikson & Bikson, 2001;T. K. Bikson, Goodchilds, Huddy, Eveland, & Schneider, 1991; Hahm & Bikson, 1989);
- avoiding technical jargon (Mayhorn et al., 2004);
- providing self-paced, self-directed training (Charness, Kelley, Bosman, & Mottram, 2001; Van Fleet & Antell, 2002);
- using a small group setting instead of a large group or individual setting (Danowski & Sacks, 1980);
- dividing and organizing training materials into well-defined units where each lesson builds on previous lessons and increases complexity gradually to allow for gradual expansion of knowledge and skills (Jay & Willis, 1992; Mayhorn et al., 2004);
- ensuring that trainees experience at least some level of success at the initial stage of the training (Cody, Dunn, Hoppin, & Wendt, 1999; Czaja et al., 2006; Mayhorn et al., 2004);
- keeping each training unit/session relatively brief to avoid information overload (Mayhorn et al., 2004);
- creating a supportive environment (Edwards & Engelhardt, 1989);
- holding meetings in a familiar and relaxed environment (Czaja et al., 2006; Jay & Willis, 1992)
- offering the training in early morning hours, which are generally the optimal time of day for older learners (Bean, 2003);
- providing continuous training over an extended period of time (Xie, 2007c).

There are, however, conflicting findings inviting further examination of these recommendations (Hickman, Rogers, & Fisk, 2007). One particular contradictory issue is whether computer training for older adults should be self directed or instructor directed. Self-directed learning involves self-pacing with no or minimum interaction with/assistance from others such as an instructor or peers. Supposedly, this learning method involves more active participation of the trainees in the training process. General adult learning theories suggest that

self-directed learning is the only option that fully accommodates individual differences in learning abilities and thus is more effective than the conventional instructor-based learning that features less active participation of the trainees (Belbin & Belin, 1972; Kinsbourne & Berryhill, 1972). Empirical research on older adults' computer learning provides supporting evidence: active learning that actively engages trainees in the learning process through hands-on practice, self-directed learning, or discovery-oriented/problem-solving exercise has been shown to be more effective than the conventional, instructor-based learning (Charness et al., 1992; Jay & Willis, 1992; Cody et al., 1999; Mayhorn et al., 2004; Czaja & Drury, 1981; Gist et al., 1988; Callahan, Kiker & Cross, 2003).

Yet there is also evidence that instructor-based training benefits older adult learners as well. A meta-analysis finds significant correlation between observed older learner training performance and each of the three instructional methods: lecture, modeling, and active participation. Further, each instructional method contributes independently of the other methods to explain observed performance (Callahan et al., 2003). The potential benefit of learning from an instructor becomes even more prominent when including not only task performance but also social relationships and individual well-being as outcome measures. As a natural result of older adult computer training (which generally take place in a face-to-face setting), older learners have opportunities to interact and socialize with the instructor as well as other older learners (Xie, 2006; 2007a; 2007b; 2007c). In doing so, older adults can develop meaningful social relationships that are important for their well-being. Although the benefits of this type of social relationship have not yet received much attention, there is preliminary evidence (which was not expected by the researchers who conducted these studies) that social interactions that occur during the computer training process may have partly contributed to the observed positive association between training and the well-being of older adults (Billipp, 2001; Bradley & Poppen, 2003; Eilers, 1989; Karavidas, Lim, & Katsikas, 2005; White et al., 2002). Some researchers even argue that it may not be the computer training per se but rather the social interaction that occurs during the training process that has contributed to improved well-being (Dickinson & Gregor, 2006).

In short, the relative benefits of different training strategies (e.g., self- or instructor-directed) may be at least partly dependent on the outcome measures (Hickman et al., 2007). Perhaps the best approach is to use multiple training strategies (Callahan et al., 2003) and multiple outcome measures simultaneously (Prince, 2004) to try to find a technique combination that can maximize training effects on a broad range of outcomes.

5. Research setting

The existing literature on computer training for older adults inspired the development of the training program used in the present study, as is detailed further in the Procedure section below. Particularly important was the inclusion of the following key features:

- The computer classes took place in a supportive, familiar, and relaxed environment for older adults. This was possible because of a fruitful partnership between an LIS academic program and the public library system in Prince George's (PG) County in Maryland (the PG County Memorial Library System). Graduate students in the Master of Library Science (MLS) program in the College of Information Studies at the University of Maryland served as instructors and assistant instructors of the computer classes, which greatly helped to reduce the workload on the often significantly understaffed public libraries. Also, these MLS students were trained to be patient, encouraging, and friendly, which helped to create and maintain positive interactions and relationships with older adult trainees. Meanwhile, the Library System provided networked computers, space, and necessary staff support to facilitate the implementation of the training.

- The Library System serves an extremely diverse community with high proportions of ethnic minority older adults: The majority of the population of PG County in Maryland was Black or African-American (65.5 percent). The rest of the population of PG County consisted of 21.6 percent White, 10.9 percent Hispanic or Latino (of any race), 3.8 percent Asian, and 0.4 percent American Indian and Alaska Native (U.S. Census Bureau, 2000). Thus, this study presented a valuable opportunity to reach ethnic minority older adults.
- This study also involved partnering with local senior centers, especially the OASIS Senior Center in PG County in Maryland, which enthusiastically helped to promote this project among their members.
- The training material used in the study was the "Helping Older Adults Search for Health Information Online: A Toolkit for Trainers" (http://nihseniorhealth.gov/toolkit/toolkit.html) developed by the National Institute on Aging (NIA) of NIH. This freely available Toolkit includes detailed lesson plans, interactive in-class exercises, take-home practice exercises, and other supportive handouts (e.g., glossary of computer and Internet terms) designed to help trainers to train older adults at all skill levels to use the NIHSeniorHealth.gov and MedlinePlus.gov websites to find high-quality health information. This toolkit was chosen because it has a number of features that, as recommended in the literature, are conducive to helping promote computer self efficacy and reduce computer anxiety. These include the use of lessons that build upon previous lessons and gradually increase in complexity, thus allowing for gradual expansion of knowledge and skills (Jay & Willis, 1992). Also, during the first two weeks of the training, older adults were taught to use the NIHSeniorHealth.gov site, which was designed with careful consideration for older adults' cognitive, physical, and sensory abilities (Morrell, Dailey, & Rousseau, 2003). Teaching older adults to begin their health information searches with this site ensures that they can experience at least some level of success at the initial stage of the training, which is another important factor that can promote computer self efficacy and reduce computer anxiety (Cody et al., 1999; Czaja et al., 2006; Mayhorn et al., 2004). Health information was deliberately selected as the specific content area of this computer training program in an explicit effort to increase the perceived usefulness of computer technology which is a powerful predictor of technology use (Czaja et al., 2006). Only NIH-developed online health information resources were taught in this program to avoid potential problems associated with the quality of online health information (Childs, 2005; Kunst, Groot, & Latthe, 2002).

6. Method

One hundred and thirty-one older adults (Mean Age=68.9, SD=8.0) participated in this study between September 2007 and July 2008. Seventy-three percent of the participants were female, and 27 percent were male. Eighty-five percent of the participants were native English speakers. Seventy-nine percent of participants drove their own vehicle, 12 percent relied on public transportation, and 2 percent relied on others for transportation. Additional demographic characteristics of the participants are presented in Table 1.

The training material used in this study was the NIA/NIH Toolkit (see the previous section). The pretraining questionnaire measured basic demographics, computer/Internet experience (seven questions measuring the duration and frequency of general computer and Internet use, use of the Internet for health information, and use of the NIHSeniorHealth.gov and MedlinePlus.gov websites), and knowledge about computer/Internet terminology (27 yes/no items measuring familiarity with computer/Internet terms ranging from basic ones like "software" to more advanced ones such as "homepage").

The post-training questionnaire measured satisfaction/evaluation of various aspects of the training (e.g., duration, frequency, length of each session, class size, student/instructor ratio, handouts, hands-on practice); expectations for and views of public libraries; use, usability, and usefulness of the NIHSeniorHealth.gov and MedlinePlus.gov websites; change of health-related behavior (e.g., taking the information found on the two websites learned in the training class to discuss with a health care professional), and self-evaluation of learning outcomes.

Finally, both the pre- and post-training questionnaires measured computer attitudes. Informed by Czaja and colleagues' (2006) study, the 10-item Computer Anxiety Scale (CAS) (Gressard & Loyd, 1986; Loyd & Gressard, 1984; Woodrow, 1991) as well as the efficacy and the interest subscales (five items in each subscale) of the Attitudes Toward Computers Questionnaire (ATCQ; Jay & Willis, 1992) were used in this study. Participants were asked to indicate the degree to which they agreed or disagreed with the 20 statements on a 5-point Likert-type scale with anchors of *strongly agree* to *strongly disagree*. Sample statements include: "Computers do not scare me at all" (CAS); "I know that if I worked hard to learn about computers, I could do well" (efficacy); and "Learning about computers is a worthwhile and necessary subject" (interest).

6.1. Procedure

Initially, older adults were recruited using standard recruiting techniques including advertisements in the Library System's newsletter and local newspapers, and flyers posted in branch libraries of the Library System and other local organizations (e.g., senior centers, community centers). On the recruitment flyers, the phone numbers of the two participating branch libraries were listed, and interested older adults were asked to call the libraries to leave their names and phone numbers. A librarian then passed along this information to the research team. Next, a member of the research team (typically an MLS student) would call people on the waiting list to schedule them into an upcoming training class. Less than two months after the initiation of the training classes, recruitment in this fashion had to be stopped because the research team was getting overwhelming responses that were far greater than what the limited resources of this project could accommodate. Since then, recruitment has simply relied on word of mouth. Even so, there continues to be a long waiting list of interested older adults that could not be scheduled into one of the training classes in a timely fashion, which indicates that there is a great need in this community for this type of computer training.

In Session 1, participants were first asked to sign the consent form (approved by the Institutional Review Board of the University of Maryland) and then to complete the pretraining questionnaire, which typically took no more than 20 minutes. The training began upon completion of the pretraining questionnaire. Each training class met twice a week, two hours each time, for a total of four weeks (thus ensuring more extensive training over a longer period of time that is necessary for older learners). Classes met between 9:00–11:00 am, the optimal learning time of the day for older learners (the libraries were not open to the public until 10 am, thus the class could get the first hour uninterrupted). Class size was small (no more than 7 trainees per class), and instructor/student ratio was high (in addition to the instructor, most classes also had an assistant instructor who walked around the room to make sure that each student followed the instructor correctly). The instructor (and assistant instructor) frequently provided immediate, positive, and useful feedback whenever needed. Each trainee had one computer to work on during each class session. Hands-on practice was emphasized and encouraged throughout the training, and handouts (e.g., in-class exercises, glossary of computer/Internet terms) were provided for each class session. During the last twenty minutes of the last session (Session 8), the post-training questionnaire was administered. Of the 131 participants, 100 completed both the pre- and post-training questionnaire; 31 did not complete the training and thus completed only the pretraining questionnaire.

7. Results

7.1. Participants' experience with and knowledge about computers/Internet

Prior computer/Internet experience: Fifty-three percent of participants had experience with computers, while the rest had no prior experience with computers. Prior computer and Internet experience for those who reported some prior experience with computers is summarized in Table 2. Ninety-two percent of computer users had never used either the NIHSeniorHealth.gov or the MedlinePlus.gov websites.

Knowledge about computer/Internet terms: Fifteen percent of participants reported being unfamiliar with any of the 27 computer/Internet terms including the word "computer"; 24 percent were familiar with fewer than 10 terms; 43 percent with 10–19 terms, and 17 percent with 20–26 terms. Less than 2 percent of participants reported being familiar with all 27 terms.

7.2. Older adults' perceptions of the public library computer-training program

Satisfaction/evaluation of the training: The vast majority of participants thought the two-hour length (79%), twice a week class frequency (81%), class size (85%), and student/instructor ratio (96%) were "just right" while all but two participants wanted each class session to be longer than two hours and meet more than twice a week. This "I want more" message is even more apparent in answers to the question about the four-week duration of the training. While 28 percent of participants thought the duration was "just right," another 68 percent wished the training lasted longer than four weeks. Everyone strongly agreed or agreed that the handouts and hands-on practices had contributed to their learning.

Self-evaluation of learning outcomes: The vast majority of participants strongly agreed or agreed that they had learned a lot from the training (70% and 27%, respectively). The rest neither agreed nor disagreed. One-hundred percent of participants said that they would recommend this course to other older adults.

Expectations for and views of public libraries: Seventy-three percent of participants said they did not expect public libraries to provide this kind of program. Interestingly, almost everyone said that public libraries *should* provide this kind of computer training programs for older adults (99% said yes with 1 percent missing data). In the past, ninety-five percent of participants were not able to get this kind of training from any public library. Almost everyone (98%) said that this program has made him or her have more positive views of public libraries.

7.3. Older adults' use of computer training to find health/medical information and guide health- or medically-related decisions

Finding health/medical information: Participants reported their usage of the NIHSeniorHealth.gov and MedlinePlus.gov websites during the course of the four-week training, and evaluated the usability and usefulness of both websites. For usage, participants were asked how frequently they used each website outside of class to find health and medical information for self or loved ones. For usability, participants were asked about their ability to find needed information from these two sites and ease of use. Participants also rated the usefulness of the two sites. These data are summarized in Table 3.

Health- and medically-related decision making: Seventy-five percent of participants reported that what they had learned from the NIHSeniorHealth.gov and MedlinePlus.gov sites through the training had affected their decision about a health- or medically-related issue, while 25 percent reported no effect in this regard. Almost half (48%) of participants reported that what they had learned through the training had made them change the way they took medicine. Since the start of participating in the training, twenty-one percent of participants had taken the

information learned from the NIHSeniorHealth.gov and MedlinePlus.gov sites to discuss with their healthcare provider at least once. Seventy-six percent of participants said they had not, but plan to or would "probably" do so in the near future.

7.4. Changes in computer attitudes from pre- to post-training

To evaluate changes in computer attitudes from pre- to post-training, we used dependent t-tests to assess changes in computer anxiety, interest, and efficacy for the 100 participants who completed both the pre- and post-training questionnaire (excluding four participants who were missing data on the anxiety scale and three who were missing data on the interest/efficacy scale). This analysis revealed that a) computer anxiety significantly decreased from pre- to post-training, $t(95) = 8.18$, $p < .001$ (Pre = 2.44; Post = 2.03); and b) computer interest and efficacy significantly increased from pre- to post-training: Interest $t(96) = -3.30$, $p = .001$ (Pre = 4.26; Post = 4.40); Efficacy $t(96) = -4.14$, $p < .001$ (Pre = 4.02; Post = 4.25). See Figure 1 below.

The 31 participants who completed only the pretraining questionnaire were not included in this analysis. Independent t-tests comparing participants who completed only the pre-training questionnaire (n = 31) to those who completed both the pre- and post-training questionnaire (n = 100) revealed that there were no statistically significant differences between these two groups in baseline computer anxiety, interest, and/or efficacy measures, nor did they differ in education or health, *p*s > .27. There was a nonsignificant trend for participants who completed both the pre-and post-training questionnaires to be younger than those who completed only the pre-training questionnaire, $p = .08$.

8. Discussion

LIS researchers and practitioners alike have long struggled with how to transfer scientific knowledge effectively and efficiently into feasible practice that can make a real impact on the lives of communities and individuals. The present study addressed this gap between research and practice through use of a public library computer training program for older adults that was developed and implemented via a strategic and productive collaboration among public libraries, senior centers, the NIA and NLM of NIH, and an LIS academic program at a state university. Each participating organization brings something unique and valuable into this collaborative project: The public library system provides the necessary facility, environment, and administrative and staff support; the senior center helps to promote the program, the NIA provides authoritative health information resources; the NLM provides funding; and the LIS academic program provides the vision and human resource through well-trained and dedicated faculty and MLS students.

This collaboration and the resultant computer training program proved effective on several fronts. The strategic choice of collaborating with the PG County public library system provided a valuable opportunity to reach and serve socially, economically, and technologically disadvantaged older adults. As described in the Results section, the majority of participants were older, African American women, with yearly household incomes less than $40,000, who had no or little prior experience with and very limited knowledge about computer technology, rarely used the Internet to find health information, and had never used the NIHSeniorHealth.gov and MedlinePlus.gov websites. Providing health-oriented computer training in this community is a powerful way to improve both the health literacy and computer use of these traditionally underserved patrons. This collaboration also provided new opportunities for MLS students—future librarians—to gain valuable, guided experience working with older adult patrons and experienced public librarians in a real public library setting, while at the same time easing the burden of such a program on the often under-staffed public libraries.

Several findings provide strong support for the popularity of this computer training program among the older adult participants. The vast majority of participants had overwhelmingly positive perceptions of the training, including the class session length, twice a week class frequency, small class size, student/instructor ratio, the handouts, and hands-on practices. Ninety-seven percent of participants reported that they had learned a lot from the training. Most of the participants also expressed strong desires for wanting to have more of this training, further illustrating the needs for providing this type of computer training. The length of the waiting list for this program, despite the cessation of formal recruitment methods, is also a testament to the success of the training and the positive response of participants, as recruitment has largely relied solely on word of mouth after the first few weeks. Interestingly, while most participants did not expect public libraries to provide this kind of training and in the past were not able to get such training from any public library, almost everyone said that public libraries should provide this kind of training program for older adults, and that this program has indeed made them have more positive views of public libraries.

The training was also useful to the participants. During the course of the four-week training, most participants used the NIHSeniorHealth.gov and MedlinePlus.gov websites at least twice outside of the training sessions to look for health information for oneself or a loved one, and had found these two sites both useful and easy to use. Most impressively, most participants reported that what they had learned from the training had affected their health-related decisions or behavior. As a further indication of behavioral changes, a notable minority of these participants (21%) reported that, since the start of participating in the training, they had already taken the information learned from the training to discuss with their health care provider at least once. Considering that the training lasted for just four weeks, during which time many participants did not have any doctor's appointments, it is likely that an even higher percentage of participants would use the information learned in the training to participate more actively in their own healthcare in the future. In fact, another 76 percent of participants indicated that they did plan to or "probably" would do so in the near future.

These findings suggest that the computer training program developed in this study may have important implications for everyday life and health and medical decision making. In particular, while a few decades ago patients were expected to be passive recipients of medical care, expecting doctors to make all of the decisions, patients are now encouraged to stay well informed and to play a more active role in their own medical care decision-making (Ballard-Reisch, 1990; McNutt, 2004). Being able to access high quality health information and use it to participate in one's own healthcare is an important component of assisting older adults with the transition from a provider-centered to a more participatory approach to healthcare and, as such, empowers these older adults (Ballard-Reisch, 1990; Brody, 1980; Jones & Phillips, 1988; McNutt, 2004).

Research suggests that computer self-efficacy is an important predictor of older adults' use of technology: People with lower computer self-efficacy are less likely than those with higher computer self-efficacy to use the technology (Czaja et al., 2006). The effects of computer self-efficacy are mediated by computer anxiety, which is directly linked to computer use (Czaja et al., 2006). Computer interest is also an important dimension of computer attitudes that affects computer adoption (Jay & Willis, 1992). Thus, when training older adults, it is important to use training strategies that can help older adults to increase computer self-efficacy and interest and decrease computer anxiety. The significant differences in computer anxiety, interest, and self-efficacy obtained in the pre- and post-training questionnaires support hypotheses 1 and 2, further suggesting that the training program was successful in achieving the intended goals. Overall, these findings suggest that instructor-based computer training, when used in combination with other conducive factors as reported in previous sections, can be effective in facilitating older adults' learning and use of the Internet to meet their health information needs.

It is also important to note that, while computer training can be an important means to various ends (e.g., use the Internet to find high quality health information), the activity of learning computer skills can be an important end in itself (Xie, 2007c; Xie & Jaeger, 2008). This perspective resonates with the growing literature on lifelong learning, which has reached a consensus that learning is important for the well-being of older adults (World Health Organization, 2002). Research shows that learning in later life can compensate for negative changes associated with the aging process (Hooyman & Kiyak, 1999; Schneider, 2003), and help older adults stay physically and mentally healthy and socially active (Dench & Regan, 2000; Duay & Bryan, 2006; Purdie & Boulton-Lewis, 2003). Computer learning can provide great opportunities for personal growth, which is a key indicator of psychological well-being (Ryff, 1989; Ryff & Keyes, 1995). This emphasis on learning as an end in itself is also consistent with the mission of public libraries, which stresses the importance of public libraries serving not only the information needs but also the learning needs of older adults (Van Fleet, 1995; Van Fleet & Antell, 2002).

Because the sample used in this study was not a random one, the findings of this study should not be generalized without caution. Participants of this study were self-selected, willing, and able to go to a public library regularly to attend the computer training sessions, suggesting that these older adults were active, mobile, healthy, and interested in learning. While this sample may not be representative of the overall older population, it might, nonetheless, be a good reflection of older adult patrons that any public library computer training program would typically attract.

This study has also identified important issues worthy of more systematic examination in the future. In particular, the attrition rate of the participants was approximately 30 percent. Informal feedback from some participants suggests that the differences in individual prior computer experience might have at least partly contributed to this high attrition rate. More experienced users could get frustrated and felt they were not making best use of their time when the instructor had to stop frequently to help new users to keep up with basic procedures (e.g., move the mouse). The opposite could happen as well: New users could become embarrassed and frustrated, and even get intimidated by the more experienced users. Interestingly, it has also been observed that in a few mixed-level classes, more experienced users voluntarily started helping new users to learn during the session, and the attrition rate tended to be lower in those classes. Due to the design of this study, it was not possible to go beyond these informal observations to examine scientifically what factors might have contributed to the differential class dynamics in the mixed-level classes, and if there were any statistically significant differences in learning outcomes. In addition, since the vast majority of participants reported overwhelmingly positive feelings about the training (ceiling effect), it was not possible to determine if those who engaged in such informal peer-teaching/learning had more positive subjective feelings about the training than those who relied primarily on the instructor for learning. Further examination of these aspects may reveal important factors or strategies that can help to improve the effectiveness of computer training for older adults.

9. Conclusion

The computer training program developed in this study has several unique features that make it highly valuable to a broad range of senior-oriented organizations and the LIS field. First, it innovatively brings together multiple local, state, and national organizations that have not only shared interests but also complementary resources and expertise to contribute to the program. In doing so, these organizations can better address their mission while at the same time better utilizing their previously under-utilized resources (e.g., the NIH online health information resource, despite its high quality, was previously rarely used or even known by most participants of this study). Second, this program presents an attractive, innovative opportunity

to integrate LIS research and practice to a fuller extent. Throughout the entire process, the design, development, and implementation of the training curriculum and procedures have been guided by relevant findings evident in the research literature. This research- or evidence-driven approach helps to explain why the participants had overwhelming positive feedback on virtually every aspect of the training and, further, found the training to be useful to their everyday lives. Third, the involvement of MLS students in this program helps to minimize the additional workload added to the already busy schedule of public library practitioners. At the same time, it provides an excellent opportunity for these MLS students to gain valuable first-hand experience working with older adult patrons in a real public library setting. The involvement of MLS students also enhances the program's sustainability. During the 11-month duration of this study, eight different MLS students served as instructors/assistant instructors and/or schedulers for the training classes through a variety of mechanism: as full- or part-time graduate research assistants, getting course credits (independent study or public library field study), or simply volunteering. Their enthusiasm speaks for the attractiveness of the program from the point of view of MLS students, which also illustrates the sustainability of the program. Through these innovative collaborations and integrations, this computer training program can help organizations to work together to improve the health and computer literacy of the rapidly aging population in the nation.

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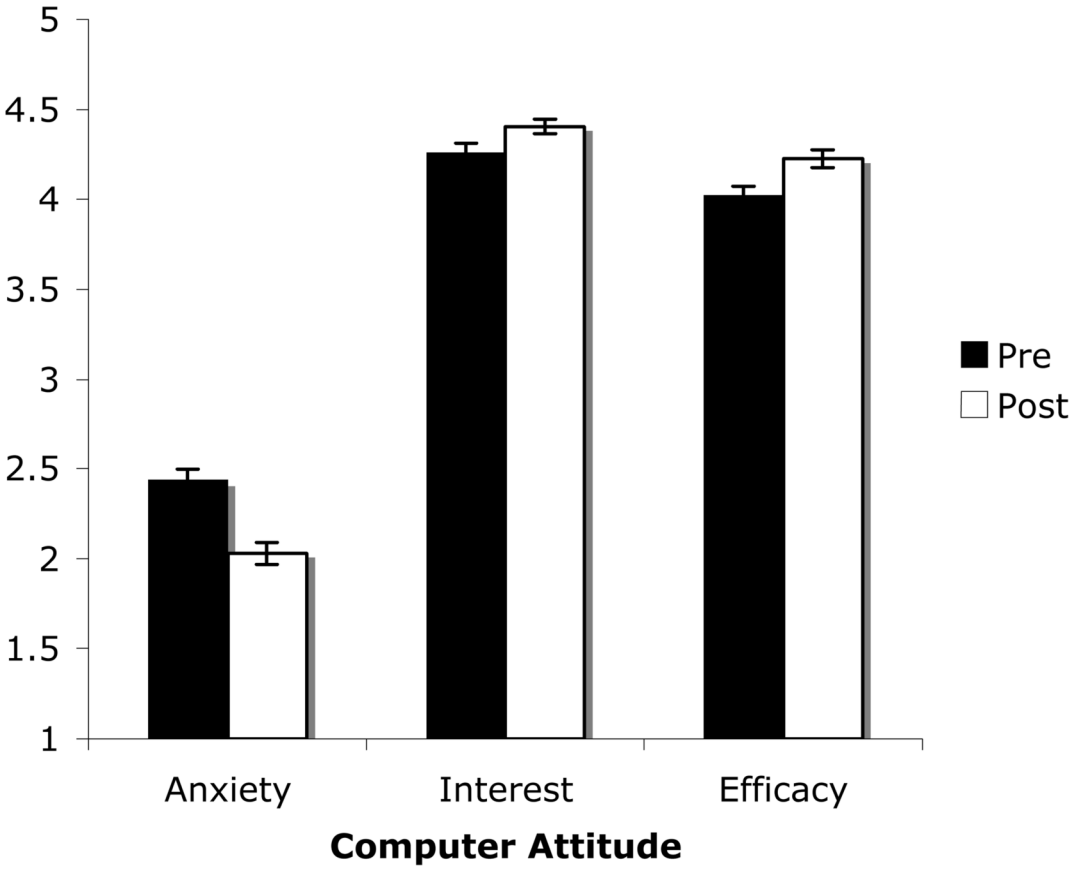

Fig. 1.
Mean changes in computer attitudes (anxiety, interest, and efficacy) from pre- to post-training. Higher values refer to greater anxiety, interest, or efficacy. Error bars refer to standard error of the mean.

Table 1

Demographic characteristics of participants

Age	**54–59**	**60–69**	**70–79**	**80–89**
% of participants	22	43	26	9
Ethnicity	**African American**	**White**	**Latino**	**Other/Unspecified**
% of participants	55	29	5	11
Education	**High School**	**Some College/Associate's**	**Bachelor's**	**Post-Bachelor's**
% of participants	32	28	7	18
Health Rating	**Poor**	**Fair**	**Good**	**Very Good or Excellent**
% of participants	1	16	57	24
Yearly Household Income	**< $20,000**	**$20,000–$29,999**	**$30,000–$39,999**	**$40,000–$ 99,999**
% of participants	21	16	12	25

Notes: Three percent of participants reported having no formal education or less than a high school education. For yearly household income, 26% did not know for sure or did not wish to answer. Some cumulative percentages do not add to 100% because missing data are not reported in the table.

Table 2

Pretraining computer and Internet experience among computer users in the sample

Computer Experience	**< 1 year**	**1–3 years**	**3–5 years**	**> 5 years**
% of participants	46	20	11	23
Internet Experience	**< 1 year**	**1–3 years**	**3–5 years**	**> 5 years**
% of participants	57	19	14	10
Frequency of Computer Use	**< Once a week**	**Once a week**	**Every 2–3 days**	**Everyday**
% of participants	49	16	24	11
Use of Internet for Health Info	**Never**	**< Once a month**	**< Once a week**	**> Once a week**
% of participants	58	20	11	10

Note: Some cumulative percentages do not add to 100% because missing data are not reported in the table.

Table 3

Use, usability, and usefulness of NIHSeniorHealth.gov and MedlinePlus.gov

NIHSeniorHealth.gov				
Usage	**0–1 time**	**2–4 times**	**5–10 times**	**> 10 times**
% of participants	19	41	20	19
Usability				
Able to find needed info	**Occasionally or Never**	**Sometimes**	**Most of the Time**	**Always**
% of participants	7	5	42	46
Ease of Use	**Difficult**	**Neither Difficult nor Easy**	**Easy**	**Very Easy**
% of participants	0	34	45	21
Usefulness	**Useless**	**Somewhat Useful**	**Useful**	**Very Useful**
% of participants	1	2	43	54
MedlinePlus.gov				
Usage	**0–1 time**	**2–4 times**	**5–10 times**	**> 10 times**
% of participants	23	39	26	12
Usability				
Able to find needed info	**Occasionally or Never**	**Sometimes**	**Most of the Time**	**Always**
% of participants	7	10	39	44
Ease of use	**Difficult**	**Neither Difficult nor Easy**	**Easy**	**Very Easy**
% of participants	1	31	49	19
Usefulness	**Useless**	**Somewhat Useful**	**Useful**	**Very Useful**
% of participants	1	8	48	43