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Investigating the Effects of Header Display Formats on Reading Webpages

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Abstract

This thesis investigated the influence of format (static vs. dynamic) and relevance (relevant vs. not relevant) on the creation of effective Web site header displays. Through evaluation of current trends in header display design, the aim of this research was to offer plausible explanatory mechanisms within the perceptual and visual systems, along with practical recommendations for both users and designers alike. While presenting 100 undergraduate students with simplified Web page interfaces containing only a header and paragraph text, looking time was measured followed by score on a set of text-comprehension questions. Score was then considered as a function of header characteristics such as format and relevance. Results revealed a negative relationship between scores in the relevant and not relevant conditions, suggesting an influence of header relevance on subsequent text-comprehension.

Investigating the Effects of Header Display Formats on Reading Webpages

At the turn of the century, nearly 361 million individuals had access to the World Wide Web. Today, that number is closer to 2.8 billion, reflecting a 676% increase in user base over the past 14 years (Miniwatts Marketing Group, 2014). With this number indicating that approximately 40% of the world's population makes daily use of this tool now known as the Internet, the body of literature surrounding it is growing. Éthier (2005) suggests that the volume of knowledge available can be classified according to four primary sources:

- Knowledge from computer and user interface research;
- Knowledge from related fields (such as psychology, marketing, and architecture);
- Knowledge from professionals with practical and developed expertise in the field;
- Knowledge from users of the Web.

Although the type and relevance of suggestions and tips offered by each source are unique, it is by considering all of them that one gains an accurate picture of the current state of the Web. It is also important to note that in this context, emerging trends tend to be driven by experts, supported by users, investigated through research, then examined in related fields – nearly always in that order. Unfortunately, as a function of this process often occurring over extended periods of time, much of the current empirical literature is related to trends and design principles that no longer exist or are considered out-of-date.

One trend which clearly illustrates this disconnect is that of header displays. Kelly (2008) discussed effective header design, outlining the importance of keeping headers small and relevant, for fear of stepping "completely outside the box," and doing something totally unconventional. The author states that the purpose of a header is strictly brand/product recognition, and as such, argues that keeping the header small allows for as much space as possible to be dedicated to content. In contrast, a recent post by Bourn (2014) offers a "go big or

go home" approach, emphasizing the use of large, dynamic, and graphical components – citing "small and simple" as the unconventional approach. She suggests that headers occupy the most valuable (prominent) real estate on a page, and thus are the perfect place to convey key information as well as the company brand. Meanwhile, when turning to the empirical literature, no recent work exists in support of either hypothesis, leaving anyone interested in making scientifically justified and informed decisions at a loss. Not only does this reinforce the tendency to use information and ideas not based in research, but it highlights how unreliable and subject to bias such "knowledge" truly is. By relying solely on their own expertise and personal experience, the authors of the two articles mentioned above arrived at completely opposite conclusions – both equally confident in their presentation of a rigorously untested "gold standard" on the matter.

Although many individuals still trumpet the usefulness of personal experience and expertise, a growing number of organizations and businesses are relying on a more empirical approach known as Web site usability testing. This approach focuses on in-depth investigations of how individual users navigate a particular website, and in correcting any points or places where users get stuck (i.e. are unable to complete a stated goal, such as finding a certain page or piece of information). Although the resulting data are certainly useful for the creation, updating, and maintenance of a particular Web site, the current focus on Web site usability testing has generated a creative environment in which knowledge of underlying visual and perceptual processes is subordinated in favour of specific test-case data. While this strategy is advantageous to organizations and businesses that can afford this type of research, both the general public and design community are no better off. Data related to specific contexts and Web sites are difficult to generalize, often use measurement metrics only relevant to particular organizations, and do little to inform the broader spectrum of overarching design practices. It is here, at the juncture of

practice and research that the present study lays; with the goal of bridging the gap between current Web design practices and the perceptual processes which underlie them. Through empirical evaluation of current trends in header display design, the aim of this research is to offer plausible explanatory mechanisms (within the perceptual and visual systems), along with practical recommendations for both users and designers alike.

Defining the Header

Historically speaking, the header was the top-most content of a Web page, characterized by its rectangular shape ("Definition of Header," n.d.). It contained items such as the site name and logo, and served much like the letterhead seen on printed documents – its function ultimately to offer quick and easy recognition of a brand, service, or organization. More recently, the function, shape, and style of the header have evolved. The header is no longer constrained to rectangular shapes or top-of-page placement, and displays greater variety in how, why, and when it is used. Although a modern header typically still maintains its placement at the top of a page, it has taken on the additional role of providing meaningful context for the content that follows (Allen, 2014). In doing so, headers now occupy greater amounts of screen-space while also featuring more graphical and interactive elements designed to capture and direct the user's attention (Pozin, 2014). While this could be argued as a logical and natural progression, it also raises the question of whether such large and graphical headers are in fact headers at all? With increased bandwidth availability and new formats emerging daily, some would argue that the line between header and content has been blurred to a point where the distinction is no longer meaningful or necessary. Perhaps then, if this is in fact the case, modern headers should be thought of as a new format for content presentation, rather than a separate entity all on their own.

Regardless of where the distinction between header and content stands, the increase in both Internet speeds and bandwidth has undoubtedly facilitated a change in the format and style

used today – something that will no doubt continue to change and evolve with time. While seemingly innocuous, this fact highlights the reality that although technology makes such changes possible, they are in fact changes that technology cannot itself evaluate – reinforcing the need for psychological research in understanding the bridge between the system and the user.

Format. With the current trend towards larger and more graphical headers, two overarching formats have emerged: static headers (lacking movement/change), and dynamic headers (including movement/change). Static headers contain non-moving and fixed elements that do not change or give the illusion of movement, frequently taking on the appearance of a large still-image or graphic (often with a text-overlay). Dynamic headers, in contrast, focus on movement, interactivity, and elements of change; featuring animations, changes in luminance, and other spatiotemporal discontinuities. Such defining characteristics of dynamic headers are evident in videos, as well as in stationary images with components animated via use of JavaScript, CSS animations, or other scripting libraries. Although the fact that both static and dynamic headers can be composed primarily of images may appear to confound this distinction, it is the quality of motion and change that truly sets the dynamic ones apart – something that static headers distinctively lack.

In hopes of observing the most pronounced differences/similarities between these two header formats (the first independent variable of interest), this experiment will consider videos to be the dynamic headers, and still-image clips from the videos to be the corresponding static headers. It is believed that this distinction will allow for the best possible comparison between conditions, while also controlling for affect-based influences of the header graphics themselves. Given that previous research has established that pictorial images elicit strong emotional responses (Bradley, Greenwald, Petry, & Lang, 1992) and influence information-processing strategies (Chowdhury, Olsen, & Pracejus, 2008), the importance of controlling for these effects

should not be overlooked – particularly given that the dependent variable of interest is score on a set of comprehension questions answered after viewing a Web page.

Although the intensity of affect will be different in the static vs. dynamic conditions (likely due to the dynamic condition automatically capturing more attention), this is in essence what the current experiment seeks to investigate – whether the inherent qualities of the dynamic vs. static format do have an effect. The component of affect being held constant across conditions is more concerned with the tone or mood of the content.

Relevance. Another important quality of headers and the second independent variable of interest is their [perceived] relationship to the content of the Web page (relevance). More specifically, relevance can be thought of as how well the header prepares the user (provides a script or schema) for the content of the page. If the two are distinctly related and/or share a widely recognized semantic relationship (i.e. a header featuring a sunrise and content that discusses coffee), the header is considered relevant; whereas when this type of relationship between header and content is absent, the header is considered to be not relevant. Note that the use of the term "irrelevant" has been purposefully omitted since the not relevant headers are designed to "not point to something," as opposed to "point to something else."

Although it might seem misplaced to use a header unrelated to page content, the current trend for big and graphical headers does include a sub-category focusing almost entirely on aesthetic appeal (Rocheleau, 2014). Cases where a logo is placed over a stunning mountain range backdrop or a top-of-the-world lookout are becoming increasingly common, and in fact, find support in the empirical literature covered below. Many Web sites, for both modern creative agencies and well-established businesses alike, are turning to this option as a valid design alternative for increasing purely visual appeal – largely with the goal of capturing attention and leaving the user with a sense of "awe," which in theory, should help drive business. While this

approach differs from both the historical (branding) and present-day (contextual) purpose of the header, it reinforces the importance of identifying the header's role. Although the historical vs. present vs. modern approaches each offer functionally different suggestions, the current research seeks to evaluate their influence on text-comprehension by combining components of each.

Creating effective headers. While it is clear that the issue of creating effective headers is one of significant complexity, an understanding of the current trends surrounding them is insufficient, and, would in effect, be akin to rehashing old news. The Web contains an abundance of pop-culture articles outlining exactly how to design the perfect header, but what is lacking is the empirical support behind it. No concerted effort has been made to link visual, perceptual, or psychological processes to the understanding of header design, and as such, a discussion of relevant considerations follows in an effort to understand the contributions of format (static vs. dynamic) and relevance (relevant vs. not relevant) to the overall effectiveness of Web site header design and creation.

Attentional Control

In understanding the best way for a header to capture and direct the user's attention, it is first necessary to identify the two types of attentional selection that occur: top-down and bottom-up.

Top-down. As described by Yantis (1993), top-down (or goal-directed/endogenous) selection occurs because the information or stimulus satisfies a goal-directed criterion. This type of selection relies heavily on knowledge-based factors, such as beliefs about the task at hand and related expectancies. While environmental conditions can also have an influence, top-down selection is typically characterized by a deliberate state of attentional readiness in which the user is expecting a particular type of stimulus. The contingent capture account is complementary to top-down attentional selection, supporting the notion that capture is dependent upon the

attentional set of the observer (Folk, Remington, & Johnston, 1992).

An important limitation of top-down selection was noted by Theeuwes and Van der Burg (2011), who demonstrated that when a user is given pre-trial information about their target, they are able to identify it more efficiently – but only when the distractors are less-salient than the target. Given that Web site users tend to implicitly understand the defining characteristics of a header (pre-trial information about the target) and the header is usually the most salient item on the page, this suggests that rather efficient selection will occur. Theeuwes and Van der Burg (2011) also noted that in cases where both the target and distractors were of equal salience, knowledge of the location of the target was required for more efficient selection. As such, in rare cases where this may occur on Web sites, the implicit knowledge that the header is at the top of the page (target location), should compensate for salience effects and maintain efficient header (target) selection. In the context of these findings, it is hypothesized that the two major limitations of top-down attentional selection can be readily overcome using the implicit knowledge of the user.

Bottom-up. In contrast to top-down selection, bottom-up (or stimulus-driven/exogenous) selection offers an account that relies primarily on the inherent ability of a stimulus to capture attention independently of the user's goals. Pinto, Olivers, and Theeuwes (2006) have suggested that dynamic items among static targets, items that differ significantly from their surroundings, and items featuring abrupt onsets (or spatiotemporal discontinuities of 100 ms or more) are all capable of producing salience effects and capturing attention automatically – an account which, similar to theories of bottom-up attentional selection, supports the notion that capture can occur regardless of the goals or attentional set of the observer (Theeuwes, 1992). Changes in properties such as luminance have also been shown to co-opt bottom-up processing mechanisms and drive the automatic capture of attention, regardless of specific user goals (Davis & Leow, 2005).

Attentional selection of headers. When considering the unique case of Web site headers, it is hypothesized that those containing dynamic or novel (more salient) elements will be most efficiently selected and processed – benefiting from the immediate (faster) attention-capturing effects of bottom-up selection (Meur, Callet, Barba, Member, & Thoreau, 2006), and also from the less error-prone processing that then follows from top-down selection (given that the header is in fact the first thing a user typically searches for on a page). Research investigating classical paintings has suggested that those images featuring more "dynamic elements" (the illusion of movement, depth, etc.) are subjectively judged to be more interesting, which leads to greater looking time (Massaro et al., 2012) – something that has been associated with greater comprehension in high school students (Schroeder, 2011). As such, in the context of this experiment, it is predicted that dynamic headers will produce greater comprehension scores along with increased looking time (time spent on the page) as compared to static headers.

Affect and Schema Effects

Despite the lack of research specifically addressing the question of whether headers can prime a user for the content of a Web page, the role of "providing context" is frequently cited as one of the primary purposes of a Web site header (Allen, 2014). Given that schema effects are often described in similar terms, it is hypothesized that the header of a Web page will act to prime the user in this way, prior to their exposure to the content.

Affect. Investigations by Bradley et al. (1992) found that pictorial images rated highly on the affective dimension of pleasantness were recalled more quickly in the short-term, positing that the emotional qualities of an image influence how well the image is encoded into memory. This suggests not only that the emotional quality of headers is important, but also that relevant headers should produce the best comprehension scores if affect is held constant – that is to say that if all headers have the same emotional qualities (and thus, will be encoded equally well),

then those headers relevant to the page content should provide the most retrieval and memory cues for the content and its comprehension. Other work from the realm of marketing described how viewing a highly positive or negative image in a print ad for merely 30 seconds could dramatically alter reader affect in the respective direction (Chowdhury et al., 2008). This same study also reported that information processing strategies changed as a function of affect, suggesting a benefit for more positive images in information comprehension and retention.

Taken together, these and other findings suggest that it is both possible and relatively easy to manipulate user affect via the presentation of mere images. In this way, headers judged as "nice" or "pleasant" should benefit the user's perception and comprehension of Web pages and their content. While image affect was not the focus of the current research, it was an important consideration in ensuring that affect-based influences were not the source of experimentally observed variability.

Related content. Another dimension relevant to the consideration of priming and schema effects is that of the header's relevance to the content. Research has shown that the presentation of a relevant schema-inducing image activates semantically related concepts in memory, and primes for quicker understanding and better recall of subsequently presented text (Bransford & Johnson, 1973). Given such findings, it is logical to hypothesize that headers will be able to produce a similar schema/priming effect, which will directly influence text-comprehension and memory. Specifically, it is predicted that relevant headers will produce higher comprehension scores, while not relevant headers will lead to comparatively lower comprehension scores.

Combined Effects

Having considered each of the independent variables separately, a framework to understand their combined influence must now be considered. The overall question of interest is whether format (dynamic vs. static) and relevance (relevant vs. not relevant) significantly

influence the effectiveness of header displays (as measured by score on a set of comprehension questions presented after viewing a Web page). The interaction predictions are as follows: that dynamic and relevant headers will produce the best comprehension scores, and that static and not relevant headers will produce the worst comprehension scores. Both of these predictions are rooted in the hypothesized advantage of dynamic/interesting headers in producing greater looking time, and also of relevant headers to produce memory enhancing priming effects. It is predicted that these two factors will have a synergistic interaction and provide optimal comprehension in the dynamic and relevant condition. All variables of interest will be examined by presenting the user with a simplified Web site interface (containing only a header followed by paragraph text) and then a subsequent set of comprehension questions.

Method

Participants

Ninety-one undergraduate students attending the University of Western Ontario (50 males, 30 females, and 11 unspecified) ranging in age from 18 to 23 years took part in this study. Participants were recruited via the Undergraduate Psychology Research Pool (SONA) and compensated with research credit towards completion of a first year psychology course. Approximately 25 participants were randomly assigned to each of the four experimental conditions (dynamic relevant, dynamic not relevant, static relevant, static not relevant), and none had any previous experience with the study. Testing was conducted online/at-home with participants using their personal computer to complete a single testing session lasting approximately 20 minutes. Due to missing data points, 11 participants were excluded from analysis.

Materials

A preliminary demographic questionnaire captured participant's age, gender, screen

width, screen height, and web browser. Each experimental trial used the format shown in Appendix A, with a header (750 pixels tall by 246 pixels wide) at the top of the page, followed by 5 to 6 paragraphs of text. Headers were either a 5 second animated GIF image (dynamic condition) or still-image-frame from the GIF (static condition), generated from freely available stock video footage of either coffee being poured, or "http://www.youtube.com" being typed one letter at a time ("Coffee Cup Stock," n.d., "YouTube Stock," n.d.). The text used in each trial was the content of one of two online news articles, discussing either coffee or YouTube (Groden, 2013; McDuling, 2014). The pairing of header content (coffee being poured vs. "http://www.youtube.com" being typed) with the text/article content (coffee vs. YouTube) determined whether the trial was part of the relevant or not relevant condition. Appendix B and Appendix C list the multiple-choice questions used to assess text/reading comprehension, and were generated by two independent readers.

Procedure

Participants were tested individually via an online survey completed at-home from their personal computer. After loading the survey homepage and verifying browser compatibility (must be non-mobile and JavaScript-enabled), they proceeded to read a letter of information and provide informed consent. Preliminary demographic information was collected, and participants were then guided through two experimental trials where header relevance varied and header format was held constant. Within each trial, there were three phases.

During the first phase, participants were provided with a description of the reading and comprehension task, and told to press a button when they were ready to start the trial. The second phase presented a header image paired with 5 to 6 paragraphs of text (see Appendix A), and asked the participant to click a button when they were finished reading. The total time spent on this page prior to clicking the button was the measure of looking time. The third phase had the

participant respond to a set of 10 multiple-choice questions regarding the text they had just read, and then informed them the trial was complete. The number of questions answered correctly was the dependent measure of comprehension score. These three phases were the same for each trial, with the header image and text block being manipulated to generate the various conditions. The order of trials (and respective IV conditions) was counterbalanced across participants to eliminate possible order effects.

Results

A multiple regression analysis was employed to assess the impact of demographic factors on text-comprehension scores. Using the stepwise method, it was found that none of age (M = 18.58), gender (50 males, 30 females, 11 unspecified), screen size (M = 1380 x 840 pixels), or web browser (38 Google Chrome, 32 Safari, 8 Firefox, 2 Other, 11 unspecified) contributed significantly to the variance in text-comprehension scores in the relevant, $R^2 = .045$, $F(4, 74) = .876$, *ns*, or not relevant condition, $R^2 = .023$, $F(4, 75) = .448$, *ns*. This supports the notion that any observed effects can be attributed to the independent variables of interest. Additionally, a negative correlation between text-comprehension scores in the relevant and not relevant condition, $r = -.394$, $p < .001$, suggests that the experimental manipulation of relevance did have an effect – whereby participants whose text-comprehension was helped by a relevant header displayed comparatively lower text-comprehension when a non-relevant header was presented. This is in line with the hypothesis that relevant headers prime participants with semantically related concepts, offering a better comprehension of the text on the Web page.

When correlations were performed to consider the relationship between looking time and text-comprehension, results were less clear. Although greater looking time was related to lower text-comprehension in the relevant condition, $r = -.200$, $p < .05$, a non-significant relationship in the opposite direction appeared in the not relevant condition, $r = .158$, *ns*. While no specific

predictions were made regarding the interplay of header relevance and looking time, these results suggest that looking time may not be directly related to content/text-comprehension. Additionally, these findings run counter to the prediction that greater looking time should result in great comprehension, highlighting the need for further investigation.

Subsequent analysis utilized a two-way mixed split-plot ANOVA (SPANOVA) to investigate whether format (between-subjects) and relevance (within-subjects) were causally related to text-comprehension as well as looking time. Due to the large variance in both text-comprehension scores (relevant: $M = 5.00$, $SD = 2.579$; not relevant: $M = 4.99$, $SD = 2.340$; see Figure 1) and looking time (relevant: $M = 98.619$ ms, $SD = 74.858$ ms; not relevant: $M = 117.435$ ms, $SD = 180.583$ ms; see Figure 2), Greenhouse-Geisser corrected values were used in all cases. The first SPANOVA utilized comprehension score as the dependent variable of interest, and found no significant effect of format, $F(1, 88) = .187$, $\eta^2 = .002$, power = .071, *ns*, or relevance, $F(1, 88) = .000$, $\eta^2 = .000$, power = .050, *ns*, and produced a non-significant interaction, $F(1, 88) = 1.692$, $\eta^2 = .019$, power = .251, *ns*. The secondary SPANOVA, which considered looking time as the dependent variable of interest, produced a series of similarly non-significant results for format, $F(1, 89) = .062$, $\eta^2 = .001$, power = .057, *ns*, relevance, $F(1, 89) = .761$, $\eta^2 = .009$, power = .145, *ns*, and their interaction, $F(1, 89) = .946$, $\eta^2 = .011$, power = .168, *ns*. By noting the size of the error bars in Figure 1 and 2, these results can be understood to be largely a product of the variance in the two dependent measures – particularly given the aforementioned negative correlation between text-comprehension scores in the relevant and not relevant condition, which suggests some type of relationship does exist.

Discussion

The present study sought to investigate whether format (dynamic vs. static) and relevance (relevant vs. not relevant) significantly influence the effectiveness of Web site header displays

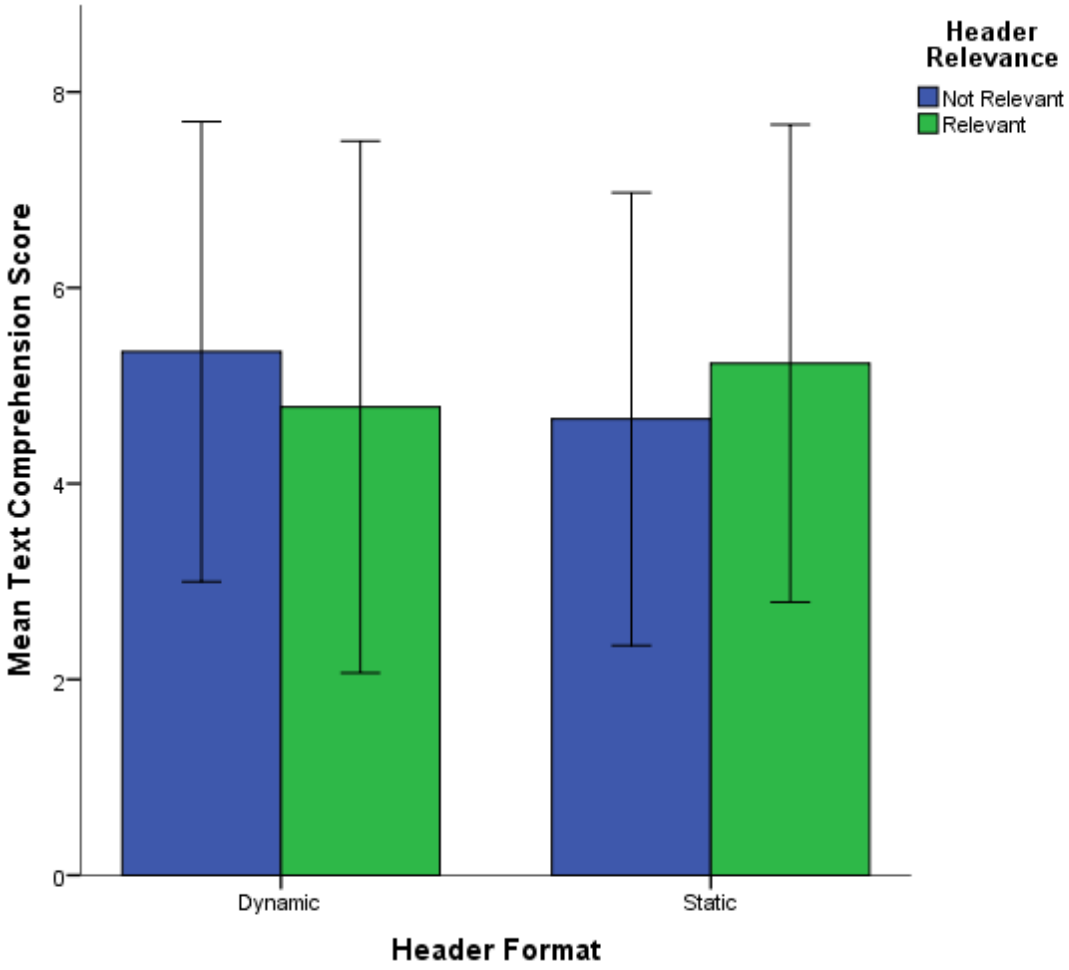

Figure 1. Effect of header format and relevance on mean text-comprehension score. Error bars represent standard deviations.

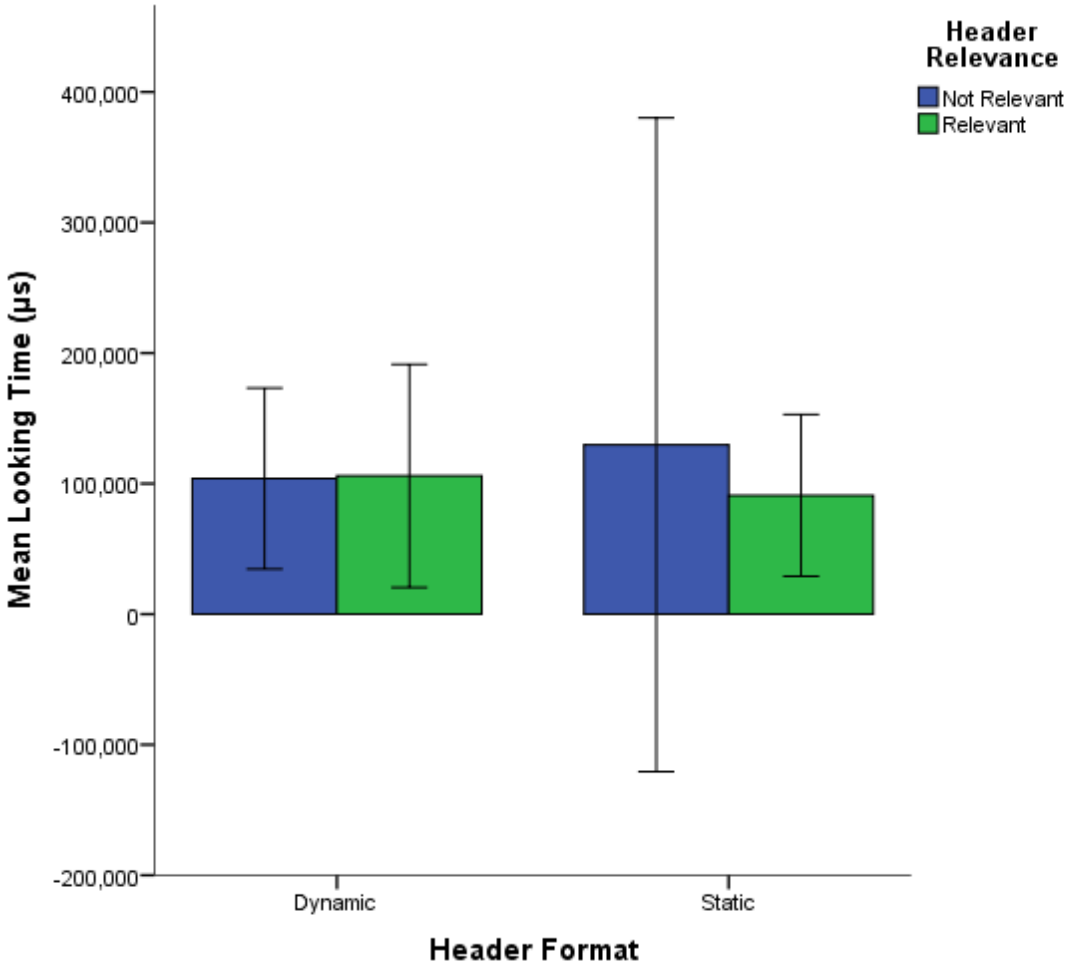

Figure 2. Effect of header format and relevance on mean looking time (in microseconds). Error bars represent standard deviations.

(as measured by score on a set of comprehension questions presented after viewing a Web page). It was hypothesized that dynamic and relevant headers would produce the best comprehension scores, that static and not relevant headers would produce the worst comprehension scores, and that relevance and format would produce a synergistic interaction – with each of these predictions rooted in the hypothesized advantage of dynamic/interesting headers in producing greater looking time, and also of relevant headers to produce memory enhancing priming effects.

Preliminary data analysis confirmed that demographic factors did not predict a significant amount of variance in comprehension scores, and that an inverse relationship exists between scores in the relevant and not relevant conditions. These results offer support for the suggestion that header relevance relates to comprehension of the subsequent text, and is thus an important consideration when designing Web site headers. As previously noted by Bransford and Johnson (1973), images can activate semantically related concepts in memory via schema induction, and when viewed before blocks of text, generate priming effects. When such images are relevant to the subsequent text, they should prime related concepts and aid in comprehension, while not relevant images should prime for semantically unrelated concepts, and hinder comprehension. Thus, when designing Web site header displays, relevance to the content should be maintained in order to maximize comprehension and subsequent recall.

Additionally, correlational data challenged the hypothesis that increased looking time will translate directly into better comprehension and recall. In the not relevant condition, no significant relationship was observed, while in the relevant condition, looking time was inversely related to text-comprehension (although these findings should be interpreted with caution given the overwhelming amount of variance in looking time). While some participants spent only 30 seconds reading the 5-6 paragraphs of text presented, others spent up to 16 minutes, offering real cause for concern. Due to both the online and at-home nature of the study, participants were free

to complete the trials at their own pace, and it appears some individuals may have walked away mid-trial and returned many minutes later. Nicholls, Loveless, Thomas, Loestscher, and Churches (2015) noted that studies being completed late in the semester and offering compensation in the form of research credit (as was the current study) tend to have lower participant motivation, while Pittenger and Doering (2010) emphasized that when participant motivation is low and little educational scaffolding exists in an online setting, completion rates tend to decline dramatically (as does the effectiveness of self-study). Not only do such findings suggest possible limitations to the current study's methodology, but also underscore the importance of considering participant motivation as a potentially confounding factor.

In noting the significant variance in both score and looking time (as shown by the error bars in Figure 1 and 2), it becomes plausible to understand this variability as a function of an unmeasured variable, such as participant motivation. While correlational data is able to identify trends that generalize across clusters of participants (i.e. those with low vs. high motivation), these same clusters may be the source of a SPANOVA's inability to extract significant results. For instance, it may be that people who were poorly motivated showed little difference between conditions, but people who were more motivated showed enough difference that overall the relationship was significant. If this is in fact the case, then the importance of using appropriate statistical methodology is paramount, suggesting a focus on the negative correlation obtained between scores in the relevant and not relevant conditions, as opposed to the non-significant result produced by the SPANOVA for header relevance.

Work by Oberfeld and Franke (2013) has supported the appropriateness of this suggestion by outlining the significant increase in Type I error rate observed when using a mixed design repeated measures ANOVA with a non-normally distributed response variable. They offer that the variance heterogeneity observed in such cases causes significant deviations from the

assumed robustness of an ANOVA design – even when using corrected values. In addition, null results for the effects of both format and relevance run counter to a large and well-founded body of work outlining differences in both visual processing and attentional control as a function of visual field characteristics (Davis & Leow, 2005; Massaro et al., 2012; Meur et al., 2006; Pinto et al., 2006; Theeuwes, 1992; Yantis, 1993), suggesting the need for further investigation.

A final methodological consideration stems from the fact that participants were not actually aware they were being timed, which was done in an effort to reduce performance demands and simulate a natural reading session on the Web. Past research has shown that students classified as fast readers will maintain their critical reading performance regardless of time pressure, although those classified as slow readers require an untimed environment in order to perform at their best (Van Voorhees, 1974). Thus, in order to capture an accurate measure of reading time as well as comprehension, the necessity of a covertly timed trial is made evident. Additionally, the need for future replication of similar studies in a lab setting is made plain – not only to monitor participants and ensure that looking time reflects actual time spent looking, but also to incorporate the use of eye-tracking methodology to discern the effect of header vs. text on looking time – something beyond the reach of the present work.

While it is clear that header differences in format and relevance should influence the visual processing that occurs, the current study clearly outlines the need for tighter participant control in order to fully tease apart any observable effects. Additionally, the necessity of more precise measures (such as eye-tracking technology) to further understand changes in looking time is made plain. By combining these two methodological changes, future research can further investigate the inverse relationship between text-comprehension under relevant and not relevant conditions, and offer greater insight into the visual and perceptual mechanisms at work. Moreover, designers and users alike should be wary of creating and using Web pages that

employ headers and other page elements not directly relevant to the content. While the distinction between relevant and not relevant has yet to be fully explored, it is clear thus far that the distinction does play a role in how content on the page is processed. By relying on headers that are schematically and semantically related to the content of the page, Web site creators can promote conditions that maximize text-comprehension and support optimal user learning.

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Appendix A

Trial Page Format

Header

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I Have Finished Reading

Appendix B

Comprehension Questions for Coffee Article

1. Researcher Michel Lewis suggested that coffee influences mood by affecting
a. insomnia
b. blood caffeine level
c. sleep cycles
d. levels of serotonin

2. For caffeine drinkers, suicide risk is cut by
a. 15%
b. 25%
c. 35%
d. 50%

3. In the 2011 study mentioned in the article, which discussed coffee's effect on the risk of depression, what were the findings?
a. men and women coffee drinkers increase their risk of depression by 15%
b. only women coffee drinkers increase their risk of depression by 15%
c. men and women coffee drinkers reduce their risk of depression by 15%
d. only women coffee drinkers reduce their risk of depression by 15%

4. The article about the benefits of drinking coffee suggested effects of coffee on all of the following except
a. heart failure
b. food allergies
c. diabetes
d. skin cancer

5. Evidence reported in the article suggests that suicide risk is decreased for
a. people who drink regular coffee or decaffeinated coffee
b. people who drink regular coffee but not decaffeinated coffee
c. people who drink decaffeinated coffee but not regular coffee
d. people who do not drink coffee of any type

6. Some negative effects of coffee consumption mentioned in the article include all of the following except
a. reduced creativity
b. insomnia
c. heightened focus
d. disturbed sleep cycles

7. The study conducted by the Harvard School of Public Health followed
a. two hundred thousand people for sixteen years
b. depressed women for one year (2011)
c. people who drink two to four cups of coffee a day
d. people with Alzheimer's Dementia

8. In discussing the link between coffee drinking and mental health, the article stated that there was a _____ connection.
a. strong
b. moderate
c. weak
d. non-existent

9. In the article, by what name is coffee also referred to?
a. joe
b. java
c. brew
d. it is only referred to as coffee

10. The study by the Harvard School of Public Health was published in
a. The Huffington Post
b. The New Yorker
c. The World Journal of Biological Psychiatry
d. The Journal of Experimental Psychology

Appendix C

Comprehension Questions for YouTube Article

1. Which videos uploaded to YouTube are scanned/compared to their database of copyrighted works?
a. only content that is flagged/reported by users
b. only those originating from particular countries/regions
c. all videos uploaded to the site
d. videos are selected at random (through an algorithm)

2. When copyrighted content uploaded to YouTube is identified, the rights holder has several options in response. Which of the following is not one of these options?
a. mute the content
b. monetize the content
c. buy the content back
d. block the content

3. What is the name of YouTube's digital content "fingerprinting" system?
a. Video ID
b. Content ID
c. Copyright ID
d. name was not specified

4. Digital fingerprinting is a technology for
a. allowing your computer to recognize your thumbprint
b. agreeing to pay music video producers for the right to watch their videos
c. monetizing rights to digital content
d. identifying copyrighted music and video content

5. Music videos account for approximately what percentage of all views on YouTube?
a. 40%
b. 8%
c. 15%
d. 80%

6. Google has paid out to content copyright owners
a. $500 million
b. $25 million
c. $15 billion
d. $1 billion

7. Ad-supported streaming music services accounted for approximately how much of the music industry's revenue in 2013?
a. 1%
b. 8%
c. 25%
d. more than 25%

8. The two segments of the music industry that are growing as other segments decline are ad-supported streaming and
a. music promotion
b. vinyl renaissance
c. Spotify
d. music for video games

9. YouTube is owned by
a. Spotify
b. Warner Brothers
c. Google
d. the music industry

10. How many reference files are presently included as part of YouTube's digital "fingerprinting" system?
a. More than 15,000,000 files
b. More than 20,000,000 files
c. More than 25,000,000 files
d. More than 50,000,000 files