Age-Related Differences in Subjective Ratings of Hierarchical Information

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Abstract

The present study investigated differences in subjective measures (Ease of Navigation, Sense of Orientation, Satisfaction) when older and younger computer users traversed expandable and non-expandable online hierarchical information structures. Twenty four older and 24 younger computer users participated in the study. Older users rated their computer and Internet experience significantly lower than younger participants. Two-way ANOVA analyses showed that Age was only significant in the Sense of Orientation, although the age-effect on user satisfaction became significant after Internet experience was factored out, indicating that Internet experience mediates the effect of age on user satisfaction. Neither hierarchy excelled in subjective measures. The results of the study suggest that older adults remain at a disadvantage regardless of the hierarchical design alternatives examined in the study.

1 Introduction

With the increasing availability and variety of online information and services, it seems that in one way or another people will have to interact with online information. The designers of online information seem to recognise that, since prospective online information users are not all experts, there is a need to help people access online information more effectively. Various forms of assistance, ranging from organizing the information in a structured fashion (e.g. in a linear or hierarchical structure) to providing navigational aids (e.g. bookmarks, compasses, geographical browsers), can be found in many online resources and services. However, there are few studies that have asked users their opinions about these various aids.

The general purpose of this research is to investigate age- and hierarchy-related differences on measures of Ease of Navigation, Sense of Orientation and users' Satisfaction when browsing online information. Hierarchical structures were chosen in this study as previous research has found that organizing information in a hierarchical structure improves information retrieval performance, especially for non-knowledgeable users (McDonald and Stevenson, 1998). Two hierarchical structures were tested: expandable and sequential, as depicted in Figure 1 and 2. There are advantages and disadvantages of providing expandable and sequential hierarchical structures, e.g. an expandable structure displays all of the information in one page but requires users to view a longer page. Previous work has shown that these advantages and disadvantages affect subjective

ratings (Zaphiris, Shneiderman and Norman, in press). However, no known study has reported whether there are age-related differences in these subjective ratings.
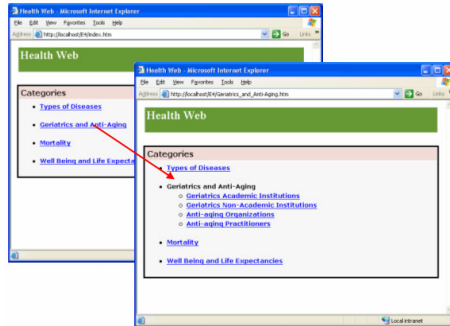

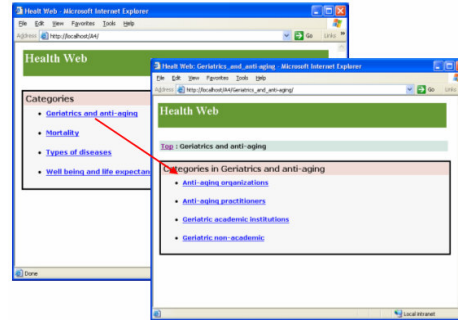| Figure 1: Expandable hierarchical structure. | Figure 2: Sequential hierarchical structure. |

Previous studies also suggested that users' Internet and/or computer abilities as well as formal education might affect users' opinions and acceptance of online information. Therefore, users' Internet and computer abilities data as well as demographic data were also recorded to be used as covariates in the statistical analysis.

2   Method

Participants consisted of 24 older adults (M=67.5, S.D.=6.5 years) and 24 younger adults (M=26.8, S.D.=5.18 years) from a variety of ethnic groups, gender, and education levels. Participants were screened out for poor vision (using a Baush & Lomb Orthorater– older adults with vision worse than 20/30 and younger adults with vision worse than 20/20 were excluded from the study), literacy (by asking them to fill in their own questionnaire) and health status (through a self-rated questionnaire, participants were only included if they filled in their health as "good" or "very good").

The computer and Internet experience questionnaire was adapted from http://www.gvu.gatech.edu. The Sense of Orientation and the Ease of Navigation questions were taken from a previous study on hierarchical structure (Zaphiris, Shneiderman and Norman, in press), while the user Satisfaction question was adopted from another study, which suggests that user satisfaction is predictive of present and future computer use (Eastin and LaRose, 2000).

To help participants get a sense of hierarchical information, two sets of information, each containing 64 pages of online information were designed and presented to participants using a standard web browser. As previous literature suggested, one of the domains of interest to older adults is health information (White, et al, 1999). Therefore, to stimulate participants' interest, the present study used the domain of health information. The test stimuli were taken from Health:Aging and Health:Senior Health directories of http://www.dmoz.org. These sites were categorized by supposed experts in the relevant areas. The stimulus layout was designed to maximize users' performance based on previous studies, such as by putting spacing between categories and by organizing information in columns (Parkinson, Sisson and Snowberry, 1985).

Two sets of stimuli were necessary to reduce familiarity because participants had to traverse the same set of information multiple times. The pages were hosted locally to maintain a consistent page loading time throughout the study and across all participants.

3   Results and Analysis

Our Computer and Internet Experience construct consisted of participants' self-assessment of their experience in using a computer or the Web, converted into a scale of 1-5. The items asked and the average ratings given by the participants are listed in Table 1. These seven items have a high internal reliability (indicating that they reliably measure the same construct). Most of these measures are significantly correlated to participants' formal education. In all measures, older participants significantly rated themselves lower than younger participants, in agreement with previous research on age-related differences in Internet experience.

Table 1: Computer and Internet experience.

Items	Young*	Old*	Mean Difference
Frequency of computer use	3.6(1.18)	2.6(0.90)	p=0.006
Duration of computer use	3.4(1.21)	2.3(0.86)	p=0.007
Duration of web browsing	2.9(1.10)	1.5(0.51)	p=0.000
Web use expertise	3.8(0.92)	2.0(1.00)	p=0.000
Comfort in computer use	4.5(0.88)	3.0(1.30)	p=0.000
Comfort in Internet use	4.5(0.93)	2.7(1.01)	p=0.000
Satisfaction with Internet skill	4.4(0.49)	2.7(0.87)	p=0.000

* Mean(Standard Deviation)

For the subjective ratings, participants were asked to rate in five bipolar scales. The items and the ratings given by the participants are listed in Table 2. These three items have a high reliability.
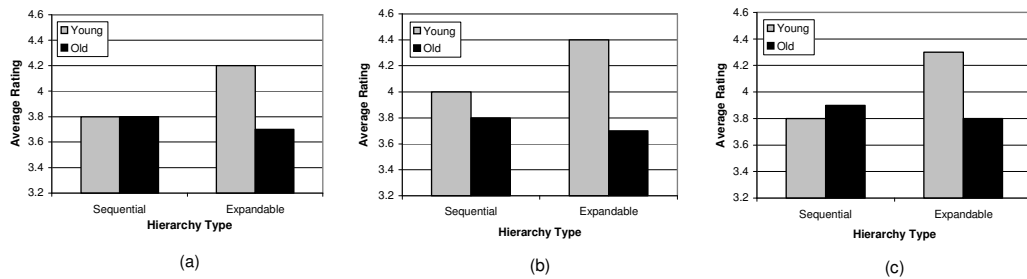

Figure 2. Average subjective ratings for (a) Ease of Navigation, (b) Sense of Orientation, and (c) Satisfaction, by hierarchy type and age-group.

In terms of Ease of Navigation, while there were no overall significant differences across age-groups or hierarchy types, there was a significant age-by-structure interaction. This is seen in Figure 2 (a) as the increased Ease of Navigation ratings associated with the Expandable Hierarchy by the Younger Users.

Table 2: Subjective ratings.

		Ease of navigation	Sense of orientation	Satisfaction
Age-differences	Without covariates	$F(1,92) = 3.271$, p=0.074	$F(1,92) = 7.671$, p=0.007	$F(1,92) = 2.188$, p=0.142
	With covariates	$F(1,83) = 1.248$, p=0.267	$F(1,83) = 7.844$, p=0.006	$F(1,83) = 4.694$, p=0.033
Structure differences	Without covariates	$F(1,92) = 1.742$, p=0.190	$F(1,92) = 0.912$, p=0.342	$F(1,92) = 2.770$, p=0.099
	With covariates	$F(1,83) = 2.135$, p=0.148	$F(1,83) = 1.381$, p=0.243	$F(1,83) = 2.912$, p=0.092
Age-by-structure interaction	Without covariates	$F(1,92) = 4.417$, p=0.038	$F(1,92) = 2.955$, p=0.089	$F(1,92) = 4.522$, p=0.036
	With covariates	$F(1,83) = 4.400$, p=0.039	$F(1,83) = 2.935$, p=0.090	$F(1,83) = 4.858$, p=0.030

With regard to Sense of Orientation, the effect of age was significant, as was the Age-by-Structure interaction. This is seen in Figure 2(b) by the overall lower ratings given by older adults, and the increased discrepancy in the expandable condition.

The age-related difference in user satisfaction was insignificant, but it became significant when Internet experience was factored out. It suggests that participants' Internet knowledge mediated the effects of age on user satisfaction, as also reported in previous studies. The age-related difference in the ease of navigation was not significant, indicating that older adults did not feel they had more problems navigating than their younger counterparts.

Previous studies found that users' subjective ratings were higher for the expandable hierarchical structure than that of the sequential hierarchy. However, this study showed that across all ages neither structure excelled in any of the subjective ratings.

The significant age-by-structure interactions in the ease of navigation and user satisfaction suggested that younger users were more satisfied with the expandable hierarchy and found it easier to navigate while for older adults the sequential hierarchy was more satisfying and easy to navigate.

4   Conclusions

The present study investigated age-differences in subjective measures of performance when users traversed online hierarchies. This study also investigated the relative performance of the designs relative to one another.

Previous studies indicated that older adults in general have lower Web and computer experience (e.g. Kurniawan, Ellis and Allaire, 2002), which might be disadvantageous for them because studies have found that lower experience is associated with lower ability (Czaja, 2000). Therefore, it is necessary to perform a check on participants' Internet-related experience to ensure that the participants in the present study are not below an acceptable level of Web and computer experience. The computer and Internet experience measures used in the present study had been tested with a large number of respondents (more than 100,000 over the course of 5 years), and

have a high reliability. Indeed, in the present study, the reliability of these five measures was quite high.

In all seven measures of computer and Internet experience, older participants significantly rated their general Internet-related experience lower than younger participants. This result is in agreement with previous research on age-differences in Internet experience (e.g. Kurniawan, Ellis and Allaire, 2002).

In terms of hierarchical design, our results did not indicate a clear winner among the expandable and sequential hierarchies. There were no meaningful age-related differences in user ratings of the sequential hierarchy, however, in the expandable category older adults gave lower ratings (relative to the sequential condition), while younger adults gave higher ratings (again, relative to their rating of the sequential condition). It appears that a design intervention such as adding "expandability" to a hierarchical information system may increase satisfaction among younger users at the expense of older user's satisfaction. Careful consideration must be given to design decisions such as these. It may be important to hide features such as these from less experienced older users, while making them available to the more experienced younger users. Future research should investigate the locus of dissatisfaction with the expandable format. This study also points out that it is important not to extrapolate the opinions of younger users on to older users.

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