ActiveOptions: Leveraging existing knowledge and usability testing to develop a physical activity program website for older adults
Marilyn J. Ostergren¹, Bryant T. Karras, MD²,³

¹ Information School,
² Department of Medical Education & Biomedical Informatics, School of Medicine,
³ Department of Health Services, School of Public Health and Community Medicine,
Health Promotion Research Center, University of Washington, Seattle, WA

Abstract
ActiveOptions (http://www.activeoptions.org) is a multi-agency effort to help people remain healthy as they age by providing Web access to information about senior-friendly exercise programs. This resource is currently available and in use in many locations across the United States. This paper focuses on the user interface to the site. It synthesizes existing knowledge related to creating an effective interface for this population, and describes the process we used which included a heuristic evaluation and usability testing.

Introduction to ActiveOptions
ActiveOptions addresses the need for older Americans to stay physically active¹ by making information about local exercise programs available on the Web in the form of a searchable database which allows users to enter a zip code, and retrieve a list of nearby programs. The ultimate goal of ActiveOptions is to reduce barriers to exercise by raising awareness about the number and variety of convenient options and, ideally, by guiding individuals to programs of high quality that meet their individual needs.²,³,⁴,⁵ The effort is a partnership between the University of Washington - Prevention Research Centers’ Healthy Aging Research Network (www.prc-han.org), and two non-profit community support agencies – the National Council on Aging (NCOA), and the Comprehensive Health Education Foundation (CHEF). It is supported by the Center for Disease Control and Prevention (CDC) Division of Nutrition and Physical Activity, and the Robert Wood Johnson Foundation.

Background
The effort started with the creation of an infrastructure⁶ that allows exercise program providers to enter their own data with the support of “community champions” who promote and advertise the resource to both older adults and service providers such as physicians and senior center staff. The data gathered includes information about the type of activities, the benefits of the activities (flexibility, strength, endurance, and/or balance), the geographic location, fees, availability of transportation; and whether the an evidence-based program is used. Implementation began in 3 pilot states (Washington, Texas, and North Carolina) and, as of July, 2007, has expanded to include 12 more (Arizona, Arkansas, California, Colorado, Illinois, Indiana, Maryland, Michigan, North Carolina, Pennsylvania, South Carolina, and West Virginia).

This paper focuses on the work of designing an interface to make the collected data accessible to older adults. It starts with a review of the relevant literature, then describes our process.

Literature review
The literature relevant to this work falls into three broad categories: Web use and older adults; effective design for older adults; and case studies of successful design processes.

Web use and older adults
Ideally, ActiveOptions will reach all older adults. However, only a subset of this population is online. According to a poll conducted by the Kaiser Family Foundation in 2004, less than a third (27%) of Americans 65+ years of age have used the Internet. Nine percent have gone online to look for information about nutrition, exercise, and weight issues. Rates of Internet use amongst older adults are significantly higher amongst those who have higher incomes and/or higher levels of education.⁷ In addition, older adults who use the Internet tend to be individuals who are open to new experiences, have strong self-esteem and self-efficacy, and have available time and money. They tend to be people who act and feel younger than their chronological age⁸.

Some biological processes of aging cause functional declines that impact computer use. These include changes in motor skills, cognition, and vision. See
Kurniawan 10 and Echt11 for detailed descriptions of these changes.

In addition to biological changes, there are generational differences that impact computer use. Younger users generally learn computer skills at work or school while older users are more likely to have learned them in a more solitary setting. Chadwick-Dias12 found a correlation between opportunities for collaborative learning and web expertise, and a negative correlation between opportunities for collaborative learning and age. Age is also correlated with attitude toward computers; Kurniawan10 found that older users tend to have a more cautious approach and less confidence in their ability to use computer technology than younger users.

Effective design practices

Individuals vary tremendously in their aging process. "older adults" is by no means a homogenous group. It is, however, a group with a high incidence of characteristics that impact computer use and this becomes apparent in studies of the group as a whole. Chadwick-Dias,13 compared younger and older user’s performance with a web site before and after usability issues were addressed. All users’ performance improved after the changes, but there was a persistent gap between the two groups; older adults continued to experience lower usability. The ramification is that careful design is especially important for this audience. Fortunately, there are many usability guidelines to help web designers create sites that work well for older users.

Three major sets of guidelines have been produced in recent years; one by AARP,14,15 one by The National Institute on Aging16,17 and one by researchers in the UK.18,19 All three are based upon published research. They primarily address issues of typography, writing style, links, navigation, presentation, and organization of information.

Other guidelines are presented in reports of individual studies rather than compiled as checklists, and some of these address different aspects of design than those covered by the checklists. One example is the tone of a site. Older adults may not identify themselves as "old" so a site that is aimed at "old people" may seem irrelevant.20 Also, the common advertising strategy of portraying idealized images of people may not be helpful with this population; AARP conducted a survey of physical activity and older adults and found that people over 50 are motivated by images of people who dress and look like them, not by elite senior athletes in high-tech clothing.1 Another aspect of design is how well it works for people with slow connection speeds. In 2004, 56% of older adults who used the Internet had a dial-up connection.21 A third aspect of design is the form of feedback and input. Older adults may benefit from multiple modes of feedback/input such as sound, touch, speech, and video or animation.21,22,23

Guidelines have a role in shaping design, but they are necessarily limited. They address a very complex phenomenon – an interaction which is subject to immense variation in context and technology as well as users skill, experience and personality. A designer may follow a set of guidelines carefully, and still produce a site that has usability problems.24 Also guidelines may become obsolete as technology changes.25

In an oft-cited article about designing for usability, Gould and Lewis26 point out the limitations of learning about an audience through intermediaries (e.g. by gathering demographic statistics or reading about them), and the importance of learning about them through direct interaction: "We recommend understanding potential users, versus ‘identifying,’ ‘describing,’ ‘stereotyping,’ and ‘ascertaining’ them." This is the purpose of usability testing. Even a small number of test participants (3-5) can provide invaluable insights into usability issues.27 Chisnell28 and Tullis29 make suggestions for recruiting and testing strategies that they have found to be particularly successful with older participants. One example is to make initial contact by word-of-mouth rather than cold calls which may be treated with suspicion by people who are well aware that their age and perceived vulnerability makes them a target.

Another strategy for revealing and understanding usability problems is to study the tasks users are faced with. “Task analysis” involves walking through an interaction with a user’s goals in mind and noting both the actions required to achieve those goals, and the cognitive effort required to identify those actions. This type of analysis can reveal how seemingly simple tasks can be fairly challenging to a new or inexperienced user. For an example of this approach in action, see Kaufman’s work.30 Also Dickinson31 descriptions of the difficulties older users often encounter with computer tasks is useful resource for those undertaking task analysis.

The design process

The process of creating a design which adheres to guidelines and incorporates feedback from usability tests includes straightforward steps like changing
background color to make text more legible and challenging steps like changing site a navigation structure to reduce confusion. The process is made even more challenging by the fact that “older adults” are very diverse. While improved usability helps everyone, there are times when a change intended to improve usability may benefit one portion of an audience and hinder another. For example, Hawthorn describes his experience developing an email interface for older users and the “tension between providing simplicity and providing features”. Gregor suggests that it is possible to design for diversity by creating a flexible interface that responds to each user’s unique abilities using a framework he calls “User Centered Inclusive Design.” Another challenge of design is that it takes place within a context which has its own constraints and complexities including time pressures and conflicting stakeholder goals. For this reason, it is helpful to learn from the experience of others who have been successful. O’Meara describes how varying stakeholder concerns were addressed in the process of developing a web application to help people evaluate nursing homes. Newell describes the clash of cultures between collaborators from industry and academia during the development of a web portal for older adults.

Methods

To develop the ActiveOptions interface, we first checked the initial design for compliance with AARP’s usability guidelines. We then conducted a usability test with 11 participants. We recruited participants by engaging the assistance of a staff member at a local senior center. Our first 5 participants came to the University of Washington Campus where we conducted the tests in a formal usability lab. We found that the barrier created by needing to travel to the University made it difficult to find recruits and was hard on those who did volunteer. Most of them used the public transportation system which entailed long waits out-of-doors. We decided that the specialized equipment of the usability lab was not necessary and conducted the remaining 6 tests at the senior center, which made it much easier to find recruits. We gave each participant $35 to acknowledge our appreciation for their willingness to help. Nine of the 10 participants were women. Three were between the ages of 55-60, two between 71-75, five between 76-80 and one over 80. Five had 1-3 years of experience using computers. Four had more than that and two had less. During each session, users were asked to test the ActiveOptions site by enacting a scenario (e.g. “You live in zip code 98118 and are searching for exercise programs in your area”). We asked them to “think aloud” (i.e. verbalize their thoughts) to give us more insight into the problems they were having. We instructed them to pretend we weren’t there to mimic the experience of being home alone without the opportunity to ask for assistance. However, it was more important that the participants not be distressed than for us to get good data, so we intervened if they seemed excessively frustrated. We video-taped each session with the camera directed to the screen and the participant’s hands. While one test administrator interacted with the participant, the other(s) took notes. We processed the data by reviewing the notes & videos to identify behaviors and verbalizations that suggested difficulties with the interface. We then organized these results in meaningful clusters and presented them to the rest of the team as a report. The team members who acted as note-takers found the experience to be invaluable – it was much more helpful to observe users in person than to read about them in a report.

The site was modified between participants to address usability problems as they were revealed. For example, our initial search interface allowed users to select three search parameters: zip code, activity and evidence-based program. When users had difficulty understanding these options, we first altered the presentation to provide more guidance. When participants were still confused, we eliminated the options and simply asked users to enter their zip code.

Results

Much of what we learned from usability testing mirrored observations described in the literature. Several participants struggled with scrolling. Those who had poor vision appreciated the large type and the ability to change type size. Most participants were disoriented when they followed a link that led to other sites, though this problem was minimized when the link opened in a new window that only partially obscured the original window.

Other observations were specific to this site. Participants who tested early versions of the site encountered significant difficulties and needed assistance to successfully retrieve information from the system. When we changed the search interface, as described above, we saw a clear difference in the level of engagement. While earlier participants expressed interest in the site, most of the later participants actually used the site; they read through the information carefully looking for exercise programs they would like to participate in.
Conclusion

Our experience developing this interface resonates with the lessons described in the literature. We found that guidelines were helpful to create an initial design that would accommodate age-related changes in vision and cognition. We conclude that even with guidelines targeted to a specific user group, usability testing was still irreplaceable to uncover remaining problems.

Further work

The pilot interface has been improved as a result of the usability testing. The system has gone into production after changes were made to address issues found in the last round of testing. Community champions and end-users have suggested further changes. We will continue to modify the interface in response to our findings and conduct additional usability tests to ensure that our changes have been effective and have not introduced new usability problems.

Improving usability does not address all of the issues raised in the literature. We also need to continue to evaluate the site’s effectiveness in terms of its ability to reach those who seldom or never go online, its accessibility to all regardless of attitudes toward aging and exercise, and its ability to help people find programs that will fit their individual preferences. Ultimately we want to evaluate its ability to increase physical activity.

Acknowledgments

The Authors would like to thank the many contributors to the development of the application described in this work including: Amelia Lacenski, Gwen Moni, Matt Dockrey, Karen Lewis, Serena Sanker, and James LoGerfo. Also, we have great appreciation for the funding agencies, the Robert Wood Johnson Foundation and CDC Prevention Research Center Funding (U48 DP000050) Physical Activity & Health Branch. Additionally we could not have done this work without the involvement of our community partners and the volunteer subjects of the usability testing.

References

12. Chadwick-Dias A, Tedesco D, Tullis T. Late breaking result papers: Older adults and web usability: Is web experience the same as web expertise? In: Extended abstracts of the 2004 conference on Human factors and computing


