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LONG PAPER

Older adults fail to see the periphery in a Web site task

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Abstract Eye movement deficiencies are inherent with age and tend to increase in distracting visual fields, in the useful field of view (UFoV), and when information is located in the periphery. Despite well-known age-related differences in eye movement, there has been limited empirical study into how older adults look at Web sites. The study of eye movement during Web site interaction is advantageous to the study of UFoV theory because Web sites are typically complex, with important navigational elements located in the periphery. Using non-invasive eye tracking, eye movement patterns were investigated in young, middle, and older adults while they initially interacted with a typical Web site (i.e., standard top and left navigation). Older adults looked less frequently at peripheral parts of the screen compared to young adults, with the left and top navigation accounting for the greatest age-related differences. Age-related differences in eye movement emerged during the initial 10 s and were independent from Internet experience, suggesting differences in eye movement while interacting with Web sites are inherent with aging. Results show age-related differences in eye movement during a Web site task. These applied, experimental results directly support UFoV cognitive theory in a real-world setting.

Keywords Internet · UFoV · Aging · Eye tracking · Principal component analysis

This report is released to inform interested parties of research and to encourage discussion. Any views expressed on the methodological issues are those of the authors and not necessarily those of the US Census Bureau, the Fors Marsh Group or of the National Institute on Alcohol Abuse and Alcoholism. When this work was conducted, Jennifer was a post-doctoral researcher at the US Census Bureau; she is now the User Experience Research Leader at Fors Marsh Group.

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1 Introduction

It is well established that eye movement degrades with age [1, 2]. In particular, eye movement deficiencies in older adults tend to increase in distracting visual fields, in the useful field of view (UFoV) and when information is located in the periphery [2–11]. Eye movement deficiencies in older adults are not necessarily related to eye physiology but instead may be related to mechanisms of selective attention, such as diminished information processing [4, 12], diminished availability of attentional resources [13–16], and inhibition insufficiency [17]. Eye movement may provide a physical correlate of these cognitive processes because of the close relationship between eye movements and attentional mechanisms [18–20]. Despite known age-related differences in cognition and eye movement, there has been little research into how older adults look at Web sites. The study of eye movement in the context of Web site interaction is advantageous to the study of UFoV theory because Web sites are typically complex and

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oftentimes distracting, with important navigational elements located in the periphery.

Older adults are the fastest growing group of Internet users [21–23]. Despite this trend, older adults often report difficulty using the Internet [24–27]. One dimension of Web site design that directly influences the user experience is ease of navigation. Ease of navigation can be defined as the way in which users access information by way of links (e.g., top navigation links, left navigation links, right navigation links, footer links). In many Web site designs, primary navigational elements are located in the periphery (top and left) of the screen; therefore, a critical factor in successfully using a Web site is *where* users look for navigational elements on the screen.

The objective of this study was to investigate eye movement patterns during initial Web site interaction in three adult groups (young, middle, and older age) using real-time, non-invasive eye tracking. Typical cognitive and usability metrics were included to provide measures of user performance. Internet experience likely influences how users interact with Web sites; therefore, Internet experience was included as a variable in the experimental design. Principal components analysis (PCA) was applied to the eye-tracking data to distinguish and interpret complex gaze patterns among age groups. Although age-related differences in eye movement are well established in highly structured, laboratory-based cognitive tasks with time constraints (e.g., UFoV task: [1]; contextual cueing task: [28]; noun-pair task: [29]), these differences may not necessarily emerge during less controlled real-life Web site interaction. Generally, in cognitive tasks, participants are required to find a stimulus among distractors. However, in Internet tasks, participants likely hold the task in mind while searching for relevant information (which may or may not be on the same page as the home page), then check for errors before making a final decision, and evaluate the selection they have made. More cognitive load might be required in Internet tasks, and participants may or may not be correct in their first click or in their final response/selection (unbeknownst to them).

Based on established empirical research showing decreased performance for older adults when stimuli are presented in the periphery [2–4, 7–11], it was hypothesized that in applied, real-world tasks (1) older adults would fixate peripheral navigation elements less often than young and middle age adults, and (2) there would be no age-related differences for fixations to elements in the center of the screen. In addition, it was hypothesized that because UFoV is due to cognitive decline inherent with age, (1) these differences would emerge quickly (within 10 s), (2) Internet experience would not account for the age-related differences, and (3) total time spent on page, which presumably would be longer for older adults who take longer to respond or click, would not account for the age-related differences in eye tracking.

2 Methods

2.1 Participants

Participant demographics, including standardized neuropsychological test scores, are presented in Table 1. Three age groups were tested (young adults: mean age = 22, range 20–25; middle age: mean age = 44, range 40–49; older adults: mean age = 67, range 62–72), intentionally selecting age ranges that were far enough apart to detect age-related differences. Participants were residents of the metropolitan Washington DC area and were recruited via advertisements in local newspapers and through a database maintained by the US Census Bureau's Human Factors and Usability Research Group. Participants completed a background questionnaire that assessed objective Internet experience (adapted from [30]; see also [31]). They indicated how often they completed each of 39 Internet activities in the last week. Activities included using the Internet to find information about a hobby, finances, health, or medicine, and using the Internet to access social networking sites, buy things, conduct personal banking, and read the news. The percentage of reported activities was used as an objective Internet experience measure, and a one-way ANOVA on Internet experience revealed no statistically significant age-related difference ($p = .11$). All participants self-reported past experience with computers and the Internet, and all reported being unfamiliar with the American FactFinder (AFF) Web site used in this study. Participants reported completing an average of 5.2 online surveys (range 0–50; no group difference) in the last year. Participants were diverse in race and education level (see Table 1).

2.2 Procedure

Prior to arriving for their session, each participant completed the Brief Test of Adult Cognition by Telephone (BTACT; [32]) and a background questionnaire that assessed Internet experience. Sessions took place in the Human Factors and Usability Research Group's Laboratory at the US Census Bureau headquarters. Each participant sat in a $10' \times 12'$ room, facing a one-way mirror and a wall camera, in front of a 17″ LCD Tobii T-120 eye-tracking monitor. The moderator read a brief introduction; the participant, working one-on-one with the moderator, signed a consent form and completed the Digit Symbol Coding task and a brief calibration of their eyes. Then, the moderator left the room—the participant and the moderator sat

Table 1 Participants' mean (and range) characteristics

	Age group		
	Young	Middle	Older
N	9	14	20
Gender	7 females, 2 males	8 females, 6 males	12 females, 8 males
Age	22 (20–25)	44 (40–49)	67 (62–72)
Education	7 less than BA/BS	8 less than BA/BS	7 less than BA/BS
	1 BA/BS	3 BA/BS	3 BA/BS
	1 more than BA/BS	3 more than BA/BS	10 more than BA/BS
Internet experience[a,c]	52 % (31–77 %)	43 % (10–95 %)	36 % (5–69 %)
WAIS-III[d] Digit Span backward[a]	7.33 (4–12)	7.50 (5–11)	6.45 (4–13)
WAIS-III[d] Digit Symbol Coding[b]	86.22 (66–111)	72.86 (51–87)	57.80 (24–81)
Rey Auditory Verbal Learning Task[a,e]	6.56 (5–8)	7.57 (3–13)	6.50 (4–10)
BTACT[e] Category Fluency[a]	23.67 (18–32)	19.79 (14–37)	18.30 (9–32)
BTACT[e] Backward counting[b]	48.56 (44–62)	60.29 (48–82)	64.70 (45–77)
BTACT[e] Short delayed recall[a]	5.33 (2–8)	5.43 (1–10)	4.20 (1–9)
Shipley Vocabulary[a]	32.11 (21–39)	30.29 (18–38)	31.00 (15–37)

[a] No significant group differences

[b] Significant group difference; $p < 0.001$

[c] Percentage of 39 Internet activities participants reported

[d] WAIS-III, Wechsler Adult Intelligence Scale, 3rd edition

[e] BTACT, Brief Test of Adult Cognition by Telephone

in separate rooms during the remainder of the sessions so the participant would not be distracted by the presence of the moderator. The moderator began video recording from the opposite side of the one-way mirror, and the moderator and the participant communicated via microphones and speakers. The participant completed a short questionnaire about their Internet searching habits and strategies and the Shipley Vocabulary test [33], and then the participant began using the Web site.

Participants read the task aloud then used the Web site to locate the information and stated their answer aloud when they felt they had found the correct answer. For this task (*How many people live in Maryland*?), participants could find the information via three different routes from the home page and required a single number to accurately identify the answer. During the task, participants' eye movements were recorded; eye tracking was non-invasive and did not constrain normal head movements.

2.2.1 *Usability metrics*

Two typical usability metrics were assessed: accuracy and efficiency. Accuracy was calculated in two ways: the percentage of participants who successfully completed the task, and the accuracy of the first click. Efficiency was calculated as the mean time to complete the task (successful completions only).

2.2.2 *Eye tracking*

The default settings were used for fixation filters in Tobii Studio version 2.3. The gap fill-in (interpolation) max gap length was enabled at 75 ms, and the eye selection was an average of both eyes. The noise reduction was disabled; the velocity calculator was at window length of 20 ms; the I-VT classifier was set at a velocity threshold of 30 degrees/second. The merge adjacent fixations filter was enabled with the maximum time between fixations at 75 ms and the maximum angle between fixations at 0.5°. The discard short fixations filter was enabled at the minimum fixation duration of 60 ms.

Eye movement patterns were examined in pre-defined areas of interest (AOIs). Ten (10) areas that were visible on the main page before scrolling (i.e., "above the fold"), as shown in Fig. 1, were uniquely identified. These areas were defined by separating the screen into parts based on the existing sections of the page. For example, AOIs included the top and left navigation, the top banner, the logo, and the *Fast Access* box in the center of the screen.

A PCA-based approach was developed to visualize and interpret the patterns of eye fixations among experimental conditions. PCA is an unsupervised data reduction technique that captures patterns of covariance from complex, multidimensional data sets [34–37].

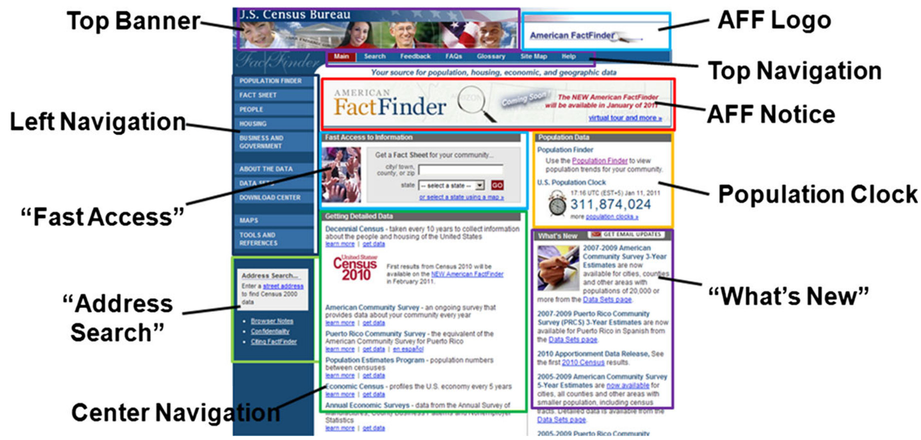

Fig. 1 Screen that was visible before scrolling; areas of interest labeled and denoted in *colored boxes*

Principal components analysis was used to extract fixation patterns. A covariance matrix PCA was selected to generate a more defined component structure. Components were rotated (using varimax rotation) to make the fixation patterns more pronounced, simple, and interpretable. The result of PCA is a set of principal components (PCs), which represent orthogonal portions of covariance associated with the fixation patterns. Each PC has a set of component loadings and component scores associated with it: component loadings reflect the pattern of variance in the total number of fixations associated with each component, and component scores indicate the "strength" of a particular pattern associated with each participant. That is, the greater the component score, the greater the relatedness is of that individual's eye movement to the corresponding component. Any participant with a component score that fell outside ±3 was eliminated from all subsequent analyses. One older adult was designated an outlier (component score of 6.2) and was removed from subsequent analysis. After omitting the outlier, the case/participant (42) to variable/AOI (10) ratio was 4.2 to 1.

The dependent variable was total number of fixations within a pre-defined AOI. Fixations are instances where the eyes are relatively still and indicate an area of attention [38–40]. Scores were grouped by age group to reveal variability in the fixation pattern associated with the experimental manipulation. Two approaches to ensure the PCA solution was reliable and non-erroneous were used. First, a comparison of all components scores grouped by age was conducted using multivariate analysis of variance (MANOVA). A significant MANOVA test statistic (Pillai's trace) was followed up by one-way ANOVAs on each component. In addition, the pattern of loadings (Table 2) associated with each component was visually compared with the heat and gaze opacity maps, which were created using Tobii Studio to represent the total number of fixations on the screen, across all participants in each group. The default settings for radius parameters of heatmaps in Tobii Studio version 2.3 (50 px) were used. In the heat maps, red areas represent many fixations (up to 32), yellow areas represent a moderate number of fixations, and green areas represent few fixations (as few as 1). In the gaze opacity maps, the clear areas in which one can "see through" the overlay are areas that represent many fixations, and black areas represent little to no fixations.

Table 2 Varimax rotated component loading matrix

	Components		
	1	2	3
Left navigation	.969		
Top banner	.591		
Top navigation	.519		
AFF notice			
Address search			
Fast access		.985	
Getting detailed data		.707	
Internet experience			
Population Clock			.992
What's new			.509
AFF logo on right			
% Variance explained = 92.3	69.1	13.3	9.9
Raw eigenvalue	280.4	54.0	40.5

3 Results

3.1 Usability data

The average task completion rate (accuracy) across all participants was 80 %. A chi-square test revealed no significant effect of age on accuracy, X^2 (2) = 1.1, $p = .59$ (young 89 %, middle 86 %, older 75 %). For first-click accuracy, there were three possible AOIs participants could click to get to the correct answer. A chi-square test revealed no difference across age groups in the accuracy of

the first click, X^2 (2) = .83, $p = .66$, with 76 % of the older adults correctly making the first click, while 79 % of middle and 90 % of young adults correctly clicked the first time. The average time participants needed to complete the task (successful completions only) was 98 s (SD=92). A one-way ANOVA showed no significant difference across groups [79 s (SD = 49), 121 s (SD = 138), 96 s (SD = 58), young, middle, older adults, respectively].

3.2 Eye-tracking data[1]

Principal components analysis was used to visualize patterns of eye fixations. PCA extracted a set of three principal components (PCs) that accounted for 92.3 % of the variance in the data set (see Table 2). To determine whether any of the individual PCs accounted for a pattern of eye movement that related to age group, the scores for each of the three PCs were grouped by age and statistically compared with MANOVA. For all ANOVAs, the assumption of homogeneity of variance was checked using Levine's statistic. Heterogeneity was corrected using the Brown-Forsythe *F* statistic. Effect sizes for significant statistics are reported with partial eta squared (η_p^2).

Using Pillai's trace for the test statistic, MANOVA revealed a statistically significant effect of age across scores for PCs 1, 2, and 3, $V = 0.37$, F (6, 76) = 2.4; $p = .04$. Follow-up one-way ANOVAs revealed only PC1 statistically segregated the age groups, F (2, 39) = 5.2; $p = .01$; $\eta_p^2 = .21$ (see Fig. 2). No other PC was statistically significant ($p = .14$; $p = .80$, PC2 and PC3, respectively). Bonferroni post hoc analysis on the fixation pattern associated with PC1 revealed a similar pattern between young and middle age adults ($p = .60$) and between middle and older adults ($p = .17$), but it revealed different patterns for young and older adults ($p = .01$). This finding suggests that the fixation pattern difference, as revealed by PC1, was attributable to a significant difference in eye movement between young and older adults.

Next, the location of the most prominent age-related differences in eye fixations was assessed. PC1 loading values were used as a guide for visualizing patterns of eye movement and to interpret the underlying structure of age-related differences. The loading values associated with PC1 revealed three peripheral AOIs (of the 10) that loaded highly on PC1: left navigation, top banner, and top navigation (see Table 2). This result was consistent with the heat and gaze opacity maps depicting mean fixation count patterns, across age groups (see Fig. 3). The difference

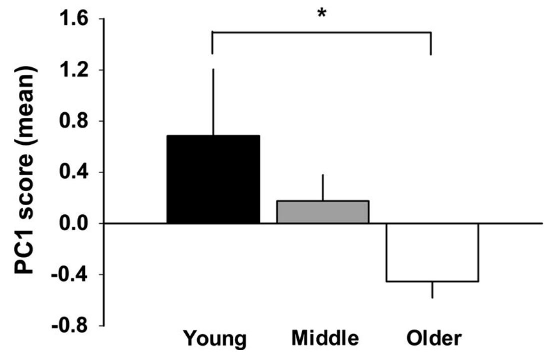

Fig. 2 A pattern of eye movement segregates young and older adults. PC1 scores indicate the relatedness of the pattern of eye movement associated with PC1 and each participant. $*p < .05$

among age groups, as reflected by higher loading values for PC1, can be attributed to the eye movement patterns between young and older adults, since significantly higher PC1 scores were found for young compared to older adults (see Fig. 2). These differences were not found between young and middle age adults or between middle and older age adults. Thus, results suggest unique eye movement patterns between young and older adults, and specifically, this difference is greatest in the left navigation. Consistent with the present hypotheses, older adults fixated the peripheral left navigation less often than younger adults, and there were no age-related differences for other AOIs. There were no age-related differences between young and middle age and between middle and older age adults.

To ensure that older adults were not merely fixating for long periods of time in the periphery, fixation duration data for all AOIs were examined. PCA revealed no overall age-related difference for total fixation duration across the AOIs.

To verify the pattern extracted using PCA, the number of fixations by age group for the AOIs that contributed most to the overall pattern (left navigation, top banner, top navigation) were statistically compared using one-way ANOVAs. Results shown in Table 3 indicate a significant difference in the number of fixations in the left navigation by age group, F (2, 40) = 4.1, $p = .02$, $\eta_p^2 = .17$, while the top banner and top navigation only approached significance, F (2, 40) = 3.2, $p = .05$, $\eta_p^2 = .14$, F (2, 40) = 2.0, $p = .14$, respectively. A Bonferroni post hoc analysis on the left navigation paralleled the results from the PCA, showing that older adults fixated the left navigation significantly less often than young adults ($p = .03$), and there were no differences between young and middle age or between middle and older age adults. Age comparisons of mean number of fixations conducted on the remaining seven AOIs revealed no significant differences. Together, these results verify the use of PCA in extracting a pattern of eye movements that was related to the age of the participants.

[1] To account for missing data, prior to analysis, the video recordings for 25 participants whose percentage of captured fixations (compared to the total screen capture time) was below 75 % were examined. Eight participants (one middle age and seven older adults) were omitted from all analyses due to lack of eye-tracking data.

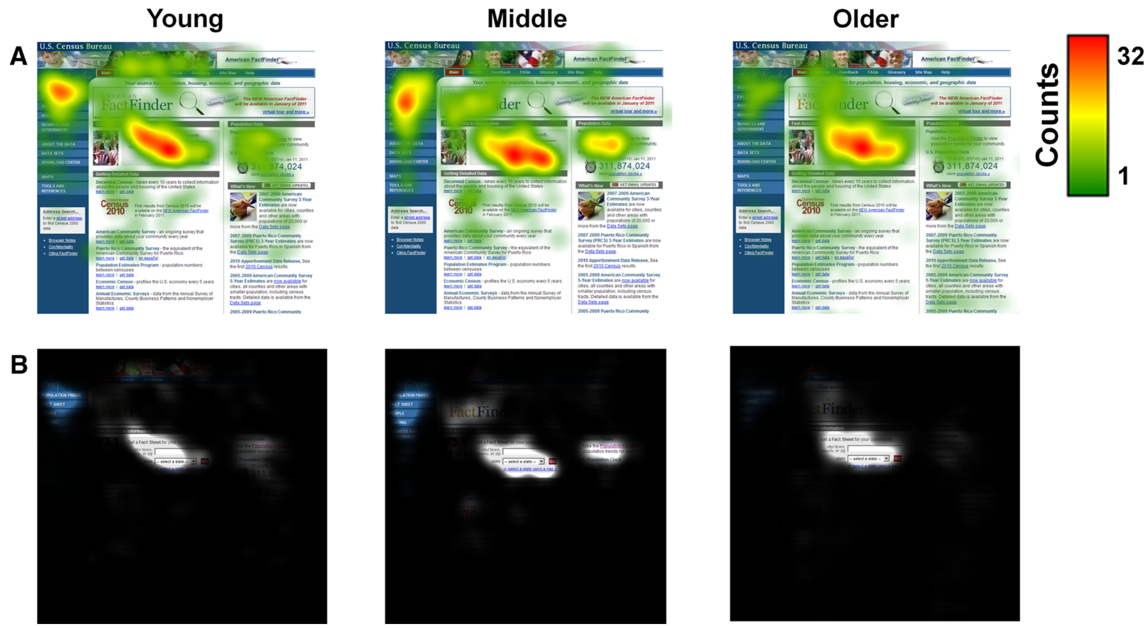

Fig. 3 Mean fixation count **a** heat maps and **b** gaze opacity maps for each group: young (*left*), middle (*center*), and older adults (*right*). Differences in eye movement are shown in the peripheral left navigation elements of the screen. A common area of fixation for all age groups was the center

Table 3 Mean (SE) fixations during task and first 10 s

	Age group		
	Young	Middle	Older
Mean fixations during task			
Left navigation[b]	8.67 (2.81)	6.43 (1.36)	2.75 (0.89)
Top banner[c]	4.44 (2.42)	0.93 (0.30)	1.35 (0.32)
Top navigation[a]	2.44 (0.93)	0.79 (0.35)	1.20 (0.43)
Whole screen[a]	52.56 (16.67)	35.14 (6.10)	43.00 (5.60)
Mean fixations during first 10 s			
Left navigation[b]	4.56 (1.24)	5.15 (1.24)	2.35 (0.79)
Top banner[b]	2.89 (1.46)	1.00 (0.32)	1.15 (0.29)
Top navigation[b]	1.11 (0.35)	0.38 (0.18)	0.50 (0.17)
Whole screen[a]	24.00 (1.70)	20.00 (1.30)	20.95 (1.60)

[a] No significant group differences

[b] Significant group difference, young versus older; $p < 0.05$

[c] Significant group difference, young versus older; $p = 0.05$

Internet experience As mentioned, participants completed an objective Internet experience questionnaire, in which they indicated how often they completed each of 39 Internet activities in the last week. This measure was included to ensure a strong measure of Internet experience (compared to, for example, asking participants to subjectively assess their skills using a Likert scale). A one-way ANOVA revealed no statistically significant age-related difference ($p = .11$) for Internet experience. Thus, Internet experience was included as a covariate in a subsequent one-way ANOVA of Age on PC1 to assess if Internet experience influenced where users looked for pertinent information during the task. Analysis of covariance (ANCOVA) confirmed that Internet experience did not account for the difference in eye movement pattern between age groups, $F\ (2, 39) = 5.2$, $p = .01$, $\eta_p^2 = .21$. Thus, age-related differences in eye movement pattern during Web site navigation were not related to Internet experience.

Initial search strategy Next, fixation patterns were examined during the first 10 s of interaction with the Web site to gain insight into differences in initial search strategy. AOIs that loaded highest on PC1 (left navigation, top navigation, top banner) were included, as well as Internet experience as a covariate (MANCOVA). Using Pillai's trace for the test statistic, MANCOVA revealed a statistically significant effect of age on the mean number of fixations in the first 10 s, $V = .35$, $F\ (6, 76) = 2.69$; $p = .02$. Significant differences for age were found for the left navigation, $F\ (2, 39) = 3.4$; $p = .04$, $\eta_p^2 = .15$, top banner, $F\ (3, 39) = 3.5$; $p = .04$, $\eta_p^2 = .15$, and top navigation, $F\ (2, 39) = 4.4$; $p = .02$, $\eta_p^2 = .18$ (see Fig. 4). To determine whether these differences might be due to some nonspecific age-related difference in the overall number of fixations, the number of fixations in the first 10 s of interaction with the Web site were compared across age groups for the whole screen. A one-way ANOVA revealed no overall difference in the number of fixations for the whole screen ($p = .30$, see Table 3), indicating age-related differences

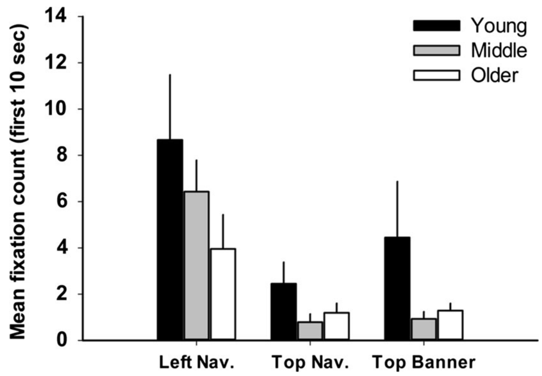

Fig. 4 Mean fixation count by AOI for first 10 s for each age group

in fixation patterns were not due to overall age-related differences in total number of fixations during the first 10 s of the task. Data for shorter and longer periods of initial interaction (up to 30 s) were examined, providing identical results. Heat maps for the first 10 s (shown in Fig. 5) visualize the underlying data. Thus, it appears that older adults deployed an initial search strategy for pertinent information that was different from young adults.

Time on page It was considered that older adults might be more efficient than young adults at Web site navigation and that they would demonstrate a speed–accuracy trade-off. That is, older age adults might stay on the page longer in order to complete the task correctly. The time spent on the page by each age group was examined. A one-way ANOVA revealed no significant age-related differences. Thus, age-related differences in eye movement during Web site navigation were due to how older adults initially looked at the Web site and not to overall time they spent on the page.

4 Discussion

To the authors' knowledge, this is the first applied study examining age and eye movement during a real-life Web site search task. Eye-tracking results showed that older adults did not look at the peripheral parts of the display as often as young adults. Specifically, they did not look at the left navigation, top banner, and top navigation as often, and this difference occurred early, in the first 10 s of interaction. These applied, experimental results directly support UFoV cognitive theory, showing that in a highly complex visual field, older adults miss important information in the periphery. Overall, results suggest that well-established eye movement deficiencies in older adults also emerge when navigating Web sites.

4.1 Aging and Internet experience

Because many Web site designs include important navigational elements in the periphery, older adults are likely to miss critical information that would otherwise enable them to successfully accomplish tasks. These results imply that poor user experience among older Internet users may be due, at least in part, to failure to see peripheral navigation elements. While it was found that Internet experience was not associated with performance for any age group, it is likely that experience has an effect on the strategies people employ when interacting with a new, unfamiliar Web site since prior experience with technologies predict computer-related task performance [41–44]. An objective measure of Internet experience was based on a percentage of reported Internet activities; it is possible that subjective self-reported computer experience (i.e., perceived experience) is related to strategy (e.g., the choices participants made as they worked on finding the answer to the task question) and performance. Future studies should examine the relationship between strategies people use to navigate Web sites and performance.

4.2 Cognitive decline

Several aspects of cognition that decline with age, such as spatial memory, short-term memory, and sustained attention, are crucial to successful Web site navigation [1, 45–52]. The older adults in this study were relatively high functioning, as shown by the working memory (Digit Span backward), executive function (Category Fluency), and verbal ability (Rey Auditory Verbal Learning Task and Shipley

Fig. 5 Mean fixation count heat maps for each group for first 10 s: young (*left*), middle (*center*), and older adults (*right*)

Vocabulary) scores (Table 1) and by the lack of age-related differences in task accuracy, first-click accuracy, time to complete task, time spent on the page, and fixations on the whole page in the first 10 s. Older adults however scored lower than the young and middle age adults on complex attention (Digit Symbol Coding), and scored lower than young age adults on processing speed (backward counting). Correlational analyses yielded no relationship between differences in gaze pattern and Digit Symbol Coding ($\eta_{\mathrm{p}}^2 = .03$) or backward counting ($\eta_{\mathrm{p}}^2 = -.005$). These results suggest that age-related differences in complex attention and processing speed do not fully account for the age-related differences in eye movement and that the differences may be due to another aspect of cognition, such as UFoV differences.

4.3 Useful field of view (UFoV)

The finding that older adults spent less time fixating the peripheral navigation features of the Web site is consistent with literature demonstrating peripheral processing and UFoV decline [1, 7–10, 53, 54]. UFoV is the total visual field in which useful information can be acquired without moving the head or eyes [1, 55]. Age-related decline in UFoV has important implications for the study of how older adults look at Web sites because Web sites are inherently complex, there are often distracting elements on the screen, and stimuli are often far from the center of the screen. The present data confirm that information in the periphery may be difficult for older adults to access because they simply do not look there. In this study, only fixation counts were assessed. Future research should also examine scan path length and fixation duration as these measures may serve to confirm the finding that age-related differences in cognition do not account for the eye-tracking differences found. Furthermore, while performance on portable devices (e.g., tablets) was not assessed, future research should aim to assess the user experience for older adults, as often Web site navigation on portable devices is located more in the center of the screen rather than the left.

4.4 Implications for design

The work presented suggests that, in order to make information accessible to older adults, it needs to be placed in the center of the screen. This does not necessarily translate into placing important items *solely* in the center; rather duplicate links may appear in the center and main navigation to allow all users easy, efficient access to important information. Prior work [6] has demonstrated positive effects of central links for older adults, but this is the first empirical study to address this.

4.5 Conclusions

To the authors' knowledge, this is the first applied study examining age and eye movement during a real-life Web site search task. It has been found that older adults look less frequently at peripheral navigation elements than young adults. Age-related differences emerged during the initial 10 s of interaction, suggesting that older adults deploy a different Web site search strategy. The findings presented suggest that well-established age-related deficiencies in eye movements during visual search apply to Web sites. The results of this research provide new insight into how age impacts the way people access information on Web sites.

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