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Culture and the Complex Environment: Comparing the Complexity Difference between East Asians and North Americans

by

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ABSTRACT

Previous cultural research found that East Asian pictorial representations (e.g., paintings) contained more elements than North American ones, and that East Asians were more likely than North Americans to prefer context-rich information to context-impoverished information (Miyamoto, Nisbett, & Masuda, 2006; Masuda, Gonzalez, Kwan, & Nisbett, 2008). Four studies were conducted to examine the cultural variations of the complexity difference between East Asians and North Americans. Study 1 analyzed the posters collected at the SPSP conference and the results indicated that East Asians were more likely than North Americans to design complex posters when posters contained two or more studies; however, no cultural effect was found when posters contained a single study. In Study 2, I analyzed portal pages of governments and universities in East Asian (e.g., China, Japan, Korea) and North American societies (e.g., USA and Canada), and found that East Asian portal pages were more complex than North American ones. Based on the findings, I further investigated people's speed in dealing with complex web information in Study 3 and simple web information in Study 4. The results showed that East Asians were faster than North Americans in dealing with information on complex WebPages, especially at the bottom of sections, but no cultural effect was found when participants were asked to perform the same tasks on simple WebPages. This research reinforced the previous cultural research on visual representations, and suggested that East Asians were more likely than North Americans to prefer to complex designs, which in turn can affect people's patterns of attention and cognition. (255 words)

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CHAPTER I

INTRODUCTION

Traditionally, Western paintings were generally short and framed with well proportioned width and length, while many Chinese paintings were drawn on the scroll paper making them extremely long and thus can contain the whole scene or stories. Although the different representations were caused by the different painting techniques prevailed in each society, the long Chinese paintings can contain more elements than those Western paintings. My studies have attempted to investigate the relationships between culture and the complexity difference and to determine whether East Asians' complexity preferences (e.g., Poster Designs, Portal Page Styles and Webpage Information Searching) systematically differ from those of North Americans. The archival data analysis of conference posters and of government and university portal pages and two experiments which investigate participants' information search speed by using mock WebPages were conducted.

Holistic Thought versus Analytic Thought

Instead of focusing on the universal laws underlying the development of human beings, cultural psychology emphasizes the importance of societal and cultural contexts in understanding human beings and their behaviors. Recently, empirical studies focusing on cultural variations in cognitive processes have revealed systematic differences in some basic cognitive processes including categorization, causal explanation, and attention. Collectively these separated into holistic and analytic by Nisbett and colleagues (Nisbett, Peng, Choi, &

Norenzayan, 2001; Nisbett, 2003).

Such differences between two cultures/societies encouraged investigators to explore the underlying reasons for these differences. Nisbett *et al.* (2003; Nisbett, Peng, Choi, & Norenzayan, 2001; Nisbett & Masuda, 2003) maintained that the cultural differences can be traced back to the emergence of ancient Chinese and ancient Greek civilization. They argued that the ancient Chinese civilization's origin as a farming society that demanded cooperation emphasized the need for social harmony. This subsequently prompted East Asians to more closely attend to social relationships. Conversely the terrain of ancient Greece contains numerous mountain ranges that descend into sea, forcing ancient Greeks to pursue pastoral and subsistence hunting lifestyles as well as trade. These non-agricultural activities encouraged ancient Greeks to be more autonomous (Uskul, Kitayama, & Nisbett, 2008) and focus on objects that could be directly controlled through exercises of one's will. These different production practices strengthened the fundamental prioritization of certain characteristics/manners of looking at things between East Asians and North Americans.

The ideologies in these two societies tend to support these perceptual tendencies. Western ideologies in general were inclined to understand the world in terms of salient objects and their attributes, whereas Eastern ideologies (e.g., Buddhism, Taoism, and Confucianism) were more likely to emphasize the statement that all things in the world are interrelated and to understand the world in terms of relationships between the objects and the contexts (Nisbett & Masuda, 2003; Masuda, Gonzalez, Kwan, & Nisbett, 2008). For example, Aristotle

explained that stones fall through the air because they possess the property of "gravity", while wood floats on water because it possesses the property of "levity". In contrast, Chinese understood and tried to explain the world using interactions and relationships between objects and environments, which led them to understand phenomena such as acoustic resonance, magnetism and tidal phenomena much earlier than the ancient Greeks. "The Chinese therefore had a kind of recognition of the principle of 'action at a distance' two thousand years before Galileo articulated it." (Nisbett, 2003, p. 22)

The findings of child rearing practices and socialization in Developmental Psychology also supported that North Americans were more likely to pay attention to objects and their attributes comparing East Asians. For example, Fernald & Morikawa (1993) found that American mothers focused more on the targets overall and emphasized the names of the objects by providing labels frequently and consistently when they played with their infants, while Japanese mothers labeled the toys less often than did American mothers. In another study, Miller (1984) found that older Americans made more references to general dispositions and fewer references to the contextual factors in explanation of other persons' behaviors than did Hindus. Meanwhile, references to dispositions underwent a much greater developmental increase among Americans than among Hindus, whereas references to contextual factors showed the opposite tendency.

In summary, the differences between East Asian and North American cultures have continued to be perpetuated: East Asians were more holistic and emphasized circumstances and relationships, while North Americans were more

analytic and paid attention to objects' attributes. Besides these ecological explanations, recent empirical research in attention, visual representation and relationships also provided evidence supporting the argument.

Culture and Attention

Attention is a fundamental cognitive process allowing people to selectively concentrate on one thing while ignoring others. According to the cultural perspective, the proper interpretation of psychological phenomena not only requires the study of persons, but also the study of their ecological contexts in particular cultural milieus (Bruner, 1990). Specifically, the fundamental cognitive processes need sensory inputs; meanwhile, they can also be influenced by subjective factors such as expectations within the particular culture. In other words, culture can only be completely understood from a cultural perspective. The assumption has been continually and consistently supported by empirical studies in cultural psychology.

Early cross-cultural studies conducted by Abel and Hsu (1949) found that Chinese Americans were more likely to give "whole-card responses" whereas European Americans were more likely to give "part-card responses" when asked to interpret Rorschach ink blots. The tendency was replicated by the recent empirical findings. For example, Masuda and Nisbett (2001, 2006) found that these cultural variations in attention were observable even in the detection of changes in visual scenes. Participants were presented with animated vignettes of underwater scenes and asked to describe them. After coding the first sentence, they found that American participants were more likely to begin their descriptions

by mentioning salient objects, while Japanese participants were more likely to start by mentioning contextual objects (Masuda & Nisbett, 2001). In change blindness studies (Masuda & Nisbett, 2006; Masuda, Nhan & Ito, 2010), participants were presented various pairs of animated vignettes that differed slightly in content and were then asked to identify changes as fast as they could. The results indicated that Japanese participants were more apt to not only detect a change in the context, but to do it faster. Canadians, on the other hand, were more likely to detect changes on the focal objects such as the color and the shape.

In other studies (Masuda, Ellsworth, Mesquita, Leu, Tanida, & van de Veerdonk, 2008), participants were presented five cartoon figures in line and asked to judge the central figure's facial expression. The results indicated that Japanese participants' judgments were more readily influenced by the surrounding figures' facial expressions than their American counterparts. When participants were presented with a happy central figure with four other happy surrounding figures, Japanese participants rated the central figure happier than did American participants; when participants were presented a happy central figure with four sad surrounding figures, American participants rated the central figure happier than did Japanese participants.

Meanwhile, the tendency that East Asians are more likely to pay attention to the background was also found in situations without social cues. Ji, Peng and Nisbett (2000) adopted the device invented by Witkin and colleagues (Witkin & Berry, 1975; Witkin & Goodenough, 1977), and found that Chinese participants were more readily influenced by the context (frame) of an object (rod) and made

more errors than did North Americans when asked to rotate a central rod until perpendicular with a tilted frame. The results were replicated by Kitayama and colleagues (Kitayama, Duffy, Kawamura, & Larsen, 2003), who presented participants with a set of a frame and line which they were asked to replicate in a second frame of either differing or identical sizes without reference the first set. In the absolute task, participants were instructed to draw a line in the second frame with the same length as the line in the first frame. In the relative task, participants were instructed to draw a line whose proportion to the second frame was the same as the proportion of the first line to the first frame. To perform well in the absolute task, participants needed to ignore the first frame and focus on the length of the first line. Conversely, the relative task required participants to attend to the proportion of the first line to the first frame. As expected, researchers found that Japanese participants performed better in relative tasks and taking into account of the frame, while North Americans performed better in the absolute tasks by ignoring the frame.

Also, Masuda and colleagues asked participants to focus on pictures with either one circle or one circle surrounded with four other identical circles. No cultural difference in patterns of attention was found between Canadian and Japanese participants when they were asked to focus on scenes with only a single circle; however, when asked to examine scenes with multiple circles, the average length of saccades away from the center of the central circle for Japanese participants were longer than that of Canadians. The results indicated Japanese participants paid more attention to the surrounding information compared to

Canadian participants (Masuda, Akase, Radford & Wang, 2008).

Recently, the cultural variations in attention were measured by using the eye tracker. Comparing those behavioral measurements (e.g., ratings), the eye tracker provides an objective and quantitative measure of a person's point of gaze in a visual scene displayed on a computer screen. For example, when naturalistic scenes containing a salient object in conjunction with a complex background were presented by the eye tracker, Chua and colleagues (Chua, Boland, & Nisbett, 2005) found American participants spent more time on focal objects than did Chinese participants, while Chinese participants made more saccades to the backgrounds than did Americans. Using the eye tracker, researchers replicated the cartoon experiment conducted by Masuda et al. (2008). They calculated the time participants spent on each figure and found that the ratio of time spent on background figures to time on the target figure was significantly longer for East Asians than for Canadian participants (Masuda, Wang, & Ishii, 2010).

These findings about culture and attention provided the convincing evidence in support of the assumption that East Asians pay more attention to the context while North Americans are more likely to focus their attention on the central objects. The different patterns of attention founded in differing modalities have influenced the ways in which people perceive and view the world.

Visual Representation and Relationships

Culture can shape people’s behaviors in a variety of ways (Markus & Kitayama, 1991; Nisbett, 2003). The context sensitivity of East Asians also influences their aesthetic preferences (Masuda, Gonzalez, Nhan, & Nisbett, 2008;

Wang, Masuda, & Ito, 2010). An analysis of archival data of Masuda et al. (2008) indicated that East Asian artists have traditionally applied a bird's eye view that increases the visible area of the scene by placing the horizon line high in the upper part of the frame, whereas the Western linear perspective shows a three-dimensional view in two-dimensional space. Behavioral data analyses by Masuda et al. (2008) indicated that when drawing scenic images, East Asians are more likely than their North American counterparts to apply the bird's eye view; in addition, when drawing pictures of scenery and when taking portrait photographs, North Americans were more likely than East Asians to exclude context. In general, East Asians tended to place the human model in the background and include more contextual information, while Americans tended to prioritize figures by de-emphasizing the background information. Furthermore, analyses of aesthetic preferences indicated that when participants were asked to select the best picture from sets of photographs showing variations in relative size of model and background, East Asians preferred context-inclusive portraits with wide backgrounds and small models, whereas North Americans preferred photographs in which the models filled most of the field.

Why are East Asians likely to be sensitive to contextual information in addition to salient focal information? Nisbett and his colleagues (Nisbett, 2003; Nisbett, Peng, Choi, & Norenzayan, 2001) have posited that East Asians are historically influenced by ancient Chinese holistic ways of thought, in which everything in the world is thought to be interrelated. By contrast, the analytic way of thinking shared by North Americans and Westerners in general originated in

ancient Greek philosophy, whereby all things were thought to have unique characteristics independent of context.

Previous research into sensitivity to relationships gives credence to this assertion. For example, Chiu (1972) showed sets of three objects to Chinese and American children. Two of the objects could be categorized according to their shared properties, and the third had a relationship with one of the others. Participants in this experiment were asked to judge which two objects could be grouped together and which one should be excluded. For example, in a picture containing a chick, a cow, and some grass, the chick and the cow can be considered to have shared properties (they are both animals), and the grass can be considered to have a relationship with the cow (cows eat grass). Results showed that Chinese children were more likely to emphasize relationships; for example, they were more likely than North American children to group the cow and the grass together, whereas North American children were more likely to put the cow with the chick.

Ji, Zhang, and Nisbett (2004) replicated the results by asking Chinese and American undergraduates to engage in a similar task involving sets of three words. Two of the words categorically shared the same characteristics, and the third word had a relationship with one of the others. For example, with the set *carrot–eggplant–rabbit*, Chinese participants were more likely to group *carrot* and *rabbit* together (rabbits eat carrots), whereas North American undergraduates were more likely to group *carrot* and *eggplant* together (both are vegetables). Ji et al. maintained that North Americans' tendency to habitually categorize things

according to their shared properties reflects a more object- and property-oriented view of the world, whereas East Asians' tendency to habitually categorize objects according to relationships indicates a more relationship-oriented worldview. Ji, Peng, and Nisbett (2000) also confirmed the hypothesis that East Asians are more attentive than Americans to relationships in the environment; in their study, East Asians displayed not only higher covariation accuracy when recalling pairs of objects on a computer screen, but also more confidence that their answers were correct.

Given the findings outlined above, I maintain that when people are sensitive to relationships, their drawings, designs, and graphic layouts are likely to include, rather than exclude, more pieces of information that are potentially relevant to the target information. At the same time, this relationship sensitivity facilitates a tendency to regard everything as equally important and embedded in the whole context, instead of clearly differentiating between focal and peripheral items.

Choi, Dalal, Kim-Prieto, and Park (2003) empirically demonstrated that East Asians have a stronger desire to include more pieces of information than do North Americans. In their cross-cultural study on causal attribution, Choi et al. asked Korean and American participants to read a brief summary of a murder case in which a professor had been murdered and the chief suspect was a graduate student. Participants were then provided with a booklet containing a variety of facts (e.g., the professor had a conflict with the graduate student, the professor's hobby was XXX, the graduate student's GPA was XXX). The task was to read

through all the facts and then exclude the facts thought to be irrelevant to the investigation. As expected, Korean participants excluded much less information than the American participants, indicating that Koreans prefer to consider as many pieces of potentially relevant pieces of information as possible.

These findings suggest that East Asians' context sensitivity and relationship sensitivity might facilitate creation of and preference for context-rich visual representation, whereas North Americans' object-oriented sensitivity might facilitate creation of and preference for visual representations comprising a limited number of focal objects and issues, and avoidance of complexity and context richness. I maintain that such culture-specific tendencies in preference have been developed through socialization processes. Developmental findings have demonstrated this possibility. According to Duffy, Toriyama, Itakura, and Kitayama (2009), children are gradually socialized into culturally dominant patterns of attention, and they serve as carriers of culturally shared patterns of attention for the next generation. Thus, once patterns of attention are created in a given culture, they will remain relatively stable. I would like to apply this concept of a culture-individual-culture cycle to the issue of culturally dominant patterns of visual representation. That is, if members of a given culture are exposed to culturally dominant patterns of visual representation, they might gradually and unconsciously internalize such a tendency and find such representations aesthetically superior and more functionally informative.

Of course, investigating the entire cycle is beyond the scope of my dissertation. Rather, I initiated this research paradigm by simply examining

whether East Asians were indeed more likely than North Americans to create context-rich complex visual representations when conveying information in limited spaces (e.g., conference posters) and in virtually unlimited spaces (web sites). I have also investigated whether people who are accustomed to 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 and Study 4: the information search task). I believe the findings of the current studies will help to explain the mutual relationships between culturally created visual representations and the psychology of those who live in a given culture.

General Hypotheses

According to Morling and Lamoreaux (2008), practices, symbols, and enforcement structures including visual representations can convey the dominant cultural messages. However, the core cultural message is often abstract and it is mediated by the cultural resources which work as important vehicles to convey the cultural message. People who live in a given society are frequently exposed to the resources, which in turn facilitate them to develop psychological processes and behaviors which resonate with the core cultural message. Kim (1998) found that nonverbal messages transmitted by models in Korean and American magazine advertisements generally reflect their respective cultural orientations. In addition, Masuda et al (2008) analyzed the aesthetics (e.g., paintings) and found the same tendency. However, there are many other cultural resources besides advisements and aesthetics. In this study, I focus on some other cultural products, notably actual products of conference posters and internet portal pages. The studies also

explore the possibility of the cultural differences in information search speed on WebPages. I hypothesized that East Asians, as more holistic thinkers, would be accustomed to emphasizing relationships and contextual information. Thus, East Asians would be predisposed to produce more complex layout designs. In contrast, North Americans, as more analytic thinkers, would de-emphasize contextual information. Accordingly, they would produce less complex layout designs. Furthermore, East Asians who were habituated to the complex designs should be more proficient when dealing with complex information, which was defined as the large amount of information, whereas there's no such an advantage for their North American counterparts.

In study 1, I examined whether posters produced by East Asians are symmetrically more complex than posters produced by North Americans. In addition to the cultural factors, there are many other factors capable of influencing poster complexity, such as the methodology the poster adopts and the number of studies addressed. Accordingly, I anticipated that posters produced by East Asians would be no more complex than those produced by North Americans when posters without clear categorizations were included. However, I anticipated East Asian posters would be more complex than North American ones when posters were clearly categorized.

Study 2 further examined the cultural variations of the complexity differences on portal pages of the websites. Considering the varied types of websites, it is meaningless to comparing all portal pages with different categories. However, I anticipated that East Asian portal pages would be more complex than

North American portal pages when websites were selected on similar content and topic.

In Study 3 and 4, I examined cultural variation in the information search speed on mock website pages. Because East Asian are repeatedly presented with complex WebPages, in study 3, I anticipated that East Asians would be less frustrated with complex WebPages and be faster than North Americans when asked to search for information on complex WebPages. In addition, considering the factor that the beginning portions of WebPages are similar for most WebPages, in study 4, I anticipated East Asians would be no faster than North Americans when they were asked to explore the content of simple WebPages.

The four studies were comprised of a variety of research methodologies. If predicted cultural differences consistently emerge under different conditions, the convergence of evidence would reach the conclusion that East Asians are more likely than North Americans to prefer the complex designs.

CHAPTER II

STUDY 1: POSTER ANALYSIS

Overview

Previous empirical studies found that the physical environments in East Asian societies were more complex than those in North American societies even when controlling for locations of similar population size and density; meanwhile, in change blindness tasks, both Japanese and American participants primed with complex scenes were faster in identifying changes that occurred in the background than those primed with simple scenes (Miyamoto, Nisbett & Masuda, 2006). These findings provide evidence that not only does environment complexity directly affect a person's ability to respond and deal with information, but also differences in the physical world might propagate such differences. This idea was further demonstrated by a study wherein Masuda and colleagues (Masuda, Gonzalez, Kwan, & Nisbett, 2008) found that Japanese participants were more likely than American participants to prefer paintings containing the rich contextual information. When participants from two societies were asked to draw pictures, Japanese participants tended to draw pictures containing more background objects comparing with North American participants.

All of the previous findings have indicated that East Asians are more likely to prefer the context-rich information to context-impoverished information. These findings however, have mainly focused on differences in contextual areas. Meanwhile, it is hard to clearly distinguish the boundaries between the fore- and background in most scenes. Accordingly, it would be prudent to consider these

scenarios as a whole to further investigate the cultural differences between the two societies. Study 1 examined cultural variations in the complexity between East Asian and North American posters, which were categorized by the first authors' names and their working locations. Because there are many other than culture such as the methodology employed by the conference posters and the number of studies, I anticipated there would be no difference among the posters when all posters were included. However, when posters were categorized according to certain roles, I anticipated East Asian conference posters would be more complex than North American ones.

Method

Materials

Electronic versions of posters at 2008/09 SPSP conference (Society for Personality and Social Psychology) were selected. Because the SPSP conference was annually held in the United States, posters at this conference produced by North Americans were more prevalent than those produced by East Asians. I randomly selected the equal number of North American posters based on the number of posters produced by the first authors that had East Asian names. In total, 247 posters[1] were selected for analysis, which was divided into three groups according to the first authors' names and their working locations: 128 North American posters, 50 East Asian posters and 69 posters which were produced by authors in the unmatched group. These three groups were defined by their first authors' names and their working locations, where North Americans were defined as those working in North America with North American names; East

Asians were authors working in East Asia with East Asian names; finally the unmatched group was composed with authors either working in East Asia with North American names or working in North America with East Asian names.

Criteria of Measurement

Because posters in the analysis were from the SPSP conference they were all completed in English. In the analysis, I used four criteria to measure their complexity: the number of words, characters, tables and pictures thus including all of the elements of a conference poster. Pictures included data figures, experimental flow charts, and university crests. The number of words and characters were calculated using the "word count" feature after all the contents of a poster was pasted on a new MS word file. The total number of tables and pictures was tallied by hand.

Results and Discussion

Considering the factor that research posters can contain different number of studies (e.g., single study vs. multiple studies) and different methodologies (e.g., survey vs. experiment), which will affect the poster complexity. To test the cultural effect, in this study, I conducted the analysis in each category.

1. Conference Posters with Single Study vs. Multiple Studies

Considering the factor that the different number of studies on each poster and its effect on the poster complexity, I divided these posters into two categories: single study posters vs. multiple studies posters, where multiple studies posters contain two or more studies.

1.1 Universal Tendency of the Design of Conference Posters with

Single Study vs. Multiple Studies

Before test the cultural effect, it is natural to investigate whether the number of studies on posters can affect the design. As shown in Table 2.1, the average number of tables was significant: t (245) = 1.98, p = .049, η^2 =.016, and the average number of words, characters and pictures was not significant (Fs < 1, respectively). The results indicated that posters with multiple studies had more tables compared to posters with a single study.

Table 2.1: Mean of words, characters, tables and pictures on posters with single study and multiple studies (n = 245)

	Single study	Multiple studies	*t*	*p*
Word	971.55	1019.86	.92	.360
Characters	5501.04	5772.54	.91	.363
Tables	.70	1.07	1.98	.049*
Pictures	4.35	4.83	1.13	.260

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

1.2 Cultural Effect among Conference Posters with Multiple Studies

As shown in Table 2.2, when posters contain two or more studies, there was a cultural effect on the number of words and characters (marginal), but there was no cultural effect on the number of tables and pictures. The overall results indicated that East Asians were more likely than North Americans and authors in the unmatched group to design complex posters when they contained multiple studies.

Words: As shown in Table 2.2, there was a main effect of culture, F (2,

56) = 3.19, p= .049, η^2 = .102. Planned t-tests indicated that: East Asians tended to put more words on posters with multiple studies than both the unmatched (t (29) = 2.15, p = .040, η^2 = .138)) and North American groups (t (34) = 2.36, p = .024, η^2 = .141)). There was no difference between the unmatched group and North Americans: t < 1.

Table 2.2: Mean of words, characters, tables, and pictures of three groups' posters with multiple studies (n = 56)

	East Asians	Unmatched	North Americans	*F*	*p*
Words	1308.88	975.57	973.68	3.19	.049*
Characters	7302.75	5526.96	5537.07	2.81	.069*
Tables	1.25	1.26	.86	.48	.624
Pictures	4.63	4.22	5.40	.97	.386

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

Characters: As shown in Table 2.2, there was a marginal main effect of culture, F (2, 56) = 2.81, p= .069, η^2 = .091. Planned t-tests results indicated that: (1) East Asians were more likely than the authors in the unmatched groups *(t* (29) = 2.01, p = .054, η^2 =.122)) and North Americans (t (34) = 2.29, p = .028, η^2 = .134)) to put more characters on posters with multiple studies; (2) there was no difference between authors in the unmatched group and North Americans: t < 1.

Tables and pictures: As shown in Table 2.2, there was no main effect of culture on the number of tables and pictures (Fs < 1, respectively), which indicated that there was no difference on the number of tables and pictures among

the posters made by East Asians, authors in the unmatched group and North Americans when posters contained two or more studies.

1.3 Cultural Effect among Conference Posters with a Single Study

As shown in Table 2.3, when posters contained one study, there was no significant difference on the number of words, characters, tables (Fs < 1, respectively), but there was a cultural effect on the number of pictures: F (2, 185) = 3.07, p = .049, η^2 = .032.

Table 2.3: Mean of words, characters, tables and pictures on posters with one study (n = 185)

	East Asians	Unmatched	North Americans	*F*	*p*
Words	999.14	1028.11	933.94	1.31	.27
Characters	5571.86	5708.09	5376.06	.47	.63
Tables	.81	.54	.73	.68	.51
Pictures	4.50	5.13	3.93	3.07	.049*

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

Planned t-tests found that people in the unmatched group tended to put more pictures on the posters than did North Americans: t (144) = 2.36, p = .020, η^2 =.037. There was no difference between other two comparisons: East Asian posters and posters made by people from the unmatched group, East Asian posters and North American posters (Fs < 1, respectively).

2. Conference Posters with Experiment vs. Survey Designs

Similarly, the different methods posters adopted could also affect the

complexity design in the sense that survey posters generally need more data to produce the model and more words to describe the characters of research tools comparing the most experiment posters. Accordingly, I anticipated the different complexity between experiment and survey posters.

2.1 Universal Differences between Experiment and Survey Posters

The results showed that there were more words, characters, and tables on survey posters, while there were more pictures on experiment posters.

Words: As shown in Table 2.4, there was a main effect, t (245) = 2.25, p = .026, η^2 = .020, the results suggested that survey posters contained more words than experiment posters.

Table 2.4: Mean of words, characters, tables and pictures between experimental and survey posters (n = 245)

	Experiment	Survey	*t*	*p*
Words	947.12	1052.88	2.25	.026*
Characters	5380.82	5925.02	2.04	.042*
Tables	.61	1.14	3.26	.001***
Pictures	4.87	3.68	3.18	.002**

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

Characters: As shown in Table 2.4, there was a main effect, t (245) = 2.04, p= .042, η^2 = .017, the results suggested survey posters contained more characters than experiment posters.

Tables: As shown in Table 2.4, there was a main effect, t (245) = 3.26, p= .001, η^2 = .041, the results suggested survey posters contained more tables than

experiment posters.

Pictures: As shown in Table 2.4, there was a main effect, t (245) = 3.18, p= .002, η^2 =.040, the results suggested there were more pictures on experiment posters comparing survey posters.

2.2 Cultural Differences in Content among Experiment Posters

As shown in Table 2.5, there was no cultural effect among three groups' posters on the number of words, characters, tables, and pictures (Fs < 1, respectively) when addressing studies that had adopted the experiment method.

Table 2.5: Mean of words, characters, tables and pictures of experiment posters (n = 160)

	East Asians	Unmatched	North Americans	F	p
Words	1010.55	985.80	899.56	1.61	.20
Characters	5651.03	5542.88	5179.85	.89	.41
Tables	.84	.62	.51	1.02	.36
Pictures	4.84	4.94	4.84	.02	.98

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

2.3 Cultural Differences in Content among Survey Posters

As shown in Table 2.6, there was no cultural effect among three groups' posters on the number of words, characters, tables, and pictures (Fs < 1, respectively).

In summary, the results showed that: (1) Posters with multiple studies had more tables than posters with a single study, although they had similar

numbers of words, characters and pictures. The results indicated that posters with multiple studies were more complex than posters with a single study, which also provided us evidence that it is prudent to analyze the cultural effect in each category. The cultural difference was found on the number of words and characters among three groups and East Asians were more likely than authors in the unmatched group and North Americans to put more words and characters on the posters containing multiple studies.

Table 2.6: Mean of words, characters, tables and pictures of survey posters (n = 81)

	East Asians	Unmatched	North Americans	*F*	*p*
Words	1110.95	1075.84	1019.41	.49	.62
Characters	6171.47	5923.58	5823.83	.19	.83
Tables	.95	1.21	1.20	.22	.81
Pictures	4.00	4.53	3.20	2.28	.11

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

Meanwhile, when posters containing a single study, there was a difference on the number of pictures and no cultural difference on the number of words, characters and tables among three groups; (2) Survey posters contained more words, characters, and tables than the experiment posters, while experiment posters contained more pictures than survey posters. The results also gave us evidence that survey and experiment posters are different and it is better to analyze the cultural effect in each category. However, there was no cultural

difference in both categories. In other words, people in three groups put similar amount of information on either the survey or the experiment posters.

Overall, East Asian posters were more complex than posters produced by authors in the unmatched group and North Americans, especially when posters contained multiple studies. However, as one way to express people's research, posters analyzed in this study were constrained in their sizes because authors will have to follow the conference rules. In this case, it is advisable to further investigate the complexity difference in the domains where people can express their ideas in the situations where flexible amount of information was available.

CHAPTER III

STUDY 2: PORTAL PAGE ANALYSIS

Overview

The results of study 1 demonstrated that East Asians tended to create more complex posters, especially when posters contained multiple studies. However, a conference poster is a single piece of printed paper designed to be attached to a wall or "board", which is normally restricted to a fixed size. This limitation was overcome in Study 2 in which I analyzed cultural differences existing on "portal pages" of websites.

Continuing to gain popularity, the internet is quickly becoming one of the most important avenues to access information, not only for the daily news, but also other activities such as shopping and banking. In July of 2008, there were approximately 253 million internet users in China alone. In the United States, approximately 70% of population (or 220 million people) were internet users. Japan and South Korea have similarly high percentages (Barboza, 2008). As one of the most powerful mass media, the internet is affecting people's lives.

Meanwhile, a Webpage creates a medium of unlimited size to accommodate different content. Theoretically, people can put an infinite amount of information even on a single Webpage. This unique characteristic provides people the freedom to decide the amount of information presented and furthermore provides a better platform to test the complexity difference between East Asians and North Americans.

Also, it is obvious that each Website contains many pages, many of which

are regularly updated and changed. Portal pages however are relatively stable compared to other links and sub-pages that contain more detailed information. The portal page is the main Webpage of a website and serves as the index or table of contents for other detailed files on the website. Although the detailed contents on portal pages will be constantly replaced, the basic structures of the portal page will remain stable for a long time. The relatively stable character also provides the opportunity to investigate the complexity difference between two societies. To standardize the analysis in this study, I focused only on the portal pages.

Finally, on each website, some links may lead visitors to other related websites making the analysis complicated. For example, the links on website of University of Alberta can lead visitors to "the City of Edmonton" and "the Weather Office" etc. Accordingly, we assume that the portal page is the cultural products we should focus on.

According to previous findings and the results of study 1, I hypothesized that the layout of East Asian portal pages would be more complex than North American ones. Specifically, East Asian portal pages would contain more information (e.g., words and characters) than North American portal pages.

Method

Materials

Different types of business websites vary in the amount information they provide given the range of their objectives. For example, people normally list their most attractive items prominently on the portal page to attract the customers' attention. Thus the portal page of for-profit retail companies will contain more

information than the portal pages of non-profit companies. To avoid this confounding variable in the current analysis, I selected two types of non-profit portal pages: university portal pages and government portal pages. East Asian portal pages were from three countries: China, Japan and Korea, while North American portal pages were from two countries: the United States and Canada.

In this study, government portal pages consisted of official government portal pages from the federal and provincial levels (provinces and territories in Canada, states in the United States, and prefectures in Japan respectively). There were 99 East Asian governmental portal pages (China, Japan & Korea) and 66 North American governmental portal pages (US & Canada).

The university portal pages consist of the top 100 universities in North America and the top 100 universities in East Asia according to their rank in 2007 on the website "Webometrics" (Webometrics Ranking, 2007), which is a website dedicated to annually ranking universities all over the world.

In total, 365 portal pages from governments and universities were included in the analysis.

Criteria of Measurement

To compare the variation in portal page complexity, I adopted four criteria: the length of the scroll bars, and the number of the links, words, and bytes (Appendix I, II).

The Length of Scroll Bars

A scrollbar is a graphical widget through which continuous text, pictures or anything else can be scrolled through or navigated including time in video

applications, i.e., viewed even if it does not fit into the space in a computer display or window. Generally, the shorter the scroll bar is, the longer the webpage. Longer WebPages in turn can provide more space thus making the presentation or larger amounts of information possible. In other words, a long webpage (that subsequently has a short scroll bar) is likely to contain more information than a short webpage with a long scroll bar.

To precisely measure the scroll bar, I used an IBM laptop (T42), 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 minimal scale of millimeter (mm).

The Number of Links

In most conventional internet browsers, a link in this context refers to the icons, pictures, actual words and anything which lead the visitor of the page to another page within the structure of the target web pages, or to external resources. I manually counted the number of links on each portal page.

The Number of Words and Bytes

Because words and bytes can be changed from time to time and as such too difficult to be counted individually, I used an easy way to roughly estimate the complexity of the portal pages. I first used "special paste" command and pasted all the words on each portal page on a separate word file and tallied the numbers of words and characters on each portal page by using the "*word count*" command in Microsoft Office Word 2003. There were two different types of characters and only "characters without spaces" were counted in this study because spaces can be

manufactured during the copying and pasting process and don't affect the overall complexity of portal pages.

Meanwhile, because the lengths of English and East Asian words vary, I adopted the unit of byte to precisely compare the complexity of portal pages. On a Webpage, an East Asian word is considered to be one character and occupies the space of two bytes, while a single English letter is considered as one character and occupies one byte space. Accordingly, the number of bytes on English portal pages is equal to the number of English characters (or letters), while the number of bytes on East Asian portal pages is equal to two times of the number of East Asian characters (words).

Results and Discussion

In this study, I selected two types of non-profit portal pages: university and government portal pages and analyzed them criterion by criterion. As mentioned, each type of website has its own relatively stable structure. Governments and universities are different types of organizations where governments mainly focus on local or national issues (Appendix III), and it is prudent to analyze them individually.

1. The Results of Government Portal Pages[2]

1.1 The Length of Scroll Bars: There was a main effect of culture, as seen in Table 3.1, $t\ (163) = 7.44$, $p < .001$, $\eta^2 = .25$. The results indicated the scroll bars of East Asian government portal pages were shorter than those of North American ones and East Asian government portal pages were longer than North American ones.

1.2 The Number of Links: There was a main effect of culture, as seen in Table 3.1, t (163) = 10.05, $p < .001$, $\eta^2 = .38$. East Asian government portal pages contained more links than North American ones.

1.3 The Number of Words: There was a main effect of culture, as seen in Table 3.1, t (163) =7.45, $p < .001$, $\eta^2 = .25$. The results indicated that East Asian government portal pages contained more words than North American ones.

1.4 The Number of Bytes*:* There was a main effect of culture, as seen in Table 3.1, t (163) = 5.69, $p < .001$, $\eta^2 = .17$. East Asian government portal pages contained more bytes than North American ones.

Table 3.1: Mean of government portal pages (n =163)

	East Asians	North Americans	*t*	*p*
Bar (mm)	107.73	152.73	7.44	.000**
Links	172.69	68.68	10.05	.000**
Words	1829.46	433.44	7.45	.000**
Bytes	5607.92	2620.05	5.69	.000**

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

2. The Results of University Portal Pages[3]

2.1 The Length of Scroll Bars: There was a marginal main effect of culture, as seen in Table 3.2, t (198) = 1.97, $p = .050$, $\eta^2 = .019$. The scroll bars of East Asian university portal pages were significantly shorter than those of North American ones, which indicated that East Asian portal pages were longer than North American ones.

2.2 The Number of Links: There was a main effect of culture, as seen in

Table 3.2, t (198) = 2.64, p =.009, η^2 = .034. East Asian university portal pages contained more links than North American ones.

2.3 The Number of Words: There was a main effect of culture, as seen in Table 3.2, t (198) =8.55, p < .001, η^2 = .27, which indicated that East Asian university portal pages had more words than North American ones.

2.4 The Number of Bytes: There was a main effect of culture, as seen in Table 3.2, t (198) = 2.46, p= .015, η^2 = .030. East Asian university portal pages contained more bytes than North American ones.

Table 3.2: Mean of university portal pages (n = 198)

	East Asians	North Americans	*t*	*p*
Bar (mm)	159.91	170.29	1.97	.050*
Links	64.72	55.02	2.64	.009*
Words	1000.23	311.72	8.55	.000**
Bytes	2592.16	1935.01	2.46	.015*

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

In summary, the results of study 2 indicated that the scroll bars of East Asian portal pages, both governments and universities, were significantly shorter than those of North American ones. In addition, the results indicated that there were more links, words and bytes on East Asian portal pages than North American portal pages. These results provided evidence that East Asian portal pages tend to contain more information than North American ones.

These findings were consistent with the results of study 1 and other previous findings that East Asians are more likely to prefer the context-rich

environments to context-improvised environments, and supported the hypothesis that East Asians were more likely than North Americans to design complex layouts.

CHPATER IV

STUDY 3: EXPLORING COMPLEX WEBPAGES

Overview

The results of Study 1 & 2 indicated that East Asians were more likely than North Americans to prefer to complex designs in a single visual space. A famous Chinese proverb says that "practice makes perfect". When people are constantly presented with complex stimuli, they would have more chances to become more proficient at dealing with them. Accordingly, in this study, I hypothesized that people who are surrounded by the complex internet environments (e.g. Chinese) will be faster than those who are surrounded by the simple internet environments (e.g. Canadians) when they are asked to identify pieces of information on complex or long WebPages.

Study 2 found that the length of the scroll bars of East Asian portal pages was shorter than that of North American ones, which indicated that the length of each page in East Asian websites were longer and contain more pieces of information than North American ones. I assume that, if people are exposed to such complex information for a long period of time, and find it is common, they should be habituated to effectively deal with them. Consequently, when participants were asked to identify objects located at the bottom of complex WebPages, I hypothesize that East Asians would be faster than North Americans.

Method

Participants

Forty-one European Canadian students (21 females, 20 males), 36 Asian

Canadian students[4] (22 females, 14 males) and 38 Asian international students[5] (21 females, 17 males) were recruited from the University of Alberta, Canada. All participants received credits for the fulfillment of course required research participation.

Materials

In this study, 12 complex WebPages (Appendix IV) were created using Adobe Photoshop 7.0 and Macromedia Dreamweaver 8, with lengths varying from 1920 to 3090 pixels and widths fit to a standard 17 inch screen with a display resolution of 1024 by 768 pixels. Participants were able to search for the target information by moving scroll bar up and down. To balance gender differences regarding familiarity with some of the topics covered by the WebPages, a variety of topics were used. These included: cameras, flowers, veggies, watches (male and female), fruits, wines, mushroom, makeup, ties, socks and jewelries. Thus, the best effort was put forward to balance stereotypically masculine and feminine topics.

On each Webpage, I randomly choose four different objects (pictures) as the target stimuli forming a total of 48 stimuli, which were printed out with a color printer. Due to differences in the original sizes of the selected stimuli, some were resized, though at equal ratios to prevent distortion. This has no effect of the color, overall shape or name of the stimuli. During the experiment, they were stored in a folder and presented one by one.

A desktop computer with the 17 inch standard monitor was used to present these WebPages. Timing for each item was conducted using a sport watch with a

precision of 0.01 seconds.

Procedure

At the beginning of the experiment, participants were told that their overall task was to find the objects on the WebPages as fast as they could. Each time, they were presented one object in the file folder. During each trial, participants were allowed to back and forth between the folder and the screen to check their answers. After four practice trials, participants were asked to engage in 48 experimental trials which were randomly ordered.

In each trial, participants were instructed to observe the sample picture carefully, after which they would signal the experimenter by saying "ready" to indicate that they can begin the task. The experimenter started to time the participants' performance at the same time s/he allowed participants to search for the item on the screen. Once an answer was provided, the experimenter would stop the timer, verify, and then begin the timer after they instructed the person to continue searching. When participants gave wrong answers, they were notified, and were asked to continue to search for the right ones. When the right object was found, participants were asked to move the mouse on the object, and confirm verbally. Then, the sport watch can record participants' reaction time for one target. Following the same procedure, participants were asked to search for other targets till all were correctly identified.

During the search, the mouse always started from the top right corner when participants moved to a new Webpage while following searches began from the location of the previous object.

At the end of the study, participants were asked to fill out familiarity and demographic questionnaires after which they were debriefed and dismissed.

Results and Discussions

1. Internet Familiarity

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 scale, where 0 meant "not at all", and 9 meant "extremely familiar". As seen in Table 4.1, results showed that there was no cultural effect, $F < 1$, which indicated that there was no difference in using internet among three groups.

Table 4.1: Mean and Std. Deviation of internet familiarity among groups

	Canadians	Asian Canadians	International Students	n	*F*	*p*
Mean	7.88	8.06	7.81	110	.53	.59
SD	1.03	1.06	1.05			

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

Meanwhile, as seen in Table 4.2, there was no gender effect, $t(111) = 1.19$, *ns*, which indicated males and females rated themselves as equally familiar with the internet.

Table 4.2: Mean and Std. Deviation of internet familiarity between genders

	Male	Female	n	*t*	*p*
Mean	8.04	7.81	111	1.19	.24
SD	.96	1.10			

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

2. Participants' Reaction Time

2.1 Cultural Differences of the Reaction Time

As shown in Table 4.3, the time participants spent on 48 objects was analyzed and provides evidence for an effect of culture among the three groups, F (2, 110) = 3.56, p = .03, η^2 = .06.

Planed t-tests indicated that the cultural differences existed between: (1) Canadian and Asian Canadian participants: t (74) = 2.08, p = .04, η^2 = .055; (2) Canadian participants and East Asian international students: t (76) = 2.45, p = .02, η^2 = .073. Meanwhile, the difference between Asian Canadian participants and East Asian international students was not significant.

Table 4.3: Mean (ms) and Std. Deviation of reaction time of three groups

	Canadians	Asian Canadians	International Students	*n*	*F*	*p*
Mean	12020.32	11021.65	10840.99	110	3.56	.03*
SD	2093.72	2074.09	2162.58			

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

The results indicated that both international students and Asian Canadian participants were faster than Canadian participants in identifying objects on complex WebPages.

2.2 Cultural Differences in Different Locations

The above analysis suggested that when all the stimuli were examined collectively, Asian Canadians and international students were faster than Canadian participants. In an attempt to specify the findings, the question "which

section or sections of the Webpage can participants perform well?" became relevant. When divided into vertical sections, three possible patterns exist: (1) Asian Canadian and international students are faster as a whole WebPages; or (2) they are faster in the upper sections; or (3) they are faster at the bottom sections. The results of study 2 indicated the lengths of East Asian WebPages were longer than North American ones, but maintained very similar widths and upper portions. Based on this finding, I further hypothesized that the difference would occur at the bottom of the WebPages.

Following this logic, I equally divided each Webpage into three sections based on their actual lengths as assessed in the software of Macromedia Dreamweaver 8: upper, middle, and bottom. Among the 48 objects, there were 11 objects located in the upper section, 17 objects located in the middle section, and 20 objects located at the bottom section. The results of *One-way ANOVA* in each section were as following (Table 4.4):

Upper: There was no cultural main effect in the upper section, $F < 1$. The results suggested that participants from the three groups tended to perform equally well when the objects were located in the upper part of the complex WebPages.

Middle: There was no cultural main effect in the middle section, $F < 1$. The results suggested that participants from three groups can perform equally well when the objects were located in the middle of the complex WebPages.

Bottom: There was a cultural main effect at the bottom, F (2, 110) = 5.60, p= .005, η^2 = .092.

Planed t-tests indicated that when objects were located at the bottom

section of the complex WebPages: (1) Asian Canadian participants performed faster than Canadian participants: t (74) = 2.44, p = .017, η^2 = .075; (2) international students performed faster than Canadian participants: t (76) = 3.07, p = .003, η^2 = .11; (3) there was no difference between Asian Canadian participants and international students.

The results indicated that both Asian Canadian participants and international students were faster than Canadian participants in identifying the objects which were located at the bottom of the complex WebPages, but all three groups performed equally well when the objects were located in the upper and middle sections.

Table 4.4: Mean (ms) and Std. Deviation of three sections

		Canadians	Asian Canadians	International Students	F	*p*
Upper	Mean	9721.44	9212.91	9154.08	.61	.55
	SD	2387.35	2617.62	2536.12		
Middle	Mean	12690.85	12127.13	11972.54	.55	.58
	SD	2321.34	3317.92	3860.07		
Bottom	Mean	12714.76	11076.81	10806.99	5.60	.005**
	SD	3070.62	2723.14	2320.41		

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

2.3 Gender Differences

As shown in Table 4.5, when the three groups of participants were included, there was no gender effect in identifying 48 objects, which indicated

that both males and females can perform equally well on complex WebPages.

Table 4.5: Mean and Std. Deviation of males and females

	Male	Female	*n*	*t*	*p*
Mean	11381.18	11278.51	111	.25	.80
SD	1864.07	2387.29			

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

In summary, the results of the complex WebPages indicated that: (1) there were no difference among three groups on internet familiarity; (2) Asian international students and Asian Canadians were faster than Canadians in the process of searching; (3) when WebPages were vertically divided into three sections, there was no cultural difference among three groups when objects were located in the upper and middle sections, but Asian international students and Asian Canadians tended to be faster than Canadians in identifying objects located at the bottom of WebPages; (4) both males and females were able to use the internet equally well.

CHPATER V

STUDY 4: EXPLORING SIMPLE WEBPAGES

Overview

The results of study 2 indicated East Asian portal pages were much longer than North American ones, and the results of study 3 showed that Asian international students and Asian Canadians were faster than Canadians in identifying objects on complex WebPages, especially when these objects were located at the bottom. According to the structure of WebPages, although East Asian portal pages were longer than North American ones, the width will be similar for most websites. The results of study 3 also found that there was no cultural difference among three groups when objects were located in the upper or middle sections of complex WebPages. Accordingly, I hypothesized that there would be no difference among three groups when they were asked to identify objects on simple or short WebPages.

Method

Participants

Forty-three European Canadian students (19 females and 24 males), 40 Asian Canadian students[4] (22 females and 18 males) and 32 Asian international students (20 females and 12 males) were recruited at the University of Alberta, Canada. All participants received credits to fulfill a course requirement for the participation.

Materials

In this study, following similar procedures as study 3, I created 12 short

WebPages (Appendix V) using Adobe Photoshop 7.0 and Macromedia Dreamweaver 8. Their lengths vary from 880 to 1350 pixels, which were a bit shorter than a half of the complex ones (960 to 1545 pixels). Their widths fit to a standard 17 inch screen with the displaying solution of 1024 by 768 pixels. Meanwhile, these 12 simple WebPages contain same topics as complex ones, i.e., they are short versions of complex WebPages. The locations of target objects in simple WebPages were different from those in complex WebPages.

Procedure

The procedure including target stimuli and tools used in the simple Webpage exploring study was same as the procedure in study 3.

Results and Discussions

1. Internet Familiarity

Similar to the complex Webpage study, participants were asked to answer one familiarity question after finishing the searching tasks, which was a 10 points Likert scale, where 0 means "not at all" and 9 means "extremely familiar". The results showed that there was no cultural effect on internet familiarity among three groups (Table 5.1).

Table 5.1: Internet familiarity among cultures

	Canadians	Asian Canadians	International Students	n	*F*	*p*
Mean	7.88	8.03	7.79	112	.49	.61
SD	1.03	1.06	1.04			

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

Meanwhile, there was no gender difference on internet familiarity, which indicated that males and females rated themselves as equally familiar with internet (Table 5.2).

Table 5.2: Internet familiarity between genders

	Male	Female	n	*t*	*p*
Mean	8.04	7.78	113	1.33	.19
SD	.96	1.09			

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

2. Results of Reaction Time on Simple WebPages

2.1 Cultural Differences of Reaction Time

The total time participants spent on 48 objects was analyzed, and there was no cultural effect among the three groups when participants were asked to search for target objects on simple WebPages: $F < 1$ (Table 5.3). The results indicated that three groups were equally well in searching on simple WebPages.

Table 5.3: Mean and Std. Deviation of reaction time

	Canadians	Asian Canadians	International Students	*n*	*F*	*p*
Mean	7588.86	7436.23	7388.74	112	.16	.85
SD	1728.98	1674.91	1414.90			

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

2.2 Gender Differences of Reaction Time

As shown in Table 5.4, when three groups participants were included, there was no gender effect in identifying all 48 objects: t (113) = .36, p= .72, η^2

= .001. The results indicated that both males and females can perform equally well in simple WebPages.

Table 5.4: Mean and Std. Deviation of gender differences

	Male	Female	*n*	*t*	*p*
Mean	7538.59	7428.29	113	.36	.72
SD	1820.46	1425.25			

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

In summary, the results of the simple WebPages indicated that: (1) there was no difference among three groups in using internet; (2) there was no difference among Asian international students, Asian Canadians and Canadians in exploring simple WebPages; (3) both males and females rated themselves as equally familiar with internet.

CHPATER VI

DISCUSSIONS

General Findings

The present studies investigated contemporary cross-cultural complexity differences with reference to cultural variations in the presentation of information such as posters and WebPages, as well as cultural variation in information searching speed on complex and simple WebPages. Based on previous findings on cultural variation in attention (Masuda & Nisbett, 2001; Kitayama, Duffy, Kawamura & Larsen, 2003), artistic aesthetics (Masuda, Gonzalez, Kwan, & Nisbett, 2008), relationships (Ji, Zhang, & Nisbett, 2004) and causal attribution (Choi, Dalal, Kim-Prieto, & Park, 2003), I assumed that East Asians, being strongly accustomed to holistic patterns of cognition, would be more likely to exhibit a predilection for complex designs. Two studies (Study 1 & 2) were conducted to test these hypotheses.

Previous findings indicated that East Asians were faster than North Americans in identifying elements of the background information, but also found no differences in identifying the foreground information (Masuda & Nisbett, 2006; Masuda, Nhan & Ito, 2010). Researchers (Miyamoto, Nisbett & Masuda, 2006) also found that both Japanese and Americans more readily detected a larger number of contextual changes after being primed with complex Japanese scenes. Accordingly, I assumed that East Asians, being generally exposed to complex WebPages in their daily routine, would be faster at identifying objects on complex WebPages (Study 3). However, the advantage for East Asians would disappear

when participants were asked to identify pieces of information on simple WebPages (Study 4).

Culture and Complexity Difference for Designs

Study 1 analyzed the complexity of conference posters. Both East Asian and North American posters, written in English, were collected at SPSP (Society for Personality and Social Psychology) conference in the United States in 2008/09. Based on first authors' names and their working locations, posters were divided into three groups: East Asians, North Americans and authors in the unmatched group. Four criteria were selected to evaluate the complexity of the posters: the number of words, characters, tables and pictures. The results indicated that East Asians were more likely than authors in the unmatched group and North Americans to put more words and characters on the posters when posters contained multiple studies. Meanwhile, authors in the unmatched group included more pictures than did North Americans on posters that addressed only one study.

While posters addressing survey studies contained more words, characters and tables and fewer pictures than experimental posters, no cultural difference was found in either experiment or survey posters. These findings suggested that generally speaking, East Asians were more likely than North Americans to design complex posters especially when the posters addressed two or more studies.

Study 2 also analyzed information actually used in each society in which the amount of space was not fixed. In this study, I investigated complexity of websites' "portal pages", which can provide people unlimited space to create and place content as they need. Government and university portal pages from the

United States and Canada were compared with East Asian portal pages from China, Japan and Korea. In the analysis, the length of the scroll bars as well as the number of words, characters and bytes were used as to estimate the conventional design. The results indicated that East Asian portal pages, both government and university portal pages, were longer and contained more words, characters, and bytes than North American portal pages. This study demonstrated that East Asians were more likely than North Americans to design complex products.

The first two studies consistently showed that East Asians were more likely to include more complex designs than their North American counterparts, which we believe show their preference. These findings are consistent with previous research on culture, attention and artistic aesthetics that have contrasted holistic and analytic patterns of cognition (Nisbett, 2003, Masuda et al., 2008). East Asians, which have been influenced by ideologies such as Buddhism, Taoism and Confucianism, have developed cultural values that emphasize interconnectedness among elements and an understanding of the world in terms of their relationships with other objects. This has influenced their cognitive styles which guided them to produce complex representations (e.g., posters, portal pages and artistic aesthetics). These complex environments and products have in turn been shown to reinforce their holistic cognitive styles.

In contrast, North Americans, influenced by Western ways of thinking, have developed cultural values that emphasize salient objects and their attributes and thus tended to operate on rule-based categorization. Such cultural values may have influenced conventions for representing concepts and objects and thus

guided them to create simpler representations in order to place prominence on a select group of what are perceived to be distinct elements by deemphasizing unnecessary contextual information. Simple environments and products thereof, may have and continue to, strengthen the Western analytic cognitive style.

Culture and Complexity Difference on Performance

Study 3 and 4 investigated the relationship between culture and the complexity behaviours. As demonstrated in study 1 and 2 as well as previous findings on aesthetic arts and relationships, East Asians have more exposure to complex stimuli and they are more practiced at dealing with them. Greater proficiency in dealing with complex information would make the creation of complex designs as a matter of habit. Study 3 was designed to investigate people's performance on the complex WebPages. In study 3, 12 complex mock WebPages were created and the reaction time for each stimulus was measured. The results indicated that East Asian international students and Asian Canadians were faster than European Canadians in identifying target objects on complex WebPages especially when objects were located at the bottom of long WebPages. Meanwhile, when complex WebPages were repeatedly presented, international students' relative advantage in dealing with complex WebPages disappeared as Asian Canadian and Canadian participant proficiencies increased in the later searching tasks[6]. Study 4 was designed as a comparison study and investigated participants' performance on simple WebPages. In study 4, based on complex WebPages, a series of simple ones were created that were half or less the length of formers. The results indicated that participants in three groups were equally fast at identifying

objects on simple WebPages.

The last two studies showed that East Asians and Asian Canadians were faster than European Canadian participants in dealing with the information on complex WebPages while no difference was found among the three groups in dealing with information on simple WebPages. These findings are similar to the previous findings on culture and the physical environments (Miyamoto, Nisbett & Masuda, 2006). East Asians, living in complex physical surroundings and accustomed to encounters with complex representations, have developed cultural values that create complex settings, which, in turn, would facilitate their skills to deal with the complex information.

Implications

The findings of present studies provide us with a variety of implications which suggest further examination. The findings resonate with the research findings on culture and categorization, culture and field-dependence, and culture and languages, which in turn allow us to further produce fruitful research questions. Followings are the details of the relationships between the current and previous findings.

Cultural Variations in Categorization

According to previous findings, there are different types of categorizations: taxonomic categorization, which is made on the basis of similarity of attributes such as similarities in perceptual properties among objects, and thematic categorization, which is made on the basis on causal, spatial and temporal relationships among objects (Chiu, 1972). Researchers (Ji, Zhang, & Nisbett,

2004; Unsworth, Sears & Pexman, 2005) indicated that categorization varies with culture. North Americans have a stronger bias towards taxonomic categorization, while East Asians may include both taxonomic and thematic categorizations in their semantic networks. Accordingly, people of North American cultures tend to excel at categorization, while East Asians, by contrast, are less proficient with categorization due to the greater emphasis on relationships which leads them to use an exemplar-based strategy for categorization (Nisbett, Peng, Choi & Norenzayan, 2001; Norenzayan, Smith, Kim, & Nisbett, 2002). In turn, more complex representations tend to be constructed with exemplar-based strategies due to the larger amounts of information that is needed to clarify relationships. Current research results then were supported by previous findings.

As such, putting things together will make East Asians to better reorganize them, which was demonstrated by Bousfield's 1953 work on categorical clustering. Defined as the phenomenon occurs during a free recall task in which individuals systematically organize their memory according to categories (Phillips, 1974; Gutchess et al, 2006), research on categorical clustering with Americans suggests that they tend to exhibit more categorical clustering than East Asians. Conversely, East Asians tended to use categories as an organizational strategy based on taxonomic categories less than do Americans (Norenzayan, Smith, Kim & Nisbett, 2002; Ji, Zhang, Nisbett, 2004). The results of the current studies demonstrated the same tendency. Generally observing website designs, North American portal pages tended to be organized more simply around general categories constructed the de-emphasis of none directly pertinent information.

Conversely, East Asian portal pages tended to group information via the use of numerous and detailed categories. For example, instead of using "Money" as a category as was on English MSN portal page (www.msn.com), the Chinese MSN portal page (www.msn.com.cn) used 8 sub-categories such as "Economy", "Finance and Economics", "Business Stock", "Fortune', "Financing", "House Property" and "House Living" to further elaborate on the topic of "Money". Another example is the category of "Entertainment" on the English MSN page, which had been broken down into at least five categories containing similar contents such as Entertainment, Music, Beer and Skittles, Fashion, and Vogue" (MSN online, 2009). According to previous findings (Pashler, 1988; Masuda, 2003), human beings are surrounded by and exposed to cultural resources through their lives. During the lived experience, people may internalize the dominant preference of their culture. Researchers (Zajonc, 1968) found that people are likely to prefer the objects to which they are exposed the most. As a result of this tendency, East Asians will in turn be more likely to design more complex products and as such, affect their habits when dealing with them. The findings of the present studies supported the hypothesis that East Asians are more likely than North Americans to design complex layouts in a single visual space. Furthermore, it suggested that the complexity preference is strongly influenced by the presence of familiar cultural resources. Not only should East Asians be more likely to design complex layouts, but they should accordingly be proficient in dealing with these complex layouts that contain detailed categories.

Despite the logical following of this thinking, it raises the question, that if

North Americans are more proficient at categorizing with broad categories by means of deemphasizing unnecessary information, will they be effective at dealing WebPages in which information is hidden in hierarchical categories? For example, participants can only see the main categories, such as mushroom, on the front-page, and they need to click on these main categories to get more detailed information, which can not be directly seen from the front-page. This could be accomplished by following possible experimental designs.

In the proposed experiments, participants' performance can be examined by the creation of interactive mock web pages using Adobe Flash Professional. Participants will be asked to engage in an interactive information search task, in which the target information is unfamiliar to them (e.g., edible mushrooms, good years of wines). By manipulating the spatial information of the visual field, half of the tasks will be presented on multilayered screens in which the segments of information will be accessed by clicking the link icon, causing a small box containing the necessary piece of information to pop up. The remaining half of the tasks will be presented using images on a single wide visual space; the segments of information will be accessed by using the vertical and horizontal scroll bars. The speed and accuracy of problem solving will be the behavioral measures, and the patterns of eye movement will be scanned as objective physiological measures. This study will examine whether there are systematic differences between information search performance by Canadians and that by East Asians when using North American layered format and East Asian flat format by controlling the sizes of, the numbers of words in, and the numbers of pictures in the segments of

information across conditions. Meanwhile, identical mock web pages can be used to examine whether Canadians' preference for one type of format systematically differs from that of the East Asians. Two types of visual spaces will be presented next to each other on the same computer screen, and participants will be asked to decide whether to use both or to selectively use one view according to convenience.

Field Dependence / Independence versus Complexity Difference

Previous studies on cultural variation in field dependence and field independence found a person's level of field dependency is an important determinant of the manner in which information is stored in memory. Field independents are more likely to extract and integrate episodic information to form more general beliefs, while field dependents tend to store more detailed, episodic information in memory and are less likely to generalize information across product categories (Ng & Houston, 2009). Although studies in cross cultural research have shown inconsistent results depending on the methods used to assess field dependence (Bagley, Iwawaki & Young, 1983; Kühnen & Oyserman, 2002), most researchers agree that East Asians tend to be more field dependent than Americans (Ji, Peng & Nisbett, 2000). That is, East Asians, as field dependents, are more likely to remember detailed or episodic information, while North Americans, as field independents, are more likely to generalize categories from episodic information. The tendency for East Asians to store the detailed and episodic information could be reflected via the actual products such as the paintings, advertisements, and even the physical environments they created as

demonstrated in previous findings. The current findings of Study 1 &2 found that WebPages and posters (with multiple studies) designed by East Asians were more complex than those designed by North Americans, which were consistent with these findings and broadened this area. Meanwhile, the tendency for East Asians to memory detailed information can also help explain the findings that East Asians tended to be good at dealing with complex information as demonstrated in Study 3.

Other research in the area has utilized the Embedded Figure Test (EFT, as Appendix VI), a classical method that measures field (in)dependence in which participants are asked to find a simple figure from a more complex one (Witkin et al., 1954). A number of studies have shown that Chinese and other East Asians do as well as Americans, if not better, on EFT (Bagley, 1995; Ji, Peng & Nisbett, 2000; Kühnen et al., 2001). Bagely, Iwawaki and Young (1983) found that Japanese children were extremely competent in perceptual-disembedding tasks. Both the embedded figure test and the current Webpage searching tasks required the participant to detect the target information from other information, but differ in that the target information was imbedded in interferential information for the first and juxtaposed in the second. The current results thus provided new evidence in the area of field dependence and independence, illustrating that not only do East Asians tend to be more proficient than North Americans in dealing with embedded figures, but also at dealing with the complex information.

The findings of the presented studies suggested that peoples' complexity preference varies from culture to culture to different extents based on the

situations. As such, it would be worth investigating these cultural variations over a broad range of situations in which said effects occur.

Culture and Language

Study 3 indicated that international students and Asian Canadians were faster than Canadians in exploring information on complex WebPages. According to Bagley (1995), learning complex symbols for Eastern words may give East Asians special kinds of practices in visual perception, and these cultural practices will strengthen their skills in deal with the complex information. Bagley's 1995 statement was partially supported by the international students' performance because they were exposed to those complex Eastern words. Meanwhile, when asked to find target objects with names from complex WebPages, there are theoretically three ways to achieve the task: focusing on the objects only, focusing on the names only and a combination strategy by considering both the objects and names. While plausible that international students, generally possessing a lower level of English than Canadians, would tend to focus on the objects only by ignoring their English names, while Canadians may adopt a different strategy using the combination of the objects and the names, which requires more time. Accordingly, language seems one solution to explain the phenomenon that international students were faster.

However, Asian Canadians' performance contradicted these two arguments because most Asian Canadians use English as first language just like European Canadians. The results thus indirectly supported that languages people speak will not solely dictate the strategies they take in exploring information. As such, Asian

Canadians, regardless of whether they were raised in Canada, or abroad would likely share many characteristics of East Asians, thus lending credence to the possibility that they too would share the East Asian predilection and proficiency for dealing with complex information. In concurrence with this, current findings with Asian Canadian performance on complex information has illustrated that culture remained a larger factor in visual perception tasks although language can be a major impediment to their performance.

Limitations

Although there are a variety of implications, we admit that the present studies raised many questions. First, in the conference poster analysis, there was no cultural difference between East Asian and North American posters when all the posters were included. Although the cultural factor is one issue affecting the complexity, poster design inherently contains numerous issues involved in the design. Posters addressing survey based research were, in general, more complex than posters that addressed experimental studies as demonstrated in Study 1. As a whole though, posters addressing multiple studies were generally more complex than posters with a single study by observing their means, although only the number of tables was statistically significant. In the poster study, I categorized them based on factors such as the methodologies of the studies as well as the number therein, as well as the cultural factors, which was defined by the posters' first authors' names and their working locations. When people were asked to design a layout with a limited amount of space for the necessary information, other factors may have been outweighed the cultural factors. As a result, although

there was a tendency for there to be more words, characters, tables and pictures on East Asian posters than those on North American posters, the cultural effect among posters produced by East Asians, North Americans and authors in the unmatched group may not exist when other compounded factors were included. To test the cultural effect as was demonstrated, the cultural effect was only found among posters with multiple studies.

Second, the results showed that posters produced by authors in the unmatched group contained more pictures than North American posters that only had to address a single study though no effect of culture was found amongst the other groups. Going through the posters which were produced by the authors in the unmatched group, most were in the area of cultural psychology and were operating in affiliation with researchers from other research institutes. In this study, I defined pictures as any pictures on the poster which included logos, results figures, flow charts and any other pictures making posters vivid. To make posters more attractive, people normally put the crests of research institutes they are affiliating at the top of posters. Because researchers from the unmatched group have more chances to cooperate with researchers affiliating with other institutes, they would be required to put more institute logos on the posters in order to demonstrate the affiliations of all the parties involved. As such, it is natural for posters with first authors in the unmatched group to tend to have more pictures on their posters than their strictly North American counterparts. This would not however, be an effect of culture. This result was partially substantiated by the findings that there was no cultural difference on the number of pictures on a single

study posters produced by North Americans and East Asians.

Lastly, in Study 2, the results showed that all criteria were significant and that East Asian portal pages were more complex than North American ones. More interesting however, was the detailed analysis which found that within each society (e.g., East Asia) there were also differences existing on portal pages. The findings indicated that when two cultural campuses: North American and East Asian, were compared, there was a significant difference between them. Meanwhile, cultural variations also exist within the East Asian society. Originating in central China, East Asian civilization has developed for thousands of years. During this time, the three aforementioned countries exposed to the West were affected and responded differently to Western influence in the modern era. For example, Western influences in China were staunchly resisted until the Chinese fell to Western militarism. Conversely the narrative of Japanese-Western relations is marked by comparatively more accommodation before the modern period. Accordingly, they developed their own customs in accommodation with other cultural factors. This issue remains very important though largely unexplored in examining the diversities existing among East Asian countries.

Meanwhile, in the study, Korean portal pages, both government and university, were generally less complex than Japanese and Chinese portal pages when measured by our four criteria. Upon closer examination however, Korean portal pages will tend to file and organize detailed information by using a central window through which more detailed information can be accessed by placing the mouse cursor above the desired topic. In Study I, to keep the analysis method

consistent, I only calculated the number of links, words, and characters based upon what was initially available on the portal pages without user input. Much of the hidden links however, cannot be counted in this manner despite existing as parts of the portal page. Consequently, Korean portal pages themselves were more complex than those analyzed in this study.

Final Remark

The issue of culture and ethnicity is one of the most important topics in humanities and social sciences in the 21st century. For more than two decades, cultural psychologists have examined the extent to which cultural values, beliefs, and practices shape psychological processes such as cognition, emotion, motivation, and even perception. To date, these findings suggest that there are systematic cultural variations even in so-called basic psychological processes, notably attention. People in East Asian cultures (China, Korea, and Japan) emphasize "the context-oriented mode of attention," being accustomed to attending to the relationships between events, and the situations and contexts surrounding these events, in a holistic visual-cognitive space. In contrast, people in North American cultures (Canada and the United States) emphasize "the object-oriented attention," being accustomed to attending to or searching for the salient objects and events in the scenes, and selectively focusing on them in a narrow visual-cognitive space.

Such an investigation allowed us to scrutinize the perceptual characteristics of each mode of attention. We expect that this evidence can contribute to advances in theories of cultural psychology. In addition, we expect

the evidence can help in understanding of how much culture deeply influences the basic psychological processes, as well as with the understanding of what aspects of perception are culturally universal. Finally, although this is the basic research, we expect that the findings can provide public policy potentials in dealing with multi-cultural issues in Canada: whether East Asian immigrants change or sustain their mode of attention, and what obstacles would they face in changing their mode of attention, as well as when people enjoy advantages of each mode of attention, and when people find it difficult to solve the issue because of their mode of attention.

ENDNOTES

Note 1: All posters selected for analysis were in one of the three formats: a single PowerPoint slide, Microsoft Word and PDF. Those posters that were not received by email or received with other formats such as JPEG, PowerPoint slides, and papers were excluded from the analysis because of the difficulties in quantifying their complexity.

Note 2: In the government portal page analysis, differences were also found in each society. In East Asian society, the cultural effect was found among Chinese, Japanese and Korean government portal pages (see Table 1).

The Length of Scroll Bars: There was a main effect on the length of scroll bars: $F(2, 96) = 26.29$, $p < .001$; Planed t-tests results indicated that (1) Chinese government portal pages were longer than Japanese ones: $t(81) = 4.85$, $p < .001$; (2) Chinese government portal pages were longer than Korean ones: $t(49) = 7.89$, $p < .001$; (3) Japanese government portal pages were longer than Korean ones: $t(62) = 3.27$, $p = .002$.

The Number of Words: There was a main effect on the number of words: $F(2, 96) = 50.11$, $p < .001$; Planed t-tests results indicated that (1) Chinese government portal pages contained more words than Japanese ones: $t(81) = 8.10$, $p < .001$; (2) Chinese government portal pages contained more words than Korean ones: $t(49) = 6.13$, $p < .001$; (3) Japanese government portal pages contained more words than Korean ones: $t(62) = 4.26$, $p < .001$.

The Number of Bytes: There was a main effect on the number of bytes: *F*

*(*2, 96*)* = 31.43, $p < .001$; Planed t-tests results indicated that (1) Chinese government portal pages contained more bytes than Japanese ones: t (81) = 8.53, $p < .001$; (2) Korean government portal pages contained more bytes than Japanese ones: t (62) = 5.09, $p < .001$.

The Number of Links: There was a main effect on the number of links: F *(*2, 96*)* = 60.79, $p < .001$; Planed t-tests results indicated that (1) Chinese government portal pages contained more links than Japanese ones: t (81) = 10.43, $p < .001$; (2) Chinese government portal pages contained more links than Korean ones: t (49) = 5.54, $p < .001$.

Table 1: Mean of East Asian government portal pages (n = 96)

	China	Japan	Korea	*F*	*p*
Bar (mm)	80.74	114.27	147.13	26.29	.000
Links	254.83	123.38	140.94	60.79	.000
Word	3248.06	1192.40	637.50	50.11	.000
Bytes	8507.83	3108.67	6762.13	31.43	.000

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

In North America, there was an effect on scroll bars between American and Canadian government portal pages (Table 2): t (64) = 2.02, p = .047, which indicated that American government portal pages were longer than Canadian ones, but there was no difference on the number of links, words, and bytes between American and Canadian government portal pages (Fs < 1, respectively).

Table 2: Mean of North American government portal pages (n =64)

	USA	Canada	*t*	*p*
Bar (mm)	157.38	135.43	2.02	.047*
Links	69.73	64.79	.74	.460
Words	467.79	305.86	1.83	.073
Bytes	2791.56	1983.00	1.46	.150

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

Note 3: In the university portal page analysis, differences were found in both East Asia and North America. In East Asia, there was an effect on scroll bars among Chinese, Japanese and Korean university portal pages, $F(2, 96) = 10.79$, $p < .001$. (See Table 3)

Table 3: Mean of East Asian university portal pages (n = 97)

	China	Japan	Korea	*F*	*p*
Bar (mm)	171.41	141.02	195.56	10.79	.00
Links	68.11	62.56	58.22	.57	.57
Words	951.80	1070.44	896.67	.36	.70
Bytes	2599.17	2667.02	2182.00	.22	.80

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

Planed t-tests results indicated that (1) Japanese university portal pages were longer than Chinese ones: $t(89) = 3.53$, $p < .001$; (2) Chinese university portal pages were longer than Korean ones: $t(53) = 3.51$, $p = .001$; (3) Japanese university portal pages were longer than Korean ones: $t(52) = 7.55$, $p < .001$.

There was no difference on links, words, and bytes among Chinese, Japanese, and Korean university portal pages.

Table 4: Mean of North American university portal pages (n =98)

	USA	Canada	*t*	*p*
Bar (mm)	170.22	170.90	.07	.946
Links	56.33	43.20	4.34	.000
Words	307.87	346.40	.49	.627
Bytes	1927.73	2000.50	.12	.905

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

In North America, American university portal pages contained more links than Canadian university portal pages t (98) = 4.34, $p < .001$. No difference was found on links, words and bytes ($Fs < 1$) (Table 4).

Note 4: Some Asian Canadian participants were born in Canada as the second generation, while others were born in East Asia and immigrated to Canada with their families.

Note 5: One Asian Canadian data and one international student's data were not included in the data analysis due to sickness and misunderstanding the instructions respectively.

Note 6: Cultural Differences and the Priming Effect

To test the prime effect, I equally divided all stimuli into two groups based

on their appearance order, that is, the first 24 stimuli for each participant were grouped as the first group and the second 24 was in the second group. There was a main effect, t (224) = 3.45, p = .001, η2 = .05. The results indicated that the second half of targets were faster to be found than the first half (Table 5).

Table 5: Mean and Std. Deviation of the first and second half (n=224)

	First Half	Second Half	t	p
Mean	11890.89	10692.44	3.45	.001**
SD	2680.34	2546.65		

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

Accordingly, I further hypothesized that the response difference between East Asians and North Americans on complex WebPages would mainly occur at the beginning of each test and that this difference would vanish gradually when more WebPages were presented.

Table 6: Mean and Std. Deviation of three groups (n=110)

		Canadian	Asian Canadian	International Students	F	p
First Half	Mean	12961.35	11394.06	11174.67	5.62	.005*
	SD	2697.84	2502.11	2505.77		
Second Half	Mean	10967.12	10566.36	10507.32	.38	.69
	SD	2538.08	2450.72	2685.19		

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

When all stimuli were equally divided into two groups based on their appearance order, there was a main effect of culture in the first group: F (2, 110) =

5.62, $p = .005$, $\eta^2 = .09$; but the main effect of culture disappeared in the second group: $F < 1$ (Table 6).

Planed t-tests for the first part indicated that (1) Asian Canadians were faster in identifying objects than Canadians: $t\ (74) = 2.61$, $p = .011$, $\eta^2 = .08$; (2) International students were faster than Canadians: $t\ (76) = 3.02$, $p = .003$, $\eta^2 = .11$.

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APPENDIX I

Examples of Chinese and English MSN "portal pages" with the same ratio as original portal pages, retrieved on July 15, 2009 in Study 2

APPENDIX II

Examples of the scroll bars on Chinese and English MSN portal pages, retrieved on July 15, 2009 in Study 2

APPENDIX III

Examples of Chinese, American and Canadian Government's Official Web Portal with the same ratio as original portal pages, retrieved on July 16, 2009 in Study 2



Examples of the scroll bars on Chinese, American and Canadian Government's Official Web Portal, retrieved on July 16, 2009 in Study 2



APPENDIX IV

Examples of complex WebPages in Study 3

APPENDIX V

Examples of simple WebPages in Study 4

APPENDIX VI

Example of Sample of Embedded Figures Test (EFT), retrieved April 9, 2009 from www.brainwaves.com/Puzzles_Tests.html.