

How Much Information?
East Asian and North American Cultural Products and Information Search Performance

Huitang Wang
Faculty of Extension, University of Alberta

Takahiko Masuda
Department of Psychology, University of Alberta

Kenichi Ito
Department of Psychology, University of Alberta

&

Marghalara Rashid
Department of Psychiatry, University of Alberta

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Email correspondence: Takahiko Masuda, Associate Professor at the Department of Psychology, the University of Alberta. tmasuda@ualberta.ca. This research was supported by the Social Sciences and Humanities Research Council of Canada, G124130642. We thank members of the Culture and Cognition Lab at the University of Alberta for their assistance.

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Abstract

Literature in cultural psychology suggests that compared to North Americans, East Asians prefer context-rich cultural products (e.g., paintings and photographs). The current article further examines the preferred amount of information in cultural products produced by East Asians and North Americans (Study 1: SPSP conference posters; Study 2: government and university portal pages). We found that East Asians produced more information-rich products than did North Americans. Study 3 further examined people's information search speed when identifying target objects on mock webpages containing large amounts of information. The results indicated that East Asians were faster than North Americans in dealing with information on mock webpages with large amounts of information. Finally, we found that there were cultural differences as well as similarities in functional and aesthetic preferences regarding styles of information presentation. The interplay between cultural products and skills for accommodating to the cultural products is discussed. (145 words)

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How Much Information?

East Asian and North American Cultural Products and Information Search Performance

For more than a quarter of a century, cultural psychologists have investigated how culture and the mind mutually construct each other (Bruner, 1990; Markus & Kitayama, 2010; Shweder, 1991). Some researchers have focused on the “mind” part of this mutual relationship, identifying how cultural meaning systems systematically shape psychological processes such as perception and cognition, whereas other researchers have recently initiated research on the “culture” part, investigating how people produce *cultural products*—tangible, public, shared representations of culture (e.g. Morling & Lamoureux, 2008, for review).

By using both archival data analyses (conference posters and portal pages of Internet websites) and experimentation (an information search task using mock webpages), the current article attempts to examine (a) how the amount of information—one of the characteristic differences between holistic vs. analytic thinking styles—is treated in East Asian and North American cultural products, (b) whether people with holistic and analytic thinking styles develop different skills to deal with different amounts of information, and (c) how people with holistic and analytic thinking styles evaluate different types of cultural products aesthetically as well as functionally.

Culture and Attention

Research on the “mind” part of the culture–mind relationship has accumulated evidence that the cultural meaning system of a given culture (e.g. beliefs, values, ideas, and epistemology) shapes the minds of members of the cultural group. For example, Nisbett and his colleagues (Nisbett, 2003; Nisbett & Masuda, 2003; Nisbett, Peng, Choi, & Norenzayan, 2001) maintained

that among North Americans, the dominant cultural meaning system is relatively analytical and object oriented at the expense of context; this Western way of thinking originated in ancient Greek philosophy, which regarded all things as independent from each other and having unique characteristics. In contrast, the dominant cultural meaning system shared by most East Asians is more holistic and context oriented, having been influenced by ancient Chinese ways of thinking, in which everything in the world is interrelated and therefore difficult to separate from one another.

Using this theoretical framework, Nisbett and his colleagues speculated that whereas North Americans selectively attend to salient information (e.g., a person or object) in the scene while ignoring contextual factors, East Asians are equally attentive to both the salient and contextual information. These researchers have demonstrated systematic cultural variations in attentional patterns. For example, East Asians are more likely than their North American counterparts to describe contextual information and to remember objects in relation to context (Chua, Boland, & Nisbett, 2005; Ji, Peng, & Nisbett, 2000; Kitayama, Duffy, Kawamura, & Larsen, 2003; Masuda, Akase, Radford, & Wang, 2008; Masuda, Ellsworth, Mesquita, Leu, Tanida, & van de Veerdonk, 2008; Masuda & Nisbett, 2001; 2006).

Cultural Products

On the other hand, investigating the “mind” part of the culture–mind relationship, cultural psychologists have also attempted to capture how people in a given cultural setting constitute, maintain, and consume cultural meaning systems; such studies allow us to depict a missing part of the full circle of the mutual constitution between culture and the mind (Morling & Lamoureaux, 2008). A given cultural meaning system is internalized by members of the culture, and those who internalize that system in turn produce cultural products—a variety of public,

shared, and tangible representations—that correspond to the cultural meaning system . Cultural products can include directly stated values, beliefs, and ideas mediated by written and visual forms such as religious texts and icons. But they can also be embedded in secular visual representations such as art, design, and advertising (Masuda, Wang, Ito, & Senzaki, 2012).

Research on cultural products analyzes variation in culturally dominant meaning systems embedded in the tangible, shared, and public representations available in a given culture. To date, the findings indicate that cultural products from East Asia tend to represent a collective or interdependent orientation, whereas cultural products from North America represent a more individualistic or independent orientation (Imada, in press; Imada, & Yussen, 2012; Kim & Markus, 1999; Markus, Uchida, Omoregie, Townsend, & Kitayama, 2006; Tsai, Knutson, & Fung, 2006). The research on cultural products is not limited to studies under the rubric of collectivism/interdependence vs. individualism/independence. Using the concept of holistic vs. analytic attention, Masuda, Gonzalez, Kwan, & Nisbett (2008) initiated a research program to show that the dominant messages in a given culture also influence aesthetic preferences in that culture. Thus, East Asian cultural products tend toward holistic expressions, whereas cultural products influenced by North American or Western traditions emphasize salient objects and people rather than context. However, the underlying mechanism has not been comprehensively discussed, nor has its generalizability to other types of cultural products.

The Optimal Amount of Information

When we convey information to others, the optimal amount of information is always an issue. It is necessary to present sufficient information without overwhelming the audience. Given previous findings, we assume that in general, visual cultural products of East Asians will be information rich. Instead of clearly differentiating between focal/content and

peripheral/contextual pieces of information, the holistic orientation embraces the idea that everything is equally important and embedded in the whole context. East Asians will thus find it difficult to separate target information from peripheral information, and to separate details from the main message. In contrast, North Americans' analytic orientation makes their cultural products simpler and more organized, so that they selectively focus on salient, vivid, and core information while ignoring overly contextual or detailed information. The message of analytic thought embraces the idea that each object and person is self-contained and independent. Therefore, such important core parts can be easily detached from the details or peripheral context, which are considered less important.

Previous research on sensitivity to relationships gives credence to these assumptions. Researchers have found that Chinese were more likely than their North American counterparts to emphasize relationships rather than shared properties (Ji et al., 2000; Unsworth, Sears & Pexman, 2005), and to leniently categorize things together according to similarity or relevance (Norenzayan, Smith, Kim, and Nisbett; 2002), and to take into account more pieces of information when they make a judgment (Choi, Dalal, Kim-Prieto, & Park, 2003; Koo & Choi, 2005). The results of a limited number of studies seem to suggest that East Asian cultural products are more information rich than North American cultural products (Masuda, Gonzales, et al., 2008; Miyamoto, Nisbett, & Masuda, 2006).

Current Research and Hypotheses

Can we generalize the above findings even when we examine different types of cultural products under more controlled settings? To answer this research question, we focused only on document-based information by examining whether East Asians were more likely than North Americans to create information-rich visual representations when conveying information in

limited spaces (e.g., conference posters; Study 1) and in virtually unlimited spaces (websites; Study 2). We expected that core pieces of information would be equally important for East Asians and North Americans. However, we also assumed that East Asians, as more holistic thinkers, would be accustomed to taking more peripheral and detailed parts of information into account as well. Thus, East Asians would be predisposed to produce more information-rich products. In contrast, North Americans, as more analytic thinkers, would de-emphasize pieces of information that they considered too peripheral and too detailed. Accordingly, they would produce relatively simple designs. We further investigated whether people who are accustomed to information context-rich, complex visual spaces are better at handling this information than are those who are accustomed to relatively context-free, simple visual representations (Study 3). We expected that East Asians, who were habituated to information-rich designs, would be more proficient than their North American counterparts at dealing with large amounts of information. Finally, we further investigated how East Asians and North Americans evaluate information-limited vs. information-rich portal page samples, and examined the differential effects of aesthetics and functionality. We assumed that East Asians would be more likely than North Americans to evaluate information-rich pages positively in terms of aesthetic and functional aspects.

Throughout the studies, we assumed that most psychological processes are generally similar across cultures, and that any cultural variations in a specific phenomenon should be interpreted as a matter of degree. Therefore, expecting that we would uncover both cultural similarities and cultural differences, we attempted to identify in what exact conditions we could observe substantial variations in cultural products and psychological processes.

Study 1

Study 1 examined cultural variations in the amount of information presented in conference posters, which were categorized by the first author's name and affiliation. In accordance with earlier research findings (Kim, 1998; Masuda, Gonzalez, et al., 2008), we anticipated that East Asian conference posters would be more information rich, containing both peripheral and detailed pieces of information, while North American conference posters would be relatively simple, containing only core pieces of information. We targeted the number of words and the number of bytes as the most tangible and objectively analyzable values. These two variables are mutually contingent, though they focus on the amount of information from two different angles.

Method

Electronic versions of posters at the 2008, 2009, and 2010 conferences of the Society for Personality and Social Psychology (SPSP) were collected and categorized according to first author's name and affiliation. We divided the posters into three groups: North American products (first authors have European first name and last name, and their affiliations are North American academic organizations); East Asian products (first authors have Chinese, Korean, or Japanese first and last name, and their affiliations are in mainland China, Taiwan, Hong Kong, Singapore, Korea, or Japan); and mixed group products (the first authors have Chinese, Korean, or Japanese first and last name, but their affiliations are North American academic organizations).

We identified about 100 posters each for East Asian products and mixed group products. Because the SPSP conference is held in the United States every year, North American posters were more numerous than East Asian or mixed group products. To match the number of posters from the three comparison groups, we randomly selected around 150 posters from the North

American group. On average, 85% of authors gave us permission to analyze their posters.¹ In total, 313 posters were collected for the analysis: 137 North American products, 84 mixed group products, and 92 East Asian products. Of the 313 posters, 222 reported a single study, and 91 reported multi-studies. There were no cultural differences in the mean study number of the multi-study posters, $F(1, 91) = 1.08, ns$ ($M = 2.36$ for North American posters, $M = 2.24$ for Mixed group posters, and $M = 2.14$ for East Asian posters). We expected that the poster size limitation (4 feet \times 6 feet) would allow ample space for one study but not for two or more studies. We therefore divided the posters into two groups: posters that presented a single study and posters that presented multiple studies.² The posters were all written in English. We first saved the contents of each poster as Adobe Acrobat 8.0 and then pasted the contents into a new Microsoft Word file. In the analysis, we used two criteria to measure the complexity of information: (a) the total number of words and (b) the total number of bytes, which were calculated by using the word/character count feature in Microsoft Word 2003. In English, one character corresponds to one byte.

Results

As we anticipated, when posters contained two or more studies, there was a cultural effect on the number of words and characters. The results indicated that East Asians were more likely than North Americans to design information-rich posters.

Number of words. As shown in Figure 1, the results of a 3 (cultural groups: East Asians, mixed group, North Americans) \times 2 (presentation styles: single studies vs. multiple studies) ANOVA demonstrated that there was a main effect of cultural groups, $F(2, 307) = 4.11, p = .017, \eta^2 = .026$, and the number of studies, $F(2, 307) = 7.72, p = .006, \eta^2 = .025$. These main effects are qualified by the interaction between groups and the number of studies, $F(2, 313) =$

3.49, $p = .032$, $\eta^2 = .022$.³ Planned t -tests indicated that there were no cultural variations in the number of words when a single study was presented, $ts < 1$, ns (East Asians $M = 936.04$, $SD = 295.52$; mixed group $M = 929.86$, $SD = 311.598$; North Americans $M = 924.03$, $SD = 351.77$). However, East Asians ($M = 1186.86$, $SD = 356.90$) tended to put more words on posters with multiple studies than did North Americans ($M = 901.89$, $SD = 314.41$), $t(307) = 3.11$, $p = .002$. The mixed group ($M = 1061.94$, $SD = 422.85$) marginally put more words on posters with multiple studies than did North Americans, $t(307) = 1.84$, $p = .067$. Within each cultural group, East Asians used more words when they presented multiple studies than when they presented single studies, $t(307) = 3.03$, $p = .003$, but such tendencies were marginally observed in the mixed group data, $t(307) = 1.56$, $p = .12$, and not observed in North American data, $t < 1$.

Number of bytes. The results of a 3 (cultural groups: East Asians, mixed group, North Americans) \times 2 (presentation styles: single studies vs. multiple studies) ANOVA produced tendencies similar to the above analyses. There was a main effect of cultural group, $F(2, 307) = 3.12$, $p = .046$, $\eta^2 = .020$, and the number of studies, $F(2, 307) = 6.14$, $p = .014$, $\eta^2 = .020$. Again, the results were qualified by the interaction between cultural groups and the number of studies, $F(2, 307) = 3.36$, $p = .036$, $\eta^2 = .021$. Planned t -tests indicated that there were no cultural variations in the number of words when a single study was presented, $ts < 1$, ns (East Asians $M = 5289.67$, $SD = 1654.88$; mixed group $M = 5278.06$, $SD = 1845.00$; North Americans $M = 5313.72$, $SD = 2018.35$). However, on posters with multiple studies, East Asians ($M = 6643.68$, $SD = 1954.66$) tended to put more words than did North Americans ($M = 5133.92$, $SD = 1761.31$), $t(307) = 2.89$, $p = .004$. The mixed group data ($M = 5938.30$, $SD = 2412.15$) fell between those of these two extreme groups, but were not statistically different from North American data, $t(307) = 1.62$, $p = .11$, nor from East Asian data, $t(307) = 1.46$, $p = .15$. East

Asians used more words when they presented multiple studies than when they presented single studies, $t(307) = 2.87, p = .004$, but such tendencies were not observed in the mixed group data, $t(307) = 1.38, p = .17$, nor in North American data, $t < 1$.

Discussion

In summary, East Asian authors put more words into, and allocated more bytes to, their SPSP conference presentations than did the than did North American authors. But, these differences were observed only when multiple studies were presented. We interpret this result as the 4×6 foot SPSP poster space being sufficient for all the information the authors wanted to present from a single study, as there is less content than seen in multiple studies. There was no cultural difference in the number of words nor the number of bytes when a single study was presented, and this finding indeed serves as a control criterion. Speculations that nonnative speakers would use more words and characters in the posters in order to avoid explaining their findings orally—or, conversely, that they would use fewer words and characters because their English proficiency was at an intermediate level—are not confirmed; researchers in all groups presented almost equal amounts of information in single-study posters. We observed cultural variations in the number of words and characters only when the posters presented multiple studies. When researchers need to present more than one study in a limited space, they must make a tradeoff between the amount of information and the efficiency of presentation. At one extreme, they could report everything, as if pasting a research manuscript of more than one study onto the poster. The advantage of this strategy is that the audience has access to all the information necessary for understanding the research, but the efficiency of such a method is questionable. Therefore researchers need to reduce the information somewhat. At the other extreme, they could summarize the findings of each study in a single sentence. This would be

very efficient in conveying the gist of the research, but would fail to provide the necessary context and details. We speculate that East Asians chose to include more pieces of information at the expense of efficiency of presentation. Conversely, North Americans left out some information and presented only the core parts of the study in the interest of efficiency. Finally, we speculate that East Asians at North American institutions, having internalized the holistic presentation mode, shifted toward the analytic presentation mode as a result of interactions with their North American advisors or colleagues. Of course, any analyses of the ongoing problem-solving processes of the poster authors are beyond the scope of the current studies. We maintain, nevertheless, that the differences in the number of words and the number of bytes reside in culturally shared ideas regarding the optimal amount of information, and conclude that the findings support our hypotheses.

Study 2

In Study 1, we targeted a presentation in a limited space and tested whether cultural backgrounds were reflected in presentation styles. However, presentations within strict space constraints could entail artifacts that might obscure true differences in the complexity of visual information. It is possible that North Americans would include more pieces of information if provided with an unlimited space. If we were to investigate cultural products containing visual information where there is little or no substantial space limitation, would the findings of Study 1 be replicated? That is, do people universally present as much information as possible in the absence of space constraints, or will their designs still be consistent with culturally dominant styles of presentation? To answer this question, Study 2 targeted portal pages of websites as a source of analysis. Investigating webpage design serves our purpose because theoretically, the lengths of the pages are limitless. In addition, the Internet is quickly becoming one of the most

important avenues for accessing information. In July 2008, there were approximately 253 million Internet users in China alone. In the United States, approximately 70% of the population (220 million people) were Internet users, and Japan and South Korea have similarly high percentages (Barboza, 2008).

Theoretically, people can put an infinite amount of information on webpages, or as much as the server allows. In addition, web designers can include as many pieces of information as they wish in a single frame. However, they usually create links when the amount of information in a single frame becomes too large to functionally convey information. The amount of information on the portal page is especially important, as one of the functions of this page is to influence the audience's first impression or attitude toward the organization. Therefore, we assumed that the web designers would consider both aesthetics and functionality of the design of the portal pages more seriously than in the case of other pages, and that cultural variations in design decisions regarding the optimal amount of information on a webpage would be most observable in the portal pages. In addition, compared to the other pages on a website which are more likely to be deleted or to change in length as content is added or removed, the layout of the portal pages used in our analysis was relatively stable. This meant the portal pages could be standardized and used as targets for cross-cultural comparison. In accordance with the results of Study 1, we hypothesized that East Asian portal pages would be more information rich than North American ones.

Internet pages are used to present information of many types and genres, and can be user made or professionally designed. To avoid confounding variables, Study 2 analyzed the amount of information in government and university portal pages. East Asian data included portal pages from three countries: China, Japan, and Korea. North American data included portal pages from

two countries: the United States and Canada.

Method

Materials. We retrieved information on official portal pages of governments at the national level and the regional level (provinces and territories in Canada; states in the United States of America; prefectures in Japan, Republic of China, and Republic of Korea). There were 99 East Asian governmental portal pages and 66 North American governmental portal pages. We also retrieved information on the portal pages of the top 100 universities in North America (Canada and the United States) and the top 100 universities in East Asia (Japan, Republic of China, and Republic of Korea) according to the 2007 ranking scores on the Webometrics website (Webometrics, 2007), which is dedicated to ranking universities all over the world each year. In total, 365 portal pages from governments and universities were included in the analysis. We analyzed four dependent variables: the length of the scroll bars, the number of links, the number of words, and the number of bytes used for the pages.

Length of scroll bars. A scroll bar is a graphical widget by means of which the user can navigate to continuous text, pictures, or anything else on a webpage that does not fit into the space in a computer display or window. Generally, the shorter the scroll bar, the longer the webpage. Long webpages theoretically provide more space to hold larger amounts of information. In other words, a long webpage with a short scroll bar is likely to contain more information than a short webpage with a long scroll bar. To precisely measure these scroll bars, we used a laptop with a 14.1" standard screen, opening each portal page in the full-screen window. The scroll bar on the right side was measured using a plastic ruler with a minimum scale of 1 mm.

Number of links. In most conventional Internet browsers, a link is usually an icon,

picture, or word that leads visitors to other pages on the same site or to external resources. We manually counted the number of active links on each portal page.

Number of words. We determined the number of words as we did in Study 1, using the word count command in Microsoft Office Word 2003.

Number of bytes. We used the number of bytes as the fourth dependent variable. English and East Asian languages have different kinds of characters, and these affect the number of bytes used in each language. In English, one letter occupies one byte space. In East Asian languages, each syllable is represented by a character that occupies two byte spaces. Thus, in English, the word *America* has seven letters and requires seven bytes, whereas the same word in Chinese consists of only two characters and so requires only four bytes. In general, sentences written in English contain more bytes than pages written in East Asian languages. Use of the byte as the unit of analysis implemented a more robust rule to assess cultural variation. We reasoned that if the number of bytes in East Asian pages were still larger than that in North American pages, the cultural variation in information complexity would be strongly proven.

Results and Discussion

We analyzed government and university pages independently. The results overall indicated similar patterns, which supported our hypotheses.

Government portal pages. The results of multiple *t*-tests revealed that there was a main effect of culture regarding length of scroll bars, $t(163) = 7.44, p < .001, \eta^2 = .25$; number of links, $t(163) = 10.05, p < .001, \eta^2 = .38$; number of words, $t(163) = 7.45, p < .001, \eta^2 = .25$; and number of bytes, $t(163) = 5.69, p < .001, \eta^2 = .17$ (Table 1). The East Asian government portal pages had shorter scroll bars (and therefore longer pages) and contained more links, words, and bytes than North American ones. To test if differences in the amount information persisted when

the size of the webpage is controlled for, we carried out an Analysis of Covariance by using the length of scroll bars as a covariate. The results replicated those of the *t*-test analyses above:

number of links, $F(2,164) = 36.29, p < .001, \eta^2 = .18$, number of words, $F(2,164) = 14.11, p < .001, \eta^2 = .08$, and number of bytes, $F(2,164) = 6.83, p < .01, \eta^2 = .04$.

University portal pages. The same patterns were observed when we ran multiple *t*-tests on university portal pages. The results indicated that there was a main effect of culture regarding length of scroll bars, $t(198) = 1.97, p = .050, \eta^2 = .019$; number of links, $t(198) = 2.64, p = .009, \eta^2 = .034$; number of words, $t(198) = 8.55, p < .001, \eta^2 = .27$; and number of bytes, $t(198) = 2.46, p = .015, \eta^2 = .030$ (Table 2). The East Asian university portal pages had shorter scroll bars (indicating longer pages) and contained more links, more words, and more bytes than their North American counterparts. Again, to test whether differences in the amount of information persist when the size of the webpage is controlled for, we carried out an Analysis of Covariance by using the length of scroll bars as a covariate. The results mostly replicated those of the *t*-test analyses above: number of links, $F(2,164) = 4.06, p < .05, \eta^2 = .02$, number of words, $F(2,164) = 72.20, p < .001, \eta^2 = .27$, and number of bytes, $F(2,164) = 3.36, p < .07, \eta^2 = .02$.

In summary, the results of Study 2 indicated that East Asian portal pages of both governments and universities contained larger amounts of information than North American portal pages. We speculate that East Asian web designers are motivated to include all the available information in a single visual space, whereas North American web designers prefer to narrow down the amount of information. Thus, even in an unlimited space, both groups' patterns of presentation correspond to those found in posters with multiple experiments (Study 1). Of course, this speculation derives only from the amount of information found in the portal pages themselves; it does not necessarily mean that North American portal pages offer access to less

information than East Asian ones. For example, North American web designers might adopt a strategy that uses more multilayered websites. If that is the case, North American portal pages could connect users to the same amount of information as East Asian pages. Although it is beyond the scope of this article, the question of whether North Americans are more likely to prefer multilayered pages is a worthwhile topic for future research.

Study 3

Given the consistent results of Study 1 and Study 2, which indicate systematic cultural variation in presentation styles, one might wonder why East Asians are not overwhelmed by the deluge of information. “Practice makes perfect” is a famous proverb in both East Asian and North American cultures, and we assume that when people are constantly presented with or surrounded by large amounts of information, they will have more opportunities to become proficient at dealing with them. Previous findings regarding perception and the physical environment support this assumption (e.g. Miyamoto et al., 2006). To test this possibility in the context of the current research, we created an information search task on mock webpages. We hypothesized that East Asians (who have been exposed to information-rich webpages) would be more skilled in handling large amount of information than would North Americans (who are used to simpler webpages), and that the East Asians would therefore be faster at finding target pictorial objects on a webpage. This time, we applied a pictorial information search task, avoiding the issue of language differences between North Americans and East Asian international students. We asked participants to engage in the information search task on both short and long webpages using the repeated-measures design.

We also addressed the issue of aesthetic and functional preferences regarding the web design. In Studies 1 and 2 we observed that East Asians and North Americans had differing

design preferences. Are these due to East Asians' and North Americans' perceptions of functionality or their perceptions of aesthetics? To answer this question, we asked East Asian international students and European Canadians to indicate their preference for a short and a long portal page on the basis of aesthetic and functional criteria. The investigation allowed us to further examine cultural similarities and differences in design.

Method

Participants. Thirty-six European Canadian students (23 females and 13 males) and 32 East Asian international students (21 females and 11 males) were recruited at the University of Alberta. All participants received a partial credit to fulfill a course requirement for participation.

Materials. Although the East Asian international students were enrolled in academic courses at a Canadian university, their reading ability in English varied. To minimize the effect of language fluency, we created a pictorial information search task on mock webpages. Twelve long webpages and 12 short webpages were created using Adobe Photoshop 7.0 and Macromedia Dreamweaver 8. The average length of the long webpages was 2381 pixels, and the average length of the short webpages was 1185 pixels. The width was fitted to a standard 17-inch screen with a display resolution of 1024 by 768 pixels.⁴ Each page presented a similar amount of pictorial information and short descriptions (e.g., the name of a fruit was adjacent to the image of the fruit). Using the 24 webpages, we created two sets of stimuli, each consisting of six short and six long webpages. Participants were assigned to either one of the stimulus sets to engage in the information search task. From a variety of pictorial images on each webpage, we selected four images of target objects as the test stimuli. In total, participants were asked to search for 48 stimuli (4 target stimuli \times 12 mock pages).

Procedure. Participants were told that their task was to find the target objects on the

webpages as quickly and as accurately as they could. In total, 48 pictorial images of target objects, one for each page, were stored in a clear folder; each image was presented in order in the folder. Participants engaged in the information search task four times for each of the 12 mock webpages. First, participants viewed the first target item in the folder and then searched for the target stimulus on the mock webpage. When the participants indicated that they had found the target stimulus on the webpage, the experimenter validated their answers. The dependent variable was the amount of time between the moment when the participants started to search for the target stimulus on the webpage, and the moment when they declared that they had found the target. The information search task was easy, and therefore all participants accurately identified the target objects. Following the same procedure, participants were asked to search for the remaining three targets on the webpage. When all four targets had been identified, the participants were presented with the next webpage and four target images one after another. The mouse pointer was always set at the top right corner when participants moved to a new webpage. To verify that all participants were equally familiar with the scroll bar function for observing long webpages, participants were presented with a test webpage, and asked to move the scroll bar from the top to the bottom three times. To examine the effect of fatigue, we had them engage in this task twice, once before and once after the experimental trials, and measured their reaction speed each time. After completing the information search task, participants were also presented with pictures of two mock webpages—a short version and a long version of experimental stimuli—and asked to evaluate each webpage according to aesthetic and functional criteria using a 7-point Likert scale (Comparison 1). The questions were as follows: “I felt the amount of information in the webpage is [aesthetically/functionally] more natural”; “If I designed a portal page, I would design it like the webpage because it is [aesthetically/functionally] nice”; and “I

like the design of the webpage because it is [functionally/aesthetically] nice.” Subsequently, participants were presented with pictures of two mock webpages— a simple university portal page and a moderately complex university portal page —and asked to evaluate each webpage according to aesthetic and functional criteria using a 7-point Likert scale (Comparison 2). At the end of the experiment, participants were asked to fill out a questionnaire regarding their familiarity with the internet, as well as a demographic questionnaire. Finally, they were debriefed and dismissed.

Results and Discussion

Bar scrolling speed.⁵ A 2 (culture: European Canadian vs. East Asian) \times 2 (session: before the experimental trials vs. after the experimental trials) ANOVA was applied to the scrolling speed. As we expected, there were no main effects of culture, $F < 1$, or session, $F(1, 62) = 1.77$, *ns*. The interaction between culture and session was also not significant, $F < 1$.⁶ We concluded that both European Canadians and East Asians were equally familiar with the scroll bar function and that there was no effect of fatigue.

Internet familiarity. Similar to the procedure in Study 3, participants’ Internet familiarity was estimated by the self-reported question “How much are you familiar with the Internet?” and rated on a 10-point Likert-type scale ranging from 0 (*not at all*) to 9 (*extremely familiar*). The results showed that East Asian international students were slightly less familiar with the Internet than their European Canadian counterparts; however, this result did not reach statistical significance, $F(1, 66) = 2.23$, *ns*. Therefore, we concluded that European Canadian students and East Asian international students were equally familiar with the Internet.

Reaction times. A 2 (culture: European Canadian vs. East Asian) \times 2 (length of pages: short vs. long) ANOVA was applied to participants’ reaction time. As shown in Figure 3, we

identified a main effect of length of pages, $F(1, 66) = 67.85, p < .001, \eta^2 = .51$. A main effect of culture was not significant, $F < 1$. In general, both groups performed faster when they engaged in the task with the short pages than with the long pages. However, this effect should be qualified by the interaction between culture and length of pages, which indicated statistical significance, $F(1, 66) = 6.50, p < .01, \eta^2 = .09$. The simple effect analyses indicated that East Asians ($M = 10937.23, SD = 3184.54$) were more likely than European Canadians to perform faster ($M = 12604.94, SD = 5551.19$) when they engaged in the long webpage task, $F(1, 66) = 6.93, p < .01$, but such a cultural variation in reaction time was not observed when participants engaged in the short webpage task, European Canadians, $M = 7183.62 (SD = 2159.96)$, East Asians, $M = 8079.05 (SD = 2525.74)$, $F(1, 66) = 1.99, ns$ (see Figure 2).

Page Length Evaluation. In Comparison 1, participant's evaluation scores of each question item regarding the short webpage were subtracted from those of the long page, resulting in an average value of the three scores based on their aesthetic and functional evaluation, Cronbach's $\alpha = .87$, and $.86$, respectively. These two scores were then used for analyses as indicators of participants' relative preference for the short and long portal pages. A 2 (culture: European-Canadians vs. East Asians Internationals) X 2 (type of evaluation: aesthetics vs. functionality) ANOVA was used for an analysis of participants' relative preference for the short and long pages. As seen in Figure 3, the results indicated that there was a main effect of type of evaluation, $F(1, 66) = 4.34, p < .04, \eta^2 = .06$. The main effect of culture, and their interaction was not statistically significant. $F < 1, F(1, 66) = 1.31, ns$, respectively. The findings suggest that, after engaging in the search task, both European-Canadians and East Asians tend to think the short webpage was aesthetically more attractive than the long webpage. We found that both groups exhibit an aesthetic preference for the short page, and this tendency was significantly

different from zero, European-Canadians, $t(35) = 3.02, p < .005$, East Asians, $t(32) = 2.61, p < .02$. By contrast, both European-Canadians' and East Asians' preferences for the short page in respect to its functionality was attenuated. Although European-Canadians' score was significantly different from zero, $t(35) = 2.74, p < .01$, the East Asians' score was not statistically significant, supporting a general lack of specific preference pattern in regards to page functionality, $t < 1$. These results suggest that after the exhaustive task, both cultures generally aesthetically prefer short webpages to long pages. However, such preference for short pages was different when they evaluate the webpages based on functionality. We interpret East Asians' lack of preference towards the shorter pages in this domain to indicate they were resilient towards the fatiguing effects of the longer webpages.

The length of long webpages used in Study 3 was long enough that there is a possibility that even East Asians developed negative feelings towards the experimental stimuli, which researchers intentionally made long and complex. Participants' low evaluation of the pictures from the long webpages might be highly influenced by this factor. To account for this possibility, in Comparison 2 we also asked participants to evaluate a simple university portal page and a moderately complex university portal page, on which the amounts of information on which were similar to real pages. Again, Participants' evaluation scores for each question item regarding the simple portal page were subtracted from those for the moderately complex portal page. Thus we obtained an average value of the three scores regarding their aesthetic and functional evaluation, Cronbach's $\alpha = .92$, and $.94$, respectively. In the analysis, these two values were used as indicators of participants' relative preference for the short and long portal page. A 2 (culture: European Canadian vs. East Asian) \times 2 (type of evaluation: aesthetics vs. functionality) ANOVA was applied to participants' relative preference for the simple and moderately complex pages. As

shown in Figure 4, the results indicated that there were main effects for culture, $F(1, 66) = 7.79$, $p < .001$, $\eta^2 = .11$, and type of evaluation, $F(1, 66) = 16.81$, $p < .001$, $\eta^2 = .20$. The interaction was marginally significant, $F(1, 66) = 3.45$, $p < .07$, $\eta^2 = .05$. Consistent with previous analyses, both groups aesthetically preferred the simple webpages to the moderately complex webpages, relatively speaking, but this preference for the simple page in respect to its functionality was attenuated. In addition, a substantial pattern of cultural variation in preference was also revealed. East Asians were more likely than their European-Canadian counterparts to prefer the moderately complex design to the simple-portal page, giving further credence to the findings of Study 2. In fact, further analyses revealed that European-Canadians' aesthetic preference for the simple webpages was significantly different from zero, $t(35) = 2.44$, $p < .02$, whereas East Asians' aesthetic preference for the moderately complex webpage was significantly different from zero, $t(32) = 2.27$, $p < .03$. This tendency was intensified when East Asians evaluated the moderately long webpage based on its functionality, $t(32) = 3.29$, $p < .01$, whereas European-Canadians did not show any specific preference pattern, $t < 1$.

Is there any association between participants' aesthetic/functional preferences and their information search performance? To answer this question, we carried out correlation analyses. First, we created a new variable, "performance difference score," by subtracting participants' search performance scores on the short webpages from those on long webpages. Then, we analyzed whether the performance difference score correlated with participants' aesthetic/functional preferences in Comparison 1. The results indicated that there was a significant positive correlation only between the performance difference score and the functional preference, $r(n = 68) = .26$, $p < .04$, and this pattern was significant only in East Asian data, $r(n = 32) = .50$, $p < .005$, but not in European Canadian data, $r(n = 36) = .09$, *ns*. The results suggest

that when there was a large difference in information search performance between short and long webpages, East Asians tended to prefer short webpages. We interpret the results to mean that East Asians sought to excuse any substantial difference in performance between short and long webpages by attributing it to preference.⁷

Based on the findings, we interpret that functionality may play a more important role than aesthetics in deciding the length of the pages (and thus the amount of information on a page). However, in this particular experiment, participants were asked to engage in the comparison tasks right after they engaged in the information search task. In this sense, the current experimental procedure did not fully control for potential confounds of excuse or reactance, and therefore it is difficult to provide conclusive reports about the association between preference and performance. In an extension study, it would be necessary to test the participants' aesthetic and functional preferences well in advance (e.g., 2 months) of the information search task, so that the participants would not recognize the connection between the two tests.

In Comparison 2 we did the same analyses to examine the associations between the performance difference scores and aesthetic/functional preferences. However, no significant correlation among these variables was found; we interpret this to be due to the fact that sample images used for Comparison 2 were substantially different from the experimental stimuli used in Study 3. Furthermore, the information search task is different from the act of creating a conference poster or a webpage that is aesthetically and functionally natural to the creators. It will be informative to investigate the association between participants' aesthetic/functional preferences and their cultural products in a future study.

In sum, the findings suggest that there are substantial cultural similarities and differences in preference for the length of webpages. The general patterns of preferences observed in Study 3

gave support to the findings in Studies 1 and 2. With this study, however, the optimal amount of information was explained for only partially. Future research could further articulate the optimal amount of information to be presented in cultural products for each cultural group.

General Discussion

Since its advent in academia, cultural psychology has long asserted the mutual constitution of culture and the mind (e.g., Shweder, 1991). By conducting a package of cross-cultural studies comparing East Asians and North Americans, we identified systematic cultural differences in the amount of information in cultural products and in people's skill in handling large amounts of information. Study 1 investigated cultural variations in the amount of information within a limited space (SPSP conference posters). The results indicated that East Asian researchers were likely to put more words and characters in their conference posters than their North American counterparts when the posters reported multiple studies, although no difference was found in single-study posters. As we expected, the data for East Asian researchers in North American institutions fell between these two groups. Study 2 replicated and generalized the findings of Study 1 by analyzing the amount of information supplied when space was virtually unlimited (portal pages of government and university websites). The results indicated that East Asian portal pages were longer and more information-rich than North American ones. The findings of the first two studies on cultural products suggest that East Asians are more likely than North Americans to produce information-rich resources. Study 3 investigated people's performance in processing pieces of information on webpages. The results indicated that East Asian international students are faster than European Canadian participants in dealing with information on information-rich webpages, but such an advantage was not observed with short

webpages. We also found cultural similarities and differences in aesthetic and functional evaluation regarding the amount of information in webpages.

Overall, the current studies identified a mutual constitutive pattern while depicting a holistic vs. analytic contrast in both cultural products and people's skills (Nisbett & Masuda, 2003). East Asians, strongly influenced by the holistic epistemology, find it natural to produce information-rich cultural products. At the same time, being surrounded by information-rich cultural products, East Asians need to develop skills to quickly process the information in a given visual field, and these skills in turn allow them to not be overwhelmed by the deluge of information. By contrast, under the strong influence of the analytic epistemology, North Americans produce information-focused cultural products, but because of their familiarity with such products, they tend to take more time when presented with the large amounts of information considered optimal by their East Asian counterparts. We admit that our attempts outlined in this article focused only on a micro process of some specific media. However, we assert that the current findings are generalizable and provide several important implications for the advancement of cultural psychology. We also provide evidence that mutual constitution processes between culture and the mind indeed exist, and that cultural variations in such processes are scientifically testable. The implications and limitations of our studies are discussed in the next sections.

Mutual Constitution of Culture and the Mind

Morling and Lamoureaux (2008) maintain that culture and the mind, and the process of how culture and the mind are mutually constructed, need to be simultaneously investigated. Our research purpose strongly resonates with that assertion. The current article provides supportive evidence that such a multimethod research paradigm is useful for addressing the culture–mind

mutual constitution process, and further articulates Masuda, Gonzalez, et al.'s (2008) findings. The current research also clarifies some methodological strengths and limitations of research on culture and the mind. The most important limitation is that the more researchers focus on currently existing real materials, the more difficult it is to handle potential confounding variables. The current archival data analyses focused on conference posters and internet pages. One of the most serious confounding variables present throughout the current studies was language. First, Study 1 targeted only conference posters written in English. On the one hand, this limitation was necessary to control the issue of language, because it was difficult to analyze the amount of information on the posters in Korea, Japan, and Chinese-speaking locations, which were written in the researchers' native languages. But, on the other hand, it reduced the generalizability of the findings. Study 2 did investigate cultural products written in the respective languages. But this time, the differences in linguistic structure linger as an uncontrollable confounding variable. Finally, Study 3 recruited both North Americans and East Asians in a North American organization. But, to avoid any issues of linguistic fluency, we used a pictorial information task. It might seem preferable to investigate the speed at which participants process text information in their own native language, but then it would be difficult to maintain the equivalence of information presented to participants. To the best of our knowledge, there is no way to design a study that avoids all of these problems. However, if researchers accumulate the data for the multi-methodological research paradigm, the shortcomings of each study will eventually be canceled out, and the overall patterns of culturally specific characteristics implicitly embedded in cultural products and psychological processes will be uncovered.

Culture and Skill Acquisition

Humans and other organisms can inherently accommodate to the surrounding

environment, and can develop preferences for familiar environments and objects (Bornstein, 1989; Cross, Halcomb, & Matter, 1967; Moreland & Beach, 1992; Zajonc, 1968). Although we need to wait for longitudinal research on internalization processes to fully discuss this issue, the current findings provide evidence that such a phenomenon indeed occurs in the case of pictorial cultural products. When asked to search for target pictorial information in information-rich webpages, East Asians, who were accustomed to East Asian cultural products, showed strong advantages in search speed over their North American counterparts. These findings suggest that people develop specific skills to fully accommodate to the available cultural resources, and such differences in skill acquisition may deeply influence our cognitive processes.

Current advances in sociocultural neuroscience give credence to this assertion (e.g., Kitayama & Uskul, 2011, for review). For example, recent findings in neuroscience suggest that specific areas of the brain are malleably shaped through long exposure to environmental demands as well as intentional training (Maguire et al., 2000; Scholz, Klein, Behrens, & Johansen-Berg, 2009). If neural networks are shaped by people's experiences, such neuroscientific research frameworks must be applicable not only to research on expert vs. novice cognition but also to research on culture and cognition. In the context of the current paper, we can speculate that people who are constantly exposed to information-rich East Asian cultural products, and who are socially required to process them, might develop particular neural networks that are resilient to the onslaught of information.

Of course, to further investigate this issue, researchers need to begin accumulating data that indicate qualitative cultural differences in the performance of cognitive tasks, and to speculate on which neural substrates govern the process at hand. To date, several studies suggest that people who are exposed to specific cultural products develop a culture-specific attentional

pattern (Chua et al., 2005; Miyamoto, Nisbett, & Masuda, 2006; Duffy, Toriyama, Itakura, & Kitayama, 2009). However, the amount of research investigating people's actual performance is still limited, and only a few studies speculate on the neural bases of such performance (Gutchess et al., 2006). We maintain that the findings of the current paper provide concrete evidence that can serve as a stepping stone to further elucidation of the issues of culture, skills, and neuroscience.

Future Research

We admit there are several limitations in the current study. First, because we aimed at reporting results of the archival data, we could not measure the designers' values and beliefs. However, to advance the field of cultural psychology, researchers must proceed step by step toward (1) developing reliable and valid scales to measure human attention orientation, and (2) assessing the consistency between behavioral data and self-reported data. Such investigations help us to search for a common mediator that binds research findings more firmly. Second, future research should extend the paradigm by analyzing qualitative differences in information searches by examining whether there are systematic differences in the types information included in a specific visual field (e.g. context or content, image or text). Finally, participants' persistence level may differ across culture. Although we did our best to control this confounding variable by recruiting participants from the same subject pool, future research needs to find a better way of handling this issue.

Final Remarks

Cultural psychology is by nature an interdisciplinary field. Although previous studies focusing on the "mind" part of the mutually constructive mind–culture process utilized methodology developed in the cognitive sciences, researchers of culture and the mind need to

look toward research in humanities, such as cultural studies, media studies, and the history of art and design. The current article upheld the strengths of the multimethod research paradigm, and its findings have important implications for future advances in cultural psychology.

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Footnotes

¹ All posters selected for analysis were approved by the first author for their use in this analysis, and were received in one of three formats: Microsoft Word, PDF, or a single PowerPoint slide.

² Most of the posters categorized as multiple studies reported two studies. Three East Asian posters reported three studies each. Six of the mixed group posters reported three studies each, and one reported four studies. Of the North American posters, six reported three studies, two reported four studies, and one reported five studies. There was no interaction between cultural group (East Asians, mixed group, North Americans) \times number of studies, $F(3, 90) = 1.10, p = .36$. Therefore, we collapsed this variable.

³ Thirty percent of East Asian posters, 26% of mixed group posters, and 33% of North American posters reported survey research as opposed to experimental research. There were no two-way interactions between this variable and cultural groups, and no three-way interactions between this variable, cultural groups, and presentation styles, $F_s < 1$. We therefore collapsed this variable for analyses reported in the text.

⁴ The genre of mock webpages varied (cameras, flowers, vegetables, men's watches, women's watches, fruits, wines, mushrooms, makeup, ties, socks, and jewelry). A best effort was put forward to cancel out stereotypically masculine vs. feminine, as well as stereotypically Asian vs. Western, topics.

⁵ Overall, any major effect of gender and of the stimulus set were not identified. Therefore we collapsed these factors for the analyses.

⁶ A European Canadian and three East Asian international students missed a session, and were therefore excluded from the analysis.

⁷ Results of a meditational analysis also indicated that only culture predicted the performance difference score, $\beta = .29$, $t(64) = 2.37$, $p = .03$. The functional preference predicted the performance difference score only marginally, $\beta = .21$, $t(64) = 1.80$, $p < .08$, and the effect of the interaction term between the functional preference and culture was not statistically significant, $\beta = .08$, $t < 1$, *ns*. A better meditational variable that governs the relationship between culture and information search performance, if any, should be investigated in a future study.

Table 1

Means and Standard Deviations of Government Portal Pages, Results of t-Tests, and Their Statistical Significance Values (n = 163) in Study 2

	East Asian Government Pages		North American Government Pages		<i>t</i>	<i>p</i>
	Mean	<i>SD</i>	Mean	<i>SD</i>		
Bar (mm)	107.73	38.86	152.73	36.88	-7.44	< .001**
Links	172.69	82.09	68.68	22.03	10.05	< .001**
Words	1829.46	1500.18	433.44	299.91	7.45	< .001**
Bytes	5607.92	3984.12	2620.05	1859.76	5.69	< .001**

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2

Means and Standard Deviations of University Portal Pages, Results of t-Tests, and Their Statistical Significance Values (n = 198) in Study 2

	East Asian University Pages		North American University Pages		<i>t</i>	<i>p</i>
	Mean	<i>SD</i>	Mean	<i>SD</i>		
Bar (mm)	159.91	43.16	170.29	30.01	-1.97	.050*
Links	64.72	31.21	55.02	19.48	2.64	.009*
Words	1000.23	769.51	311.72	236.32	8.55	.000**
Bytes	2592.16	1971.16	1935.01	1807.28	2.46	.015*

Note. * $p < .05$, ** $p < .01$, *** $p < .001$

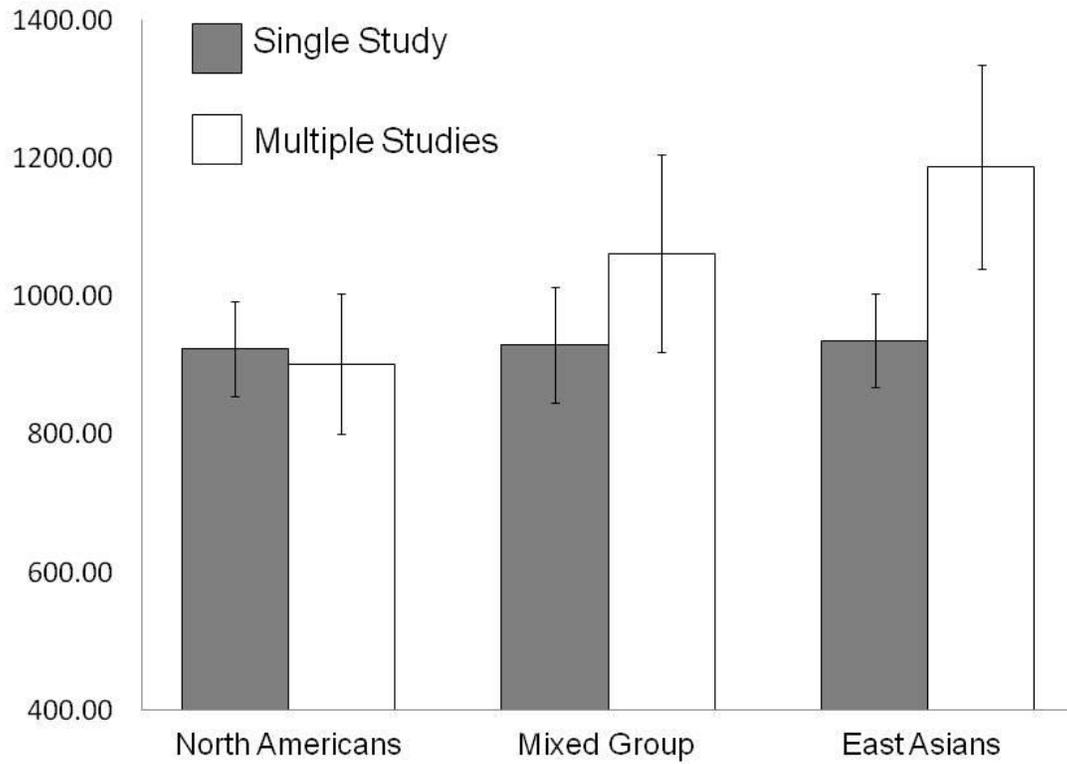


Figure 1. Mean number of words ($\pm 1.96 SE$) in North American, mixed group, and East Asian conference posters at the 2008, 2009, and 2010 meetings of the Society of Personality and Social Psychology.

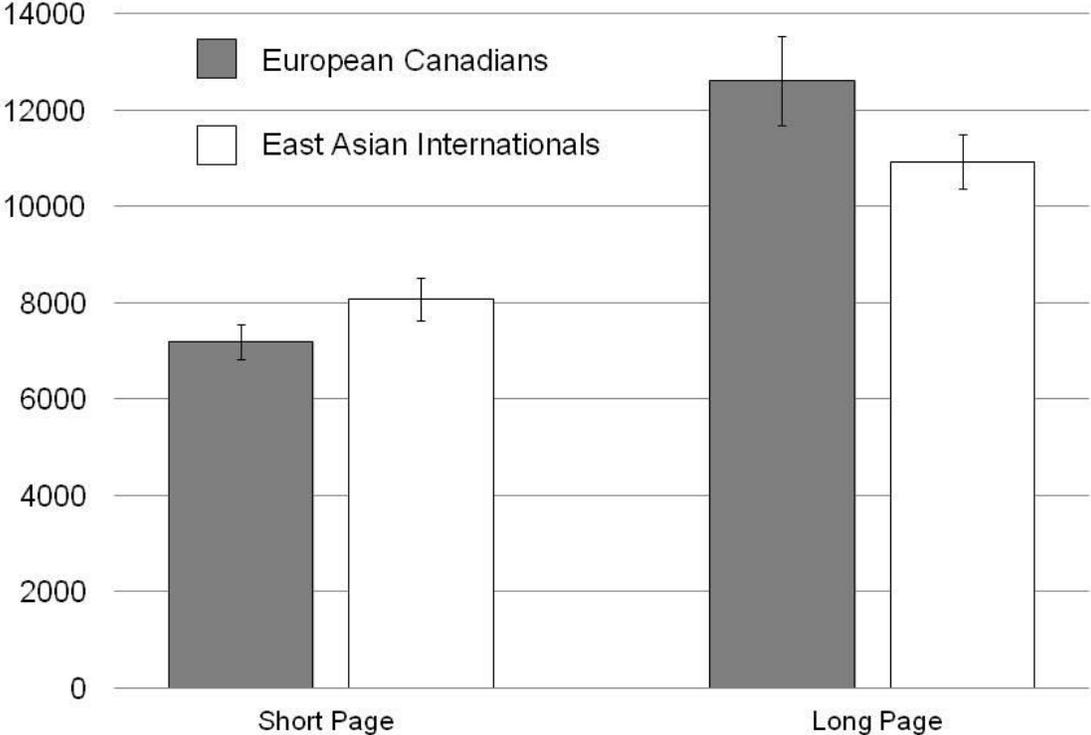


Figure 2. Participants' Reaction Time during the information search task (Short vs. Long Mock Webpages) in Study 3.

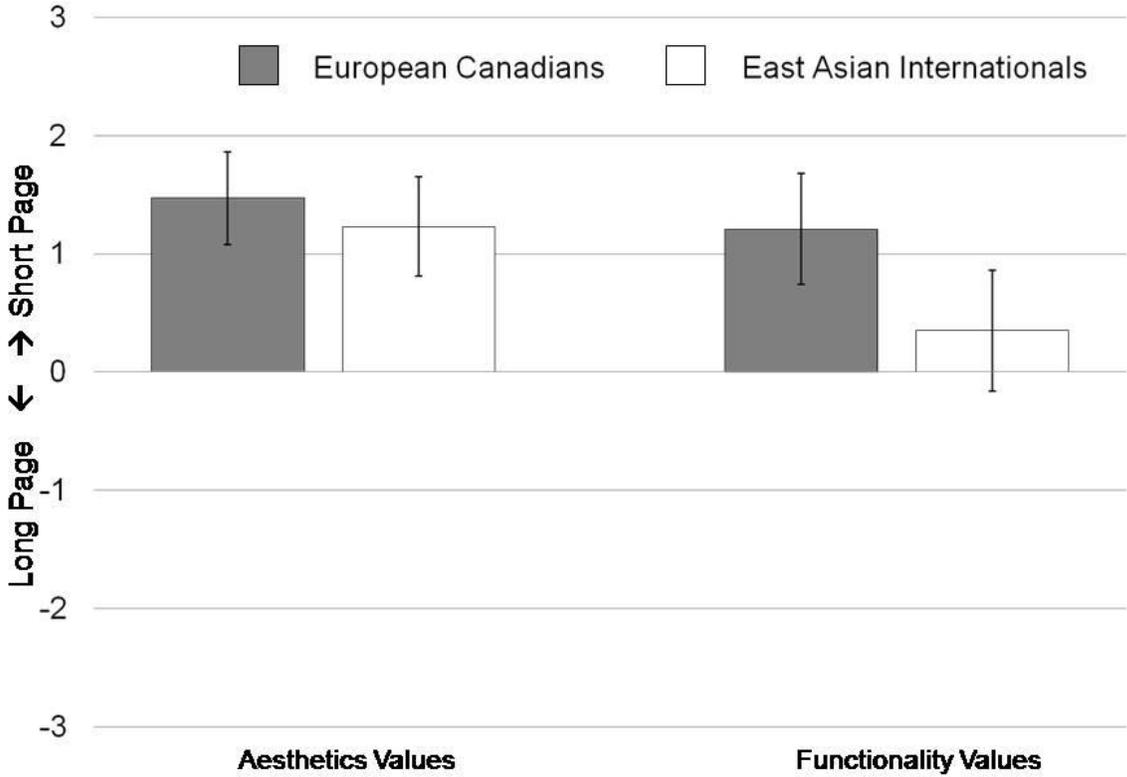


Figure 3. Participants' Aesthetic and Functional Preferences (Sample Pictures of Short vs. Long Webpages Observed during the Experimental Trials) in Study 3

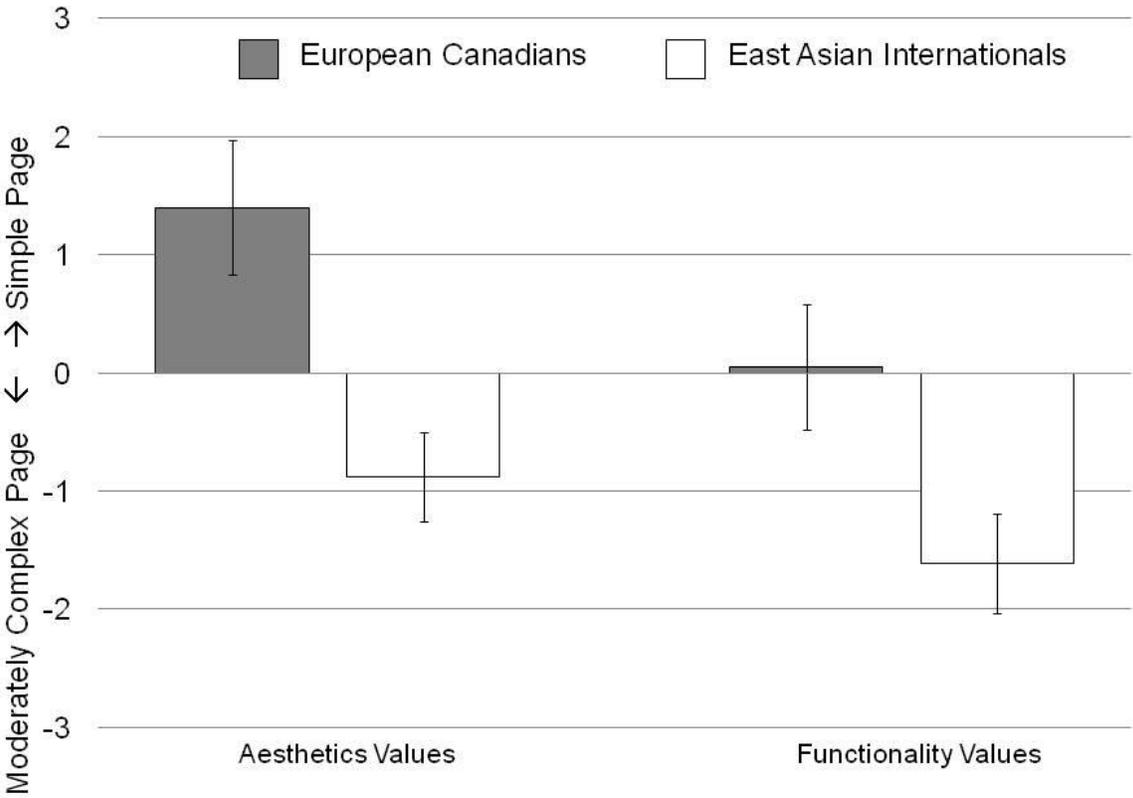


Figure 4. Participants' Aesthetic and Functional Preferences (Mock university portal pages) in Study 4

Appendix A

Examples of Complex Webpages in Studies 3a, 3b & 4

