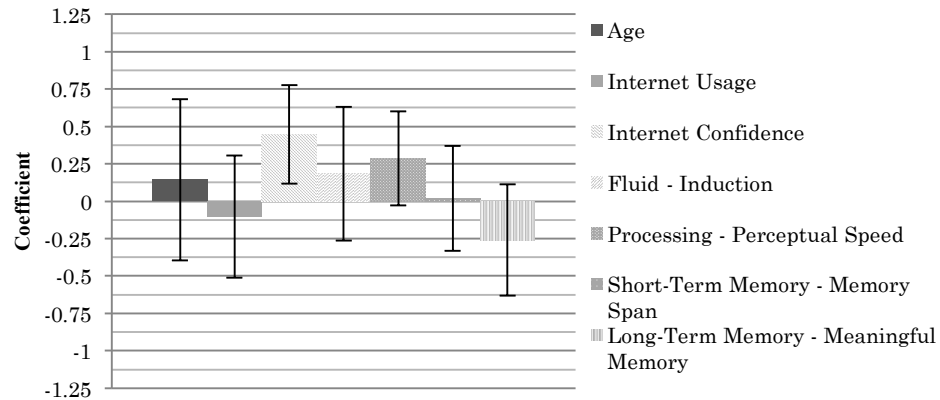


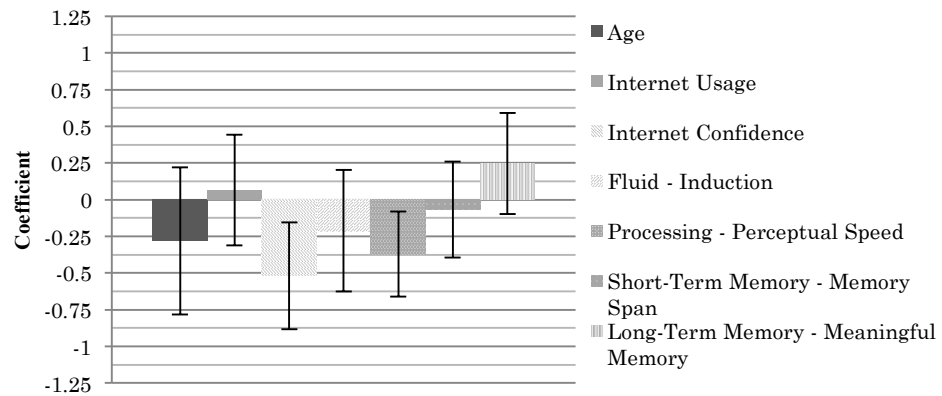
**Figure 2 Coefficient for Perceived Disorientation with 95% Confidence Intervals**

A slight difference was found when examining the reported website ease of use of participants. It was found that only Internet confidence played a significant part in determining whether a website was easy to use when performing information retrieval tasks. All other metrics had 95% confidence intervals which spanned both sides of 0, indicating that they could not accurately determine whether they may have a positive or detrimental effect on the reported ease of use of a website.



**Figure 3 Coefficient for Ease of Use with 95% Confidence Intervals**

Combining perceived disorientation and reported ease of use into one metric examining overall browsing experience creates results similar to that of perceived disorientation, with both Internet experience and perceptual speed producing significant correlations. No other factors contributed significantly in this model. This indicates that when examining the overall browsing experience of an individual when completing information retrieval tasks, a large amount of variance can be accounted for by again focusing on the previous confidence that a user has in using the Internet, and also the mental quickness that is attached to levels of user perceptual speed.



**Figure 4 Coefficient for Browsing Experience with 95% Confidence Intervals**

It was found in all three of the regression models that individuals' Internet confidence can account for a large amount of the variance that is associated with the perceived disorientation, website ease of use, and overall browsing experience of individuals when completing information retrieval tasks. Additionally, it was found that individuals' perceptual speed can influence their perceived disorientation and overall browsing experience. However, in all cases, age was unable to account for any variance and could not be used to predict any aspect of users browsing experience when completing this study.

#### 4.4 Conclusions

This experiment has provided evidence to support the concept that age cannot be used as a metric when examining the browsing experience of individuals. Factors such as individuals' previous confidence in using the World Wide Web and their perceptual speed are more significant contributors to understanding feelings of disorientation and perceived website ease of use. These factors can be used to account for a substantial amount of variance. While this has been examined before regarding user performance (for example [Czaja et al. 2001] and [Sharit et al. 2011]) the novelty in this approach is that significant differences were found when examining search experience.

From this, it is recommended that cognitive factors and Internet usage demographics should be used within the analysis of user experience when completing online activities rather than relying on user age. The experiences of users in terms of perceived disorientation and reported website ease of use, cannot be predicted by analysing age and instead, users' confidence in using technology and their perceptual speed can provide a better explanation.

#### 5. OVERALL DISCUSSION

The first experiment in this work examined how users' previous Internet usage and fluid intelligence can be used to understand the browsing habits of individuals. It

was found that an individuals' previous Internet usage could be used to find significant differences in objective measures such as task completion time.

**Users with high Internet usage are more efficient than those with low Internet usage.** High Internet usage participants would spend less time on a search result page before selecting a link than low Internet usage participants, and would also visit more pages overall. Additionally, it was observed that participants with high Internet usage would use a comparable number of mouse clicks to those with low Internet usage, suggesting that they are either making less 'misclicks' on a page, or are not using as many interactive page features than participants with low Internet usage.

**Age based differences were apparent in objective performance between older and younger adults.** While no significant difference was found in the overall search engine usage between older and younger adults, it was found that younger adults visited more pages per minute than older adults, yet their average clicks per minute was comparable. This finding is very similar to that comparing high and low Internet usage older adults, and again suggests that these younger adult participants are either performing less mis-clicks during the study, using a combination of mouse and keyboard actions, or are using less interactive page elements during a study session.

The second experiment aimed to determine what user-based metrics, apart from age, can be used to understand the browsing experience of individuals. Age, Internet abilities, and cognitive characteristics were used to examine the perceived disorientation, reported website ease of use, and overall browsing experience of users.

**User age has a very small effect when predicting users' browsing experience.** All regressions within this study reported that age could not account for a significant amount of variance that is attached to participant perceived disorientation, reported website ease of use, and overall browsing experience. As such, one of the key findings from this study, and a recommendation for future HCI work, is that age cannot be used as a grouping variable when examining the browsing experience of individuals.

**Internet Confidence, rather than Usage, is important in predicting browsing experience.** While the amount of usage that individuals have in using a particular technology may increase their speed at completing tasks, the finding in this work suggests that it is their *confidence* in using technology that has an impact in their overall browsing experience. It is therefore suggested that a possible method of increasing the browsing experience for users is to attempt to invoke feelings of confidence in a particular service from an early stage, in order to make users feel more comfortable in using them.

**Inductive Reasoning did not show to be a predictor of Browsing Experience.** A surprising outcome from this work surrounds inductive reasoning, and its inability to act as a predictor of browsing experience. A large amount of literature in the past has examined fluid intelligence as a predictor of user performance, and Inductive reasoning is one of the 3 sub-abilities in this measure. This work found that while higher levels of inductive reasoning pointed towards less participant disorientation and a higher ease of use scoring, this was not at significant

levels. A possible reason for this may be down to this work using a more subjective measure of performance, and that measures such as inductive reasoning are more key in objective performance metrics such as task completion time.

**Perceptual Speed could be used as a predictor of determining participant Browsing Experience.** The processing speed sub-ability, perceptual speed, was successfully used as a predictor of user browsing experience. Higher levels of perceptual speed, resulted in lower levels of perceived disorientation, high levels of reported website ease of use, and higher levels of overall browsing experience. These findings suggest that the mental quickness that is associated with this ability, can be utilized in order to quickly understand links between information retrieval questions, and the possible routes through a website. However, caution must be applied as high levels of processing speed have been shown to correlate with high education levels in an individual, and this may in turn produce a secondary effect.

Overall, the findings from this study suggest that Internet confidence and perceptual speed can be used to more accurately understand an individual's browsing experience than by examining their age.

### 5.1 Implications of Results

A key implication for research practice arising from this work surrounds the use of age as a grouping variable within future studies. This work has shown that age cannot be used as a suitable metric to distinguish between individuals when examining their browsing experience, and as such, further questions must be asked regarding its usage as a suitable metric when distinguishing between individuals in both the HCI and User Experience fields. While age can be used to distinguish between different generational groups, and this may be beneficial in study design, analysis should consider alternative metrics such as participant confidence in using the technology or service being tested. This method may provide additional information into the reasoning surrounding experiences of individuals before assuming that age based differences occur.

Additionally, and of importance when examining cognitive abilities, this work has shown that subjective measures, such as perceived disorientation and browsing experience, can be used as alternative measures to understand user performance rather than relying on objective measures such as task completion time.

One of the key findings from the second experiment suggested that Internet confidence is a key measure in accounting for the perceived disorientation, reported website ease of use, and overall browsing experience of an individual. This may have implications for future user training methods. A focus on increasing the confidence that individuals have in using a particular service will increase their overall experience in using it. This approach, opposed to providing users with information on how all aspects of a system works, may provide individuals with a higher level of satisfaction, improving their experience in using a service and in turn may also reduce the amount of assistance needed in the future and increase technology retention rates.

## 5.2 Limitations and Future Work

The first experiment presented in this work was used to develop an understanding into how participant Internet Usage and Inductive Reasoning can affect performance. In this experiment, a total of 18 users were recruited, with this being split into 12 older adults and 6 younger adults. Older adult participant were then further split into users with high/low Internet usage, and fluid intelligence. This low number of participants reduces the overall statistical power of the experiment. Additionally a further limitation arises in the sample choice used in this study. The research was conducted with participants that could be described as *extreme* values of independent metrics. Users were recruited based on high and low age levels, fluid intelligence, and Internet usage. Users that had ‘average’ levels were disregarded. Focusing on these dichotomous groupings was chosen to highlight the differences that were apparent in the browsing experience between these different population groups. An extension of this work would therefore be to include users that do not fall into these extreme categories, and instead examine the continuum of users in order to discover if any additional changes occur.

The second experiment in this paper aimed to discover if participants perceived disorientation, reported website ease of use, and overall browsing experience could be accounted for by analyzing their age, Internet, and cognitive abilities. During preliminary analysis, it became apparent that there was no significant difference in the processing speed, short-term memory, and long-term memory measures between the older and younger adults in this work. This may be down to the sample recruited being very highly educated. In our sample, 75% (9 participants) reported achieving a bachelor level degree or higher. Compared to Czaja et. al [2006] where 33% of their sample reported post-college degree and 22% reported college level degree. This limitation is amplified by the low sample size used in this work. A further limitation in this work lies in the number of independent metrics used in analysis when compared to the overall sample size of the population used. With a total of 20 participants and 7 independent measures in regression, caution must be applied to the findings. This imbalance in independent measures to participants severely hurts the power of any results obtained. Bonferroni adjusted significance values were however used through this experiment to help compensate for Type-I error. Whilst caution must therefore be applied to these findings, extending this work to increase statistical power could be achieved by recruiting a wider range of participants.

## 6. CONCLUSIONS

This work has explored the use of Internet and cognitive metrics as an alternative to age when carrying out website usability studies. The main finding to arise is that when subjective metrics such as participant feelings or browsing experience are being measured, age is not a suitable metric to distinguish between users. While caution may be applied to the overall results due to the low sample sizes used, this work suggests that Internet confidence and perceptual speed are suitable alternatives to measure differences in user browsing experience. It may be possible to use these measures in future usability research as an alternative to participant age when grouping individuals.

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