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Two studies on how a typeface congruent with content can enhance onscreen communication

Keywords: typeface, personality, emotion, affective processing, design, aesthetics, research methods, reading

In two studies we investigate the effects that typeface “personality” has on readers’ processing of affective information. In study 1, personality trait words were briefly shown in a typeface with a personality either congruent or incongruent to the word’s meaning. Readers were faster at an emotion lexical decision task with congruent typeface personalities than with incongruent typeface personalities. Study 2 briefly showed pages in varying fonts and found that readers’ snap judgments on emotional tone of the page were influenced by typeface personality. We conclude that readers can instantly process typeface personality and that typeface can affect onscreen affective processing.

Introduction

An abundance of evidence notes that people can develop preferences and be affected emotionally with very brief visual presentations (e.g., Smith & Magee, 1980; Zajonc, 1980). For example, Willis and Todorov (2006) found that participants could judge the traits of people after viewing their faces for only 100ms. Increasing the exposure time did not change the trait judgments. More exposure time allowed for more finely differentiated

judgments, but later judgments were already anchored on the initial impression.

A number of authors have characterized humans as having two evaluative systems (e.g., Chaiken & Trope, 1999). The first system is automatic, fast, and preconscious. The second system involves conscious thinking and is slow, effortful, and deliberate. In his influential 1980 article, Zajonc illustrated how people can develop preferences based on brief glimpses without conscious awareness. Furthermore, people are often unable to explain what in the environment has influenced their preference or behavior (Kay, Wheeler, Bargh, & Ross, 2004). Many researchers have used priming and other implicit measures, measures that are based on response characteristics such as reaction time, to demonstrate that the automatic fast system has a lasting effect on people’s stated preferences, deliberate thought, and actions (Fazio, 2001; Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Maison, Greenwald, & Bruin, 2004).

Onscreen page aesthetics are processed quickly and automatically as well and can impact readers with very brief presentations. Lindgaard, Fernandes, Dudek, and Brown (2006) found that in just 50 ms users make aesthetic judgments on their preference for a web site. Internet site pages were flashed onto a computer screen, and respondents made a decision about how appealing they found the site. Their preferences were similar to the

ones they made at longer exposures, and the impression was lasting and influenced the rest of their experience with the Internet site. Lindgaard et al. (2006) were not able to determine in their study what common aesthetic features their participants found most appealing. They did conclude that these first impression judgments based on brief glimpses are more the result of an emotional, physiologic response and before cognitive appraisal had had time to occur. Some visual information such as hue, orientation, size, and motion can be processed from just a single glimpse; this information has been termed pre-attentive processing (Healey, Booth, & Enns, 1995; Smith & Magee, 1980; Treisman, 1985). This processing occurs before visual search has been initiated and likely involves the quick thalamus amygdala circuit in the brain. Zajonc (1980) labeled impressions based on such brief glimpses as the “mere exposure effect.” The “wow” response, a term for the burst of positive emotion when first viewing a product or feature, is a particular type of first impression reaction that has a measurable physiologic component (Hazlett & Benedek, 2005).

A particular onscreen visual aesthetic that is so ever-present that it is usually not given a conscious thought by readers is typeface. Though typeface may not be the focus of a reader’s attention, it is often credited with creating a page or document’s first impression. The Vox-ATypI system classifies typefaces into eleven classes: humanist, garald, transitional, didone, mechanistic, lineal, glyphic, script, graphic, blackletter, and gaelic (Vox, 1975). The classifications are partly based on being typical of a particular century and partly based on serif and other features of the letter. In addition to these typeface categories, some characteristics can vary within a family of fonts, such as weight (light, bold, black), italic, and letter width (condensed, expanded). The combination of appearance and typographical features often lead graphic artists and typographers to describe typefaces using personality traits (Berry, 2004).

Typographers and designers are interested in the typeface personality or “typographic allusion,” which refers to “the capacity of a typestyle to connote meaning over and above the primary meaning which is linguistically conveyed by words” (Lewis & Walker, 1989, p. 243). Within communications research, many experts suggest that typefaces can convey mood, attitude, and tone while having a distinct persona based on the font’s unique features. This ability of a typeface to convey emotion or personality can be used by designers for communication purposes. For example, the personality of the typeface can be employed to enhance the communication of a document’s tone or mood or the personality of an organization’s brand.

Readers have found to perceive certain fonts or typefaces as having distinct personality traits. Mackiewicz and Moeller (2004) found that students rated typefaces differently on personality attributes and that their impression of a typeface’s personality was based on prior experience and anatomical features of the typeface. Using an online survey method, Shaikh, Chaparro, and Fox (2006) had 561 participants rate 20 fonts using 15 adjective pairs. The adjectives included pairs like stable/unstable, conformist/rebel, and sad/happy. Factor analysis found that personality traits were attributed to fonts based on their design family and clustered into five factors (Serif, Sans-Serif, Modern, Monospace, Script/Funny). Shaikh (2007) investigated the effect of using congruent appropriate typeface on e-commerce websites. She found that, when typeface appropriateness was high, users perceived the site’s company as being more professional and the content as more believable; also, their intent to use the site was greater. This study suggests that a typeface that is congruent with the company’s ethos, or mission, enhances the effectiveness of the website.

Most research investigating the effects of typeface on reader’s performance (e.g., reading speed, reaction times) has focused on legibility or readability and not perceived

personality of typeface. One notable exception to this was a study on the effects of perceptual qualities of print typeface by Lewis and Walker (1989) that used a Stroop-like paradigm. The Stroop task (Stroop, 1935) has been a popular task in experimental psychology to test word interference and attention. In the original task, a subject views names of colors presented in different colors of type and is asked to name the color of the type. For incongruent (color of type and word meaning different) combinations, the subject's reaction time is slowed, and for congruent (type and word meaning match) combinations, the reaction time is enhanced. This effect has been found to hold for any common word.

In Lewis and Walker's experiment, participants saw adjectives (e.g., fast/slow, heavy/light) descriptive of one of two print typefaces through a tachistoscope and had to press certain keys based on which adjective word was being displayed. Reaction times were slower for typefaces that were incongruent with the adjective being tested. Incongruent, for example, would be the word "light" written in heavy type. This task is opposite of the original Stroop task in that subjects respond to word meaning, and it is the visual properties of the word that are the interference or facilitator of processing. Just like word meaning can influence the responding to visual qualities of a word, the visual aspects of a word can affect processing of word meaning (Palef & Olson, 1975; Smith & Magee, 1980). Lewis and Walker speculated that the activation of semantic categories associated with typeface qualities proceeds more rapidly and is available sooner than the activation of semantic categories associated with word meaning. The visual aesthetic information had a quick effect that influenced the latter processing of word meaning.

Reaction time measures like that used by Lewis and Walker (1989) have been employed in a variety of paradigms to investigate emotional processing and automatic activation of attitudes. In the affective priming

procedure, the brief presentation of emotion words flashed onscreen has been shown to affect subsequent lexical decisions (Fazio, 2001). The theory is that the prime word activates the lexical category of the target word, and that enables a faster decision making process. In the Stroop matching task, participants choose whether the color of a word or object matches the meaning of the color word. With this task Goldfarb and Henik (2006) found that congruent word meaning/color combinations were processed faster than incongruent ones. This Stroop facilitation effect is particularly relevant for studying congruency effects of typeface personality, for the two effects share similar characteristics. Unlike priming procedures, where the facilitating prime is presented before the target word, both the facilitating colorword in the Stroop test and the facilitating typeface personality are presented simultaneously with the content meaning (MacLeod, 2005; Palef & Olson, 1975).

The effect of onscreen typography and other reading aesthetics has been investigated with reading performance measures like speed and comprehension. Gugerty, Tyrrell, Aten, and Edmonds (2004) found reading speed and comprehension advantages for the advanced ClearType rendering engine over the basic black & white rendering engine. ClearType rendering uses color subpixels to display additional resolution, while black & white rendering uses full black or white pixels (Larson, 2007). In a lexical decision task, they also found greater word recognition for words in ClearType. Letter recognition has also been compared for ClearType versus nonClearType fonts (Chaparro, Shaikh, Chaparro, and Merkle, 2010). But other more subtle on-screen aesthetic improvements don't demonstrate the large performance differences that we see with ClearType. Larson, Hazlett, Chaparro and Picard (2006) investigated the performance difference between documents with good page layout and poor page layout and found no speed or comprehension differences between these two

conditions. Investigating the effects of on-screen aesthetics may require a different approach.

Experimental objectives

We wanted to test if first impressions of onscreen visual aesthetics, without contamination by the meaning of the written content, could communicate more than just attraction and valence (positive/negative) and embody personality attributes to the display. Survey studies (Shaikh et al., 2006) have demonstrated that users will rate fonts differently on personality traits, but we were interested in whether those self-reported impressions really made a difference in how the onscreen content was processed and reacted, too. Using reaction time and other procedures designed to measure first impression effects, we investigated if more human-like typeface personality traits (which presumably involve more complex processing) than used by Lewis and Walker (1989) could affect the reading experience and the communication of written material.

Our first hypothesis was that congruent content and typeface pairings (where the meaning of the word and the personality of the typeface are similar), as opposed to incongruent content and typeface pairings, enhance and facilitate the communication of the emotional tone of the content. For example, Shaikh et al. (2006) found that their participants ranked the font Georgia high on the personality trait practical. So a congruent pairing of typeface and word meaning would be the word “practical” written in the font Georgia, and an incongruent pairing would be the word “idealistic” (an antonym of practical) written in the font Georgia. Typefaces that have a congruent emotional tone contribute to the activation of the emotion category of the content, enhancing the speed of processing emotional meaning of content and deepening the activation. Secondly, we wanted to investigate whether the personality of the typeface can

influence the perception of the emotional tone of an onscreen page. Thirdly, we wanted to address the lack of good empirical tools that Norman (2004) refers to that are needed to understand and measure the effects of aesthetics. We were interested in ascertaining whether the priming and brief exposure procedures used in these studies could be useful tools for evaluating aesthetic design. Brief exposure procedures have been used to test legibility of onscreen characters (Beier & Larson, 2010; Chaparro et al., 2010) but not for the aesthetics of fonts.

Study 1: Word test of the effects of font personality

Method

Twenty-five participants read emotionally congruent and incongruent word/font pairings quickly flashed on a computer screen. Participants were asked to decide whether it was a positive or negative emotional word by clicking a button on the screen. The study sample consisted of mainly hospital employees or students between the ages of 21 to 40 years. These individuals were mostly professionals in a medical field or students in nursing or graduate students in the biological sciences. The inclusion criteria were a minimum of one year of college, either corrected or uncorrected 20/20 vision, and that participants read from a computer screen 5 or more hours per week. Since they typically accessed many web sites and written sources during their work or study, they were exposed to a variety of fonts.

Times New Roman (TNR) typeface was compared to Monotype Corsiva. These fonts were chosen based on the results of the study on personality of fonts by Shaikh et al. (2006). These two fonts were found to have extremely different personality traits. TNR’s distinctive trait words were stable, conformist, mature, and practical, while Corsiva’s trait words were feminine, elegant,

and attractive (see Figure 1). A list was developed with 48 words congruent with TNR's traits and 48 words congruent with Corsiva's traits (see Appendix). The list was developed by using a thesaurus and selecting words from a list of trait words that shared the same personality factor as the font's trait (Watson & Clark, 1994). Twenty-four nonrelated trait words were mixed in the presented list to make a pseudo-random presentation of 120 words. In order to familiarize the participants with the task as well as to expose them more equally to both fonts (exposure to Corsiva was particularly important as participants were likely more familiar reading TNR), twelve practice words were included at the beginning for a total of 132 trials.

A mixture of positive and negative trait words was presented. Lexical decision tasks using emotional valence categories of positive and negative have been fruitful to investigate emotional priming effects (Fazio, 2001). The reason is that the participant needs to process the emotional meaning of the word in order to make the classification, insuring that the emotional/personality attributes associated with the word are processed. We were not interested in emotional valence effects, and a rough balance of negative and positive words seemed adequate, just so that participants would not begin to anticipate one valence pole or associate one font with

negative or positive valence. We tracked the percentage of trials each word was decided to be positive or negative, and there was a balance between fonts. Nine of the Corsiva words and 12 of the TNR words were endorsed as negative by more than half the participants.

In the lexical decision procedure used here, the presentation font (the font the word was presented in) was varied between TNR, Corsiva, and Verdana. Half of the Corsiva and TNR trait words were presented in TNR font and half in Corsiva font, and the nonrelated words were presented in Verdana. The trait words were counterbalanced between a TNR and a Corsiva presentation. Each trait word was presented only once to each participant. Whether the trait word was presented in congruent or incongruent font was alternated by participant so that there was an equal number of participants who saw the trait word in congruent font and in incongruent font. Examples of congruent and incongruent trait words presented in TNR and Corsiva are presented in Figure 1, along with the control font Verdana.

Participants saw the word appear in the middle of the computer screen, and there were two buttons below the word, one with a positive label and one with a negative label. They read, "The following words can be used to describe a person. Is this word a positive or negative

Congruent Corsiva	Congruent TNR	Incongruent Corsiva	Incongruent TNR	Verdana Control
<i>pretty</i>	reliable	<i>stable</i>	lithe	passive
<i>gorgeous</i>	cold	<i>inhibited</i>	lovely	rude
<i>stylish</i>	calm	<i>conformist</i>	charming	stingy
<i>trendy</i>	staid	<i>aloof</i>	moody	polite
<i>sexy</i>	constant	<i>proper</i>	attractive	lazy

Figure 1. Congruent and incongruent presentations of trait words in Times New Roman and Corsiva fonts

Note. This 14pt font size is the actual size the words were presented to the respondents

quality?” The participant used a mouse to click on either the positive or negative button to indicate whether the word was a positive or negative trait. We followed Fazio’s procedure and asked participants whether they felt the word was positive or negative, assuming there was some innate understanding of what those valence poles meant. Since there was large agreement across subjects on many words as to whether they were positive or negative, the question seems to tap a culturally shared meaning.

After the valence button was clicked, the word disappeared from the screen. Four seconds later, a new trial would start with a marker rectangle. The new word would then appear 500 ms after the rectangle. The selection and the elapsed time between presentation of word and button click was recorded. The participants used a Dell Inspiron 600m laptop with a 14.1 inch screen at a resolution of 1400 x 1050 pixels (124dpi). The target word was presented in 14 point font.

Results

Reaction time responses 2.5 standard deviations above the participant’s mean were considered failures in timely processing and decision making and eliminated, to control for the influence of extreme values on the mean (see MacLeod, 2005 on controlling for outlier effects with reaction time data). The means and standard deviations in response times for the congruent and incongruent presentations are reported in Table 1 by Trait word. In order to understand if there were significant differences between these response times, a repeated measure analysis of variance (ANOVA) statistical procedure was conducted, which uses the variance of the conditions to test whether any differences found between these mean response times were not due to chance.

Table 1. Mean (*SD*) response latency in milliseconds to trait words.

Trait Word	Font Word was Presented in	
	TNR	Corsiva
TNR	1558 (361)	1648 (389)
Corsiva	1455 (278)	1407 (246)

TNR = Times New Roman

Specifically, a 2 (Trait: TNR, Corsiva) by 2 (Font: TNR, Corsiva) repeated measure ANOVA was conducted with the mean response times for TNR trait word presented in TNR font, for TNR trait word presented in Corsiva font, for Corsiva trait word presented in Corsiva font, and for Corsiva trait word presented in TNR font. The ANOVA found a significant main effect for Trait, $F(1, 24) = 19.51$, $p < .000$. The main effect for Font was not significant, $F(1, 24) = 1.94$, $p > .17$. The Trait by Font interaction was found to be significant, $F(1, 24) = 9.86$, $p < .004$. These results indicate that when the trait word was presented in its congruent font, participants could make their decisions more quickly. The congruency effect size for the TNR words was $d = .24$ and for the Corsiva words was $d = .19$. These effect sizes are from small to somewhat above small as defined by Cohen (1988), which is not out of the ordinary, for as Cohen notes (1988, pg 25), “in new areas of research inquiry, effect sizes are likely to be small.” These findings indicate that in making decisions about the emotional tone of trait words a congruent font facilitates decision making.

The significant main effect for trait indicates that participants more quickly classified the Corsiva trait words than the Times New Roman words. There could be several possible explanations for this effect, including that the Corsiva words may have stronger emotional valence than the TNR words and, therefore, were easier to classify. The fact that the main effect for font was not significant indicates that any familiarity or other differences between fonts did not noticeably affect the reader.

Study 2: Page test of the effects of font personality

This study tested font personality effects at page level and compared the fonts Georgia, Arial, and Corsiva. The serif typeface Georgia and the sans serif typeface Arial were selected based on data from Shaikh et al. (2006) and provided a more challenging test of the font congruency effect by testing two typefaces that are commonly used in text documents.

Method

A different set of 24 participants with similar demographics was tested in this study. The participants were briefly presented a page of several paragraphs in one of three typefaces. Participants saw for 700ms onscreen presentations of one of three typefaces in 10-point font: Arial, Georgia, or Corsiva. After the page disappeared from the screen, participants were asked to rate how well (on a 4-point scale) the tone of the page matched one of six trait words, with 4 being very much like the trait word and 1 very much like the antonym of the trait word. The response scale was anchored with the trait word and its antonym. The participants read, “Does the tone of this paragraph appear to be more” like the trait word or its antonym? Participants were verbally asked to make their selection based on the “way the page looked” and not the content.

The top three traits for Georgia (practical, formal, and assertive) and Arial (stable, conformist, and unimaginative) were selected based on the Shaikh et al. data (2006: see for more detail on how the font trait rankings were developed). The 700ms presentation exposure was selected based on pilot testing results. This exposure time was found to give participants enough of a glimpse of the page to make a judgment on the 4-point scale without being able to read more than 3 or 4 words. Time to read

several words insured that the font was processed. Figure 2 shows the six trait words in their respective fonts.

Arial	Georgia
unimaginative	assertive
stable	formal
conformist	practical

Figure 2. The Arial and Georgia trait words presented in their respective fonts

Participants were questioned on each of the six trait words twice for each of the three typeface presentations. This procedure resulted in 36 experimental trials and an additional 4 practice trials at the beginning. Six of the pages presented had the same sentences but with sentence order and paragraph breaks varied, thus creating the perception of varying content. The order and pairing of the passages and fonts were counter balanced and randomly varied.

Results

Mean responses were calculated for trait choices made with pages presented in each of the five conditions: Congruent Arial, Congruent Georgia, Incongruent Arial, Incongruent Georgia, and Incongruent Corsiva (Table 2). Georgia is congruent with the trait words practical, formal, and assertive, while Arial is congruent with the trait words stable, conformist, and unimaginative. The Corsiva font presentations were always classified as incongruent because there were no Corsiva trait questions. Two participants had invalid data due to software problems, leaving 22 valid participants.

A multivariate repeated measure analysis of variance (MANOVA)¹ found a significant linear effect, $F(4,18) = 12.04$, $p < .001$, for congruency condition. Follow-up tests

comparing the conditions found that the Corsiva incongruent condition was significantly less than both the Arial/Georgia congruent and incongruent conditions, $p < .001$. Though the means for the congruent Arial and Georgia conditions were larger than the incongruent conditions, this mean difference did not reach significance ($p = .10$).

The Arial and Georgia effects were the average across all 6 traits, and these trait words varied considerably on how far apart their ranking was for the two fonts. Therefore, each of the six traits was compared separately for

Table 2. Mean (SD) font congruency rating for brief page glimpse

Trait Word	Font Presentation ^a	
	Congruent	Incongruent
Arial	3.09 (0.39)	2.96 (0.43)
Georgia	3.05 (0.33)	2.94 (0.38)
Corsiva	^b	1.55 (0.45)

Note. Responses ranged from 1-4, with 4 most like the trait.

^a Font that page was presented in was either congruent or incongruent with trait word

^b There was no congruent Corsiva condition

font congruency effects between the Arial and Georgia fonts with paired sample *T*-Tests. The means and *T*-Tests results are presented in Table 3. Because of the multiple comparisons inflating the risk of a Type I error, we used the Bonferroni significance correction, and significant *p* value was therefore .008 (.05/6).

For the three Georgia typeface traits, the ratings were higher for the trait when presented in Georgia typeface, and for the trait “Assertive,” the difference reached significance (Table 3). The congruency effect size for the “Assertive” trait was $d = .55$, which is slightly above the medium effect size marker of Cohen (1988), indicating a robust effect. The influence of the Arial typeface on ratings was mixed, with not any of the comparisons obtaining significance.

The results of study 2 suggest that the personality of a font or typeface can influence a reader’s perception of the emotional tone of an onscreen page of text, but the perceptual emotional effect often isn’t noticeably different for fairly similar fonts. Then differences may be found only for a smaller number, or even for just one specific trait.

Table 3. Page glimpse mean (SD) trait rating scores (1-4) by trait and presentation font.

Trait word questions by font personality characteristics		Font the page was presented in		Statistical comparison of the two presentation fonts for each personality trait		
Font	Trait	Arial Mean (SD)	Georgia Mean (SD)	<i>t</i>	<i>df</i>	<i>p</i> value
Arial	Unimaginative	3.22 (0.61)	2.9 (0.75)	1.43	21	0.167
	Stable	3.22 (0.61)	3.36 (0.65)	1.14	21	0.27
	Conformist	3 (0.69)	3 (0.72)	0	21	1
Georgia	Assertive	2.77 (0.61)	3.11 (0.62)	3.21	21	0.004*
	Formal	3.29 (0.5)	3.31 (0.73)	0.161	21	0.874
	Practical	3.11(0.59)	3.2 (0.47)	0.699	21	0.492

Overall discussion

The results of study 1 indicate that a typeface congruent with the word's emotional meaning can facilitate the affective classification of that word. The differences in elapsed times may seem small, but it is in line with the size of the effects commonly found in the affective priming literature (Fazio, 2001; MacLeod, 2005). To have had such an effect on word meaning, the aesthetic design of the font must have been processed more quickly with the results of that processing available to influence the semantic processing.

Study 2 demonstrated that a brief glimpse of an onscreen page of text can communicate emotional tone based on the personality of the typeface, though in comparing the effect of more similar fonts, differences are not found for many of the traits. Specifically, the typeface of the words on the page, even though no more than several of the words could have been read, influenced the rating of the emotional tone of the page for some of the comparisons. As would be expected, the congruency effect was less evident where there were larger differences between trait words and typeface personality. Typefaces closer in personality like Georgia and Arial may influence readers differently on only one or two signature traits at best. Therefore, the practical impact of typeface design on the processing of word meaning at times may be limited to a small subset of traits.

This study adds to the Lindgaard et al. (2006) findings in that it demonstrates that the initial response to visual aesthetics can be more complex personality evaluations and not just an overall rating on how appealing was the visual. Certainly though, how complex the evaluation can be is going to be a function of the exposure time, and what we found at 700ms likely does not apply to what is possible at 50ms. In fact, controlling exposure time could be a viable method for targeting the type of processing effects one is interested in. Identifying

optimal exposure durations for studying different aspects of interfaces would be a useful line of research. One obvious variable is how much visual search is conducted before the display is evaluated.

The use of these procedures in research on visual design appears useful because the processing of page content is minimized so that the effects of the aesthetics of the page are more clearly studied. When the differences in personality were slight, however, we found that we were reaching the limits of power for this method of investigation. Further research in this area that can identify improvements and enhancements to these types of procedures would be useful for the practical application of evaluating the influence of interface aesthetics. This study can only be considered an initial attempt at that task.

These research findings suggest that like other areas of humans interacting with their environment, human computer interactions are affected by fast automatic evaluations in response to subtle visual background aesthetics. Though this study did not investigate this point, other studies have found that these automatic evaluations and the data used to make them are often not available to consciousness (Kay et al., 2004; Nisbett & Wilson, 1977). Sometimes no amount of introspection can discover the aspects of an environment that evoked a certain impression or preference, and verbal reports are only post-hoc rationalizations (Nisbett & Wilson, 1977). This quality of first impressions limits the validity of verbal reports or user questionnaires for discovering the influential features of the user environment and points to the need for more implicit methods in understanding the effects of onscreen aesthetics.

A major interest in the effects of onscreen aesthetics would be determining what aspects of the visual display evoked a particular persona or appeal. Though in their pioneering study Lindgaard et al. (2006) were not successful in such a determination, these methods may

yet hold promise for such an understanding, and future research could be designed with that purpose in mind.

A number of studies have demonstrated (e.g., Kay et al., 2004) that contextual aesthetics are important factors influencing task behavior and perception, and this study reaffirms that finding for onscreen visuals. Just how far reaching is the effect of onscreen aesthetics is a topic for future research. This study examined a very small set of onscreen aesthetics, and certainly the conclusions drawn from this study are limited. At this point, it seems safe to suggest that congruency of typeface and other aesthetics with content can only enhance onscreen communication.

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Note

1. The MANOVA uses the variance-covariance matrix between conditions to test whether there are mean differences.

References

- Beier, S., & Larson, K. (2010). Design improvements for frequently misrecognized letters. *Information Design Journal* 18(2), 118–137. DOI: 10.1075/idj.18.2.03bei
- Berry, J. D. (2004). *Now read this: The Microsoft ClearType font collection*. Seattle, WA: Microsoft Corporation.
- Chaiken, S., & Trope, Y. (1999). *Dual process theories in social psychology*. New York: Guilford Press.
- Chaparro, B., Shaikh, A., Chaparro, A., & Merkle, E. (2010). Comparing the legibility of six ClearType typefaces to Verdana and Times New Roman. *Information Design Journal* 18(1), 36–49. DOI: 10.1075/idj.18.1.04cha
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*, 2nd edition. New York: Lawrence Erlbaum Associates.
- Fazio, R. H. (2001). On the automatic activation of associated evaluations: An overview. *Cognition and Emotion*, 13, 115–141. DOI: 10.1080/02699930125908

- Fazio, R. H., Sanbonmatsu, D. M., Powell, M. C., & Kardes, F. R. (1986). On the automatic activation of attitudes. *Journal of Personality and Social Psychology*, 50, 229–238. DOI: 10.1037/0022-3514.50.2.229
- Goldfarb, L., & Henik, A. (2006). New data analysis of the Stroop Matching Task calls for a reevaluation of theory. *Psychological Science*, 17, 96–100. DOI: 10.1111/j.1467-9280.2006.01670.x
- Gugerty, L., Tyrrell, R. A., Aten, T. R., & Edmonds, K. A. (2004). The effects of sub-pixel addressing on users' performance. *ACM Transactions on Applied Perception*, 1, 81–101. DOI: 10.1145/1024083.1024084
- Hazlett, R. L., & Benedek, J. (2005). Measuring the emotional reaction to passive first impression of software. In *Proceedings of the Conference Designing Pleasurable Products and Interfaces 2005* (pp. 57–70). Eindhoven, Netherlands: Springer-Verlag.
- Healey, C., Booth, K., & Enns, J. (1995). Visualizing real-time multi-variate data using preattentive processing. *ACM Transactions on Modeling and Computer Simulation (TOMACS)*, 5, 190–221. DOI: 10.1145/217853.217855
- Kay, A. C., Wheeler, S. C., Bargh, J. A., & Ross, L. (2004). Material priming: The influence of mundane physical objects on situational construal and competitive behavioral choice. *Organizational Behavior and Human Decision Processes*, 95, 83–96. DOI: 10.1016/j.obhdp.2004.06.003
- Larson, K. (2007). The technology of text. *IEEE Spectrum*, 44, 26–31. DOI: 10.1109/MSPEC.2007.352529
- Larson, K., Hazlett, R. L., Chaparro, B. S., & Picard, R. W. (2006). Measuring the aesthetics of reading. In *Proceedings of the British Conference on Human Computer Interactions*. London.
- Lewis, C., & Walker, P. (1989). Typographic influences on reading. *British Journal of Psychology*, 80, 241–257. DOI: 10.1111/j.2044-8295.1989.tb02317.x
- Lindgaard, G., Fernandes, G., Dudek, C., & Brown, J. (2006). Attention web designers: You have 50 milliseconds to make a good first impression! *Behaviour & Information Technology*, 25 (2), 115–126. DOI: 10.1080/01449290500330448
- Mackiewicz, J. & Moeller, R. (2004). Why people perceive typefaces to have different personalities. In *Proceedings of International Professional Communication Conference, 2004* (IPCC 2004, pp. 304–313). DOI: 10.1109/IPCC.2004.1375315
- MacLeod, C. (2005). The Stroop task in cognitive research. In A. Wenzel & D. Rubin (Eds.), *Cognitive methods and their application to clinical research* (pp. 17–40). Washington, DC: APA.

- DOI: 10.1037/10870-002
- Maison, D., Greenwald, A., & Bruin, R. (2004). Predictive validity of the Implicit Association Test in studies of brands, consumer attitudes, and behavior. *Journal of Consumer Psychology*, 14, 405–415. DOI: 10.1207/s15327663jcp1404_9
- Nisbett, R. E. & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, 84, 231–259. DOI: 10.1037/0033-295X.84.3.231
- Norman, D. A. (2004). Introduction to this special section on beauty, goodness, and usability. *Human-Computer Interaction*, 19, 311–318. DOI: 10.1207/s15327051hci1904_1
- Palef, S. R., & Olson, D. R. (1975). Spatial and verbal rivalry in a Stroop-like task. *Canadian Journal of Psychology*, 29, 201–209. DOI: 10.1037/h0082026
- Shaikh, A. D. (2007). The Effect of Website Typeface Appropriateness on the Perception of a Company's Ethos. *Usability News*, 9(2), <http://usabilitynews.org/the-effect-of-website-typeface-appropriateness-on-the-perception-of-a-companys-ethos/>
- Shaikh, A. D., Chaparro, B. S., & Fox, D. (2006). Perception of fonts: Perceived personality traits and uses. <http://usabilitynews.org/perception-of-fonts-perceived-personality-traits-and-uses/>
- Smith, M. C., & Magee, L. E. (1980). Tracing the time course of picture-word processing. *Journal of Experimental Psychology: General*, 109, 373–392. DOI: 10.1037/0096-3445.109.4.373
- Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology*, 18, 643–662. DOI: 10.1037/h0054651
- Treisman, A. (1985). Preattentive processing in vision. *Computer Vision, Graphics, and Image Processing*, 31, 156–177. DOI: 10.1016/S0734-189X(85)80004-9
- Vox, M. (1975). *Les cahiers de Lure*. Andenne, Belgique: R. Magermans.
- Watson, D., Clark, L., & Harkness, A. (1994). Structures of personality and their relevance to psychopathology. *Journal of Abnormal Psychology*, 103, 18–31. DOI: 10.1037/0021-843X.103.1.18
- Willis, J., & Todorov, A. (2006). First Impressions: Making up your mind after a 100-ms exposure to a face. *Psychological Science*, 17, 592–597. DOI: 10.1111/j.1467-9280.2006.01750.x
- Zajonc, R. (1980). Feeling and Thinking: Preferences need no inferences. *American Psychologist*, 35, 151–175. DOI: 10.1037/0003-066X.35.2.151

Appendix: Trait words used in study

	<u>Congruent with TNR</u>	<u>Congruent with Corsiva</u>		<u>Congruent with TNR</u>	<u>Congruent with Corsiva</u>
1	cold	moody	25	distant	fickle
2	stuffy	impetuous	26	boring	temperamental
3	conformist	hysterical	27	stiff	willowy
4	aloof	lithe	28	rigid	affected
5	inhibited	dramatic	29	detached	emotional
6	staid	dainty	30	strict	delicate
7	reserved	trendy	31	stern	sensitive
8	predictable	chic	32	conservative	voluptuous
9	prim	feminine	33	conventional	cute
10	businesslike	pretty	34	serious	enchanting
11	traditional	gorgeous	35	unwavering	captivating
12	proper	stylish	36	official	passionate
13	dedicated	sexy	37	firm	vibrant
14	constant	dynamic	38	reputable	striking
15	solid	appealing	39	settled	sensual
16	reliable	pleasing	40	constant	personable
17	calm	lovely	41	respected	charismatic
18	sensible	charming	42	steady	fashionable
19	rational	attractive	43	mature	classy
20	practical	elegant	44	steadfast	alluring
21	stable	fascinating	45	reasonable	graceful
22	composed	glamorous	46	realist	beautiful
23	objective	desirable	47	responsible	enthraling
24	established	refined	48	balanced	delightful

About the authors

Richard Hazlett is an Assistant Professor at Johns Hopkins University School of Medicine and also maintains a private consulting practice. He received a PhD in Clinical Psychology from Illinois Institute of Technology and completed a 2-year post-doctoral fellowship at Johns Hopkins University in psycho-physiological methods. His research focus has been in developing implicit measures to study user emotional experience, advertising engagement, aesthetics of design, and product desirability.

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