

Culture and Decision: Cross-Cultural Similarities and Variations in Resource Allocation between  
European Canadians and East Asians

by

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## Abstract

People engage in a variety of decision making tasks in daily life, in which people's experiences and strategies during the decision making tasks are affected by cultural influences. The primary objective of this dissertation was to examine the role of analytic versus holistic thinking styles on resource allocation across cultures. Analytic thinking style, which is more prevalent in North America, refers to a linear view about the world where objects' properties remain stable due to the independent nature of the relationships among objects. In contrast, holistic thinking style, which is more prevalent in East Asia, refers to a non-linear view of how the world is organized in which people perceive change to be a constant phenomenon due to the complex interactions among elements in the universe (Nisbett, Peng, Choi & Norenzayan, 2001). I conducted three cross-cultural studies to understand this phenomenon. Study 1 tested the role of analytic versus holistic thinking styles on people's resource allocation. Study 2 showed evidence that supported the causal link from cultural thinking styles to decision making experiences in resource allocation. Study 3 examined the role of context-sensitivity, which was found to be higher in East Asian societies than in North American societies, in resource allocation. In Study 1, Hong Kong Chinese, a representative group of holistic cultures, and European Canadians, a representative group of analytic cultures, completed a resource allocation task (i.e., fort game). The results showed that the allocation pattern of European Canadians was more concentrated than that of Hong Kong Chinese. In Study 2, thinking styles were manipulated in which Hong Kong Chinese and European Canadian participants were reminded of either holistic thinking style (by watching a movie showing a nonlinear trend) or analytic thinking style (by watching a movie showing a linear trend). Regardless of cultural backgrounds, the allocation pattern was more concentrated in the analytic condition than in the holistic condition. Finally, the role of

context-sensitivity across cultures in resource allocation among Japanese, Hong Kong Chinese and European Canadian participants was examined in Study 3. The results showed that East Asians, especially the Japanese, were more likely to change their resource allocation in a manner consistent with experimental manipulation than European Canadians. Implications of these findings for research using experimental manipulation, cross-cultural research, and applied research are discussed.

*Keywords:* Cultural Variation; Cultural Similarity, Resource Allocation, Decision Making, Culture, Analytic-Holistic thinking styles

Preface

This thesis is an original work by Man Wai Li. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name “Dialecticism and Decision Making”, Pro00027993, since December 11, 2013.

Dedication

To my grandma, who gave unconditional love and support to me but did not live to see the closing of this chapter in my life.

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CHAPTER 1

General Introduction

People have to make a lot of decisions in everyday life. For example, you have to think about whether you should have a vacation during the summer or what you plan to do during the weekend. No matter which culture people come from, they have to go through a lot of decision making and judgment processes, ranging from very important decisions (such as career decisions and house purchase) to rather trivial decisions (such as food for dinner and which shampoo to purchase). Decision making is one of the inevitable experiences in daily life, thus it is important to examine the process of decision making in order to comprehensively understand people's psychological processes.

Among these decisions, there is one type that needs to be made frequently: how you allocate available resources, including both monetary and non-monetary resources, to different available alternatives. At the personal level, how do you allocate your time to satisfy the needs for both your work and your private life? When you think about your investment plan, will you allocate more money to the most promising plan for maximizing profits or will you distribute evenly to a number of decent plans for diversifying potential risks? At the organizational level, will you primarily focus on discussing focal issues rather than discussing both focal and non-focal issues with your business partners in a negotiation? While planning your production future plan, will you primarily focus on the most promising production line or will you prefer having multiple production lines? In short, we encounter the decisions of resource allocation in a wide range of domains in both personal life and business settings. The research of resource allocation contributes to a comprehensive understanding of human psyche in the daily life.

Interestingly, organizations from different cultures seem to have different preferences for resource allocation regarding their production plans. For example, Apple, an American company based in North America, selectively concentrates their resources to develop only three models of

smart phones with limited variations, whereas Samsung, a South Korean company based in East Asia, spread out their resources to develop more than 100 models of phones that vary in sizes, features and prices in the US market (Ritchie, 2011). However, cultural variation in resource allocation strategies has not been fully examined yet. Would we observe any systematic differences in resource allocation strategies across cultures? If the answer is yes, what kind of factors might contribute to these cross-cultural differences? The questions regarding cultural variations in resource allocation are important not only because it helps us to understand psychological experiences in the Eastern and Western societies respectively, but also because it would provide insights to facilitate intercultural communication, which has been dramatically increasing due to the globalization and the establishment of cross-national firms. For example, investigating cultural variation in strategic focus of resource allocation may help to reduce misunderstanding among involved parties with different cultural backgrounds in intercultural business negotiations.

This dissertation investigated cultural similarities and variations in resource allocation from the perspective of analytic versus holistic thinking styles. There were three cross-cultural studies conducted to answer the following questions: 1) whether cultures differing in the prevalence of analytic versus holistic thinking style displayed systematic variation in the patterns of resource allocation, 2) whether there would be direct evidence for the causal link from cultural thinking styles to resource allocation via manipulating these culturally specific thinking styles, and 3) to what extent people from the cultures differing in thinking styles would be sensitive to the change of the contexts, which results in changes in their resource allocation strategies as a function of manipulations.

### **Cultural Variation in Analytic versus Holistic thinking styles**

Culturally shared beliefs, values, and norms guide people in how to think, feel, and behave in different domains of life. Analytic versus holistic thinking styles, the theoretical framework proposed by Nisbett and his colleagues, has been empirically tested and consistently supported (e.g., Nisbett, 2003; Nisbett & Masuda, 2003; Nisbett, Peng, Choi & Norenzayan, 2001). They argue that social systems in different cultures influence epistemologies—the beliefs about what is important to know and how to know the knowledge people hold. Specifically, they contend that a society's high individualistic activities promote the endorsement of an analytic thinking style. They define the analytic thinking style as

“involving detachment of the object from its context, a tendency to focus on attributes of the object to assign it to categories, and a preference for using rules about the categories to explain and predict the object's behavior. Inferences rest in part on the practice of decontextualizing structure from content, the use of formal logic, and avoidance of contradiction” (Nisbett et al., 2001, p. 293).

In contrast, a society's high interdependent and collective activities promote the endorsement of a holistic thinking style. Nisbett and his colleagues define the holistic thinking style as

“involving an orientation to the context or field as a whole, including attention to relationships between a focal object and the field, and a preference for explaining and predicting events on the basis of such relationships... rely on experience-based knowledge rather than abstract logic and are dialectical, meaning that there is an emphasis on change, a recognition of contradiction and of the need for multiple perspectives, and a search for the “Middle Way” between opposing propositions” (Nesbett et al., 2001, p. 293).

Among these characteristics, linear versus non-linear views is one of the key constructs representing the essence of analytic versus holistic thinking styles. Analytic thinkers hold a linear view about the world in which they perceive objects' properties to remain stable because people assume that a variety of phenomena can be analytically understood in predictable directions. In contrast, holistic thinkers maintain a non-linear view of how the world is organized because people perceive change as a constant phenomenon due to the complex interactions among elements in the universe, and it is hard for them to linearly predict the trend of changes (e.g. Choi, Koo, & Choi, 2007).

In general, past cross-cultural studies consistently support this theoretical framework by demonstrating that North Americans (e.g., European Americans and Canadians) are more likely to adopt an analytic thinking style whereas East Asians (e.g., Chinese, Japanese, and Korean) are more likely to adopt a holistic thinking style (e.g., Masuda & Nisbett, 2001; Chua, Boland, & Nisbett, 2005; Miyamoto, Nisbett, & Masuda, 2006, Norenzayan, Smith, Kim, & Nisbett, 2002, Choi & Nisbett, 1998). More importantly, prior work in cross-cultural research has demonstrated that such systematic differences in thinking styles are observed in a wide range of basic cognitive processes, including attention (e.g., Masuda & Nisbett, 2001; 2006; Masuda, Gonzalez, Kwan, & Nisbett, 2008; Chua, Boland, & Nisbett, 2005; Miyamoto, Nisbett, & Masuda, 2006; Senzaki, Masuda, & Ishii, 2014), reasoning (e.g., Norenzayan, Smith, Kim, & Nisbett, 2002), attribution (e.g., Choi & Nisbett, 1998; Chiu, Morris, Hong, & Menon, 2000), and perception of emotional experiences (e.g., Ito, Masuda, & Hioki, 2012; Ito, Masuda, & Li, 2013; Masuda, Ellsworth, Mesquita, Leu, Tanida, & van de Veerdonk, 2008). Recently, some cross-cultural studies showed analytic versus holistic thinking styles affect not only basic cognitive processes but also cultural products—a tangible, public, and shared representations of culture (Morling &

Lamoreaux, 2008)—including production of artworks and personal portraits (Masuda, Gonzalez, Kwan, & Nisbett, 2008), preference of web-page designs in terms of esthetics and functionality (Wang, Masuda, Ito, & Rashid, 2012), and preference of profile photos on Facebook social network website (Huang & Park, 2013).

In general, North Americans tend to primarily seek information regarding focal issues whereas East Asians tend to seek information relating to both focal issues and contexts associated with the focal issues. For example, asking participants to view scenes, Masuda and his colleagues found that both Japanese and North Americans described more focal information (i.e. the salient moving fish) than contextual information (e.g., stone and seaweed) but Japanese were more likely to describe the contextual information than European Americans (Masuda & Nisbett, 2001; Senzaki et al., 2014). Chua et al. (2005) and Senzaki et al. (2014) provided detailed investigations of people's eye-tracking attention pattern. Consistent with the verbal description data, eye-tracking data found that North Americans attended primarily to focal information whereas East Asians were more likely to attend to both focal and contextual information. Information seeking processes in attention tasks show that East Asians are, in general, more likely to scatter their “resource” (attention time) to a wider scope of information.

This dissertation further extends the research in cognitive processes to one of important decision making processes—people's resource allocation strategies, and examines whether people from different cultural backgrounds (analytic North American cultures versus holistic East Asians cultures) would behave differently in a resource allocation task—the fort game task.

### **Culture and Decision Making and Judgment**

As summarized in the prior section, cultural thinking styles have influences on psychological processes in many domains. This section summarizes how cultural thinking styles influence one's decision making and judgment.

Previous research has shown that culturally specific thinking styles guide our decision making and judgement processes. Evidence was obtained in a variety of domains in decision making, including causal attribution (e.g., Ji, Guo, Zhang, & Messervey, 2009; Shteynberg, Gelfand, & Kim, 2009; Spina et al., 2010; Zou et al., 2009), probability judgments (e.g., Yates, Lee, & Bush, 1997; Yates, Lee, & Shinotsuka, 1996), risk perception/choice (e.g., Bontempo, Bottom, & Weber, 1997; Weber & Milliman, 1997; Du, Green, & Myerson, 2002; Lau & Ranyard, 2005), conflict resolutions (e.g., Leung, 1988; Savani, Morris, Naidu, Kumar, & Berlia, 2011), consumer behaviors (e.g., Briley, Morris, & Simonson, 2000; Ji, Zhang, & Guo, 2008), and indecisive tendencies (e.g., Li, Masuda, & Russell, 2014; Ng & Hynie, 2014).

### **Culture, Attribution, and Decision Making**

Cultural variations are found not only in basic cognitive-perceptual processes, but also in decision making/judgment processes. For instance, Choi et al. (2003) investigated attribution by asking participants to exclude irrelevant information from a list of given potential factors when they made attributions about a hypothetical murder. They found that, both Koreans and North Americans included more relevant information than irrelevant information, but Koreans tended to include a greater amount of information, including both relevant and less relevant information, than North Americans in the final choice set for making the attribution. More importantly, this cultural difference was explained by the endorsement of analytic versus holistic thinking styles, in which East Asians, who were more holistic, were more likely to consider both relevant and less relevant information in causality attribution processes than Americans, who were more analytic.

### **Culture and Online Information Processing during Decision Making**

Recently, Li, Masuda and Russell (in press) investigated cultural variation in information searching processes during decision making by examining the role of importance of information in analytic and holistic cultures. In their study, participants rated the importance of six attributes for apartment selection and engaged in several apartment selection tasks. They used the correlation between the perceived importance of each attribute and the amount of information of the corresponding attribute participants viewed as an indicator, in which lower correlations indicate that participants are more likely to search for both important and less important information during the apartment selection tasks. It was found that the correlation was positive among both Hong Kong Chinese and European Canadians, which suggested that participants were more likely to seek for information that they perceived to be important. More interestingly, significantly weaker correlations were found among Hong Kong Chinese, which demonstrated that Hong Kong Chinese were more attentive to less important information (in addition to important information) compared to European Canadians.

To summarize the above findings, prior work in the research of attention, attribution and information processes suggest that holistic thinkers (East Asians) consider both important and less important factors whereas analytic thinkers (North Americans) primarily consider important factors for the final decision in decision making.

One of the underlying mechanisms for the systematic cultural variation is that holistic thinkers (East Asians) adopt a non-linear thinking style whereas analytic thinkers (North Americans) adopt a linear thinking style. The prior work suggests that analytic versus holistic thinking styles affect people's experiences in decision making and judgment: holistic thinkers in general are more likely than analytic thinkers to perceive the causalities of events as rather

complex and unexpected events that could happen anytime, therefore they are less likely to hold strong confidence in their decision (e.g., Yates et al., 1998), to take risk averse and risk prevention strategies (e.g., Hamamura et al., 2009), and to often express indecisive feelings in their decision (e.g., Li et al., 2014; Ng & Hynie, 2014; Yates et al., 2010). Extending this research line, I explored the role of culturally specific thinking styles in affecting people's resource allocation strategies, which is one of the frequent decision making tasks in daily life.

### **Culture and Change Perception**

People from holistic cultures are likely to perceive changeability to be the nature of all elements. This tendency leads them to respond differently from people from analytic cultures, where people are likely to perceive the property of elements to be rather stable. Therefore, holistic thinkers are more likely to expect changes than analytic thinkers. For example, Ji (2008) found that East Asians are more likely to perceive the nature of a given situation to be changeable whereas North Americans are more likely to believe that the current property of a given situation remains stable in the future. In the study, she asked participants to judge whether the current status of various events, such as emotion experience, parental incomes and friendship formation, can predict the outcomes in the future (e.g., how possible is it that a child from a poor family could be educated and become rich in the future? ). She found that 11-year-old East Asian children were more likely to perceive that the given information describing the current status could not perfectly predict the outcomes in the future compared to their Canadian counterparts.

The difference in linear versus non-linear thinking style could result in diverse final decisions across cultures. For example, Ji and her colleagues (2008) studied the influence of expectation of change in decision making for stock purchase. In the study, they asked East Asians and North Americans to decide when they would buy or sell the stocks when the stocks

were with either an increasing or a decreasing price trend. They found that East Asians' buying and selling decisions were based on both recent and historical price trends whereas North Americans selectively attended to the recent price trends when making their buying or selling decision, which reflected the cultural variation in the scope of information search for decision making. More importantly, East Asians were more likely to sell the stock when its price was increasing but more likely to buy the stock when its price was decreasing whereas North Americans were more likely to sell the stock with a decreasing price trend but more likely to buy the stock with an increasing price trend. Holistic thinkers believed that the current status of the price trend would change in the future; therefore they tended to sell the currently promising stock. In contrast, analytic thinkers believed that the current status of the price trend would remain unchanged in the future; therefore they tended to buy the currently promising stock. The expectation of the change in the current status leads to divergent responses in analytic and holistic cultures.

### **Hypotheses and Overviews of Studies**

To summarize, existing evidence converges to support that analytic versus holistic culturally specific thinking styles affect people's decision making processes. First, people, regardless of cultural background, tend to allocate more (attentional) resources to focal issues than non-focal issues but people from holistic cultures (or people that adopt holistic thinking style) are more likely to scatter their (attentional) resources to a wider scope of information (e.g., Masuda & Nisbett, 2001; Li et al., in press). However, prior cited studies did not address the question of whether people's actual behavior or final decision regarding resource allocation would be significantly affected by their cultural backgrounds. Extending to tangible resource allocation tasks, I hypothesized that East Asians (holistic thinkers) would be more likely to

scatter their resources to different places whereas North Americans (analytic thinkers) would be more likely to concentrate their resources in focal places (Study 1). To test this hypothesis, I recruited Hong Kong Chinese, members of a holistic culture, and European Canadians, members of an analytic culture, and used a newly developed resource allocation task. The goal for Study 1 was to provide initial evidence showing that both Hong Kong Chinese and European Canadians would be motivated to allocate more resources to the focal places but European Canadians would be more likely to concentrate their allocation in the focal places than Hong Kong Chinese.

I further hypothesized that the underlying mechanism of the cultural variation in resource allocation is due to the adoption of linear versus non-linear thinking styles, which is a key construct in analytic versus holistic worldviews. Expecting the current status to be changing in the future (non-linear logic), East Asians would be motivated to scatter their resource to be ready for any unpredictable trends. In contrast, expecting the current status to be stable in the future (linear logic), North Americans would be likely to concentrate their resources to the focal places for the current demands. In other words, compared with East Asians, North Americans would be more likely to use to the current available information and allocate their resources following the property of current available information. To obtain evidence for the relationship between thinking styles and resource allocation strategies, thinking style was manipulated with a novel manipulation in Study 2. Analytic thinking style was manipulated by reminding participants that they can adopt linear logic and make prediction based on the given information whereas holistic thinking style was manipulated by reminding participants of unpredictability, in which participants were reminded that they cannot make prediction based on the given information. I recruited both European Canadians and Hong Kong Chinese to explore the moderation effect of culture on the novel manipulation paradigm.

After exploring the underlying mechanism for cultural variations in resource allocation strategies in Study 2, I explore the moderation effect of context-sensitivity in resource allocation strategies across cultures in Study 3. Previous studies have shown that East Asians have a higher context-sensitivity than North Americans (e.g., Masuda & Nisbett, 2006), and their responses were more likely to be shifted by the context than North Americans (e.g., Li et al., in press; Zhou et al., 2012). Following these findings, holistic thinkers are expected to be more susceptible to the manipulation of the context, and, in turn, more likely to exhibit different responses than analytic thinkers. To examine the role of context-sensitivity in resource allocation, and examine whether this role would be stronger among participants from holistic cultures than those from analytic cultures in Study 3, a subtle manipulation of context was used. I recruited Japanese and Hong Kong Chinese, who were expected to have a higher context-sensitivity, and European Canadians, who were expected to have a lower context-sensitivity for this study. I expected that East Asians would demonstrate a stronger manipulation effect than European Canadians, in which East Asians would be more likely to shift their resource allocation strategies across contexts.

CHAPTER 2

Cross-Cultural Comparison in Resource Allocation

Cultural thinking styles—analytic versus holistic—have strong influences on psychological processes in many tasks. This dissertation studied the role of these specific cultural thinking styles on resource allocation, which is one of the most frequently used decision making tasks in daily life. Study 1 was conducted to provide initial evidence to show that, culturally specific thinking styles—a holistic thinking style that is prevalent in East Asia and an analytic thinking style that is prevalent in North America—could affect people’s resource allocation. With linear logic, analytic thinkers would be heavily influenced by the current status of the available information in making their final decision, whereas holistic thinkers with non-linear logic would be less likely to be affected by the current status of the available information. I hypothesized that, compared to European Canadians, who were expected to be more analytic, East Asians, who were expected to be more holistic, would be less likely to concentrate their resource allocation based on the current status of available information.

## **Method**

### **Participants**

I recruited 60 Chinese (30 males, 30 females;  $M_{\text{age}} = 20.93$ ,  $SD = 2.08$ ) from the Chinese University of Hong Kong, Hong Kong, which is a holistic culture, and 60 European Canadians (28 males, 32 females,  $M_{\text{age}} = 19.07$ ,  $SD = 1.70$ ) from the University of Alberta, Canada, which is an analytic culture.

### **Material and Procedure**

In order to prevent possible confounding effects due to individual differences in daily life experiences and maintain neutrality and familiarity across cultures, a dependent measure—a game—was developed specifically for the current research. In this game, the players need to make a series of decisions to protect their fort from an enemies' attack. This game will

henceforth be referred to as the "fort game". Using a newly developed dependent measure ensures that participants from both cultures have no prior experience with it. In addition, the goal of the fort game is straightforward and concrete: participants know that the only possible outcome of the game is either winning or losing. This would facilitate the understanding of the game across cultures. Furthermore, external validity of resource allocation in war game is suggested by the war history between North American and East Asian countries. For example, North Americans concentrated their military power whereas Japanese showed the tendency of scattering their military power when they had a fight in the Battle of Midway during the Second World War. Taken together, these features of the fort game avoid unnecessary confounding variables and are accredited with external validity.

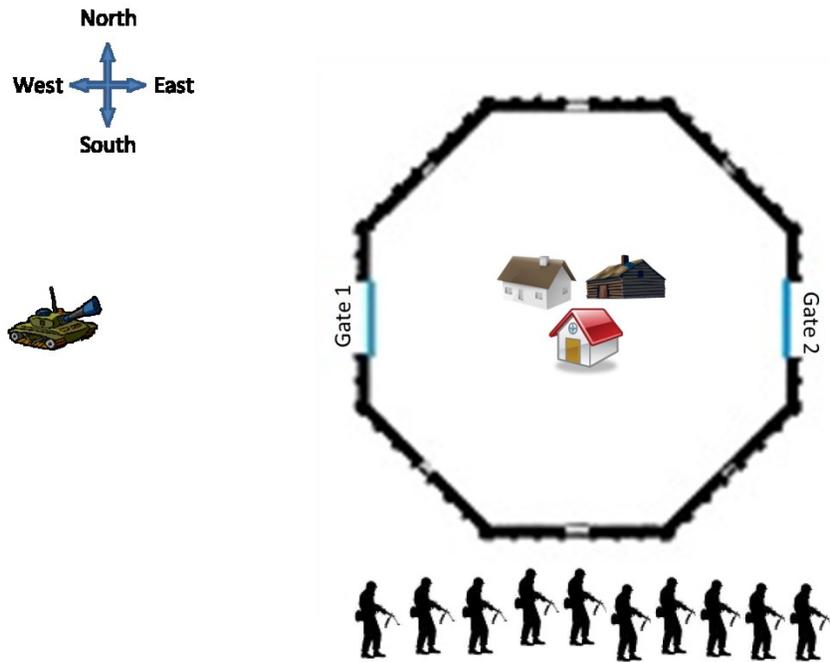
In the fort game, participants were asked to imagine themselves in the following scenario: they are a General and the enemies are going to attack their fort. They are asked to protect the fort by allocating soldiers to the gates. The enemy tank is located on the west side of their fort. The gates are the only access through which the enemy tank can enter the fort.

In order to familiarize participants with the game scenario, participants played a simpler, trial version of the game first. In this trial game, there are two gates in the fort. Participants were told that they had 10 soldiers and five soldiers may or may not be sufficient to destroy the enemy tank. They were also told that they could not change their allocation after the final decision is made and the enemy tank would not know their allocation before the enemy decides which gate would be attacked. The primary dependent variable was the number of soldiers participants allocated to each gate. I also asked participants to judge the probability that the tank would attack each gate of the fort, which was another dependent variable (see Figure 1A). Although the judgment of probability of attack may not necessarily translate to actual allocation of soldiers in

the fort game, its greater scale range (100% in total), compared with the allocation of soldier (10 soldiers in total) may be more sensitive to detect differences in resource allocation strategies.

After completing the trial game, participants played the actual game with a more complex design – there are eight gates in the fort. They were told that they had eight soldiers and one soldier may or may not be sufficient to destroy the enemy tank. Participants needed to list the number of soldiers they would allocate to each gate and judge the probability that the tank would attack each gate of the fort (See Figure 1B). Finally, participants were asked to justify their allocation pattern in writing.

A



B

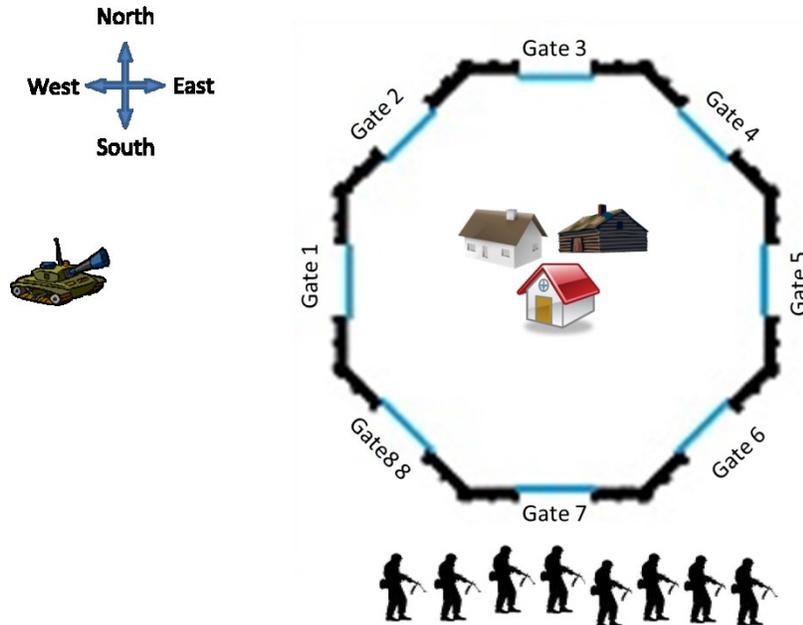


Figure 1. The stimuli used in the two-gate fort with 10 soldiers in the trial game (A) and the eight-gate fort with 8 soldiers in the actual game (B) in Study 1.

### **Data Analysis Strategies**

In the game, the enemy tank was located on the west side of the fort. With this design, the distances between the tank and each gate were different, in which some gates would be closer to the enemy, and some, farther. If participants adopt a linear logic, they would expect the enemy tank to attack the closer gates, as they expect the current status is stable and use it to predict the future trend. In other words, participants with a linear logic were expected to be more likely to perceive that the attack path of the enemy tank could be predicted by its displayed location. Therefore, the gates that were closer to the enemy tank would be more focal (and demanded the most protection). This suggests that distance would be an important piece of information about the current status of the game, which could influence resource allocation decisions.

To test the cultural variation in resource allocation, the strength of the effect of “distance between the tank and the gates” was used as an indicator of how concentrated or scattered participants allocated their resources to focal and non-focal places. A greater effect of the distance suggests that participants’ allocation strategies are more strongly affected by how focal a gate is. Based on the previous research, people of all cultural backgrounds, focus on the focal areas much more than on the non-focal areas (though this tendency is weaker among holistic thinkers) (e.g., Li et al., 2014; Masuda & Nisbett, 2006; Senzaki et al., 2014). Therefore, I expected that a greater effect of distance indicates a positive relationship between distance and allocation, which means that people are more likely to allocate resources to the focal gates (i.e., the gates closer to the tank).

To test the strength of distance effect, I used a repeated measure analysis in which the distance was entered as a within-subject factor, with two or eight levels (as there were two or eight gates depending on the game version). Because the strength of the effect of distance is the

primary predictor and culture is the moderator, I unpacked the interaction by examining the strength of the effect of distance in each culture separately instead of examining the cultural difference at each gate for a significant interaction between culture and the distance. For providing more details of the allocation pattern, I also conducted post-hoc pairwise comparison regarding cultural difference in resource allocation at each gate despite the fact that it is not the primary goal of the dissertation. The significant results from the pair-wise comparison analyses are presented in the figures. In order to prevent Type I error inflation for multiple pairwise cultural comparisons for each type of gate in a conservative strength, Bonferroni correction was used to adjust the p-value significance level. Furthermore, it is meaningless to test for main effect of between-subject factor (i.e., culture; which also applies to Study 2 and 3) in this study because the dependent variables are ipsative: participants were required to allocate all resources in each game and the probability judgment must be equal to 100%.

## Results

### Game 1 – the two-gate Fort Game

**Allocation of Soldiers.** A 2 (Culture: European Canadians vs. Hong Kong Chinese) x 2 (Distance between the gate and the enemy [enemy-to-gate distance]: closer gate vs. farther gate) ANOVA, with the former as a between-subject factor and the latter as a within-subject factor, was conducted. The analysis only revealed a significant main effect of distance, where both cultural groups allocated more soldiers to the closer gate ( $M = 5.99$ ,  $SD = 1.36$ ) than the farther gate ( $M = 3.99$ ,  $SD = 1.37$ ),  $F(1, 117) = 64.20$ ,  $p < .001$ ,  $\eta_p^2 = .35$ . The interaction of culture and the enemy-to-gate distance was not significant,  $F < 1$ ,  $p < .32$ .

**Judgment of Probability of being Attacked.** A 2 (Culture: European Canadians vs. Chinese) x 2 (Enemy-to-gate distance: closer gate vs. farther gate) ANOVA, with the former as a between-subject factor and the latter as a within-subject factor, revealed a significant main effect

of enemy-to-gate distance. Both cultural groups perceived a higher probability of being attacked at the closer gate ( $M = 61.45\%$ ,  $SD = 16.07\%$ ) than the farther gate ( $M = 37.80\%$ ,  $SD = 15.72\%$ ),  $F(1, 118) = 73.99$ ,  $p < .001$ ,  $\eta_p^2 = .39$ . More importantly, the results also showed a significant interaction of culture and enemy-to-gate distance,  $F(1, 118) = 5.56$ ,  $p = .02$ ,  $\eta_p^2 = .05$ . European Canadian participants ( $M = 65.15\%$ ,  $SD = 17.06\%$ ) perceived that the enemy tank was more likely to attack the closer gate as compared to Hong Kong Chinese participants ( $M = 57.75\%$ ,  $SD = 14.22\%$ ),  $t(118) = 2.58$ ,  $p = .01$ ,  $d = .47$ . In contrast, European Canadian participants ( $M = 35.02\%$ ,  $SD = 17.11\%$ ) perceived that the farther gate was less likely to be attacked relative to Hong Kong Chinese participants ( $M = 40.58\%$ ,  $SD = 13.78\%$ ),  $t(118) = -1.96$ ,  $p = .052$ ,  $d = .36$  (Figure 2).

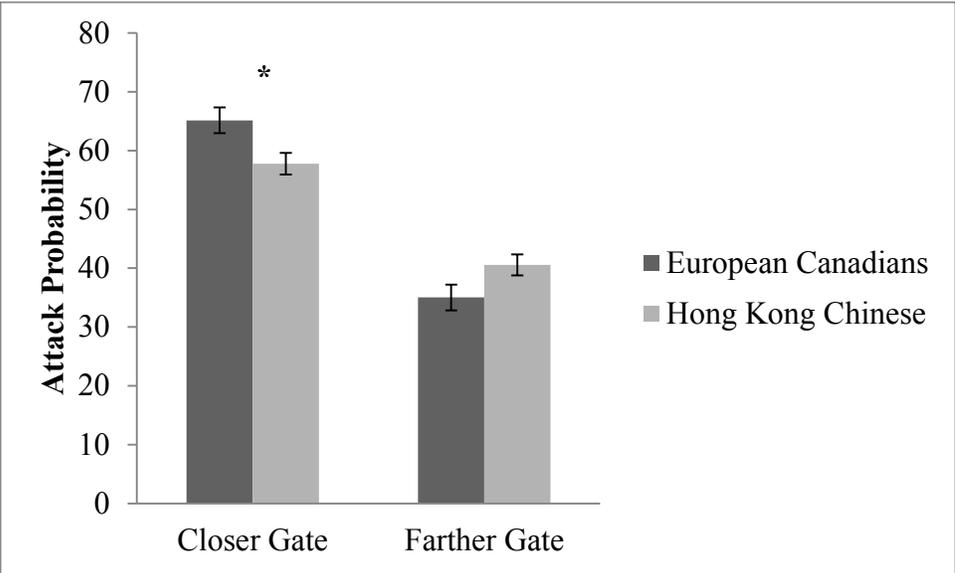
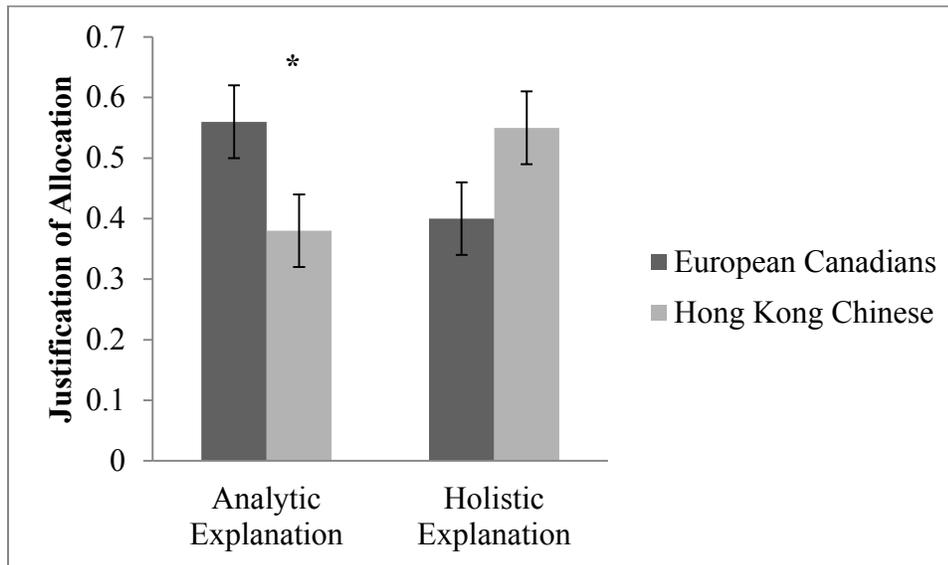


Figure 2. Probability of Attack for close and farther gate in two-gate fort game between European Canadians and Hong Kong Chinese in Study 1. \* indicates a significant cultural difference with Bonferroni correction.

**Strategy Coding data.** The responses provided by participants were coded into either an analytic or a holistic explanation. The key for the coding is whether participants were concerned about the current available information, i.e. the distance between the enemy and each gate. With linear mindsets, analytic thinkers would allocate soldiers based on the distance between the enemy tank and the gates; in contrast, non-linear mindsets among holistic thinkers would lessen the effect of distance. Therefore, responses indicating that the participants primarily considered the distance between the gate and the location of the enemy tank in their decision making for resource allocation (e.g., “I put most of the soldiers near the front because that is where the tank is”) would be coded as analytic explanations. Responses indicating that participants did not consider the distance between the gate and the location of the enemy tank as critical information (e.g., “Both sides have equal number because there are two gates with equal opportunity to enter even if the tank is closer to one”) or participants discussed the importance of other non-focal contextual information (e.g., the gates were closer to the houses in the fort) would be coded as holistic explanations. If the response involved both analytic and holistic thought, it would be coded as a holistic explanation. Two coders were trained to code the responses. Discrepancy was solved through discussion between two coders. The inter-rater reliability was satisfactory ( $Kappa = .82$ ).

Logistic regression analyses showed that European Canadians ( $M = .57, SD = .50$ ) were more likely to provide analytic explanations than Hong Kong Chinese ( $M = .38, SD = .49$ ),  $b = -.74, p = .046$ . There was no significant difference in holistic explanations between Hong Kong Chinese ( $M = .55, SD = .50$ ) and European Canadians ( $M = .40, SD = .49$ ),  $b = .61, p = .10$  (Figure 3).



*Figure 3.* Justification of allocation in the 2-gate fort game European Canadians and Hong Kong Chinese in Study 1. \* indicates a significant cultural difference.

**Game 2 – the 8-gate Fort Game**

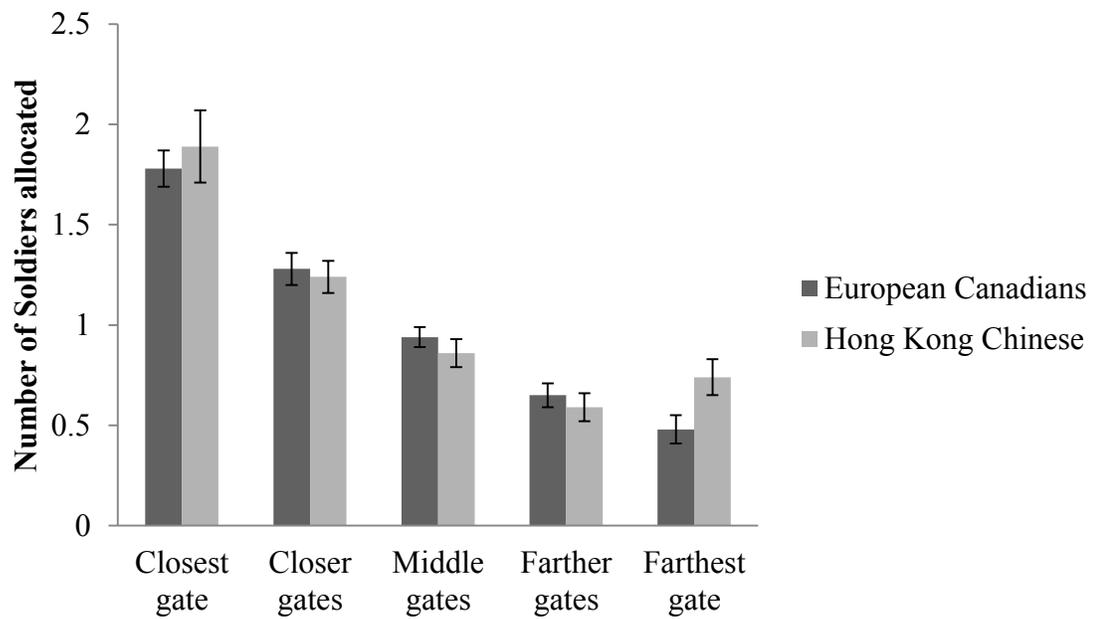
We arranged eight gates into five types of gates based on the distance between the gate and the enemy tank (Gate 1 was the closest gate, Gate 2 and Gate 8 were the closer gates, Gate 3 and Gate 7 were middle gates, Gate 4 and Gate 6 were farther gates, and Gate 5 was the farthest gate). We computed an average score for the gate categories with more than one score.

**Allocation of Soldiers.** A 2 (Culture: European Canadians vs. Hong Kong Chinese) x 5 (Enemy-to-gate distance: closest gate, closer gates, middle gates, farther gates, and farthest gate) ANOVA, with the former as a between-subject factor and the latter as a within-subject factor, was conducted for the allocation of soldiers at different gates. The main effect of the enemy-to-gate distance,  $F(4, 110) = 24.58, p < .001, \eta_p^2 = .47$ , and the interaction of culture and distance,  $F(4, 110) = 2.87, p = .03, \eta_p^2 = .09$ , were significant. In general, participants concentrated allocation of soldier at the gates that were closer to the enemy tank. The interaction showed that this tendency was stronger among European Canadians,  $F(4, 54) = 19.47, p < .001, \eta_p^2 = .59$ , than Hong Kong Chinese,  $F(4, 53) = 9.00, p < .001, \eta_p^2 = .41$  (see Figure 4).<sup>1</sup>

**Probability of Attack.** A 2 (Culture: European Canadians vs. Hong Kong Chinese) x 5 (Enemy-to-gate Distance: closest gate, closer gates, middle gates, farther gates, and farthest gate) ANOVA, with the former as a between-subject factor and the latter as a within-subject factor, was conducted for the judgment of probability of attack at different gates. The results found a significant main effect of enemy-to-gate distance,  $F(4, 110) = 29.21, p < .001, \eta_p^2 = .51$ , and a marginally significant interaction of culture and enemy-to-gate distance,  $F(4, 113) = 2.21, p = .07, \eta_p^2 = .07$  (see Figure 2). In general, participants perceived that the enemy tank would be more likely to attack the closer gates than the farther gates. The significant interaction revealed

that the perception was stronger among European Canadians,  $F(4, 55) = 17.82, p < .001, \eta_p^2 = .56$ , than Hong Kong Chinese,  $F(4, 55) = 11.87, p < .001, \eta_p^2 = .46$  (see Figure 5).

**Strategy Coding data.** The inter-rater reliability was satisfactory ( $Kappa = .88$ ). Logistic regression analyses showed that European Canadians ( $M = .52, SD = .50$ ) were more likely to provide analytic explanations Hong Kong Chinese ( $M = .35, SD = .48$ ), which was marginally significant,  $b = -.67, p = .067$ ; in contrast, Hong Kong Chinese ( $M = .60, SD = .49$ ) were more likely to provide holistic explanations than European Canadians ( $M = .35, SD = .48$ ),  $b = .74, p = .046$  (Figure 6).



*Figure 4.* The allocation pattern of soldiers in different gates in the eight-gate fort game between European Canadians and Hong Kong Chinese in Study 1.

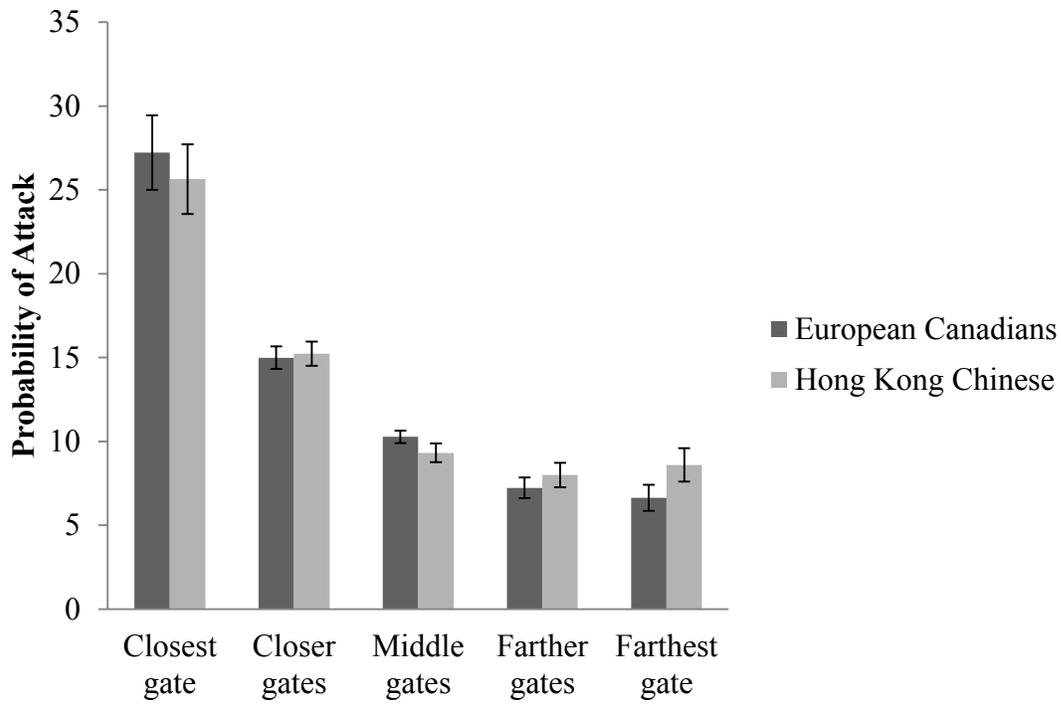
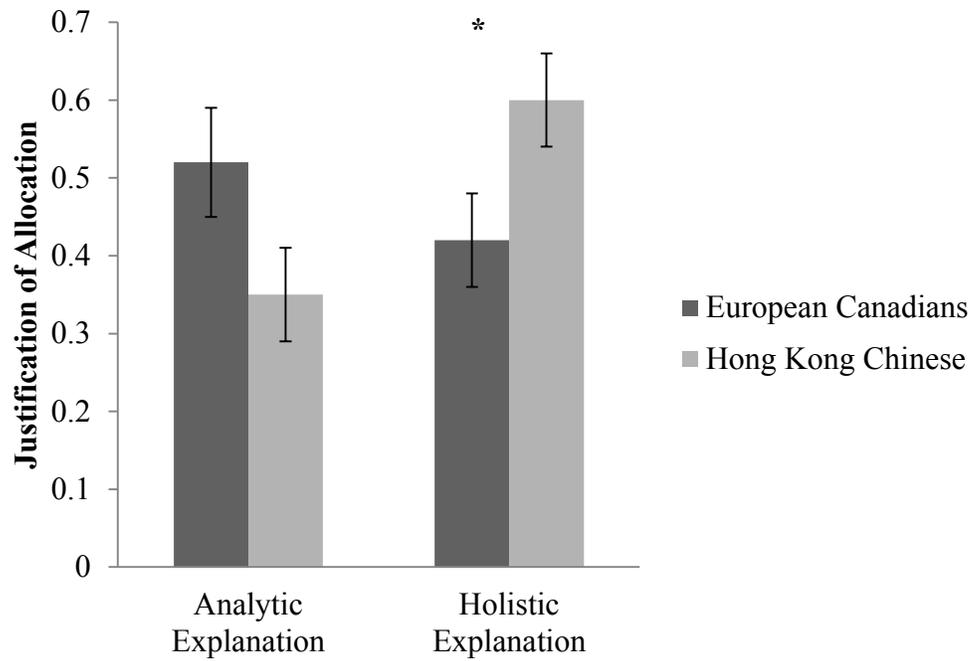


Figure 5. Probability of attack for different gates in the eight-gate fort game between European Canadians and Hong Kong Chinese in Study 1.



*Figure 6.* Justification of allocation in the eight-gate fort game between European Canadians and Hong Kong Chinese in Study 1. \* indicates a significant cultural difference.

### **Discussion**

To summarize, it was found that both Hong Kong Chinese and European Canadians allocated more resources to the closer gates, which were assumed to be focal, but Hong Kong Chinese were more likely to disperse their resources to different gates as compared to European Canadians. Similar patterns were obtained from the analysis of judgment of probability of attack.

Consistent with previous research (e.g., Li et al., 2014; Senzaki et al., 2014), a culturally similar pattern, in which both Hong Kong Chinese and European Canadians concentrated their allocation to the focal places (i.e., allocating more soldiers to the gates that were closer to the enemy tank), and a culturally different pattern, in which the allocation pattern among European Canadians was more concentrated than that of Hong Kong Chinese, were found.

The finding that people, regardless their cultural backgrounds, are automatically attracted by focal information is consistent with the prior work (Hansen & Hansen, 1988; Pratto & John, 1991). While people endorse this strategy universally, culture plays a role in modifying the strength of this tendency. People from holistic cultures are less likely to be affected by the current available information, which leads them to consider both focal and non-focal places; whereas people from analytic cultures are more likely to be affected by the current status of available information, which leads them to attend to critical information only for their decision. The responses for the justification of allocation pattern showed that European Canadians, compared to Hong Kong Chinese, were more likely to adopt linear thinking styles, in which they were more likely to perceive that the attack path of the enemy tank could be predicted by its displayed location.

CHAPTER 3

Manipulation of Thinking Styles Across Cultures

The findings in Study 1 demonstrated that Hong Kong Chinese were more likely to adopt a non-linear logic whereas European Canadians were more likely to adopt a linear logic when they engaged in the resource allocation task. This could be observed from the justifications of soldier allocation provided by participants, which suggested that the cultural difference in resource allocation was driven by the adoption of linear logic in analytic cultures and non-linear logic in holistic cultures. However, the causal linkage from culturally specific thinking styles to resource allocation pattern was only indirectly suggested in Study 1.

Socio-cultural psychologists have developed manipulation paradigms for the demonstration of the causal linkage from cultural influence to individuals' psychological processes (e.g., Alter & Kwan, 2009; Li et al., 2014; Hong et al., 2000; Zhou, He, Yang, Lao, & Baumeister, 2012; Trafimow, Triandis, & Goto, 1991; for a review, Oyserman & Lee, 2008). With the assumption that people from different cultures may have knowledge of more than one cultural mindset in addition to the one that is prevalent in one's living culture, we can activate a particular mindset. Once the mindsets have been activated through manipulation, behaviour of people, regardless of their cultural backgrounds, would be influenced by the manipulation (for a review, Oyserman & Lee, 2008).

Study 2 was conducted to obtain direct evidence of the influence of analytic versus holistic thinking styles on resource allocation. Different from implicitly activating a cultural mindset that contains general knowledge of a certain culture in some studies (e.g., activating a specific cultural mindset through showing cultural icons in a given culture) (e.g., Alter & Kwan, 2009; Hong et al., 2000), we used an explicit manipulation in which participants were directly reminded of two possible thinking logics regarding how the enemy tank would move in the specific context. Although using the implicit approach allows us to understand the power of cultural influences,

but it may not allow us to clearly pinpoint which specific factor (or sub-concept) of the broad cultural mindset would be the cause. With the explicit manipulation, it could provide a direct answer of whether the specific thinking logic is the cause explaining the obtained cultural differences in a specific context. In addition, in order to demonstrate the generalizability of the manipulation effect, participants from both analytic and holistic cultures were recruited.

## **Method**

### **Participants**

I recruited 48 Chinese (17 males, 31 females;  $M_{\text{age}} = 19.75$ ,  $SD = 1.33$ ) from the Chinese University of Hong Kong, Hong Kong, and 62 European Canadians (41 males, 21 females,  $M_{\text{age}} = 19.02$ ,  $SD = 1.21$ ) from the University of Alberta, Canada.

### **Material and Procedure**

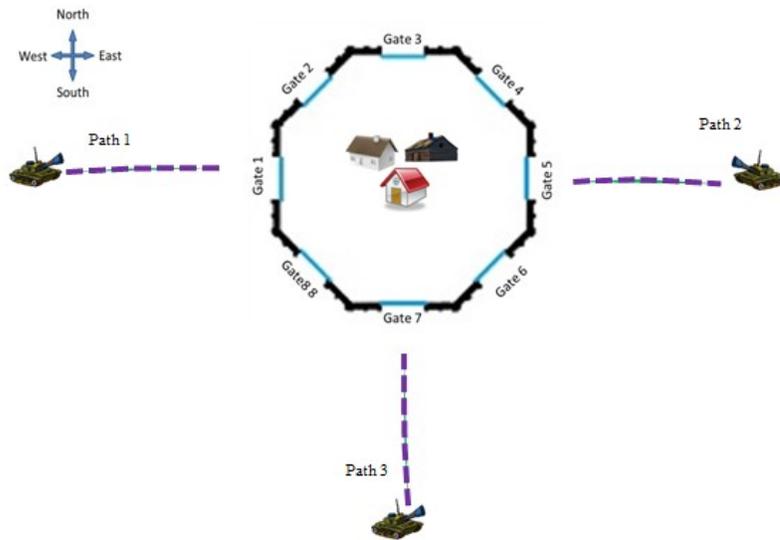
The fort game paradigm was used in Study 2. First, participants were asked to put themselves in the following scenario: they were a general and the enemy tank was going to attack their fort. Next, participants were asked to view a video showing three potential paths through which the enemy tank could attack the fort. The 3-minute video was displayed in the monitor. They were randomly assigned to either the analytic or holistic condition. Based on the justification provided by participants in Study 1 and findings from Ji (2008), it seems that the expectation of whether the current status (i.e., enemy-to-gate distance) can be used to predict future development, or not, would be the key to differentiate analytic versus holistic thinking styles. Hence, I manipulated analytic and holistic thinking styles by activating the sense of predictability and unpredictability, respectively. In the analytic condition, the video displayed that the enemy tank always attacked the closest gate in three potential attack paths, which made the participants expect that where the enemy tank was going to attack could be predicted by the

initial location of the tank. In the holistic condition, in contrast, the video displayed that the enemy tank attacked a gate with a random pattern in three potential attack paths, which made the participants expect that where the enemy tank was going to attack could *not* be predicted by the initial location of the tank—there was no relationship between the original location of the enemy and the gate which it was going to eventually attack (See the details in figure 7).

After that, participants played the actual fort game (i.e., the second game in Study 1). They were told that the enemy tank was on the west side of the fort and they needed to defend the fort by allocating eight soldiers for an 8-gate fort. They were told that the gates were the only access through which the enemy tank can enter the fort, and one soldier may or may not be able to destroy the tank. Participants were required to allocate all eight soldiers to different gates (eight gates) and estimate the probability that the enemy tank would attack for each gate.

At the end, an item, “The location where the tank is going to attack is predictable”, with a scale ranging from 1 (strongly disagree) to 6 (strongly agree), was used for manipulation check.

A.



B.

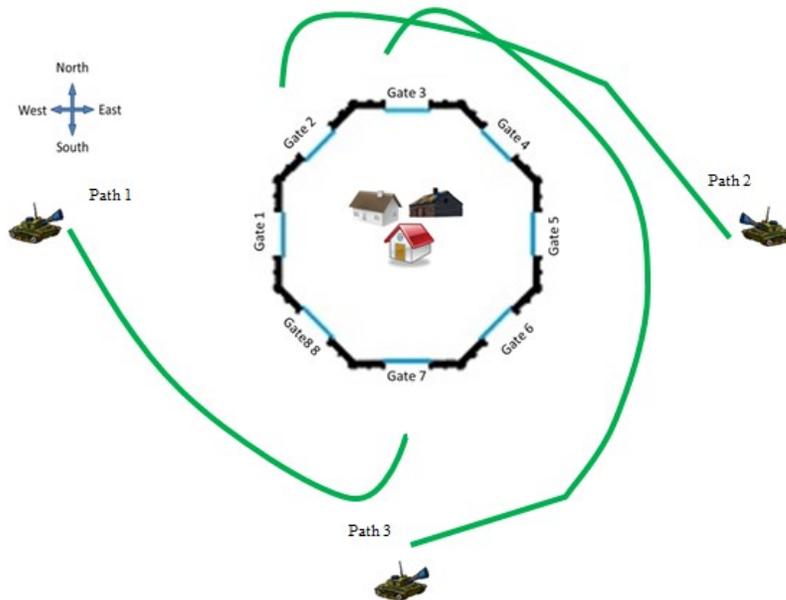


Figure 7. Display of three possible attack paths showing in the analytic (A) and holistic conditions (B) in Study 2.

## Results

### Manipulation Check

A 2 (Manipulation: analytic versus holistic condition) x 2 (Culture: European Canadians versus Hong Kong Chinese) ANOVA was conducted to examine the manipulation-check item. There was a marginally significant main effect of manipulation,  $F(1, 106) = 2.98, p = .09, \eta_p^2 = .03$ , suggesting that participants in the analytic condition ( $M = 3.20, SD = 1.46$ ) perceived the attacking path of the enemy tank to be more predictable than those in the holistic condition ( $M = 2.72, SD = 1.28$ ). The main effect of culture was significant,  $F(1, 106) = 4.23, p = .04, \eta_p^2 = .04$ , suggesting that Hong Kong Chinese ( $M = 3.27, SD = 1.22$ ) perceived the attacking path of the enemy tank to be more predictable than European Canadians ( $M = 2.73, SD = 1.47$ ) in general. The interaction of manipulation and culture was not significant,  $F < 1, p = .71$ , suggesting that the manipulation were similarly effective in both cultures.

### Allocation of Soldiers

Using the same computation method as stated in Study 1, I arranged eight gates into five categories according to the distance between the gate and the enemy tank (closest gate: Gate 1, closer gates: Gate 2 and 8, middle gates: Gate 3 and 7, farther gates: Gate 4 and 6, and farthest gate: Gate 5). An average score was computed for the gate categories that had more than one score.

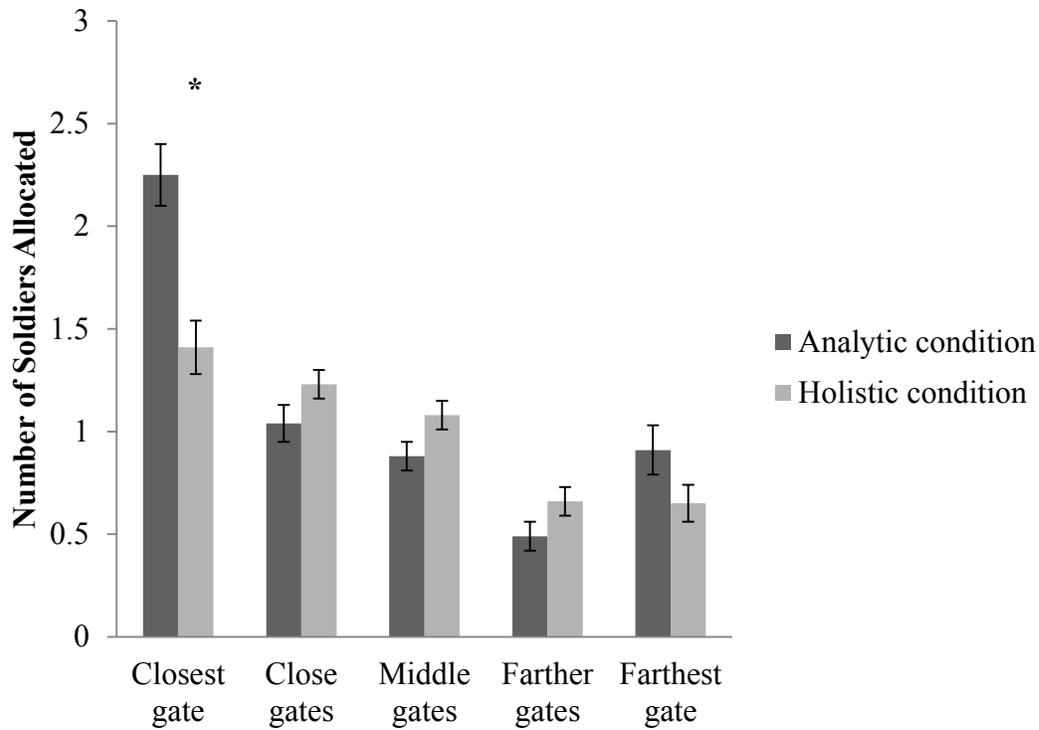
A 2 (Culture: European Canadians vs. Hong Kong Chinese) x 2 (Manipulation: analytic versus holistic condition) x 5 (Distance: closest gate, closer gates, middle gates, farther gates, and farthest gate) ANOVA, with the two former variables as between-subject factors and the latter as a within-subject factor, was conducted for the allocation of soldiers. The main effect of enemy-to-gate distance was significant,  $F(1, 103) = 23.16, p < .001, \eta_p^2 = .48$ , which suggested

that participants generally concentrated their allocation at the closer gates. More importantly, the interaction of manipulation and distance,  $F(1, 103) = 6.01, p < .001, \eta_p^2 = .19$ , was significant. Breaking down this interaction revealed that the effect of distance was stronger in the analytic condition,  $F(4, 52) = 18.27, p < .001, \eta_p^2 = .58$ , than in the holistic condition,  $F(4, 50) = 7.57, p < .001, \eta_p^2 = .38$  (see Figure 8). In other words, participants in the analytic condition were more likely to concentrate their resources at the closer gates than those in the holistic condition. All interaction effects regarding culture were non-significant,  $F_s < 1, p_s > .42$ .

### **Probability of Attack**

A 2 (Culture: European Canadians vs. Hong Kong Chinese) x 2 (Manipulation: analytic versus holistic condition) x 5 (Distance: closest gate, closer gates, middle gates, farther gates, and farthest gate) ANOVA, with the two former variables as between-subject factor and the latter as a within-subject factor, was conducted for the judgment of probability of attack at different gates.

Similar to the results obtained for soldier allocation, the significant main effect of enemy-to-gate distance,  $F(1, 103) = 27.52, p < .001, \eta_p^2 = .52$ , showed that participants in general perceived the tank would be more likely to attack the gates that were closer to it. More importantly, the interaction of manipulation and distance,  $F(1, 103) = 11.46, p < .001, \eta_p^2 = .31$ , was significant. The effect of distance was stronger among participants in the analytic condition,  $F(4, 52) = 22.18, p < .001, \eta_p^2 = .63$ , than those in the holistic condition,  $F(4, 50) = 10.73, p < .001, \eta_p^2 = .46$  (see Figure 9). In other words, participants in the analytic condition were more likely to expect the enemy tank to attack closer gates as compared with those in the holistic condition. All interaction effects regarding culture were non-significant,  $F_s < 1.18, p_s > .33$ .



*Figure 8.* The allocation pattern of soldiers in different gates between Holistic and Analytic Condition in Study 2. \* indicates a significant condition difference with Bonferroni correction.

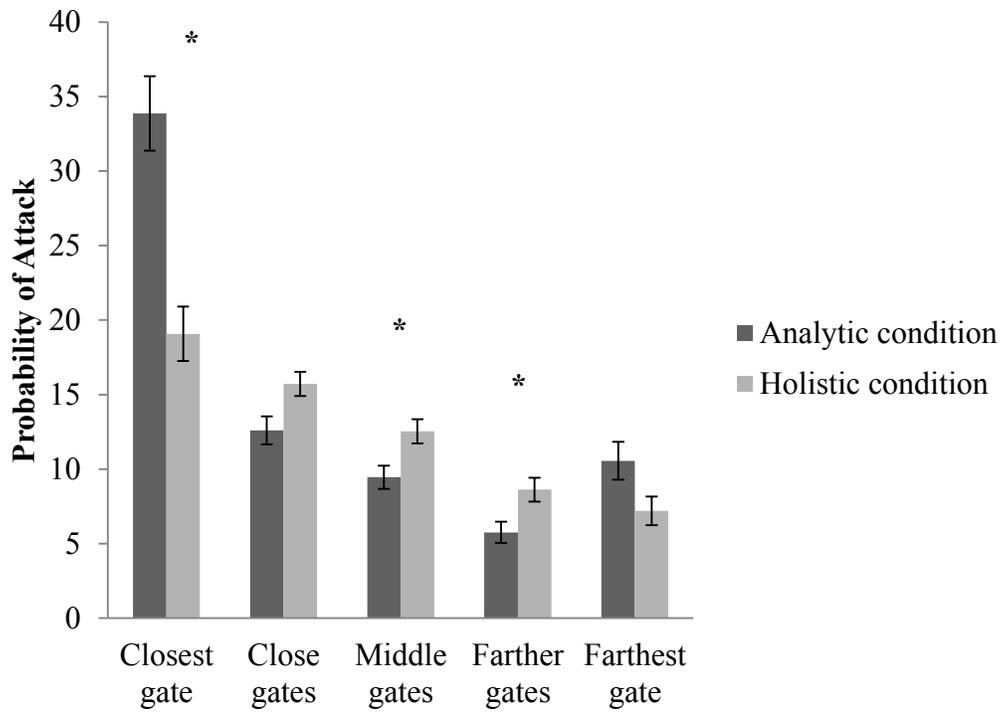


Figure 9. Probability of attack for different gates between Holistic and Analytic Condition in Study 2. \* indicates a significant condition difference with Bonferroni correction.

### **Discussion**

The primary goal of Study 2 was to provide direct evidence that analytic versus holistic thinking style would affect people's resource allocation pattern. In particular, I manipulated the activation of linear (versus non-linear) thinking style by displaying predictable attack patterns (versus unpredictable attack patterns) to the participants. With the manipulation, participants in the analytic condition tended to concentrate their allocation at closer gates compared with those who were in the holistic condition. More importantly, cultural variation obtained in Study 1 disappeared after the manipulation: the interaction of culture and manipulation was not significant. Study 2 replicated the obtained cross-cultural variation in resource allocation in Study 1, and further provided direct evidence supporting that cultural thinking styles explained the cultural variation pattern in resource allocation via manipulation.

I used the straightforward direct manipulation to remind participants of two different possible thinking styles regarding the future movement of the enemy tank, and the results showed that this specific factor affected participants' resource allocation. Future research should use a more indirect manipulation to activate people's general knowledge of a certain culture and observe whether the same results would be obtained.

CHAPTER 3

The Influence of Context Sensitivity in Resource Allocation Across Cultures

In Study 1, I demonstrated Hong Kong Chinese, who are holistic thinkers, were less likely to concentrate their resource allocation at the focal places compared with European Canadians, who are analytic thinkers. In Study 2, I further provided causal evidence in which reminders of analytic versus holistic thinking style via watching videos eliminated cultural variation, and made people from both cultures behave in a way consistent with the manipulation: participants concentrated their resource allocation more focally after watching a video displaying predictable attack patterns (analytic condition) compared to those who watched a video showing unpredictable attack patterns (holistic condition).

After studying the underlying mechanism for cultural variations in resource allocation strategies in Study 2, I further examined the moderation effect of context-sensitivity in resource allocation strategies across cultures in Study 3. To be specific, this study examined whether subtle changes in the context can lead people from analytic and holistic cultures to behave differently. Prior cross-cultural research has consistently found that East Asians, who are from holistic cultures, show greater context-sensitivity than North Americans, who are from analytical cultures. East Asians do not only detect changes in the contexts faster (Masuda & Nisbett, 2006), but also adopt more varied strategies across contexts than North Americans (e.g., Adair, Okumura, & Brett, 2001; Li et al., in press). Following these findings, I expected that East Asians would be more sensitive than European Canadians to the presence of subtle changes or the presence of stability (i.e., no change) in the context. In turn, they would be more likely to concentrate their resource allocation in focal places in the presence of contextual stability but more likely to scatter their resource allocation in the presence of contextual change. In contrast, I expected that European Canadians would behave more consistently, regardless of whether the subtle contextual change was present or not. They would not be affected by the variations of the

context because analytic worldviews contend that people's behaviors should be independent from the contexts. In other words, I expected that stronger manipulation effect of contextual change would be observed among East Asians than European Canadians.

Since this manipulation is rather subtle, I collected data from one more holistic culture, Japanese, in addition to Hong Kong Chinese, to validate the manipulation effect. Although cross-cultural psychologists do not often attempt to examine regional differences in holistic cultures in East Asia, Japanese are expected to be more holistic than Hong Kong Chinese for two reasons: 1) compared to the bilingual and relatively multiethnic societal profile in Hong Kong, Japan is a society higher in linguistic and ethnic homogeneity where traditional Japanese values and norms have dominated for a long time; 2) some research has demonstrated that Japanese had higher scores in some dimensions of East Asian cultural values than other East Asian groups (e.g., Bond & Cheung, 1983; Hofstede, 1980; Miyamoto et al., 2013; Yates et al., 2010). In regard to the regional difference between the two East Asian cultures, I expected the Japanese to show a stronger manipulation effect than Hong Kong Chinese.

## **Method**

### **Participants**

I recruited 83 Chinese participants (23 males, 60 females; Age mean = 20.28,  $SD = 1.72$ ) from the Chinese University of Hong Kong in Hong Kong, 76 participants (38 males, 38 females; Age mean = 19.26,  $SD = 2.46$ ) from the Kobe University in Japan, and 76 European Canadians (23 males, 51 females; Age mean = 19.57,  $SD = 2.39$ ) from the University of Alberta in Canada to participate in this study.

**Material and Procedure**

Following the procedures in Study 2, participants were asked to put themselves in the following scenario: they are a General and the enemy is going to attack their fort. They were also told that the gates are the only access through which the enemy tank can enter the fort, and one soldier may or may not be able to destroy the tank.

I also explored the role of quantity of available resources in allocation in Study 3. Therefore, all participants played three 8-gate-fort games with four soldiers, eight soldiers and 16 soldiers at their disposal in each game. The order in which participants played the games (with four soldiers, eight soldiers and 16 soldiers) was decided randomly, and the presentation order was recorded. Furthermore, contextual change versus stability was manipulated by varying the location of the enemy tank in relation to the gates. Across three games, the location of the tank would either stay on the west side in all three games (contextual stability condition), or appear only once on the west side, and then move to the north, east, or south side in the 2 other games (contextual change condition). The changing position of the enemy tank constitutes the subtle contextual change mentioned earlier.

For each game, participants had to list the number of soldiers they would allocate to each gate and indicate the probability that the tank would attack each gate, similar to what participants did in the previous studies (Figure 10 indicates that design).

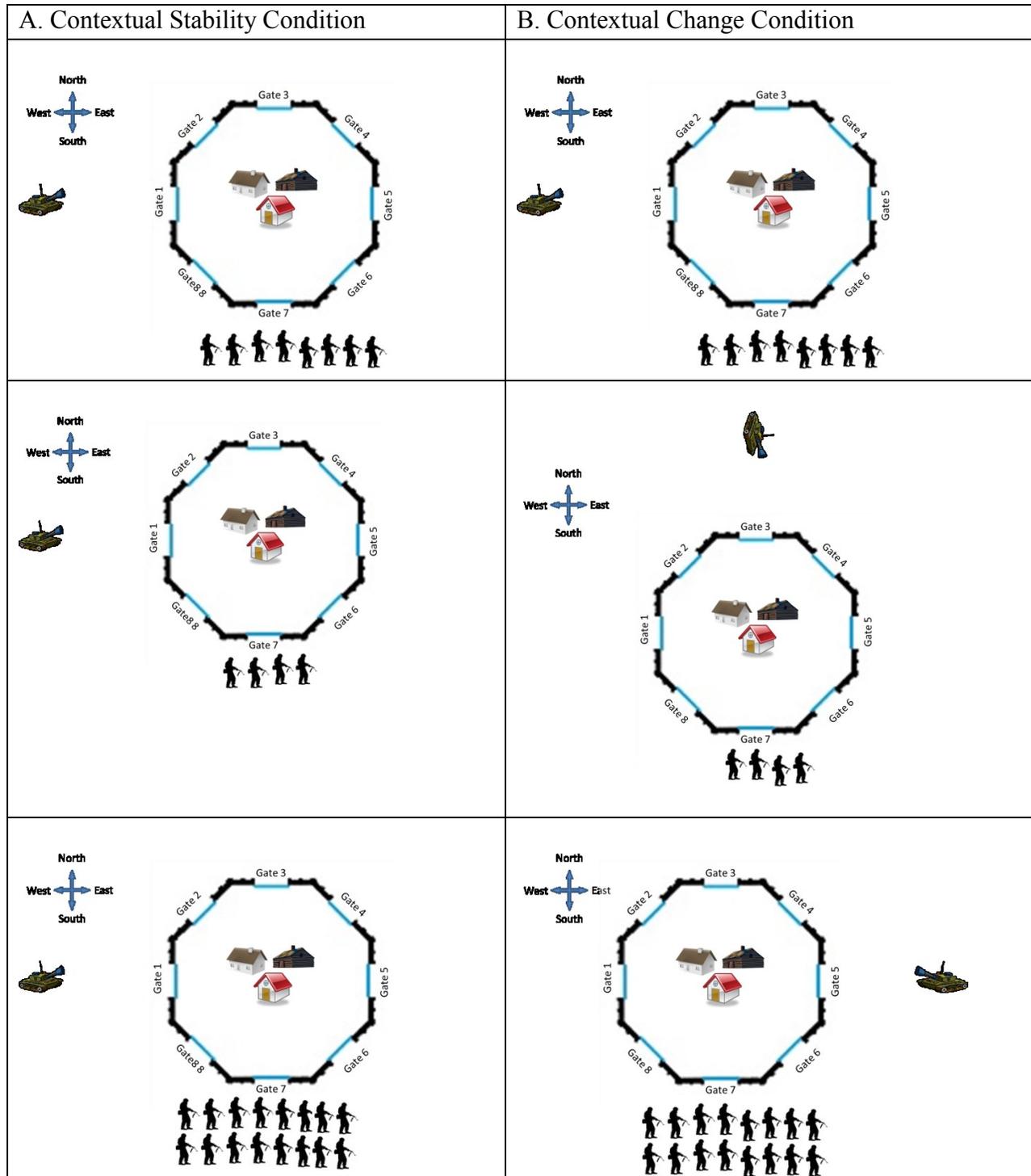


Figure 10. The fort pictures with different number of soldiers between stable context (fixed location of the tank; A) and changing context (random location of the tank; B) in Study 3. The order of four-, eight- and 16-soldiers were randomly presented between two conditions.

At the end of the game, participants filled in one scale and completed the manipulation check. First, participants answered Dialectical Self Scale (Spencer-Rodgers et al., 2010; European Canadians:  $\alpha = .81$ ; Hong Kong Chinese:  $\alpha = .76$ ; Japanese:  $\alpha = .74$ ), which was used to measure participants' linear versus nonlinear thinking style, with a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The sample items include, "There are always two sides to everything, depending on how you look at it", and "Believing two things that contradict each other is illogical" (reverse-scored item). This measure was used to validate the assumption that Japanese hold stronger non-linear logic than Hong Kong Chinese, and the two East Asian cultural groups would hold stronger non-linear logic than European Canadians.

In addition, there were two manipulation-check items regarding the presence of change or stability in the contexts: "The tank always appeared on the West of the fort" and "The location of the tank is predictable". Participants indicated their agreements with these two statements on a scale ranging from 1 (strongly disagree) to 6 (strongly agree). The correlation between these two scores was moderate, so an average score was computed (Canada:  $r = .74, p < .001$ ; Hong Kong:  $r = .54, p < .001$ ; Japan:  $r = .48, p < .001$ ; average correlation:  $r = .61, p < .001$ ).

## Results

### Manipulation Checks

**Linear versus Nonlinear thinking style.** The main effect of manipulation and its interaction effect with culture were not significant,  $F_s < 1, p_s > .70$ . The main effect of culture was significant,  $F(2, 227) = 42.10, p < .001, \eta_p^2 = .27$ . The post-hoc comparison analysis revealed that Japanese reported a stronger non-linear thinking style ( $M = 4.55, SD = .51$ ) than Hong Kong Chinese ( $M = 4.02, SD = .46$ ),  $p < .001$ , and European Canadians ( $M = 3.79, SD = .58$ ),  $p < .001$ , and Hong Kong Chinese reported a stronger tendency of non-linear thinking

style than European Canadians,  $p = .02$ . The results supported the assumption that Japanese were more holistic than Hong Kong Chinese and two East Asian cultural groups were more holistic than European Canadians.

**Change in the Contexts.** A 2 (Manipulation: stable context versus changing context condition) x 3 (Culture: European Canadians versus Hong Kong Chinese versus Japanese) ANOVA was conducted to examine the average score of the manipulation-check items. The main effect of manipulation was significant,  $F(1, 227) = 197.28, p < .001, \eta_p^2 = .47$ , which showed that participants in the stable context condition ( $M = 4.23, SD = 1.48$ ) reported the location was more predictable than those in the changing context condition ( $M = 2.20, SD = .89$ ).<sup>2</sup>

### **Analyses of Dependent Measures**

#### **The Eight-soldier Game**

With the current design, participants would be able to notice whether the location of the enemy tank was fixed (for those in the contextual stable condition) or changeable (for those in the contextual changing condition) only when they played the second and third game. Therefore, the response of first game in both manipulation conditions would not be included in the analyses because there was no information regarding the change in the contexts (or stability in the contexts). There was no systematic effect brought by the order of the game (second versus third game), thus the data for the second and third game was collapsed in this final analysis.

**Allocation of Soldiers.** A 3 (Culture: European Canadian, Hong Kong Chinese, and Japanese) x 3 (Condition: stable context versus changing context) x 5 (Distance: closest gate, closer gates, middle gates, farther gates, and farthest gates) ANOVA did not reveal a significant 3-way interaction,  $F(8, 280) = 1.18, p = .31, \eta_p^2 = .03$ . To explore the possible nuanced

differences in manipulation effect across cultures without considering the higher level of interaction, separate analyses were conducted for each culture.

Among the European Canadian participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 44) = 34.93, p < .001, \eta_p^2 = .76$ , suggesting that participants were more likely to allocate soldiers to the gates closer to the enemy tank than those farther away, whereas the interaction effect of enemy-to-gate distance and manipulation was non-significant,  $F < 1, p > .56$ .

Among the Hong Kong Chinese participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 48) = 24.68, p < .001, \eta_p^2 = .67$ , which showed that participants were more likely to allocate soldiers to the gates closer to the enemy tank than those farther away, whereas the interaction effect of enemy-to-gate distance and manipulation was non-significant,  $F < 1, p > .94$ .

Among the Japanese participants, the 2-way interaction was significant,  $F(4, 41) = 3.96, p = .008, \eta_p^2 = .28$ . The follow-up analysis revealed that the effect of distance was significantly stronger in the stable context condition [ $F(4, 41) = 49.44, p < .001, \eta_p^2 = .91$ ] than those in the changing context condition [ $F(4, 41) = 4.95, p = .007, \eta_p^2 = .52$ ] (Figure 11).

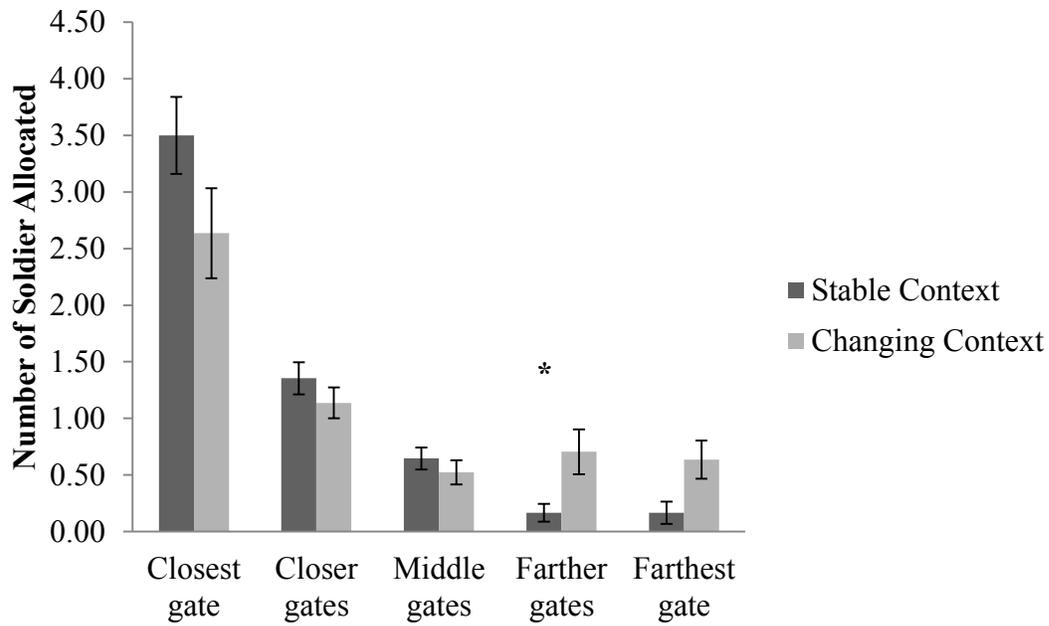


Figure 11. The allocation pattern of soldiers in the eight-soldier game among Japanese participants in the stable and changing context condition in Study 3. \* indicates a significant condition difference with Bonferroni correction.

**Judgment of Probability of Attack.** The 3-way interaction was non-significant,  $F(8, 280) = 1.17, p = .32, \eta_p^2 = .03$ . Separate analyses for each culture were conducted to explore the nuance of manipulation effect in each culture.

Among the European Canadian participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 44) = 38.24, p < .001, \eta_p^2 = .78$ , which showed that participants perceived the gates closer to the enemy tank were more likely to be attacked than those farther away, whereas the interaction was non-significant,  $F < 2, p = .34$ .

Among the Hong Kong Chinese participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 48) = 45.74, p < .001, \eta_p^2 = .79$ , which showed that participants perceived the gates closer to the enemy tank were more likely to be attacked than those farther away, whereas the interaction was non-significant,  $F < 1, p = .84$ .

Among the Japanese participants, the 2-way interaction was significant,  $F(4, 41) = 2.52, p = .06, \eta_p^2 = .20$ , which revealed that the effect of distance was significantly stronger in the stable context condition [ $F(4, 20) = 26.33, p < .001, \eta_p^2 = .84$ ] than in the changing context condition [ $F(4, 18) = 6.50, p = .002, \eta_p^2 = .59$ ] (Figure 12).

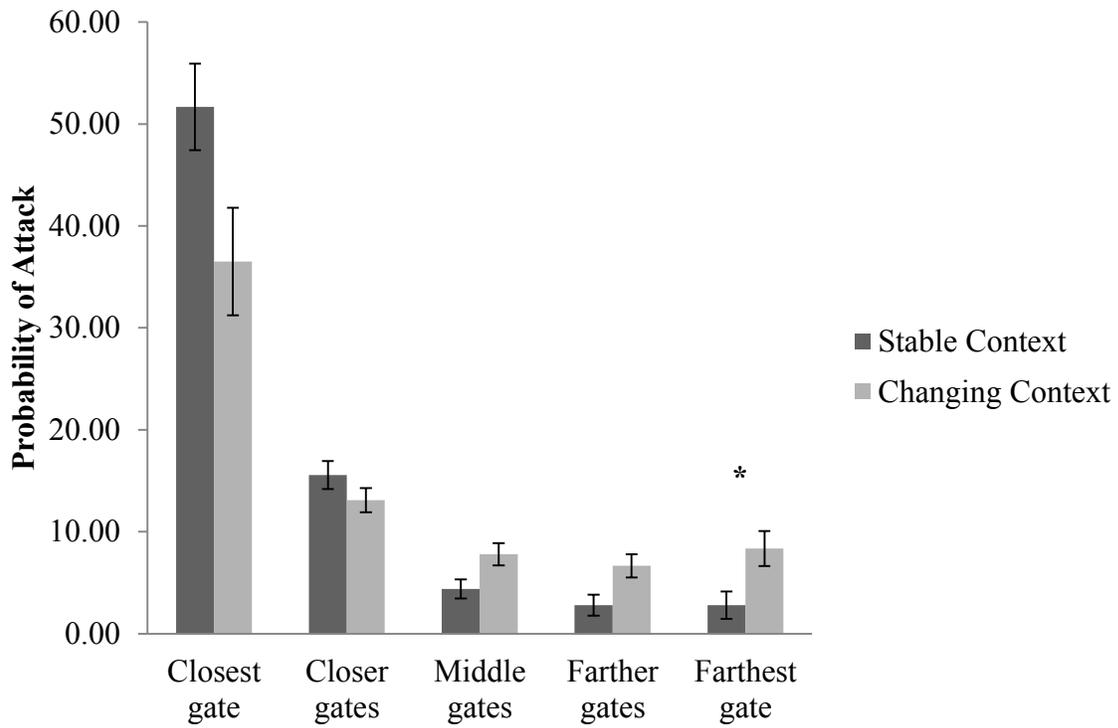


Figure 12. Probability of attack in the eight-soldier game among Japanese participants in the stable and changing context condition in Study 3. \* indicates a significant condition difference with Bonferroni correction.

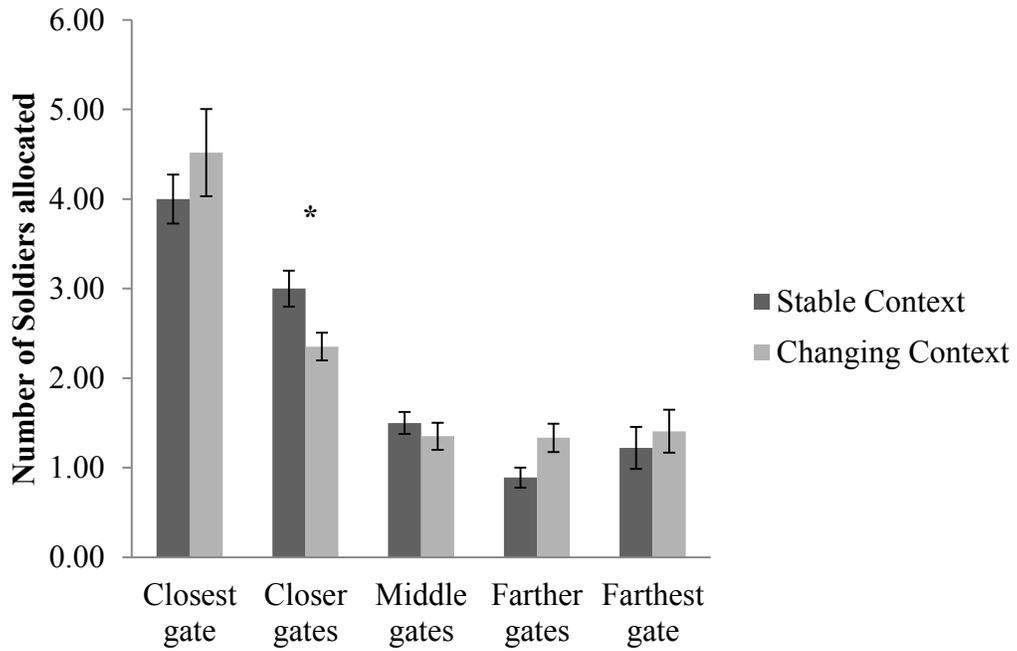
### The 16-soldier Game

**Allocation of Soldiers.** The 3-way interaction was significant,  $F(8, 302) = 2.14, p = .03, \eta_p^2 = .05$ . To unpack this interaction, separate analyses were conducted to examine the manipulation effect in each culture.

Among the European Canadian participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 44) = 19.81, p < .001, \eta_p^2 = .64$ , which showed that participants were more likely to allocate soldiers to the gates closer to the enemy tank than those farther away, whereas the interaction was non-significant,  $F < 2, p > .32$ .

Among the Hong Kong Chinese participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 51) = 20.60, p < .001, \eta_p^2 = .66$ , which showed that participants were more likely to allocate soldiers to the gates closer to the enemy tank than those farther away, whereas the interaction was non-significant,  $F < 1, p > .70$ .

Among the Japanese participants, the 2-way interaction was significant,  $F(4, 49) = 3.56, p = .013, \eta_p^2 = .23$ , which revealed that effect of distance was significantly stronger in the stable context condition [ $F(4, 24) = 9.73, p < .001, \eta_p^2 = .81$ ] than in the changing context condition [ $F(4, 23) = 6.77, p < .001, \eta_p^2 = .54$ ](Figure 13).



*Figure 13.* The allocation pattern of soldiers in the 16-soldier game among Japanese participants in the stable and changing context condition in Study 3. \* indicates a significant condition difference with Bonferroni correction.

**Judgement of Attack Probability.** The 3-way interaction was significant,  $F(8, 302) = 2.56, p = .01, \eta_p^2 = .06$ . To unpack the interaction, separate analyses were conducted to explore the manipulation effect in each culture.

Among the European Canadian participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 44) = 30.25, p < .001, \eta_p^2 = .73$ , which showed that participants perceived that the enemy tank was more likely to attack the gates closer than those farther away, whereas the interaction was non-significant,  $F < 1, p > .53$ .

Among the Hong Kong Chinese participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 51) = 40.70, p < .001, \eta_p^2 = .76$ , which showed that participants perceived that the enemy tank was more likely to attack the gates closer than those farther away, whereas the interaction was non-significant,  $F < 2.5, p > .07$ .

Among Japanese participants, the 2-way interaction (condition x distance) was significant,  $F(4, 49) = 3.81, p = .02, \eta_p^2 = .21$ , which revealed that the effect of distance was significantly stronger in the stable context condition [ $F(4, 23) = 51.75, p < .001, \eta_p^2 = .90$ ] than in the changing context condition [ $F(4, 23) = 18.77, p < .001, \eta_p^2 = .77$ ] (Figure 14).

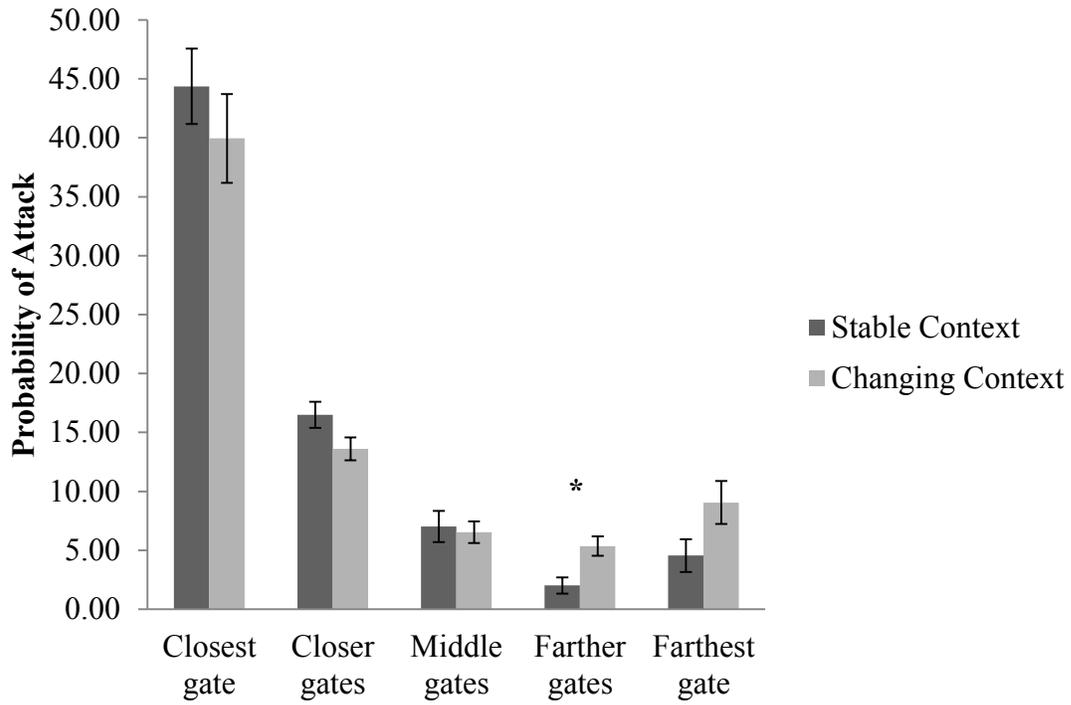


Figure 14. Probability of attack in the 16-soldier game among Japanese participants in the stable and changing context condition in Study 3. \* indicates a significant condition difference with Bonferroni correction.

### The Four-soldier Fort Game

**Allocation of Soldier.** The 3-way interaction was non-significant,  $F(8, 302) < 1, p = .99$ ,  $\eta_p^2 = .01$ . Still, separate analyses for each culture were conducted to explore potential within-culture patterns, if present.

Among the European Canadian participants, only the main effect of distance was significant,  $F(4, 45) = 195.93, p < .001, \eta_p^2 = .94$ , which showed that participants were more likely to allocate soldiers to the gates closer to the enemy tank than those farther away from the enemy tank, whereas the interaction was non-significant,  $F < 1, p > .58$ .

Among the Hong Kong Chinese participants, only the main effect of distance was significant,  $F(4, 52) = 171.35, p < .001, \eta_p^2 = .93$ , which showed that participants were more likely to allocate soldiers to the gates closer to the enemy tank than those farther away from the enemy tank, whereas the interaction was non-significant,  $F < 1, p > .63$ .

Among the Japanese participants, only the main effect of distance was significant,  $F(4, 47) = 67.05, p < .001, \eta_p^2 = .85$ , which showed that participants were more likely to allocate soldiers to the gates closer to the enemy tank than those farther away from the enemy tank, whereas the interaction was non-significant,  $F < 1, p > .61$ .

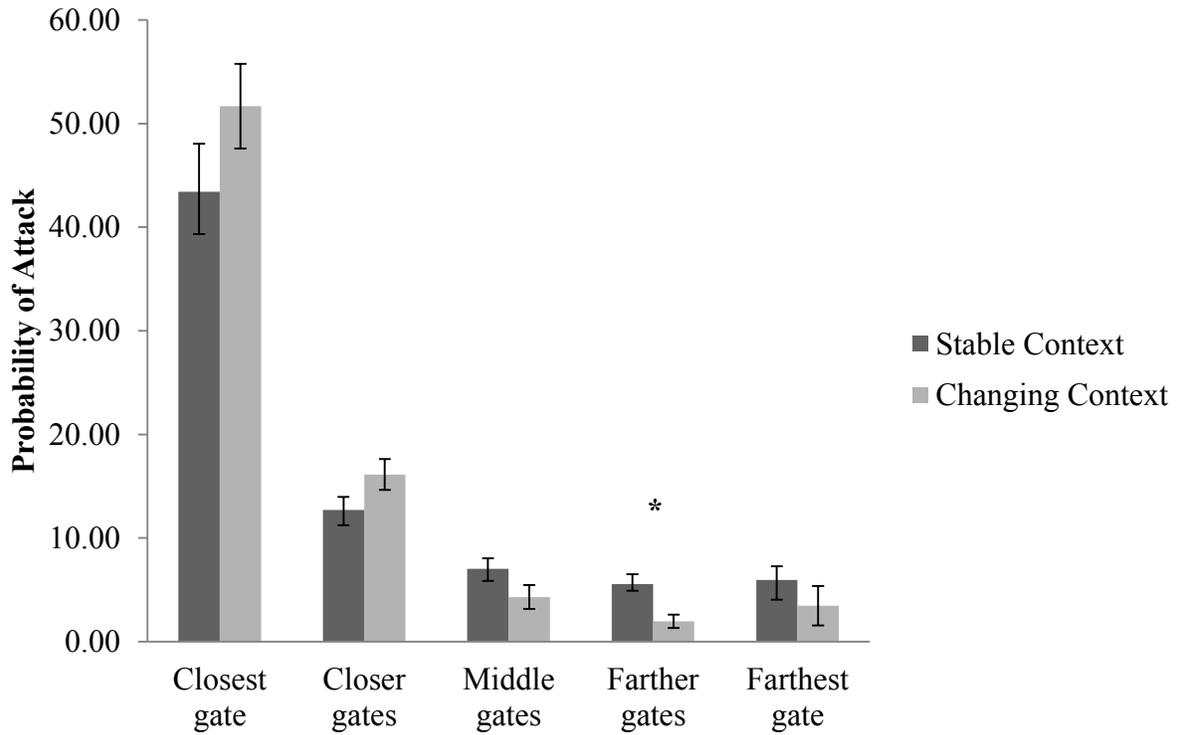
**Judgment of Probability of Attack.** The 3-way interaction was non-significant,  $F(8, 302) = 1.08, p = .38, \eta_p^2 = .03$ . Still, separate analyses for each culture were conducted to explore potential within-culture patterns, if present.

Among the European Canadian participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 45) = 42.81, p < .001, \eta_p^2 = .79$ , which showed that participants perceived the enemy tank was more likely to attack the gates that were closer than the gates that

were farther away from the enemy tank, whereas the interaction was non-significant,  $F < 1$ ,  $p > .99$ .

Among the Hong Kong Chinese participants, the 2-way interaction was significant,  $F(4, 52) = 2.78$ ,  $p = .04$ ,  $\eta_p^2 = .18$ , which suggested that the effect of distance was weaker in the stable context condition,  $F(4, 26) = 13.44$ ,  $p < .001$ ,  $\eta_p^2 = .67$ , than in the changing context condition  $F(4, 23) = 72.99$ ,  $p < .001$ ,  $\eta_p^2 = .92$  (Figure 15). The pattern was unexpected, and would be addressed in the discussion.

Among the Japanese participants, only the main effect of enemy-to-gate distance was significant,  $F(4, 47) = 60.55$ ,  $p < .001$ ,  $\eta_p^2 = .84$ , which showed that participants perceived the enemy tank was more likely to attack the gates that were closer than the those farther away from the enemy tank, whereas the interaction was non-significant,  $F = 1.05$ ,  $p > .39$ .



*Figure 15.* Probability of attack in the four-soldier game among Hong Kong Chinese participants in the stable and changing context condition in Study 3. \* indicates a significant condition difference with Bonferroni correction.

## Discussion

Despite that fact that I did not find significant 4-way interaction effects (which would indicate three cultural groups react differently to two manipulation conditions) consistently in three games across cultures, I did find some supporting evidence for my hypotheses when I analyzed the data in each culture separately.

Even though the European Canadian participants clearly noticed the stability (or change) of the location of the enemy tank between the two conditions, which was indicated by the analyses of manipulation check item, they did not vary in the allocation of soldiers or the judgment of attack probability in three games (eight-soldier, four-soldier, and 16-soldier games). Only the main effect of enemy-to-gate distance was significant – they concentrated their allocation at the gates that were closer to the enemy tank rather than those farther away from the enemy tank, which did not vary as function of manipulation.

The Japanese participants' allocation of soldiers demonstrated a consistent manipulation effect in 8- and 16-soldier fort games—they were more likely to concentrate their allocation in focal places when the location of the tank was fixed (stable context condition) than when the tank location was random (changing context condition). This pattern was observed in both 8- and 16-soldier fort games (but not in the 4-soldier fort game). The other dependent measure, perceived likelihood of enemy attack, showed a similar pattern. These results suggest that Japanese were more context-sensitive—they varied their resource allocation according to whether there was a change in the context of the game (i.e., whether the location of the tank changed).

The Hong Kong Chinese participants, the less holistic of the two East Asian groups as suggested by dialectical scores, did not consistently demonstrate the manipulation effect.

Unexpectedly, they demonstrated opposite pattern in the judgment of probability of attack in the four-soldier fort game. Although the strategies adopted by two East Asian groups were different between the two conditions, they were more likely to react in accordance to the contextual change manipulation than European Canadians, who did not show any manipulation effects across all three games.

There were a few limitations in Study 3. First, despite that fact that there were some evidence for significant manipulation effects among Japanese, the interaction between culture and manipulation was not consistently significant. The relatively small sample size in the current study may have limited the statistical power, and, in turn, the possibility of finding significant interactions. Future studies should increase the sample size. Secondly, a regional difference in East Asian cultures was found, in which Japanese and Hong Kong adopted different strategies in reacting to the stable versus changing context manipulation. From the perspective of context sensitivity, both East Asian groups demonstrated high context sensitivity because they changed their behaviors as a function of manipulation. The unexpected pattern among Hong Kong Chinese was only observed in one dependent variable across three games, so it is unclear about how reliable this regional difference is. Future research should further investigate whether this regional difference is reliable. I will also discuss the possible regional differences in East Asian societies in further detail in the general discussion.

CHAPTER 5

General Discussion

In this dissertation, I examined the role of culturally specific thinking styles—analytic versus holistic—on resource allocation to address a few major questions. The first question was whether analytic versus holistic thinking styles would affect the process and the final resource allocation outcome. I found that participants, regardless of their cultural backgrounds, were more likely to concentrate their allocation at the focal places than the non-focal places; however, Hong Kong Chinese, who are holistic thinkers, were more likely to scatter their allocation to the non-focal places compared with their counterparts in Canada (Study 1). The second question was whether the influence of analytic versus holistic thinking styles on resource allocation pattern could be supported by direct evidence through experimental manipulation. I manipulated holistic and analytic thinking styles, and found that the manipulated thinking styles influenced participants' allocation of resources in the predicted direction: those assigned to the holistic thinking style condition distributed their resources more evenly to different places whereas those assigned to the analytic thinking style condition distributed their resources less evenly, and concentrated their allocation to focal places. Also, the manipulation of thinking styles made the cultural variation obtained in Study 1 disappear (Study 2). The third question was whether East Asians, who are holistic thinkers, would be more sensitive to subtle contextual change while allocating their resources. Consistent with the previous research showing that East Asians are more sensitive to the change in the contexts than North Americans, European Canadians reacted similarly across three games between two subtle contextual change manipulations (change present vs. change absent) whereas Japanese reacted differently to the manipulations, though the manipulation effect was not consistently found in three games (Study 3).

### **Cultural and Decision Making**

Although there are some cross-cultural studies examining the process of decision making (e.g., Strohschneider & Guss, 1999; Wustenberg, Greiff, Molnar, & Funke, 2014) and some research on the final decision making outcomes (e.g., Briley, Morris, & Simonson, 2000; Ji, Zhang, & Guo, 2008; Lindridge & Dibb, 2003; Maddux & Yuki, 2006; Tse, Lee, Vertinsky, & Wehrung, 1988), these studies did not examine the causal roles of specific cultural factors in the observed cultural variations in decision making processes. By focusing on resource allocation tasks, the current dissertation compared the perceptual processes (judgment of attack probability) and final outcome of resource allocation (soldier allocation pattern) between the Hong Kong Chinese (holistic thinkers) and European Canadians (analytic thinkers) (Study 1) and further tested the explanatory link of analytic versus holistic thinking styles by manipulating thinking styles in two cultures (Study 2). I found consistent patterns in Studies 1 and 2, in which Hong Kong Chinese who are members of a holistic culture, as well as European Canadians reminded to think holistically, are more likely to allocate resources more evenly to different places whereas European Canadians who are members of an analytic culture, as well as Hong Kong Chinese reminded to think analytically, are more likely to concentrate the resource allocation at the focal places.

Cross-cultural studies usually focus on cultural variations; however, some researchers proposed that investigators need to consider the dynamics of cultural variations (e.g., Norenzayan et al., 2002; Masuda & Kitayama, 2004), i.e., both culturally universal and specific patterns. This dissertation revealed culturally universal patterns in three studies, in which participants, regardless of their cultural backgrounds, tend to pay more attention to the focal places. Consistently in cross-cultural research in perceptual-cognitive research (e.g., Chua et al.,

2005; Masuda & Nisbett, 2006; Senzaki et al., 2014) and information searching processes (Li et al., 2014), people, regardless of their cultural backgrounds, pay more attention to important information (focal information) than less important information (contextual information). While adopting this default strategy, people's decision making are also influenced by their cultural experiences. Holistic thinking style, which is more prevalent in East Asian cultures, encourages people to pay attention to the non-focal places due to the adoption of non-linear logic, whereas analytic thinking style, which is more prevalent in North American cultures, promotes concentration on the focal places due to the adoption of linear logic.

To summarize, this dissertation provided evidence demonstrating both universal and culturally specific patterns in decision making processes. This adds to our knowledge of cultural similarities and variations, and eventually helps to deepen our understanding of culture through answering the question of when and how culture modifies people's strategies across situations.

### **Implications**

#### **Implication for Manipulation Studies**

Experimental social psychologists have developed numerous manipulation paradigms to test the influence of situational demands. More often, psychologists use manipulation paradigms to provide evidence for causality. This is also done in the field of cross-cultural psychology, where many researchers have used manipulation paradigms to obtain evidence for the cultural influence in modifying people's behaviors and psychological processes (e.g., Aaker & Lee, 2001; Briley & Wyer, 2001; Gardner et al., 1999; Kimmelmeier, 2003; Levine et al., 2003; for a review, Oyserman & Lee, 2008). Usually, these studies were conducted by recruiting participants from the same culture and experimenters randomly assigned participants into different manipulation conditions (e.g., Briley & Wyer, 2002; Gardner et al., 2004; Yuki, Sato, Takemura,

& Oishi, 2013). One assumption is shared among these studies: the manipulation would be effective in a similar way to participants from different cultures. However, prior studies showed this assumption might not always hold. For example, some findings showed that participants' knowledge and experiences prior to the experiments may moderate the manipulation effect, in that the manipulation is stronger in the group with prior experiences being activated in the manipulation but ineffective to other groups that had little prior experience (e.g., Alter & Kwan, 2009; Mortensen et al., 2010). In certain cases, people's experience with a culture may lead them to exhibit patterns in opposition to what the manipulation had intended (i.e., contrast effect; e.g., Benet-Martínez et al., 2002).

In Study 3, Japanese, who were more sensitive to the demands of the contexts, changed their strategies according to the presence of change or stability in the contexts. In contrast, European Canadians behaved similarly across all manipulated contexts. Consistent with previous research (e.g., Li et al., in press; Masuda & Kitayama, 2004; Zhou et al., 2012), East Asians are more likely to show greater variations across the manipulations, especially in those manipulation paradigms that require high context-sensitivity, than North Americans. Given that we obtained consistent patterns in the current manipulation studies, it is tempting to conclude that the manipulated factor is universally true across cultures. However, as demonstrated in prior work and this dissertation, future researchers need to be careful about potential significant interactions of culture and manipulation paradigms in predicting their interested dependent variables.

### **Implication for Cross-Cultural Research**

Psychological studies are mainly conducted in North America, in which researchers mostly recruit participants from Western, educated, industrialized, rich and democratic (WEIRD) societies, particularly American undergraduates, so the existing data may not be able to fully

represent people from all over the world (Henrich, Heine, & Norenzayan, 2010). Cross-cultural psychologists conduct studies in different cultures and investigate cultural similarities and variations in behaviors and psychological processes, which contributes to a more comprehensive understanding of human psychology. However, prior cross-cultural psychological research mainly focuses on the comparison between the East (e.g., Chinese, Japanese, and Koreans) and the West (e.g., European Americans, British, and Canadians) (e.g., Markus & Kitayama, 1991; Hamamura et al., 2009; Ji et al., 2008; Masuda et al., 2008). There are only a limited amount of studies examining the regional differences within East Asian (e.g., Talhelm et al., 2014; Tse, Belk, & Zhou, 1989; Yates, Jun, Oka, Lee, Shinotsuka, & Sieck, 2010) and within North America (e.g., Nisbett & Cohen, 1996).

Despite the fact that we usually categorize various East Asian cultures (Chinese, Japanese and Koreans) as a similar cultural group and Canadians and Americans as a similar cultural group for theoretical purposes, there are some nuanced differences in different domains, such as socio-ecological characteristics and exposure to single or multiple cultural values, among different societies in the same region. For example, East Asian cultures differ in their socio-economic developments: Japan, South Korea and Hong Kong are considered to be developed economies whereas mainland China is considered to be a developing economy. Previous research has found that socio-economic developments affect people's behavior and psychological tendencies, such as happiness (Inglehart, 1997) and decision making processes (Hartung, 2002). For instance, Li, Masuda and Feng (2015) found that, despite the fact that Hong Kong Chinese and mainland Chinese share similar cultural meaning systems, mainland Chinese were less indecisive than Hong Kong Chinese because the perception of rapid socio-economic changes made mainland Chinese optimistic about their future.

Study 3 in this dissertation further suggests another nuanced difference in East Asian societies – Japanese were more context-sensitive than Hong Kong Chinese despite the fact that they are both holistic cultures in terms of intellectual and cultural tradition, and share comparable socio-economic development status. Even more surprisingly, Japanese and Hong Kong Chinese reacted differently to the change in the context. One possible reason would be that Hong Kong Chinese are more bicultural than Japanese, which makes Japanese show a greater influence of traditional East Asian meaning systems in their cognitive styles and responses. Hong Kong has been ruled by Britain for 150 years, which has made Hong Kong culture a fusion of Eastern and Western cultural elements. Hong Kong people are frequently exposed to both Eastern and Western cultural meaning systems, which makes both cultural meaning systems readily accessible in their minds (e.g., Hong, Morris, Chiu, & Benet-Martínez, 2000). This may reduce the influence of East Asian cultural meaning systems on Hong Kong Chinese. Another possibility is that the history of warfare in China is more complicated than that in Japan. Larger scales in both military force and battlefields in China allowed Chinese to develop more complicated mindsets about war. This mindset may have been transmitted to Hong Kong Chinese through history classes or stories about war, and can potentially get at the differences between the two East Asian cultures in Study 3.

This dissertation suggests that future research should consider recruiting more than one cultural group in East Asia or North America to further examine how various factors, including cultural thinking styles, contemporary socio-economic development and historical development, may interplay to affect people's psychological processes. As suggested by Norenzayan and Heine (2005), this triangulation method would contribute to disentangle the influence of different cultural and societal factors by comparing cultures that are similar in one dimension but different

in another dimension. In addition, this dissertation may also have some insights for which cultural groups should be recruited to maximize/minimize the chance of detecting cultural influences. For example, if one plans to do cultural comparisons between the East and the West, one perhaps should recruit participants from the cultures that are more stable and mono-cultural to reduce all other potential confounding factors. In contrast, if one plans to activate Eastern and Western cultural mindsets, one should recruit participants from the cultures where more than one cultural meaning system is promoted.

### **Implication for Applied Research**

The current dissertation does not only have theoretical implications, but also provides some implications for applied research, such as business studies. The current research only used one scenario – war game – and found systematic cultural variations in resource allocation strategies, which may lead to a concern of generalizability, but it is believed that the findings in resource allocation strategies in a war game can extend to other domains. For example, the current research may provide some insights for facilitating intercultural negotiation. With the great increase in the number of international firms all over the world, an increased demand on international/intercultural communication research has occurred. Previous research found that inter-cultural negotiation usually results in lower joint gains than intra-cultural negotiation (e.g., Adair & Brett, 2005; Adair, Okumura, & Brett, 2001). In addition to the cultural difference in communication styles, the current findings suggest that cultural variation in resource allocation strategies may also be important. For example, while North Americans primarily spend their time on discussing the most important terms, East Asians are motivated to discuss less important terms. The cultural difference in strategic focus of their negotiation may lead to

misunderstandings or frustrated feelings during negotiation, which results in low efficiency and effectiveness in the intercultural negotiations.

### **Limitations and Future Directions**

There were some limitations in the current research. Firstly, the current research examined how people reacted in a one-shot game, which may hinder the generalizability of the findings to daily decision making situations, which would require modifications based on the updated current situations. For example, people need to change their resource allocation in the stock market frequently in order to maximize the chance of earning profits. Although participants engaged in three games in Study 3, they did not have the constant amount of resources across games, which made it hard to compare whether participants changed their strategies across trials. Further studies should observe how people from analytic versus holistic cultures might change their strategies across continuous trials. For example, similarly to what is experienced in real-life decision making, participants will be given the feedback of their resource allocation at the end of each trial. Indeed, prior work suggested that people shift their strategies between when they engage in a one-shot game and when they engage in multiple-shot games (e.g., Kiyonari, Tanida & Yamagishi, 2000). We can observe how motivated or hesitant participants from different cultures would be to modify their previous resource allocation.

Finally, I only recruited European Canadians, a representative group of analytic cultures, Hong Kong Chinese and Japanese, two representative groups of holistic cultures (and Japanese are more holistic than Hong Kong Chinese); however it is not clear whether this finding also applies to other analytic/holistic cultures. For example, would mainland Chinese, a holistic culture with different socio-economic development, have a similar resource allocation pattern? Future research should further replicate the obtained pattern in other analytic/ holistic cultures.

### **Conclusion**

Decision making, a task that no one can avoid in daily life, was examined in this dissertation. To understand the decision making processes and final outcomes people made, I used a cross-cultural psychological perspective by focusing on the role of two culturally specific thinking styles: analytic and holistic thinking styles. I found consistent evidence supporting that cultural influences on perceptual-cognitive processes also extend to decision-making processes, in which East Asians from holistic cultures (or someone with a holistic thinking style) are more motivated to disperse their resources than North Americans from analytic cultures (or someone with an analytic thinking style) in three cross-cultural comparison studies. In addition, I contend that it is important to replicate the manipulation effect across cultures because of the fact that nuanced pre-existing knowledge cultivated by cultures may make people from one culture react differently from another culture to the same manipulation. I believe that this approach allows us to detect more nuances for the dynamics of culture.

## Endnotes

1. The assumption of sphericity was violated, so the results generated by Multivariate test were reported in Studies 1 to 3.
2. The main effect of culture was also significant,  $F(2, 227) = 14.63, p < .001, \eta_p^2 = .11$ . Follow-up analyses showed that Japanese participants ( $M = 2.68, SD = 1.44$ ) perceived the location to be significantly less predictable in general compared with Hong Kong Chinese participants ( $M = 3.39, SD = 1.32$ ), and European Canadian participants ( $M = 3.61, SD = .87$ ),  $ps < .001$ , and there was no difference between Hong Kong Chinese and European Canadian participants,  $p = .65$ . Moreover, there was also a significant interaction of manipulation and culture,  $F(1, 227) = 8.27, p < .001, \eta_p^2 = .07$ . When the interaction was unpacked by examining the manipulation effect in each culture, the effect of manipulation was significant in all cultures but the manipulation effect was strongest among European Canadians [European Canadian:  $F(1, 72) = 120.71, p < .001, \eta_p^2 = .63$ ; Hong Kong Chinese:  $F(1, 81) = 46.03, p < .001, \eta_p^2 = .36$ ; Japanese:  $F(1, 74) = 40.53, p < .001, \eta_p^2 = .35$ ]

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