Older and Younger Adults' Time Spent and Errors Made in Expandable and Sequential Hierarchies

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The present study investigates traversal time's and click errors' differences when 24 older and 24 younger computer users traversed expandable and sequential online hierarchies. Two-way ANOVA analyses show that older participants were slower but did not make more errors than younger participants. Neither hierarchy was superior in traversal time but the expandable hierarchy resulted in fewer errors in reaching the target. The results suggested a speed-accuracy trade-off in older computer participants. Although older participants significantly rated their computer experience lower than younger participants, experience did not alter any significance. The results suggest that older adults remain at a disadvantage in either hierarchy.

Keywords: age-related differences, hierarchy, health information

Studies showed that older adults have some disadvantages in fully utilizing online information, e.g., they have more trouble finding information in a Web site than younger people[1], which might lead to poor performance and abandonment[2].

Various attempts have been made to help people use online information more effectively, ranging from structuring the information (e.g., linear, hierarchical) to developing navigational aids (e.g., bookmarks, geographical browsers), especially because navigation tends to present a major challenge to users[3].

This research investigates age-related differences in the traversal time (the time required to reach a certain target) and click errors

$$\frac{\text{observed number of clics - optimal number of clics}}{\text{optimal number of clics}}$$

Hierarchical structure was chosen because it improves information retrieval[4]. Two primary hierarchies: expandable and sequential[5] were tested.

METHODOLOGY

Participants consisted of 24 independently-living older adults (M=67.5, S.D.=6.5 years) and 24 younger adults (M=26.8, S.D.=5.18 years) with diverse demographic background. Due to the nature of the

study, participants with no knowledge of computer and mouse operation were screened out. Participants' health, literacy and vision were controlled to ensure that these do not confound the interventions.

Users' experience paper questionnaire was adapted from a WWW User Survey *www.gvu.gatech.edu/user_survey/)*.
Traversal times and errors made were collected online using two sets of stimuli (to reduce familiarity) of 64 Web pages, hosted locally for a consistent loading time. For each set of the stimuli, participant searched 18 targets in each hierarchy (total=72) in the experimenter's lab using PCs, Windows98, 17″ SVGA monitors, Genius NetScroll mouse with medium double speed and pointer speeds, and server logs. The protocol took 2 hours (including breaks to minimize fatigue and boredom).

To stimulate participant interest, the highly popular health domain taken from the health sections of *www.dmoz.org* was chosen. The layout was designed to maximize ease of use by putting spacing between categories and by organizing information in columns[6].

ANOVA (Analysis of Variance) was used to analyze the data at a confidence limit of 0.05.

'Experience' construct consists of self-rated frequency and duration of computer use, duration of web browsing, Web use expertise, comfort in computer and Internet use, and satisfaction with Internet skills. The ratings were converted to 1-5 (5 being the highest). Most were significantly correlated with education. These items have a high reliability with a=0.91 (a shows how well a set of items measures a single construct).

RESULTS

ANOVA analysis indicated a significant age-effect in traversal time by age group {F(1,92)=23.574, p=0.000}. Neither hierarchy {F(1,92)=0.918, p=0.341} nor age-by-hierarchy interaction {F(1,92)=0.532, p=0.468} were significant. Factoring out Experience did not change any significance (Figure 1).

ANOVA also showed a significant hierarchy effect {F(1,95)=4.202, p=0.043}. Neither age {F(1,95)=0.828, p=0.365} nor the age-by-hierarchy interaction {F(1,95) =0.286, p=0.594} were significant. Factoring out Experience raised the hierarchy-effect to marginal significance (p=0.05, Figure 2).

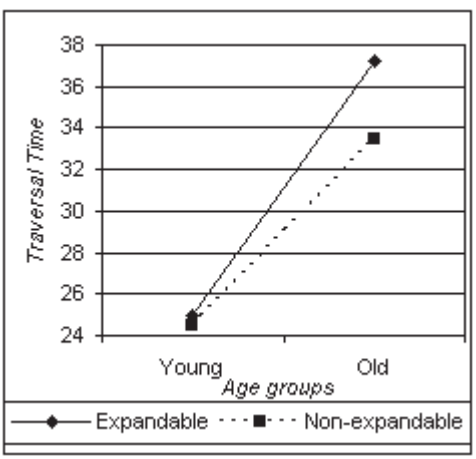

Fig 1. Age-and structure-related differences in traversal time

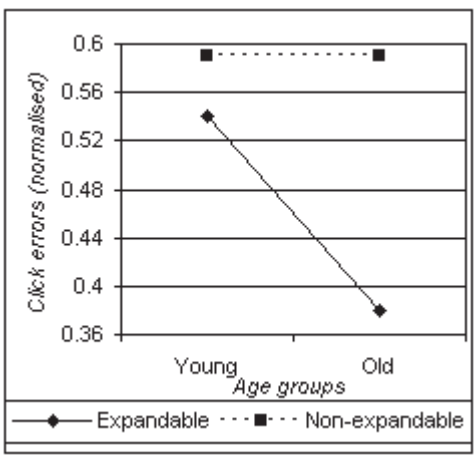

Fig 2. Age-and structure-related differences in click errors

DISCUSSION

Our older participants significantly rated their experience lower than younger participants, in agreement with previous research[7]. Older users were a factor of 1.37-1.49 slower, which follows the generalized aging ratio of 1.4[8].

Across all users, the traversal time in the two hierarchies was not significantly different, contrary to a previous finding[5], perhaps due to the effects of concomitant factors (e.g., task complexity, screen format), which creates opportunity for further study.

Older adults made similar click number of errors as younger participants. However, the expandable hierarchy needed fewer clicks to reach the target, probably due to the increased amount of contextual information. The age-related difference in speed but not in accuracy was in line with previous findings[9]. The traversal time may be affected by cognitive processing time differences since there were no significant age-related differences in click errors. Further study is required to understand these phenomena.

CONCLUSIONS

The study showed a statistical proof that older adults did not make more errors than younger adults, but they are still at a disadvantage regardless of the information structure examined here in terms of traversal time. It highlights the need to put more efforts in accommodating older users when designing information only.

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