

Faded Fonts: How Difficulty in Information Processing Promotes Sensitivity to Missing Information

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INTRODUCTION

Information on billboards and other signage is used to convey meanings, values, and features surrounding a product and has a big role to play when it comes to influencing consumer behavior. Past research has indicated the challenges of content inherent in billboards and the importance of continued research in this domain (Pieters, Warlop, & Wedel 2002; Dennis, Newman, Michon, Brakus, & Wright, 2010; Yoon et al., 2014). Despite extensive research on the effectiveness of visual information on billboards (Marlow, 2001; Huddleston, Behe, Driesener, & Minahan, 2018; Sundar, Gonsales, & Schafer, 2018; Wilson & Till, 2008; Dynel, 2011), textual information is often noted to be equally or even more effective than visual information in swaying consumer behavior (e.g., Kim & Lennon, 2008). Recent research, in fact, points to the fact that textual information can indeed be more effective than visual information in swaying human behavior (Castro & Horberry, 2004; Dillon, 2004; Toma, 2010). The literature indicates that an important consideration about textual information could be the font in which information is presented.

Fonts influence the impressions surrounding a brand (Henderson, Giese, & Cote, 2004). Furthermore, research indicates that fonts can influence both connotative meaning and emotion, which can eventually affect perception (Juni & Gross, 2008). Researchers note the importance of selecting fonts, which are used extensively in logos, in managing perceptions surrounding brand personality (Doyle & Bottomley, 2006). In addition to research on the inherent benefits of selecting the right font, the actual visibility of the font is also important (Coulter & Coulter, 2005). This is especially true with outdoor advertisements, which are only viewed for an average of five seconds (Davis, 1955). Past research demonstrates that it's necessary

Abstract /

Faded fonts on billboards and signage causes awareness of missing information. In this research we highlight the importance of fonts in advertising and wayfinding and how it impacts sensitivity to missing information. Across two studies, we demonstrate that disfluency caused by faded fonts can reduce omission neglect. Study 1 establishes the basis for consequences of disfluency on omission neglect as well as its effects on judgments. Study 2 demonstrates that disfluency increases awareness of missing information by reducing response time differences for correctly identifying previously presented versus missing information. Taken together, the two studies demonstrate that disfluency increases sensitivity to absent information. Practical implications to signage and theoretical contributions to research on omission neglect are discussed.

Keywords /

Faded fonts, Contrast recognition, Missing information, Disfluency

to have a balance between the textual and visual information presented in signage (Marlow, 2001). Bold fonts are often used to increase readability, as the higher visibility promotes fluency in the mind of the consumer. Faded fonts, other the other hand, are often used to trigger disfluency/difficulty to read information (Alter & Oppenheimer, 2008; Oppenheimer, 2008; Song & Schwarz, 2008).

Visibility in signage can break through clutter and is often combined with clear and readable messages (Taylor, Franke, & Bang, 2006). When designing content, businesses or organizations often assume that the signage should be clear and readable and try their best to avoid such disfluency (i.e. difficulty of processing information; Alter, Oppenheim, & Epley, 2013). Nevertheless, there are many practical reasons for fonts on billboards and other signage to be disfluent, including normal wear and tear caused by weather conditions and fading (Visual, 2016). Although faded signs are often indicators of economic hardship for a business, proprietors sometimes benefit by such signs (Sinfield, 2014). Alter, Oppenheimer, Epley and Eyre (2007) note that difficult-to-read lettering with reduced visibility reduces the impact of heuristics, defaults, and peripheral cues in judgments and improved syllogistic reasoning. Prior research on disfluency shows that attribution of the source of disfluency to the information increases deliberative, analytic processing (Alter et al., 2007; Diemand-Yauman, Oppenheimer, & Vaughan, 2011; Hernandez & Preston, 2013; Park, Herr, & Kim, 2016; Song & Schwarz, 2008). This can further encourage individuals to question their first impressions when engaged in decision-making or problem-solving (Alter et al., 2007; Song & Schwarz, 2008).

To show the bright side of disfluency, in the current research, we investigate the role of disfluency (versus fluency/easiness of processing information) as it influences awareness of missing information and subsequent judgment. We were interested in instances when participants generated or did not generate missing attributes due to disfluency (versus fluency). Specifically, we manipulated the disfluency/difficulty of processing information through the fonts in which signage appeared. The purpose of this research was to examine whether disfluency due to faded fonts would increase people's awareness of missing information and

eventually improve their judgments. We predicted that when signage was difficult to process because of faded fonts, consumers would detect missing information more efficiently, process information more cautiously, and make more moderate judgments. We hope our findings offer meaningful implications for both companies and the public on how the fonts of signages in billboards and advertisements may impact consumer information processing.

CONCEPTUAL BACKGROUND

Awareness of omission

Awareness of information that is missing in signage, such as missing attributes, features, options, concerns, or possibilities, is surprisingly difficult (Sanbonmatsu, Kardes, & Sansone, 1991; Sanbonmatsu, Kardes & Herr, 1992; Sanbonmatsu, Kardes, Posavac, & Houghton, 1997; Sanbonmatsu, Kardes, Houghton, Ho, & Posavac, 2003). Omission neglect, or the failure to detect the absence of important information, usually leads to extreme judgments on the basis of limited evidence. The failure to notice that information is missing can encourage consumers to form extreme judgments as they focus only on the presented information. This is mainly due to the fact that the presented information is often overestimated, and the importance of missing information is underestimated (Sanbonmatsu et al., 2003; Unkelbach, Fiedler, & Freytag, 2007). Consequently, beliefs are held with a high degree of confidence and can be highly favorable or unfavorable even when available evidence is weak. As most advertisements focus on positive information concerning their brands and products, omission neglect in such contexts usually results in highly favorable beliefs and judgments. Despite the seemingly positive impact of omission neglect on judgment, it may increase regret in the future when targets find out about important missing information (Wu, Escoe, Kardes, & Wyer, 2018; Wu, Shah, & Kardes, 2016).

Because omission neglect is consequential, it is important to discover its determinants and antecedents. We find it surprising that limited research has been conducted to investigate its antecedents. Muthukrishnan and Ramaswami (1999) find that knowledgeable consumers who consider multiple factors when making decisions

are sensitive to missing attributes. Kardes et al. (2006) demonstrate that when consumers are asked to consider the criteria used to judge a product before seeing an ad, they are more sensitive to missing information, and consequently, their product evaluations are less extreme. Both pieces of research suggest that when consumers engage in deeper processing, they become more sensitive to missing information. However, additional research on the antecedents of omission neglect is needed.

In the present research, we introduce a novel determinant of awareness of missing information. Specifically, we propose that disfluency, or the experience of difficulty during information processing (Schwarz, 2004), can mitigate omission neglect, resulting in less extreme but more stable judgments. Disfluent information is often unintentionally or intentionally presented to consumers. For example, small text, speedy dialogue, and difficult vocabulary frequently occur in the marketing context. Normal wear and tear can make a billboard or other signage difficult to follow. Although intentional and unintentional disfluency appear because of completely different reasons, both increase deliberation (e.g., Alter et al., 2007). As a consequence of increased deliberation, we predict that the experience of disfluency (e.g., a difficult-to-read font) may mitigate omission neglect by directing more effort toward the processing of information, and thus, increase the likelihood that consumers will recognize a lack of information. In other words, disfluent presentations of information signal to consumers that more effort needs to be expended to assess the sufficiency of presented information and thereby make an evaluation (Hernandez, Han, & Kardes, 2014). Finally, decreases in omission neglect, or in other words, increases in awareness of missing information, should lead to less biased judgements, lower perceived sufficiency of the presented information, and therefore, more moderate evaluations. To confirm the role of omission neglect, we attempt to rule the alternative explanation of attractiveness (Reber, Winkielman, & Schwarz, 1998). Prior research suggests that consumers may have less favorable evaluations because disfluency sometimes makes the source seem less attractive. In the present research, we show that even when the attractiveness is not affected, the disfluency effect on evaluations still occurs due to increased awareness of missing information.

Across two studies, disfluency was manipulated via easy-to-read versus difficult-to-read fonts through word-background color contrasts. Study 1 established a baseline for comparison of the consequences of disfluency on omission neglect as well as the effects of disfluency on judgment. It was anticipated that the difficult-to-read font would lead to lower omission neglect (e.g., lower perceived sufficiency of the presented information), leading to less extreme product evaluations. Study 2 used a novel response accuracy task to directly reflect omission neglect in the disfluent versus fluent conditions. We predicted that consumers would more readily memorize previously present (vs. absent) information by detecting it faster in the fluent condition but would memorize both previously present and absent information equally well in the disfluency condition. We also attempted to rule out *perceived attractiveness* as an alternative explanation in this study. Finally, although we used both billboards and on-site signage as stimuli in the studies to evaluate effects of contrast in signage, the implications in both these domains could take on different formats (i.e. faded fonts as deliberate stylistic character of place vs. off-site signage as a sign of economic decline, etc.).

STUDY 1

In Study 1, disfluency of fonts was manipulated via an easy-to-read word-background color contrast versus a difficult-to-read color contrast on a billboard. We predicted that compared to the easy-to-read color contrast, the difficult-to-read color contrast would lead to less extreme/favorable product evaluations. Furthermore, we predicted that the outcome on evaluation in our experiments would stem from decreased omission neglect. As disfluency may increase deliberative, analytic processing and encourage individuals to question their first impressions during problem-solving (e.g. Alter et al., 2007; Song & Schwarz, 2008), we predicted that disfluency should also increase consumers' sensitivity to missing information, or in other words, awareness of other important information that is absent. In this study, consumers' sensitivity to missing information was measured via perceived sufficiency and likelihood of missing information. When participants were insensitive to omissions, even a small amount of available evidence would seem

sufficient for accurate evaluation. We predicted that the difficult-to-read color contrast would lead to lower perceived sufficiency, contributing to lower product evaluations. We also predicted it would directly increase the perceived likelihood of missing information.

Procedure

A total of 111 adult participants (42.6% male; $M_{age} = 37.01$) were recruited via an online resource (i.e. Amazon Mechanical Turk) and received compensation of a small amount of money. Participants were randomly assigned to one of two conditions in a two-cell (color contrast: difficult-to-read vs. easy-to-read) between-subjects design.

Participants were asked to imagine that they saw an advertising billboard on their walk home. In particular, they were invited to evaluate a protein bar based on a picture and attribute information (see detailed stimuli in Appendix A1 and Appendix A2). The attribute information was described either in black-and-white or in light grey-light blue color contrast. In a pretest of the same subject pool, 108 participants rated how easy or difficult it was to read the attribute information (1 = *very easy to read*; 9 = *very difficult to read*). Based on the pretest, the light grey-light blue contrast ($M = 7.44$) was more difficult to read than the black-white contrast [$M = 3.20$; $F(1, 106) = 82.74, p < .001$].

After viewing the advertisement, participants reported their overall evaluations of the protein bar (1 = *very bad*; 9 = *excellent*) and the perceived sufficiency of the information given for them to make a correct evaluation of the bar (1 = *not sufficient at all*; 9 = *extremely sufficient*). Afterward, we directly asked participants how likely it was that relevant information was missing (1 = *extremely unlikely*; 9 = *extremely likely*). Finally, demographic information was collected.

Results

A one-way ANOVA performed on the overall product evaluations revealed less favorable and less extreme evaluations in the difficult-to-read light grey-light blue color contrast condition ($M = 5.09, SD = 2.11$) than in the easy-to-read black-white color contrast condition [$M = 5.91, SD = 1.82$; $F(1, 106) = 4.62, p = .034$]. Participants reported that the given information was less sufficient when viewing the difficult-to-read color

contrast ($M = 3.74, SD = 2.55$) than when viewing the easy-to-read color contrast [$M = 5.83, SD = 2.00$; $F(1, 106) = 22.55, p < .001$]. To determine whether perceived sufficiency accounted for the variations in the overall evaluation of the product, a mediation analysis was conducted (Hayes, 2012; Model 4; Bootstrap: 5000). As predicted, it mediated the relationship between color contrast and evaluation extremity (95%; CI: -1.77 to -.74). Importantly, difficult-to-read color contrast also led to higher perceived likelihood of missing information than easy-to-read color contrast [$M_{difficult-to-read} = 6.76, SD = 1.78$ vs. $M_{easy-to-read} = 5.57, SD = 2.04$; $F(1, 106) = 10.33, p = .002$]. As predicted, it was negatively correlated with perceived sufficiency ($r = -.25, p = .01$).

Discussion

Consistent with prior research (e.g. Reber et al., 1998), Study 1 showed that disfluent information led to less extreme evaluations. Nevertheless, contrary to what Reber and colleagues (1998) suggested, we found that disfluency led to less extreme evaluation even when the perceived attractiveness was not altered. Study 1 showed that difficult-to-read color contrast enhanced sensitivity to missing information, which was a novel consequence of disfluency. When the color contrast was difficult to read, participants perceived the information as less complete, contributing to less extreme/favorable evaluations.

STUDY 2

A novel response time paradigm was used in Study 2. Prior research shows that response time increases as the difficulty to finish a task increases (Bargh & Chartrand, 2000; Fazio, 1990). Because missing attributes are more difficult to detect compared to presented attributes, response time for the correct identification of missing attributes should be slower than response time for the correct identification of presented attributes. In other words, when information is easy to read, participants should be faster to detect previously present information than previously absent information. However, when information is hard to read, we predicted that participants would be equally fast to detect both types of information. This was because differences in response time as a function of whether the attribute is missing or

not would be less pronounced when information is hard to process.

Procedure

A total of 97 participants (45.3% male; $M_{age} = 36.92$) were recruited via an online resource and received a small monetary compensation. Participants were randomly assigned to one of two conditions in a two-cell (color contrast: difficult-to-read vs. easy-to-read) between-subjects design.

Participants were asked to imagine that they saw a bus stop advertisement (see Appendix B1 and B2). Specifically, participants evaluated a laptop computer based on a picture and four pieces of information. The information was shown either in easy-to-read black-white or in difficult-to-read light grey-light pink color contrast. The information presented with the difficult-to-read contrast was expected to be difficult to read but readable with effort. After viewing the information, participants reported their overall evaluations (1 = *very bad*; 9 = *excellent*), how much attention they paid to the ad (1 = *very little*; 9 = *very much*), the perceived sufficiency of the information (1 = *not sufficient at all*; 9 = *extremely sufficient*), and how attractive they thought the ad was (1 = *not pretty at all*; 9 = *very pretty*). In addition, a pretest with the same subject pool showed that the information was indeed more difficult to read in light grey-light pink than in black-white contrast conditions [$M = 7.09$ vs. $M = 3.92$; $F(92) = 50.43$, $p < .001$].

Next, participants completed a response time task. They were asked to respond as quickly and accurately as possible and to emphasize accuracy over speed. Eight pieces of attribute information (four previously presented and four not-previously presented attributes) about the laptop were presented one at a time on a monitor, and for each attribute, participants were asked to press a button labeled “present” or a button labeled “absent” to indicate whether the attribute was either present or missing in the target ad. The attributes were randomized to control for order effects. Participants concluded the survey with demographic measures.

Results and Discussion

Self-reported measures. A one-way ANOVA performed on overall product evaluations showed that

participants tended to form less extreme evaluations in light grey-light pink than in black-white contrast conditions [$M_{difficult-to-read} = 5.67$, $SD = 1.30$ vs. $M_{easy-to-read} = 6.51$, $SD = 1.43$; $F(95) = 8.98$, $p = .003$]. Participants reported that the information was less sufficient when viewing difficult-to-read color contrast ($M = 4.46$, $SD = 2.36$) than when viewing easy-to-read color contrast [$M = 5.41$, $SD = 2.27$; $F(1, 95) = 4.11$, $p < .05$]. As in Study 1, the perceived sufficiency mediated the relationship between color contrast and evaluation extremity (95%; CI: $-.57$ to $-.02$). Importantly, the color contrast impacted neither attention [$M_{difficult-to-read} = 5.43$, $SD = 2.34$ vs. $M_{easy-to-read} = 6.10$, $SD = 2.30$; $F(95) = 1.98$, $p = .16$] nor perceived attractiveness [$M_{difficult-to-read} = 4.63$, $SD = 2.07$ vs. $M_{easy-to-read} = 5.10$, $SD = 2.37$; $F(95) = 1.06$, $p = .31$]. The results on attention and attractiveness ruled out as two alternative explanations.

Response time. A within-subject ANOVA performed on response time showed that participants responded faster to previously presented than to missing information [$M_{present} = 3.73s$ vs. $M_{absent} = 4.51s$; $F(93) = 17.24$, $p < .001$]. No main effect for color contrast was found ($F < 1$). Most importantly, there was an interaction between color contrast and attribute presence/absence [$F(1, 93) = 4.54$, $p = .04$]. When the contrast was easy to read, participants responded faster to previously presented than to missing information [$M_{present} = 3.70s$ vs. $M_{absent} = 4.86s$; $F(1, 50) = 28.77$, $p < .001$]. When the contrast was difficult to read, this difference disappeared [$M_{present} = 3.77s$ vs. $M_{absent} = 4.15s$; $F(1, 43) = 1.46$, $p = .23$], indicating that participants were more sensitive to missing information in this condition. There was no effect of contrast and information presence/absence on response accuracy ($F < 1$), suggesting that participants followed the instructions to weigh accuracy over speed and that they could clearly read information in both conditions.

Using a different measure of sensitivity to missing information, Study 2 showed that disfluency increased recognition of missing information by reducing response time differences for correctly identifying previously presented versus missing attributes. When the contrast was difficult to read, differences in detecting present and absent information were lower than when the contrast was easy to read. The results suggest that participants were indeed more sensitive to missing

information when presented information was more difficult to process. Together, Studies 1 and 2 provide converging support for the hypothesis that disfluency/difficulty increases awareness of absent information.

General discussion

The purpose of this research was to explore the role of disfluency on awareness of missing information. While easy-to-read signages are commonly chosen over hard-to-read ones, our findings suggest that signages that are hard to read due to faded fonts may have some positive impacts. Our findings are consistent with and lend further support for the effect of disfluency on deliberative, analytic processing (e.g. Diemand-Yauman et al., 2011), as well as for the effect of disfluency on questioning and reconsidering first impressions (Alter et al., 2007; Song & Schwarz, 2008). Our research suggests that disfluency due to faded fonts of signages leads to increased awareness of missing information that is typically neglected. This increased awareness of missing information in turn decreases the extremity of evaluations and may improve consumer information processing.

Our research is of critical importance to businesses, consumers, and public policy makers. Presenting information fluently through clear fonts can induce extreme judgments and neglect of important information that is absent. On the other hand, presenting information disfluently through faded fonts can encourage consumers to process information more cautiously. While signage communicators usually want positive audience reactions, it is often important and ethical to encourage the target audience to make cautious and stable judgments and decisions. Neglecting important information because of fluency may have highly negative consequences. If the audience's reactions are positive only because important absent information has been neglected, the impact can be more harmful than beneficial. For instance, neglecting absent side effects of a medication may lead to severe health issues. In this case, it is crucial that both doctors and patients are aware of the side effects, either present or absent in the current communication. Our findings suggest that one way to remind

audiences of unknown information is to present information in harder-to-read signs.

As signages are crucial to any forms of advertising, including billboards, they should be balanced based on the image and message a firm wants the consumer to process and the way in which they want them to process it (Sundar, Dinsmore, Paik, & Kardes, 2018; Sundar, 2018). Recall of textual elements is the lowest percentage based on Pieters and Wedel's (2004) research on magazine advertisements and is further reinforced by the "sake of exposure time" (Marlow 2001), but textual elements can be more effective, for example, in advertising at an airport where there are constantly long lines, according to Wilson and Till (2008). Based on Taylor, Franke, and Bang's (2006) work, visibility as a channel of decluttering, readability, and clarity is the most important element of a billboard. It draws consumers into a physical store more than the gravitational model of placing billboards in close proximity to a store and focusing mostly on nearby potential shoppers, but it can collaborate with that model as well.

While the current research focuses on advertising billboards, future research might explore how disfluency impacts information processing on other communication media. Future research might also examine whether disfluency triggered by elements other than faded fonts lead to similar results. It is worth expanding upon the practical implications of disfluency's effects on both short- and long-term brand reputations to better inform future marketing activities. It is possible that disfluency benefits long-term reputations in particular because it encourages consumers to make more cautious judgments and decisions. Furthermore, future research could also explore moderators that drive responses to disfluency. It is possible that individual traits such as critical thinking and the need for closure may affect how individuals respond to disfluency. Whereas disfluency may be a good debiasing technique for some people, it may not work on others. We hope our investigation of disfluency's effects on awareness of missing information in the context of billboard signage presents meaningful implications and opportunities for future research.

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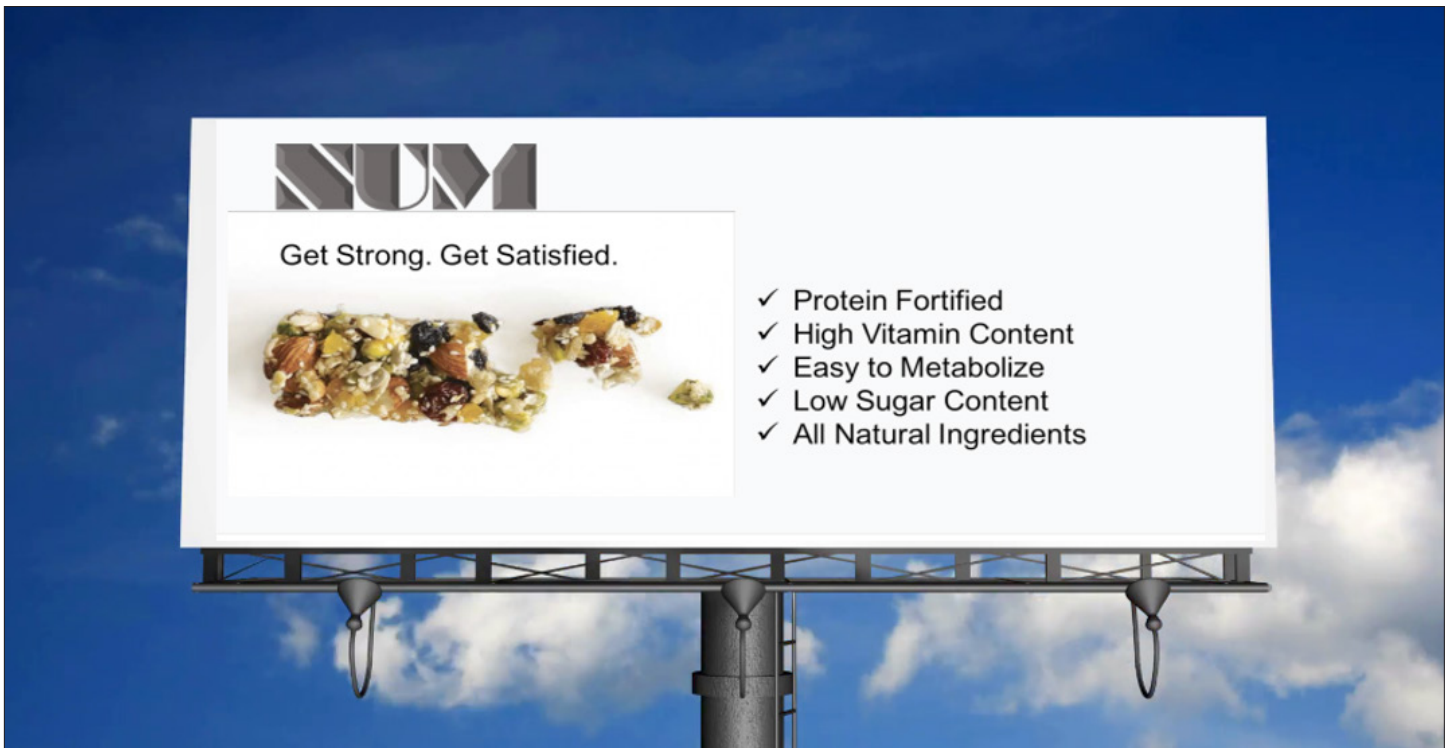
APPENDIX A1

Difficult-to-read advertising billboard used in Study 1



APPENDIX A2

Easy-to-read advertising billboard used in Study 1



Easy-to-read contrast color used in Study 2



Difficult-to-read contrast color used in Study 2



Summary of Studies

Study 1		
	Difficult-to-read	Easy-to-read
Product Evaluations	5.09 (2.11)	5.91 (1.82)
Perceived Sufficiency	3.74 (2.55)	5.83 (2.00)
Likelihood of Missing Information	6.76 (1.78)	5.57 (2.04)

Study 2		
	Difficult-to-read	Easy-to-read
Product Evaluations	5.67 (1.30)	6.51 (1.43)
Perceived Sufficiency	4.46 (2.36)	5.41 (2.27)
Response Time		
	Difficult-to-read	Easy-to-read
Present Information	3.77ms	3.70ms
Absent Information	4.15ms	4.86ms