5-2005

Bilingual consumer memory in the advergaming context: A cross-script comparison

Monica D. Hernandez
University of Texas-Pan American

BILINGUAL CONSUMER MEMORY IN THE ADVERGAMING CONTEXT:

A CROSS-SCRIPT COMPARISON

A Dissertation

by

MONICA D. HERNANDEZ

Submitted to the Graduate School of the
University of Texas-Pan American
In partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

May 2005

Major Subject: International Business

BILINGUAL CONSUMER MEMORY IN THE ADVERGAMING CONTEXT:

A CROSS-SCRIPT COMPARISON

A Dissertation
by
MONICA D. HERNANDEZ

Approved as to style and content by:

Michael S. Minor
Chair of Committee

Vern Vincent
Committee Member

Chiquan Guo
Committee Member

Jerwen Jou
Committee Member

May 2005

ABSTRACT

Hernandez, Monica D., Bilingual Consumer Memory in the Advergaming Context: A Cross-Script Comparison. Dissertation, Doctor of Philosophy in Business Administration (PhD), May 2005, 138 pp., 52 tables, 18 figures, 75 references.

Written language is the core of culture and central to marketing communications. The differences in language processing exhibited by Eastern/Western bilingual consumers are of great concern for global and multinational companies wishing to effectively promote their products through the Internet. Advergaming is a promotional method consisting of the delivery of advertising messages through electronic games. Despite recent scholarly interest, no previous research has compared brand memory across groups of bilinguals of different writing systems or scripts in the advergaming context.

The dissertation investigated differences in brand memory of bilinguals of languages based on different scripts. Specifically, a logographic-based language (Chinese), a biscriptal language (Korean), and alphabetic-based languages (English and Spanish) were investigated. The purpose was to compare differences in brand recall and recognition across groups of bilinguals from China, Mexico, South Korea and the United States. Since high arousal levels might negatively influence cognitive capacity as generated by emotional intensity, the effect of arousal was also examined.

The data collection procedure involved a series of international experiments. The experimental stimuli consisted of designated exposure to selected advergames. Following the gameplay in experiment 1, data was collected through translated surveys. In experiment 2, data was collected during the gameplay with aid of an electrocardiogram machine, and after the gameplay via self-reported measures of arousal.

Four hundred subjects participated in experiment 1. Contrary to expectations, results indicated that alphabetic and biscriptal participants outperformed logographic participants. The main finding confirmed that second language proficiency is a key concept that should be included when comparing East/West bilingual consumers' memory. Familiarity with brands was also a factor affecting both recall and recognition scores, indicated by significant differences among groups.

Thirty additional subjects representing the script groups of interest participated in experiment 2. Triangulation of measures indicated that the physiological (heart rate) measures impact was the most salient. The most robust finding was the negative effect of physiological measures on recall scores.

In sum, the effect of script, second language proficiency, prior brand familiarity and arousal in short-term brand memory was uncovered, in order to provide guidelines for an effective use of brand placements in advergames.

DEDICATION PAGE

To my husband Manuel and our son Alex.

To my parents Carlos and Carmen.

ACKNOWLEDGEMENTS

I want to thank to Dr. Michael Minor who not only served as my committee chair but also as a great mentor. I want to express my profound gratitude to Dr. Minor for encouraging me through the academic program as well as for his guidance toward my future academic life.

I am thankful to my committee members Dr. Vern Vincent, Dr. Chiquan Guo and Dr. Jerwen Jou. I want to thank them for all their support and the opportune guidance that made the writing of this dissertation possible.

I would like to thank Dr. Jaebeom Suh from Kansas State University whose support made possible the completion of the data collection procedures in Korea. I also want to express my gratitude to Jung Woo from Yonsei University at Seoul, South Korea for his collaboration with the data collection for the main study. I want to thank Yong Jian Wang for his collaboration with the data collection for both the pilot and main study at Quindao, PRC. I'm thankful to Karla Garcia de Gomez from Universidad La Salle at Ciudad Victoria, Mexico. I want to thank Karla for her help with making the data collection possible for both the pilot study and main study in Mexico.

I thank Mr. Rick Gray, director of the Student Health Services for providing access to an EKG machine, and Claudia Garza for the training in EKG use.

Lastly, thanks to my parents, sisters and in laws for their support. Thanks to my husband for his encouragement and patience.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Page

CHAPTER 1

INTRODUCTION

Cultural content (attitudes, values and behaviors) has been the main focus of cross-cultural consumer and advertising research, whereas enduring structural issues (e.g. language) have attracted less attention. The differences in language structures between the Far Eastern and Western languages are of interest because these differences influence consumer memory of verbal information (Schmitt, Pan, and Tavassoli 1994), and consumer information processing (Tavassoli 1999). The difference in ad processing exhibited by bilingual consumers is another recently explored aspect on language research. Taken together, both areas are of main concern for global and multinational companies wishing to effectively promote their products through the Internet.

One promotional method that is increasingly attracting attention is advergaming. Advergaming is the delivery of advertising messages through electronic games. Advergames aim to build brand awareness, to offer product information, and to provide a means to compare similar products, with the purpose of developing lasting exchange relationships with the customers (Hernandez and Minor 2003). Advergames offer a unique environment in which the use of language is minimized, usually being limited to brand names display. In addition, the extensive exposure to the brands is a distinctive feature offered by this technique.

Research Problem

Previous work on consumer bilingualism by Luna and Peracchio (1999, 2002b, 2002c) has mainly focused on the application of psycholinguistic models (based on Western bilinguals) to processing by Spanish/English and English/Spanish bilinguals, both of which are Western languages based on alphabetic script. Moreover, previous work by Zhang and Schmitt (2001) on Eastern/Western differences in recall by bilingual consumers has not been conducted in an online setting. In addition, Zhang and Schmitt's (2004) study on the role of language proficiency has been conducted between natives of two languages. Thus, there is a need to assess the effectiveness of online advertising across multiple groups of bilingual consumers.

In particular, no previous research has been conducted to compare interactive ad processing by bilinguals of different writing systems in online settings. Specifically, brand recall and brand recognition across groups of bilinguals in the advergaming context have not been empirically compared.

Research Purpose

The present study intends to investigate differences in bilingual consumer memory of advertising by natives of distant languages, including logographic based languages (such as Chinese), biscriptal (a language based on both logographic and alphabetic scripts) language (such as Korean), and alphabetic languages as well (such as Spanish and English). The purpose of the study is to empirically evaluate differences in the effect of second language (hereafter, L2) proficiency on brand recall and brand recognition of several groups of bilinguals of different scripts. Specifically, recall and recognition scores by natives of Korean, who also speak English (based on alphabetic script) as an L2, would be compared against groups of Chinese (a logographic script) and English bilinguals, in addition to groups of Spanish/English and English/Spanish bilinguals (both languages based on alphabetic script).

This purpose is accomplished by assessing the effectiveness of the display of brands in online games -via brand recall and brand recognition- across groups of bilinguals from four countries: China, Mexico, South Korea and the United States.

Glossary of Linguistic Terms

The use of linguistic terms throughout the text is extensive. For the unfamiliar reader, this section contains a glossary of these terms.

Biscript. The use of both alphabetic and logographic scripts or writing systems within the same language (Tavassoli and Han 2001).

Ideograph. A character in a writing system that represents some idea and is a picture of some object related to that idea (Akmajian et al. 1990).

Lexicon. A listing of all the words in a given language, each with its form, its meaning, and its part-of-speech classification (Akmajian et al. 1990).

Lingua franca. Trade language; a language that is used by general agreement as the means of communication among speakers of different languages (Akmajian et al. 1990).

Logograph. A character in a writing system that represents a complete word (Akmajian et al. 1990).

Morpheme. The minimal unit of word building in a language. Any part of a word that cannot be broken down further into meaningful parts (Akmajian et al. 1990).

Phonology. The subfield of linguistics that studies the structure and systematic patterning of sounds in human language (Akmajian et al. 1990).

Pictograph. A character in a writing system that represents some object by a schematic, physical representation of that object (Akmajian et al. 1990).

Psycholinguistics. A subfield of linguistics whose goal is to discover the psychological principles that underlie the human's ability to comprehend, produce, and acquire language (Akmajian et al. 1990).

Semantics. The study of meaning, reference, truth, and related notions (Akmajian et al. 1990).

Significance of the Research

There are an estimated 1.3 billion people speaking English as an L2 (Luna and Peracchio 2003), although there are only 341 million native English speakers (World Almanac & Book of Facts 2003) around the globe. These figures put English in third place among the most spoken languages in the world. Globalization and the Internet reinforce the need to become bilingual.

Several large groups of bilingual consumers around the world have been identified. By 2000, the most spoken language in the world was Mandarin. According to the World Almanac & Book of Facts (2003), taking in consideration L1 speakers only, an estimated 874 million people speak Chinese (Mandarin). Moreover, an estimated 410,000 foreign students in China have studied Mandarin as an L2 over the past 10 years, increasing at an average annual rate of 35 percent (Martin 2003). In addition to the educational setting, Tsang (2002) cited that privately owned Chinese businesses make up the world's fourth economic power after North America, Japan and Europe. He also claimed that Chinese entrepreneurs have been dominating the economies of Hong Kong, Taiwan, Singapore, and most other Southeast Asian countries. Thus, the necessity to become Chinese/English bilingual will increase as overseas Chinese enterprises compete with enterprises from the triad nations.

Additionally, the inclusion of China into the study is central because the number of Chinese Internet users reached 80 million as of June 2004, and it is expected that the 153 million Chinese online users will surpass the number of American users by 2006 (Green & Sager 2004). Probably motivated by the absence of video game consoles (e.g. Sony's Playstation) due to the piracy problem of the country, the Chinese online potential game market promises to be the largest in the world with projected revenues up to $127 million by 2006 (Wallace 2004).

Other rapidly increasing large bilingual segments are located in the Americas. Spanish occupies the fourth position in the most spoken languages in the world, with an estimate of 358 million L1 speakers (World Almanac & Book of Facts 2003). The merging of economic groups, the Southern Common Market (MERCOSUR) and the South American Free Trade Area (SAFTA) with the North American Free Trade Agreement (NAFTA) by 2010, and the expected increase in the Hispanic population in the United States will also increase the necessity to be Spanish/English bilingual (Martin 2003).

The inclusion of a Mexican sample is also important to the study because the number of Mexican Internet users has exceeded 4.6 million, ranking second after Brazil in the number of users among Latin American countries and possessing the largest number of Internet users speaking Spanish in Latin America (Instituto Nacional de Estadística, Geografía e Informática 2003).

Another important bilingual segment is located in South Korea. In particular, South Korea recognizes the importance of English for advancing economic growth after the economic crisis and for maintaining the nation's competitiveness, made mandatory by globalization and the Internet. South Koreans introduced English conversation for elementary schools in 1997, in addition to making English one of the most important subjects in university entrance exams. This occurred as a result of consideration of the possibility of the adoption of English as an official L2 (Jung 2000).

Although Korean language ranks only tenth in the most spoken languages in the world with an estimate of 78 million native speakers (World Almanac & Book of Facts 2003), the inclusion of South Korea is important in this study because the Korean online connectivity phenomenon seems to have no precedent in the world. By 2002, South Korea possessed the largest high-speed Internet market penetration in the world (French 2002). An estimated 11 million or 70 percent of Korean households possess broadband connections (Fulford 2003). In comparison, the broadband share of Internet-connected households in the United States by October 2004 is 51.3 percent (Web Site Optimization 2004).

Electronic game playing has extended to South Koreans of all ages and it is no longer considered to be just for the youthful population. About 55 percent of game players are 21 to 30 years old (Vikas 2003). The gender disparity is also declining, with 36.5 percent of gamers being female (Kushairi 2003).

Examination of processing of advertising in an L2 by bilingual consumers is acquiring importance as consumer markets are increasingly global, coupled with rapidly growing segments of Internet users speaking more than one language. In particular, companies wishing to target the half of the current Internet users speaking English as L2 are concerned with the effects of memory on attitudes and product evaluation (Luna, Peracchio and De Juan 2003).

In sum, the dissertation contribution will impact several knowledge areas. Because of the large bilingual segment in the countries involved in the study, and its basis on psycholinguistics framework, the study will make a significant contribution to both consumer behavior and advertising, specifically in the area of international Internet advertising. Previous research by Zhang and Schmitt (2001) suggested the examination of differences in the information processing of logo brands by alphabetic versus logographic bilinguals of other languages than Chinese and English. Additionally, Zhang and Schmitt (2001) also suggested the examination of the interaction with nonlinguistic visual elements, in particular logos and symbols. Zhang and Schmitt (2004) stressed the need to include the level of language proficiency as a cognitive factor, as well as suggested the possibility to test memory on online setting. Thus, by the provision of empirical cross-script evidence in a graphic and highly interactive environment, the present dissertation intends to follow these suggestions and to provide guidelines into an effective use of visuals in conjunction with brand names in order to build memorable brands among the diverse Internet audience. In addition, the study is among the earliest to investigate advergaming in detail.

Dissertation Outline

The remaining parts of the dissertation are organized as follows. Chapter 2 presents the literature review. The bilingualism conceptual framework, the East-West script differences framework, research on East-West bilingual consumerism, the advergaming framework, and the effects of familiarity and arousal in cognitive measures are presented.

The research methodology is presented in Chapter 3. This chapter focuses on how the research questions would be empirically tested. Research objectives, research hypotheses, analytical methods, experimental stimuli, and for each experiment its sampling procedure, data collection procedure, and measures are described.

Chapter 4 includes the experiment procedures, samples description, recall and recognition data analyses, and discussion of the results obtained from the experiment 1. Additional exploratory analyses on false positive responses in both recall and recognition tests are also included.

Description of the experiment procedure, sample, data analysis, and results obtained from the experiment 2 follows in Chapter 5. Discussion of the results is also provided in this chapter.

General discussion about the findings, limitations and directions for future work are integrated in Chapter 6.

Appendix A contains the brand recall survey designed for experiment 1. Appendix B contains the brand recognition survey designed for experiment 1. Appendix C contains the survey designed for experiment 2. Appendix D contains the instructions for the selected advergames as the experimental stimuli.

Results of the pilot study are presented in Appendix E. This appendix describes the procedure, data analysis, and results obtained from the pilot study conducted with data from two Far-Eastern countries and two Western countries. Details on measures, samples, results of the multivariate analyses performed, recall-recognition relationship, and discussion of the findings are provided in this appendix. Appendix F contains an alternative ANOVA analysis for previous familiarity with brands. Lastly, appendix G contains a regression analysis for previous familiarity with brands.

CHAPTER 2

LITERATURE REVIEW

Consumer Bilingualism

The large segment of people speaking English as an L2 around the globe in conjunction with increasing globalization and the Internet reinforce the need to become bilingual. A broad definition of bilingualism involves all individuals who actively speak more than one language, even if they are not fluent in an L2 (Kroll and De Groot 1997). English is considered the lingua franca of the Internet, with an estimated projection of only one-third of users being English native by 2004 (Crocket 2000).

The seminal work by Luna and Peracchio (1999) was based on two psycholinguistic models, the Revised Hierarchical Model (RHM) (Dufour and Kroll 1995) and the Conceptual Feature Model (de Groot 1992). The conceptual work presented by Luna and Peracchio (1999) derived a series of propositions regarding the effect of individual and message level variables on memory and comprehension of ad content. Specifically, from the former model, motivation, cue centrality, and graphic congruity were proposed to moderate language effects on ad effectiveness. From the later model, ad concreteness was added as a moderator of the same effects.

Processing of printed advertisements by Spanish-English bilingual consumers has been examined by Luna and Peracchio (2001). By comparing memorability of ads, Luna and Peracchio (2001) concluded that L1 stimuli exhibited superiority in recall over the L2 stimuli. In particular, a high level of graphic-text congruity was found helpful in the processing of L2 advertising messages. Additionally, congruity led to increasing memory for L2 advertising messages.

Luna and Peracchio (2002a) conducted a study with Spanish/English speakers in online settings, and found that evaluation of web sites containing information presented in L2 was enhanced by congruent graphics with the verbal content. However, evaluation of web sites containing information presented in L1 was favored when low congruity existed. Thus, there was a difference in processing of verbal and visual information if the information was presented in L1 or L2.

Based on the Conceptual Feature Model, a bilingual lexico-semantic representation, Luna and Peracchio (2002b) proposed that a word association task helps to identify the dual nature of bilinguals' cognitive structures and the degree in which it differs. Word association tests request an individual to list the thoughts he has when thinking about a particular, word, concept, or idea. The methodology proposed was derived from Spanish/English bilinguals.

Founded on the cognitive framework of the Revised Hierarchical Model, Luna and Peracchio (2002c) assessed the impact of motivation (intrinsic and extrinsic) on both L1 and L2 processing of cognitive measures of printed ad effectiveness. The findings indicate that L2 ads could also lead to levels of memory similar to those of L1 ads due to high motivation exhibited by the Spanish-English bilingual consumers.

A series of studies by Luna, Peracchio and De Juan (2003) supported the notion that graphic and cultural congruity facilitates L2 processing and boosts positive attitudes in online settings for Spanish-English bilinguals. The studies included the formation of attitudes toward a web site and toward the products offered.

East-West Script Differences

Two major types of writing systems or scripts have been distinguished (Akmajian et al. 1990). Far Eastern languages, such as Chinese, are based on logographic scripts. The basic unit of logographic scripts is the character, which is composed of an arrangement of strokes that is ideographic or pictorial in its origins. Far Eastern languages are structurally different from the alphabetic systems used in Middle Eastern and Western languages, such as those employing the Arabic, Hebrew, Cyrillic and Latin alphabets (Tavassoli 2003). In particular, Western languages such as English are based on the Latin alphabet consisting of symbols representing sounds. The basic unit of alphabetic scripts is the letter, which is composed of simple strokes.

Chinese characters are used not only in the Chinese language but also in Japanese, Korean, and Vietnamese. New scripts were invented in these latter languages over time and they are used either in addition to or interchangeable with Chinese characters (Fairbank, Reischauer, and Craig 1973). Therefore, these languages incorporated both alphabetic and logographic scripts. In particular, the Korean language utilizes both Hancha script, based on Chinese characters, and Hangul script, based on an alphabetic script. The invention of a Korean phonetic system -known today as Hangul- was the most remarkable intellectual achievement during the early Yi dynasty (1392-1910). Hangul, meaning Korean letters, was developed by the Hall of Talented Scholars in 1443 under the direction of King Sejong. Hangul had two purposes, to indicate the Korean pronunciation of Chinese characters and for writing the native language. Uses for Hancha and Hangul were specialized. Chinese was used in written form (Hancha) and for purposes of scholarship and government, while Hangul was used only for explicating Chinese texts and for writing native songs (Fairbank, Reischauer, and Craig 1973).

Previous consumer research addressing differences in writing systems have compared one Eastern language versus one Western language. Schmitt, Pan, and Tavassoli (1994) compared Chinese and English, and they found that Chinese consumers recalled better when the visual memory instead of the phonological memory evidence was retrieved. In contrast, English native speakers seem to be more likely to recall information when the phonological trace is accessed compared to the visual trace.

Tavassoli (1999) also compared Chinese and English, concluding that differences in information processing result from relative differences in dependence on short-term memory components. In particular, (1) differences in the primacy of phonological versus semantic access were found, (2) the phonological mental code for both spoken and written information was relatively more pronounced in English, whereas the visual and/or semantic code was relatively more pronounced in Chinese, and (3) differences were also found in contextual processing, which was more pronounced in Chinese.

Tavassoli and Han (2001) compared the basic processing of Korean Hancha and Hangul. A difference was found in that spatial memory is better for logographic words (Hancha) than for the same word written in the alphabetic script (Hangul). Tavassoli and Han's (2001) findings suggested that organization of a layout could affect the efficiency of information search. In particular, it was found that the consistency in the design of Web pages played a more significant role for logographic script (Hancha).

Tavassoli and Han (2002) examined interference from nonverbal information and its reciprocal, the integration in memory of words with nonverbal information. A series of experiments tested recall of words written in Korean Hangul and Hancha, preceded or followed by background music or simple graphics, which were presented as distractors. Irrelevant sound was found more distracting in alphabetic ads, whereas irrelevant images were more distracting in logographic ads. Memory with pairings with auditory representations was better than when these were paired with brand names written in Hangul. On the other hand, memory with pairings with visual representations was found better when paired with brand names written in Hancha. Findings also held when tested among Mandarin/English and Cantonese/English subjects.

East-West Bilingual Consumers

Hung and Heller (1998) explored the way Chinese/English bilinguals reported their perceptions of brands placed in television commercials. The image that viewers associate with the advertised brand and two attitudinal measures were tested in Chinese only, English only, and bilingual questionnaires. Bilinguals were found processing some marketing stimuli in their L1 and other marketing stimuli in their L2. A shift from their L1 to their L2 occurred when the brand perception (i.e. image) had a strong international influence. For instance, subjects might have associated fashion with international sources, and consequently, with their L2.

Translation from an alphabetic script into a logographic script offers three possibilities for brand name creation (Zhang and Schmitt 2001). The first possibility is a phonetic translation, in which the sound of the original name is preserved. For instance, the Chinese brand names for Mou-tuo-luo-la, Si-wo-qi, De-fu and Ai-ke-sen sound like Motorola, Swatch, Dove and Exxon, respectively. However, the translated brand names have no specific meaning in Chinese.

Semantic translation is a second possibility, in which whether the lexical meaning of the original brand name is preserved or new brand associations are created. Xi-bei is the brand name used by Northwest Airlines, which is translated to "northwest", and Lian is the brand name used by United Airlines, which means "put together". Purely semantic translation is possible if the original name is a lexicalized item in the dictionary, such as Wei-ruan, the brand name used by Microsoft, meaning "micro (tiny) soft".

Third, a phonosemantical translation is possible by preserving the sound of the original name and brand associations are created. Qiang-sheng is the brand name in Chinese used by Johnson & Johnson's. Qiang-sheng sounds like the English name and translates to "strengthen the life", which is the desired image for most products of this company. Another example of phonosemantical translation is Ke-kou-ke-le, which is the Chinese name for Coca-Cola meaning "tastes good and makes you happy."

Using Chinese and English languages, Zhang and Schmitt (2001) tested the effectiveness of the translation using the three possibilities mentioned. The findings revealed that the original emphasis on English and the method of translation used determine the effectiveness of translation.

Advergaming

Electronic games are gaining recognition as a new, captivating and persuasive environment among advertisers and companies. The increasing popularity in online electronic games is without precedent. The online games audience exceeded 50 million in 2002, and by 2005 it is expected to reach more than 80 million (Fattah and Paul 2002).

Online games involve consumers in ways not possible with the traditional promotional methods used on the Internet, such as banners and pop-up windows. Most of the banners are simply ignored (Olsen 2001; Rodgers 2002). Pop-up windows seem to be more disturbing than attractive (Jackson 2001). Although web linkage -the ability to quickly jump from one webpage to another- is considered the strongest capability of the Internet, this ability also inhibits the retention of consumers for any useful span of time and represents a weak method for advertising.

In contrast, online games maintain the player's full attention during the time the game is being played, creating an excellent niche for advertisers. In 1999, the average electronic player spent approximately 6 hours a week using a video game console, and 10 hours a week using the Internet (Nielsen Media Research 2002). According to YaYa (2002), the number of hours playing video games is estimated 13 hours a week.

Youn, Lee and Doyle (2003) profiled American adult online players. Demographically, online players are younger, better educated, and better off financially than non-players. No gender difference was found. Psychologically, players were found more innovative, more impulsive, variety- and fun-seeking, and less risk-adverse than non-players. Additionally, online players engage more often in word of mouth communication with peers.

Traditionally, electronic game play had long been considered male dominant. However, in conducting a series of international experiments in Mexico, Peru and the

United States, Hernandez and Chapa (2004) found that contrary to this long-established belief, both male and female Hispanics show similar attitudes toward advergames.

Two alternative models have been proposed listing antecedents to the formation of attitudes toward advergames. The proposed model by Youn and Lee (2003) integrated escapism, competition, boredom relief, and fun as antecedents toward positive attitudes, whereas curiosity was identified as an antecedent toward negative attitudes. Identified consequences of attitudes included attitude toward the site, relationship building, and purchase intentions.

The proposed model by Hernandez, Chapa, and Minor (2004) included negative aspects that might lead to negative attitudes, such as incongruity, lack of entertainment value, intrusiveness, and irritation. Further, Hernandez et al. (2004) empirically tested this model of the antecedents to negative attitudes toward advergames through a series of international experiments. Overall, Latin Americans exhibited positive attitudes toward advergames. Hernandez et al. (2004) found that intrusiveness was the factor accounting for most of the negative attitude toward advergames. Lack of ad congruence, referring to the atypical ads falling outside expectations, was found to be precursor of intrusiveness. Interestingly, the more intrusive the ads in games were perceived, the less irritating they were rated.

Recent scholarly studies have addressed the effectiveness of product and brand placements in electronic games via assessment of brand recall and attitudes toward brand placements. Nelson (2002) addressed short- and long-term brand recall and attitudes toward brand placements in commercial games among a small group of American players. Findings revealed that players were able to recall 25 to 30 percent of brands in the short term and about 10 to 15 percent in the long run. Brands demonstrated recall superiority when they were a major part of game-play, when they were local, new or atypical brands, or relevant to the player. Overall, attitudes toward product placements were positive, depending on whether the brand made sense to the game or not.

Hernandez et al. (2005) assessed brand recall in online settings, extending previous analysis of language systems by providing a comparison of recall by natives of one Eastern language (Korean) versus three groups of natives of two Western languages (Spanish and English) simultaneously. Subjects with the ability to process a biscriptal language (Korean) demonstrate recall superiority in one out of two experimental stimuli over subjects habitually processing language based on alphabetic script (English and Spanish). Overall, brand recall and attitudes results were consistent with Nelson's (2002) findings. Results also indicated that neither the level of expertise of players nor the perceived goal difficulty has an effect on brand recall.

Brand Familiarity in the Online Setting

The integration of the Internet into the marketing strategy is recognized as a strong vehicle to build brand familiarity (Rohm and Sultan 2004). However, though few studies have been conducted addressing the effect of brand familiarity in the online advertising setting, consistent results have been found in those studies. Dahlen (2001) examined the effect of brand familiarity in banners, finding that familiar brand ads tend to wear out quickly whereas unfamiliar brand ads need multiple exposures. Campbell and Keller (2003) addressed the effect of brand familiarity in both television and online ads, finding that repetition of unfamiliar brands showed decreased effectiveness.

Arousal and Emotional Intensity

The term "arousal" and its synonyms "alertness," "activation," and "excitation" describe a process that energizes behavior and affects non-exclusively cognitive performance (Ragazzoni 1998). Arousal indicates the level of activation associated with an emotional response, and could be measured on a continuum with very excited at one extreme to calm at the other end (Bolls, Lang and Potter 2001). Several studies had addressed the effect of arousal on different online aspects. The effect of arousal on online behavior has been examined on the Internet shopping experience (Menon and Khan 2002), finding that the more stimulation and information load, the less the consumer will engage in shopping behavior. Lee, Suh, and Whang (2003) found that greater dimensions of emotion –including arousal- significantly influenced positive consumer attitudes.

Emotional experience could be measured by behavioral, self-reported and physiological data (Bolls, Lang and Potter 2001). Facial responses and emotional behaviors (i.e. crying) are considered behavioral data. Written or verbal reports of how an emotion feels by the person who experienced it constitute self-reported data. Heart rate, skin conductance, and facial electromyography comprise physiological data. Bolls, Lang and Potter (2001) indicate several drawbacks for each one of these measures. Self-reported measures are more susceptible to social desirability bias. Physiological measures could be used to assess both the arousal and valence dimensions of emotion, though they might lack external validity attributable to the data collection methods. Finally, emotional responses could occur without any indication of facial expression, thus behavioral measures might fail to attain any emotional response measure. Thus, following Reekum et al.'s (2004) procedure on testing appraisal dimensions in a computer game, the dissertation procedures would use three measures to overcome the possible drawbacks inherent to the approaches described. Specifically, self-reported, behavioral and physiological (heart rate) measures would be used.

Contradictory findings of the effect of arousal on memory are found in the literature. According to Cahill and McGaugh (1995), aroused subjects exhibited enhanced long-term memory. On the other hand, following the theoretical perspective that arousal has an effect independent of valence, Shapiro, MacInnis, and Park (2002) found support to the claim that subjects exhibiting a moderate arousal condition were better able to discriminate target attributes from distractors than were those in the high arousal condition. Conversely, Tavassoli (1995) indicated arousal might influence cognitive capacity as generated by emotional intensity.

CHAPTER 3

RESEARCH METHODOLOGY

Research Objectives

The purpose of the study was to combine aspects of two streams of language research in an online promotional medium, specifically consumer bilingualism and East-West differences, to empirically evaluate differences in the effect of L2 proficiency on brand recall and brand recognition of several groups of bilinguals of different scripts. To accomplish this purpose, the study intended to fulfill the following objectives:

1. *To compare groups of proficient logographic/alphabetic and biscriptal/alphabetic bilinguals with groups of not proficient logographic/alphabetic and biscriptal/alphabetic, as well as alphabetic/alphabetic bilinguals, in order to determine if both the visual and phonological traces of memory usually retrieved by the first groups leads to superiority in brand recall and recognition.*
2. *To compare the group of biscriptal/alphabetic bilinguals with groups of logographic/alphabetic and alphabetic/alphabetic bilinguals, in order to determine if regardless of level of proficiency, the native mastering of both scripts leads to superiority in brand recall and recognition.*

3. *To compare recall and recognition measures across all groups in order to determine if memory is a function of the way it is accessed.*
4. *To measure the effect of brand familiarity on brand memorability in the advergaming context.*
5. *To measure the effect of arousal on brand memorability under a context usually characterized by emotional intensity.*

Research Hypotheses

Alphabetic script natives heavily rely on phonological short-term memory, while logographic script natives rely more on visual short-term memory. When tested in static brand display, Tavassoli and Han (2002) concluded that visual brand identifiers or logos are integrated in memory easily with logographic brand names. In contrast, auditory brand identifiers are integrated in memory easily with alphabetic brand names. When tested in the multimedia context, Tavassoli and Lee (2003) concluded that visual cues - such as meaningless logos, images and colors- were more potent retrieval cues in logographic language natives than in alphabetic language natives. In comparing Spanish/English bilingual and monolingual participants, Luna and Peracchio (2003) reported evidence supporting the claim that pictures might reduce the processing load involved in L2 acquisition. In particular, the presence of congruent pictures increases bilinguals' comprehension of L2 wording. The graphic and interactive nature of advergames, characterized by constant display of visual cues -such as meaningful and meaningless logos, characters, colors and packaging- offers a unique environment for matching pictures and messages. Differences in visual short-term memory resulting from exposure to stimuli in advergames are expected among logographic and alphabetic groups given that spatial memory is better for visual cues than for auditory cues for logographic natives. Recently, a study addressing the role of language proficiency by Zhang and Schmitt (2004) concluded that highly proficient Chinese-English speakers accessed both visual (processed by their L1) and phonological (processed by their L2) traces, whereas the less L2 proficient speakers only relied on the visual trace of their L1. Thus, because of their ability to access information of both visual and phonological traces, the "proficiency-recall" and "proficiency-recognition" hypotheses are derived:

$H_{proficiency\text{-}recall}$: *Chinese-English and Korean-English bilinguals who are highly proficient in their L2 (English) will exhibit brand recall superiority over less proficient bilinguals and those speaking two alphabetic languages (English/Spanish).*

$H_{proficiency\text{-}recognition}$: *Chinese-English and Korean-English bilinguals who are highly proficient in their L2 (English) will exhibit brand recognition superiority over less proficient bilinguals and those speaking two alphabetic languages (English/Spanish).*

By isolating script effects, Tavassoli and Han (2001) concluded that consumers' experience with a specific script could strongly influence thought in formation of memory and attitudes, independent of a language's grammar or vocabulary. Using pair-recognition tests, Tavassoli and Han (2002) also examined interference from nonverbal information (i.e. logos). Participants of an experiment were explicitly instructed to learn the pairings between brand names (i.e. Bensu, Fatow, Hayda) and an auditory (sound) or visual (logo) brand identifier. After the task, pair recognition was tested. Their findings indicated that memory with pairings with auditory representations was better than pairings with brand names written in Hangul. On the other hand, memory with pairings with visual representations was better than pairings with brand names written in Hancha. Based on these findings, Zhang and Schmitt's (2004) finding that highly proficient Chinese-English speakers accessed both visual and phonological representations of the L1 could be extended to Korean speakers, whose dominant language accesses both representations. Thus, it is expected that Korean participants whose dominant language involves both scripts might exhibit memory superiority over those participants whose dominant language involves only one script. Therefore, because of Korean natives' ability to process information in both logographic and alphabetic scripts, the "mono/biscriptal-recall" and "mono/biscriptal-recognition" hypotheses are posited:

$H_{mono/biscriptal\text{-}recall}$: *Regardless of level of proficiency in their L2, Korean-English bilinguals will exhibit brand recall superiority over monoscriptal/alphabetic bilinguals (Chinese-English, Spanish-English, English-Spanish).*

$H_{mono/biscriptal\text{-}recognition}$: *Regardless of level of proficiency in their L2, Korean-English bilinguals will exhibit brand recognition superiority over monoscriptal/alphabetic bilinguals (Chinese-English, Spanish-English, English-Spanish).*

Memory for brand names depends on whether it is accessed via recall or via recognition (Lerman and Garbarino 2002). Lerman (2003) found that recognition of morphemically familiar names outperformed recognition of unfamiliar names when mismatch of exposure and memory retrieval modes (auditory-visual) occurred. In contrast, the morphemically familiar name was more likely to be recalled than the morphemically unfamiliar name after auditory exposure. Advergames represent a highly visual exposure mode. Alphabetic script subjects heavily rely on phonological short-term memory, while logographic script natives rely more on visual short-term memory. By extension, it is expected that when exposed to mismatched exposure and memory modes (auditory/visual), logographic natives relying more on visual memory should outperform alphabetic natives relying on phonological memory in recognition tests. In contrast, alphabetic subjects relying more on phonological memory should outperform logographic natives in recall tests. Furthermore, Zhang and Schmitt's (2004) conclusion that highly proficient Chinese-English bilinguals accessed both visual (processed by L1) and phonological (processed by L2) traces, whereas the less proficient speakers only accessed the visual trace processed by their L1, would lead to differences in recall and recognition tests between subjects accessing both representations (visual and phonological) and those accessing only one code (visual or phonological). Thus, the "phonological trace-recall" and "visual trace-recognition" hypotheses are derived:

$H_{phonological\ trace\text{-}recall}$: *Bilinguals heavily relying on phonological trace (alphabetic natives and English proficient bilinguals) will exhibit brand recall superiority over bilinguals heavily relying on visual trace (proficient and not proficient Chinese and Korean bilinguals).*

$H_{visual\ trace\text{-}recognition}$: *Bilinguals heavily relying on visual trace (not proficient Chinese) will exhibit brand recognition superiority over bilinguals* *heavily relying on phonological trace (alphabetic natives, biscriptals, and English proficient bilinguals).*

Previous research addressing printed advertisements indicates that previous brand familiarity increases the memory of brand names. In particular, Kent and Allen (1994) found that advertising claims for mature brands were less susceptible to interference, where interference effects have been shown to be robust across countries (Kent 1997). In addition, Kent and Kellaris (2001) indicate that strong advertisement-brand links are formed for known and mature brands. One experiment tested by Campbell and Keller (2003) in online advertising confirmed that ads for unfamiliar brands wear out faster, showing decreased effectiveness at lower levels of repetition relative to ads for familiar brands. By extension, it is expected that advergames' extended and multiple exposures to the prior familiar brands will be reflected in increased effectiveness of brand memory. Thus, the "familiarity-based recall" and "familiarity-based recognition" hypotheses are derived:

$H_{\text{familiarity-based recall}}$: *Regardless of native script, Internet users will exhibit brand recall superiority for prior familiar over unfamiliar brand names.*

$H_{\text{familiarity-based recognition}}$: *Regardless of native script, Internet users will exhibit brand recognition superiority for prior familiar over unfamiliar brand names.*

Consistent with Tavassoli's (1995) findings, two studies found a negative effect of arousal on ad recall in the Super Bowl context. Among the Pavelchak, Antil, and Munch (1988) findings, both pleasure and arousal were necessary dimensions to characterize the effects of emotion on ad recall. However, arousal demonstrated a higher impact on recall. Newell, Henderson, and Wu (2001) concluded that programs evoking strong emotional reactions inhibit ad and brand recall. Emotional intensity emphasizes arousal, which narrows attention to the stimuli responsible for the emotional experience and subsequently inhibits recall of other peripheral stimuli. Since the sports games genre simulates real life sports, a substantial nonverbal component in promoting a company's brand extends to the advergame setting, and it is particularly useful for hypothesis testing. Thus, the "arousal-recall" and "arousal-recognition" hypotheses are posited as follows:

$H_{arousal\text{-}recall}$: *Participants exhibiting lower arousal levels will exhibit brand recall superiority over participants exhibiting higher arousal levels.*

$H_{arousal\text{-}recognition}$: *Participants exhibiting lower arousal levels will exhibit brand recognition superiority over participants exhibiting higher arousal levels.*

Analytical Methods

"Proficiency Recall" and "Proficiency Recognition" Hypotheses Testing

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average) factorial design for ANOVA with six groups was performed to test the "proficiency-recall" hypothesis comparing the means of brand recall score. The brand recall score was used as the dependent variable. The sample consisted of three groups according to the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants the biscriptal group, and the American and Mexican participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Interaction and main effects and raw means were examined.

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average) factorial design for ANOVA with six groups was performed to test the "proficiency-recognition" hypothesis, addressing differences in the means of brand recognition scores among all groups. The brand recognition score was used as the dependent variable. The sample was classified in three groups based on whether their native language is biscriptal (Korean) or monoscriptal (Chinese, English, Spanish). Each group was subclassified into two more groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Interaction and main effects, and raw means were examined.

"Mono/biscriptal-Recall" and "Mono/biscriptal-Recognition" Hypotheses Testing

A 2(number of scripts: monoscriptal, biscriptal)x2(proficiency: below average, above average) factorial design for ANOVA with four groups was performed to test the "mono/biscriptal-recall" hypothesis. The brand recall score was used as the dependent variable. The sample was classified into two groups based on whether their L1 was biscriptal (Korean) or monoscriptal (Chinese, English, Spanish) (0-Monoscriptal language and 1-Biscriptal language). Each group was subclassified into two more groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Interaction and main effects and raw means were examined.

A 2(number of scripts: monoscriptal, biscriptal)x2(proficiency: below average, above average) factorial design for ANOVA with four groups was performed to test the "mono/biscriptal-recognition" hypothesis. The brand recognition score was used as the dependent variable. The sample was classified into two groups based on whether their L1 was biscriptal (Korean) or monoscriptal (Chinese, English, Spanish). Each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Interaction and main effects and raw means were examined.

"Phonological Trace-Recall" and "Visual Trace-Recognition" Hypotheses Testing

A simple design for ANOVA was performed to test the "phonological trace-recall" hypothesis, comparing the means of brand recall scores among all groups. The brand recall score was used as the dependent variable. The sample was classified into two groups based on the independent variable phonological trace access (0-Visual trace access and 1-Phonological trace access). The L2 for all participants was a phonological language (English). Thus, only non-proficient Chinese participants constituted the visual group, and proficient Chinese, Korean, Mexican and American participants the phonological group.

Each group was subclassified into two more groups based on the level of proficiency of their L2 (0-Below average (accesing L1 trace), 1-Above average (if different L2 script from native script, accessing L2 trace)). Table 1 illustrates how the groups were classified.

Table 1

	Proficient in L2	Not proficient in L2
Logographic	Visual Phonological	*Visual*
Biscriptal	Visual Phonological	Visual Phonological
Alphabetic	Phonological	Phonological

To test the "visual trace-recognition" hypothesis, an additional simple design for ANOVA was performed, comparing the means of brand recognition scores among all groups. The brand recognition score was used as the dependent variable. The sample was classified into two groups based on the independent variable visual trace access (0-Phonological trace access and 1-Visual trace access). The L2 for all participants was a phonological language (English). Thus, the Chinese and Korean participants constituted the visual group and the Mexican and American participants the phonological group.

"Familiarity-based Recall" and "Familiarity-based Recognition" Hypotheses Testing

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average)x2(familiarity: non-familiar, familiar) factorial design for ANOVA with twelve groups was performed to test the "familiarity-based recall" hypothesis. The brand recall score was used as dependent variable. First, the sample was classified in three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants the biscriptal group, and the American and Mexican participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Lastly, the groups were subclassified into the previous familiarity with brands (0-Not familiar, 1-Familiar). Interaction and main effects were examined.

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average)x2(familiarity: non-familiar, familiar) factorial design for ANOVA with twelve groups was performed to test the "familiarity-based recognition" hypothesis. The brand recognition score was used as the dependent variable. First, the sample was classified in three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants the biscriptal group, and the American and Mexican participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Lastly, the groups were sub-classified on the previous familiarity with brands (0-Not familiar, 1-Familiar). Interaction and main effects and raw means were examined.

"Arousal-Recall" and "Arousal-Recognition" Hypotheses Testing

Because of the small sample size available for testing the "arousal-recall" and the "arousal-recognition" hypothesis, two regression analyses were performed instead of a canonical correlation. The objective addressed by multiple regression analysis is to explain the nature of whatever relationships exist between a single dependent variable and several independent variables by measure of the relative contribution of each variable to the overall prediction of the dependent variable (Hair et al. 1998). Thus, a regression analysis used the brand recall score (to test the "arousal-recall" hypothesis) and another regression used the brand recognition score (to test the "arousal-recognition" hypothesis) as dependent variables respectively. The measures of arousal (self-reported, behavioral and physiological) were used as independent variables.

Experimental Stimuli

Sports sponsorship has been demonstrated to possess a substantial nonverbal component in promoting a company's brand in an international context (Quester and Farrelly 1998). Since the sports games genre simulates real life sports, this nonverbal component extends to the electronic game setting, and it is particularly useful for the hypothesis testing. Hence, sports games with different characteristics and pace were selected for the study.

The games selected for the study were 3D Dune Derby (http://www.nabiscoworld.com/games/nw_shock_nwdn.htm), Mini-mini Golf (http://www.nabiscoworld.com/games/nw_shock_nwmm.htm) and Sumo Wrestling (http:// www.nabiscoworld.com/games/rb_shock_rbsw.htm) from nabiscoworld.com. The Nabisco site was selected because it is one of the ten highest traffic gaming sites, ranking fourth in time usage (Fattah and Paul 2002). Another criterion considered in the selection was that Nabisco is a multinational company and offers the same brands in each of the countries involved in the study.

The game 3D Dune Derby (game A) is a buggy racing game exhibiting 4 brand products and 1 corporate brand. The brand products are Ritz Bits sandwiches, Chips Ahoy!, Oreo, and Fun Fruits. The corporate brand is Nabisco. The brand names are displayed on buggies, dashboard, start banner, banner checkpoints, and signal flags. One brand is always visible in the frame of the play window. Background music and sound effects (driving, crashing) are heard during the gameplay. 3D Dune Derby is a rapid game requiring quick reflexes.

The game Mini-mini Golf (game B) promotes 6 brand products and 1 corporate brand. The brand products are Ritz Bits sandwiches, Mini Chips Ahoy!, Nutter Butter Bites, Mini Oreo, Cheese Nips, and Teddy Grahams. The packages of the product exhibiting the brand names are shown as part of the obstacles of the game. Each brand is shown one by one in the different holes. Participants randomly selected the order of the holes. The brands are always visible in the frame of the play window. Sound effects are heard when the ball hits the obstacles. Mini-mini Golf is a lengthy and slow-paced game, and it requires avoiding obstacles by carefully timing shots.

The game Sumo Wrestling (game C) promotes 1 brand product and 1 corporate brand. The brand product is Ritz Bits sandwiches. The sumo wrestler characters are sketched versions of the product. The box of the product is shown at the beginning of the game. During gameplay, the brand is depicted on the wrestling ring, the background, and the score counter. In addition, the brand is always visible in the frame of the play window. Sound effects (screaming, falling) are heard during the gameplay. Sumo Wrestling is a short game requiring accuracy in lunging at the opponent.

Experiment 1

Sampling Procedure

Convenience samples were used representing both sexes. Convenience samples are formed from the most accessible population members. In order to achieve generalizability of results, the entire sample for experiment 1 included 400 participants from China, Mexico, South Korea, and the United States. The same procedure described below was used in the recruitment of participants.

Data Collection Procedure

Lab experiments were conducted in university computer labs in the countries involved in the study. Participants worked on computers assigned individually. Participants were randomly assigned to one of the two conditions (recall or recognition). To avoid demand artifacts, the participants were told this was a video games study. Specifically, as opposed to explicitly telling them to memorize the logos, the incidental learning method was used. The participants were provided with instructions for the games in their native language in all countries. The participants were instructed to play each game for 5 minutes. In order to avoid any sequence effect, the games were presented in a random order. During a total of 15 minutes of playing, the participants were exposed to the brands several times. Following the game play, participants completed the questionnaires.

Measures

Level of proficiency of L2 was based on self-reported 7-point Likert scales. Following Luna and Peracchio's (2001) language proficiency measurement, self-reported scale items were adapted from MacIntyre, Noels, and Clement (1997). The items asked participants to rate from 1 to 7 their own proficiency in their L2 in different situations (e.g. understand English movies without subtitles) or in general (e. g. reading proficiency). Additional questions addressed the languages the participants speak, L1, age at which they started learning their L2, and the chronological order in which the languages were learned. Ten additional items addressed demographics.

Free recall of brands after game play was reported for each country. The free recall scores were determined by summing all the brands recalled in each game. Two things should be noted about the total number of brands recalled. First, some of the brands occurred in more than one game. Second, the number of brands differs considerably for the three games. The maximum score for game A is 5, the maximum score for game B is 7, and the maximum score for game C is 2. It was not expected that the players of the game B would recall all brands, because the assigned time for game playing was not intended to encompass all holes. On average, each participant made 3 holes during the assigned time.

The retrieval cue provided in recognition tests is the stimulus by itself (Singh and Rothschild 1983). A two-alternative forced-choice recognition task was used. Participants were tested with several random pairs of items (in each pair, one item was seen and one not seen) from which they had to pick out the presented stimulus. Specifically, three pairs of items were presented for game A, three pairs for game B, and one pair for game C.

Each pair was randomly created, and the position (left or right) of both target and distractor was also randomly selected. The distractors included other Nabisco brands (LifeSavers, Triscuit) and other comparable global snack brands (Cheez-it, ChipsDeluxe). Examples of pairs of items are included in Appendix B. To correct for successful guessing in recognition, the brand recognition scores were determined by summing all the brands recognized in each game (hit score) minus the false alarms.

Experiment 2

Sampling Procedure

A convenience sample was used for the study representing both sexes. Experiment 2 collected data from 30 bilingual individuals from three script groups (logographic/alphabetic, biscriptal/alphabetic and alphabetic/alphabetic bilinguals).

Data Collection Procedure

A second experiment was conducted in an adapted lab with a computer and an electrocardiogram (hereafter, EKG) machine. Initially, informed consent was obtained from each participant. Two electrodes were attached to the right and left wrists, two electrodes to the right and left ankles, and six electrodes across the chest of the participant. Prior to exposure to the experimental stimuli, the baseline heart rate or tonic state was recorded for each participant. The participants were provided with instructions for the advergames. The participants were instructed to play each game for 5 minutes. During a total of 15 minutes of playing, the participants were exposed to the brands several times. Simultaneously, a complete 12-lead EKG was recorded on EKG paper at specific intervals for each game. Specifically, EKGs were recorded at 15 seconds after starting each game and at 2 minutes 30 seconds of gameplay. In addition, unobtrusive simple observations were conducted simultaneously with the gameplay. The researcher recorded the facial, verbal and/or corporal expression of the participant. Following the game play, participants completed the questionnaires independently.

Measures

In addition to the measures used in experiment 1, arousal was assessed via self-reported, behavioral and heart rate measures. Within the virtual reality context, Jang et al. (2002) claim that heart rate variability is useful for assessing the emotional states of the participants. Since the virtual reality and electronic games contexts share some commonalities, such as the simulation of real activities, the heart rate variability measured by the EKG was used to assess the emotional states of the participants.

Variations in anatomy and orientation of the heart from person to person were taken into account, thus the EKG variability was addressed within participants. The procedure for calculating the heart rate followed the method proposed by Thaler (1995). EKG paper has light and dark lines running vertically (measuring amplitude) and horizontally (measuring duration). The light lines delineate squares of 1mmx1mm, and the dark lines delineate squares of 5mmx5mm. The procedure requires finding an R wave (first upward deflection) that falls on one of the heavy lines of the EKG paper. The small squares are counted until the next R wave. The heart rate is obtained by dividing 1500 by the total of small squares. Scores were computed as change from the individual heart base score for each game.

Self-reported arousal measures were assessed by six 7-point Likert scale items as adapted and cross-culturally tested by Soriano and Foxall (2002): stimulated (relaxed), excited (calm), frenzied (sluggish), jittery (dull), wide-awake (sleepy), and aroused (unaroused). The total self-reported arousal score was obtained by summing up the scores of the six items.

CHAPTER 4

EXPERIMENT 1

Pilot Study Summary

A pilot study was conducted with 102 participants from China, Mexico, South Korea and the United States. Detailed information is located in Appendix E. Overall, results indicated significant differences in recall tests between bilinguals accessing either traces or phonological trace and bilinguals accessing a visual trace only. This finding indicates that the difference among groups relies on the traces the bilingual access. Considering the small sample size, results cannot be considered conclusive. In addition, a canonical correlation analysis also suggested that participants should be assigned randomly to either recall or recognition tests in the main study, in order to avoid a sequence effect that could confound the results.

Main Study

Data Collection Procedure

Data was collected during Fall 2004. The duration of the experiment was 30 minutes on average. The participants were provided with instructions for the games in their L1. Participants were randomly assigned to one of the two conditions (recall or recognition). To avoid demand artifacts, they were told this was an electronic games study. The participants were instructed to play three games presented in random order for five minutes each. Following the gameplay, participants completed the questionnaires in their L1 independently.

Samples

A convenience sample of mixed gender was used for the study. Four hundred subjects from China, Mexico, South Korea and the United States voluntarily participated.

China. One hundred participants from Qingdao constituted the Chinese group. The participants' L1 was Chinese and their L2 was English.

Mexico. One hundred participants from Ciudad Victoria constituted the Mexican group. The participants' L1 was Spanish and their L2 was English.

South Korea. One hundred participants from Daegue constituted the Korean group. The participants' L1 was Korean and their L2 was English.

United States. One hundred participants from the Rio Grande Valley Area at South Texas constituted the American group. The participants' L1 was English and their L2 was Spanish.

Table 2 contains the demographics per country.

Table 2

	China (N=100)	Mexico (N=100)	South Korea (N=100)	United States (N=100)
Age				
Mean	24.31	18.4	22.58	21.71
Std. deviation	3.890	1.576	2.775	3.799

Minimum	18	16	19	17
Maximum	36	32	36	36
Sex				
Male	45.7%	43.5%	49.0%	40.8%
Female	54.3%	56.5%	51.0%	59.2%
Video game console				
Ownership	41.4%	46%	14%	53.5%
Video games playing in hours/week				
Mean	5.96	1.579	1. 8553	2.449
Minimum	0	0	0	0
Maximum	40	21	30	40
Computer				
Home (own)	81.8%	99%	97%	88.9%
Work (own)	56.6%	41%	36.7%	59.5%
Time usage in hours/week				
Mean	19.40	11.2283	14.7158	14.648
Std. dev.	23.875	9.79807	11.06524	16.15648
Minimum	2	1	2	1
Maximum	80	60	50	80

Table 3 contains information about the level of proficiency of the participants' L2. Listening, reading, speaking and writing skills were reported in a 7-point Likert scale.

Table 3

	China (N=100)	Mexico (N=100)	South Korea (N=100)	United States (N=100)
Listening				
Mean	3.20	4.91	3.51	6.12
Std. deviation	1.392	1.688	1.352	1.239
Reading				
Mean	3.52	4.86	4.11	5.67
Std. deviation	1.365	1.741	1.476	1.478
Speaking				
Mean	3.09	4.61	2.95	5.71
Std. deviation	1.318	1.814	1.417	1.5
Writing				
Mean	3.37	4.63	3.02	5.38
Std. deviation	1.389	1.587	1.392	1.621
Age learned L2				
Minimum	3	1	1	2
Maximum	25	17	17	30
Years of formal L2 education				

Minimum	3	1	1	1
Maximum	24	15	15	23

Memory Scores Descriptives

Recall Scores. Table 4 contains the recall scores for each game per country.

Table 4

	China (N=50)	Mexico (N=50)	South Korea (N=50)	United States (N=50)
Game A				
Minimum	0	0	0	1
Maximum	3	4	5	5
Mean	.72	1.56	1.46	2.36
Std. deviation	.809	1.146	1.147	1.191
Game B				
Minimum	0	0	0	0
Maximum	3	4	6	6
Mean	.90	1.04	1.44	2.46
Std. deviation	.647	.856	1.358	1.606
Game C				
Minimum	0	0	0	0
Maximum	1	2	1	1
Mean	.30	.68	.66	.96
Std. deviation	.463	.587	.479	.198

Recognition Scores. Table 5 contains the descriptives for each game per country. The brand recognition score was calculated by taking the number of hits minus the number of false alarms. The maximum number of targets is indicated in the first column in parenthesis.

Table 5

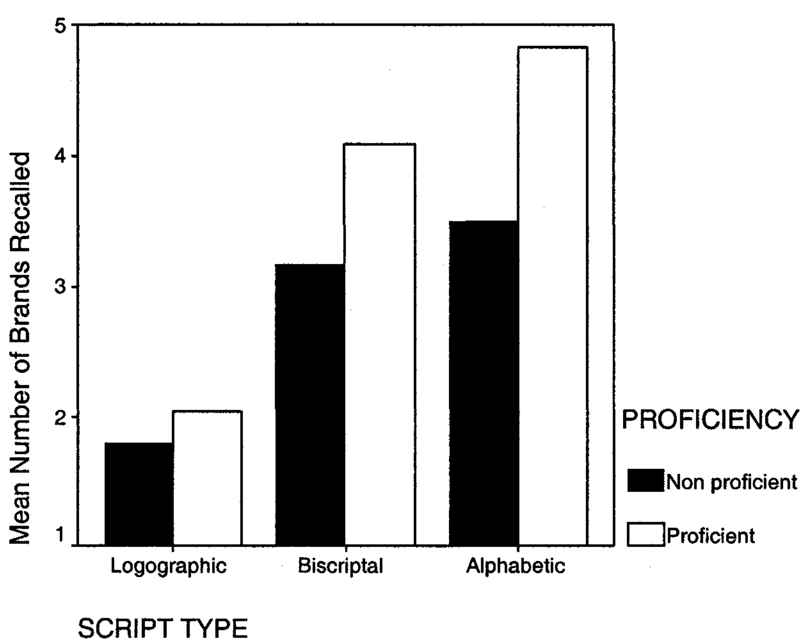
	China (N=50)	Mexico (N=50)	South Korea (N=50)	United States (N=50)
Game A				
Maximum (3)	3	3	3	3
Mean	1.40	1.86	1.56	2.10
Std. deviation	1.14286	.85738	1.19796	.95298
Game B				
Maximum (3)	3	3	3	3
Mean	1.46	1.58	1.70	1.50
Std. deviation	1.18166	1.05153	1.16496	1.19949
Game C				
Maximum (1)	1	1	1	1
Mean	.90	.78	.94	.94
Std. deviation	.30305	.41845	.23990	.23990

Data Analyses

Recall Analysis

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average) factorial design with six groups was performed to test the "proficiency-recall" hypothesis comparing differences in means of brand recall. The brand recall score was used as the dependent variable. The sample was classified into three groups based on the independent variable L1 script type (denoted by 1-Logographic-based language, 2-Biscriptal language, 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants constituted the biscriptal group, and the Mexican and American participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). The sample means are depicted in the figure 1.

Figure 1



An examination of the sample means suggest that both proficient and non-proficient alphabetic natives recalled better than the other groups. However, the results contradicted the "proficiency-recall" hypothesis. Table 6 provides the summary output from the ANOVA performed.

Table 6

Between participants	SS	df	MS	F	Sig. of F
Intercept	1712.764	1	1712.764	313.499	.000
Script type	151.208	2	75.604	13.838	.000
Proficiency	27.984	1	27.984	5.122	.025
Script type*Proficiency	8.472	2	4.236	.775	.462
Error	1059.895	194	5.463		
Corrected total	1328.35	199			

The interaction effect (script by reported proficiency in L2) was nonsignificant ($F(2,194)=.775$, $MSE=4.236$, $p=.462$). This indicates that the effects of the script type and proficiency are independent. Thus the main effects can be interpreted generally (Hair et al., 1998). The effect of script was significant ($F(2,194)=13.838$, $MSE=75.604$, $p<.05$). The post-hoc Scheffé test revealed that the logographic group differs from both the biscriptal group and the alphabetic group. The asterisk indicates that pair of means is significantly different at the .05 level. Table 7 shows the Scheffé test results.

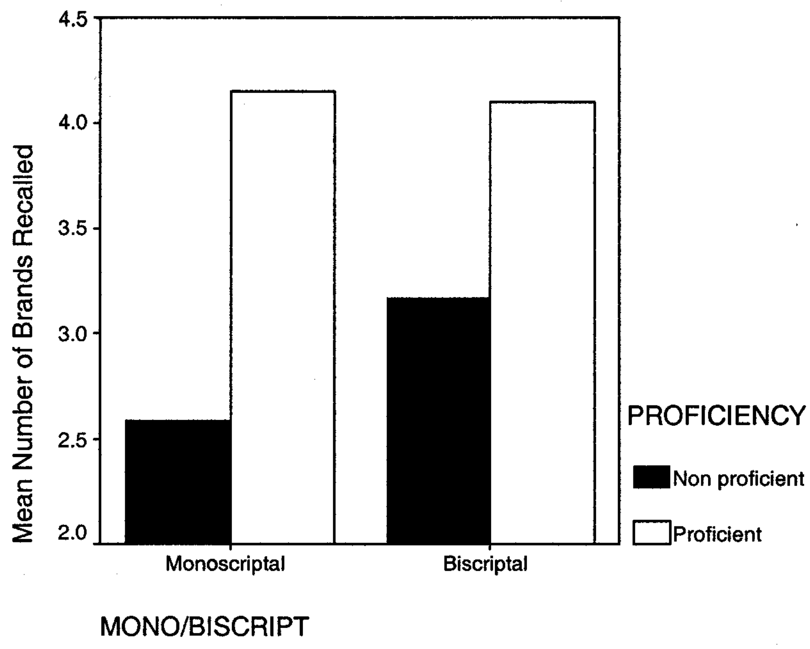
Table 7

(I) Script type	(J) Script type	Mean Difference (I-J)	Std. Error	Sig.
Logographic	Biscriptal	-.1.64*	.467	.003
	Alphabetic	-2.61*	.405	.000
Biscriptal	Logographic	1.64*	.467	.003
	Alphabetic	-.97	.405	.059
Alphabetic	Logographic	2.61*	.405	.000
	Biscriptal	.97	.405	.059

Finally, the effect of reported proficiency was also significant (F(1,194)=5.122, MSE=27.984, p<.05). These results indicate that there is a difference among groups due to both native script and level of proficiency.

Next, a 2(number of scripts: monoscriptal, biscriptal)x2(proficiency: below average, above average) factorial design with four groups was performed to test the "mono/biscriptal-recall" hypothesis. The brand recall score was used as the dependent variable. The sample was classified into two groups based on whether their L1 was biscriptal (Korean) or monoscriptal (Chinese, English, Spanish) (denoted by 0-Monoscriptal language and 1-Biscriptal language). Each group was subclassified into two more groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). The sample means are depicted in the figure 2.

Figure 2



A simple examination of the sample means suggests that proficient monoscriptal and proficient biscriptal outperformed the non-proficient groups. Table 8 provides the summary output from the ANOVA performed.

Table 8

Between participants	SS	df	MS	F	Sig. of F
Intercept	1735.413	1	1735.413	274.289	.000
Script type	2.449	1	2.449	.387	.535
Proficiency	54.067	1	54.067	8.546	.004
Script type*Proficiency	3.477	1	3.477	.550	.459
Error	1240.082	196	6.327		
Corrected total	1328.355	199			

The interaction effect (mono/biscriptal L1 by reported proficiency in L2) was nonsignificant ($F(2,196)=.550$, $MSE=3.477$, $p=.459$). Again, the main effects were interpreted generally. The effect of mono/biscriptal L1 also was nonsignificant ($F(1,196)=.387$, $MSE=2.449$, $p=.535$). However, the effect of reported proficiency was significant ($F(1,196)=8.546$, $MSE=54.067$, $p<.05$). These results indicate that the native mastering of both scripts does not represent an advantage in memory. However, proficiency in a L2 does represent an advantage. Overall, the results did not support the "mono/biscriptal-recall" hypothesis.

Another simple ANOVA was performed to test the "phonological trace-recall" hypothesis comparing means of brand recall as a function of the phonological trace access. The brand recall score was used as the dependent variable. The sample was classified into two groups based on the independent variable phonological trace access (0-Visual trace access and 1-Phonological trace access). The L2 for all participants was a phonological language (English). Thus, only not-proficient Chinese participants constituted the visual group, and proficient Chinese, Korean, Mexican and American participants the phonological group. The sample means are depicted in the figure 3.

Figure 3

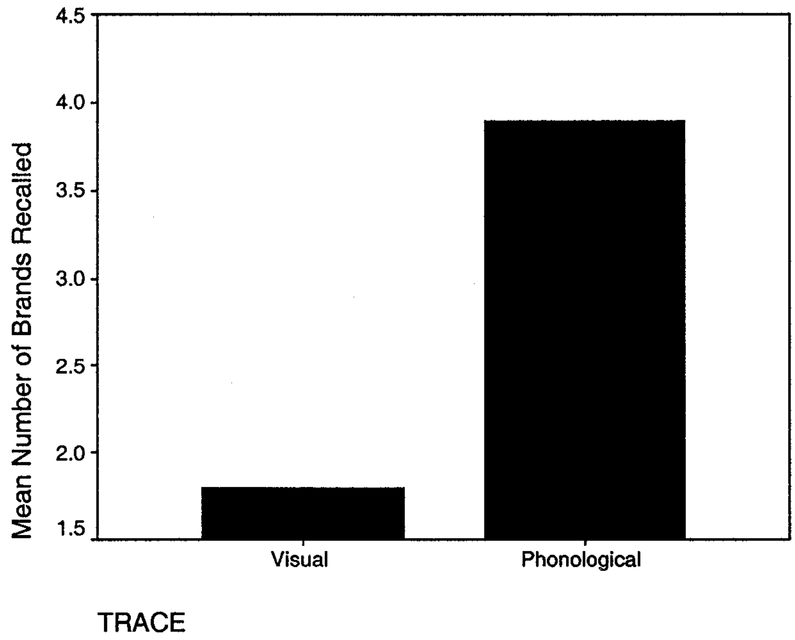


Table 9 provides the summary output from the ANOVA performed. The effect was significant (F(1,198)=15.460, p<.05). Therefore, the "phonological trace-recall" hypothesis was supported.

Table 9

	SS	df	MS	F	Sig. of F
Phonological trace (Between groups)	96.206	1	96.206	15.460	.000
Phonological trace (Within)	1232.149	198	6.223		
Total	1328.355	199			

Another simple ANOVA was performed to test the "familiarity-based recall" hypothesis comparing means of brand recall as a function of the previous familiarity with brands. The brand recall score was used as the dependent variable. Two groups of familiarity with brands (0-Not familiar, 1-Familiar) were classified based on a 7-point scale. The group of no familiarity with brands included the subjects who classified themselves rating 1 (not familiar) to 3 in the scale. The group of familiarity with brands included the subjects who classified themselves from 4 to 7 (very familiar) in the scale. The sample means are depicted in the figure 4.

Figure 4

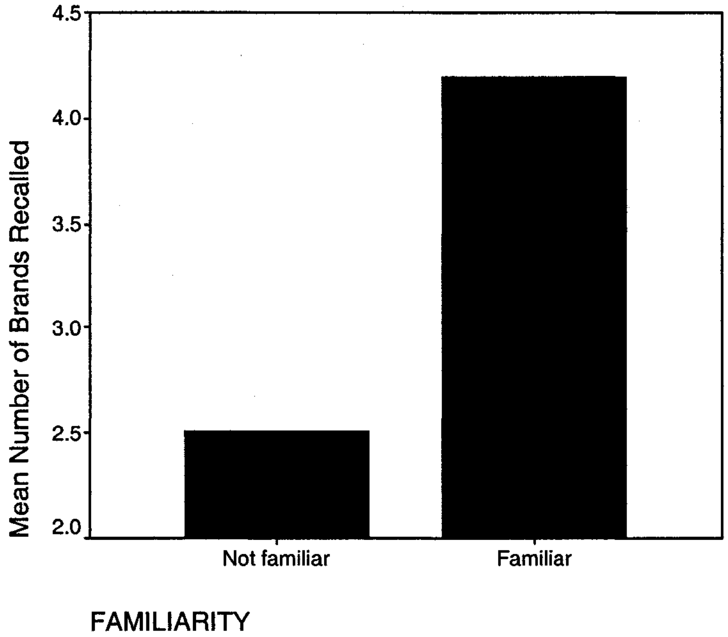


Table 10 provides the summary output from the ANOVA performed.

Table 10

	SS	df	MS	F	Sig. of F
Familiarity	128.090	1	128.090	21.130	.000

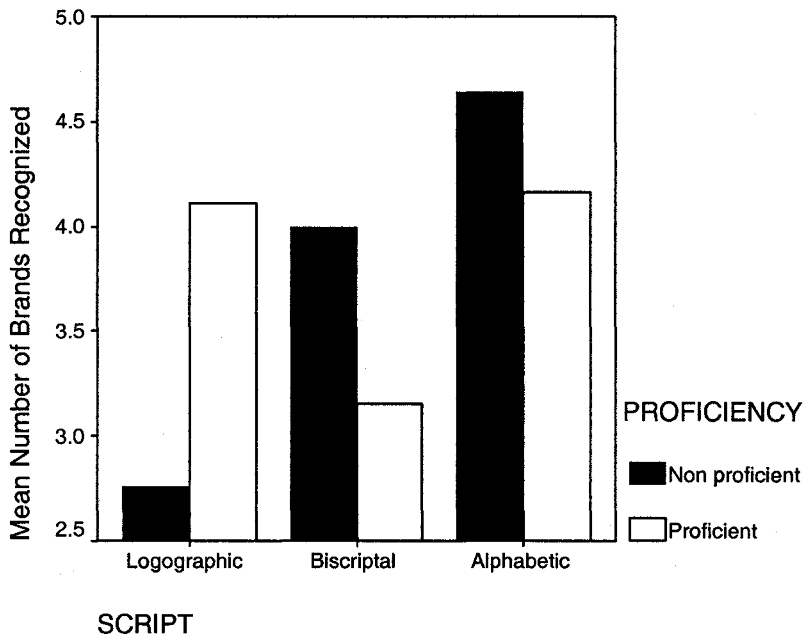
(Between groups)					
Familiarity (Within groups)	1200.265	198	6.062		
Total	1328.355	199			

The effect was significant ($F(1,198)=21.130$, $p<.05$). Therefore, the "familiarity-based recall" hypothesis was supported.

Recognition Analysis

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average) factorial ANOVA with six groups was performed to test the "proficiency-recognition" hypothesis. The brand recognition score was used as the dependent variable. The brand recognition score was calculated by taking the number of hits minus the number of false alarms. The sample was classified into three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants constituted the biscriptal group, and the Mexican and American participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). The sample means are depicted in the figure 5. When the proficient groups were compared across the three script groups, results contradicted the "proficiency-recognition" hypothesis. Similarly, when the not-proficient groups were compared across the three script groups, results also contradicted the "proficiency-recognition" hypothesis.

Figure 5



An examination of the sample means suggests that the proficient logographic and non-proficient alphabetic recognized the presented brands better than their nonproficient counterparts. However, the non-significant main effect indicated that these differences were not reliable. Table 11 provides the summary output from the ANOVA performed.

Table 11

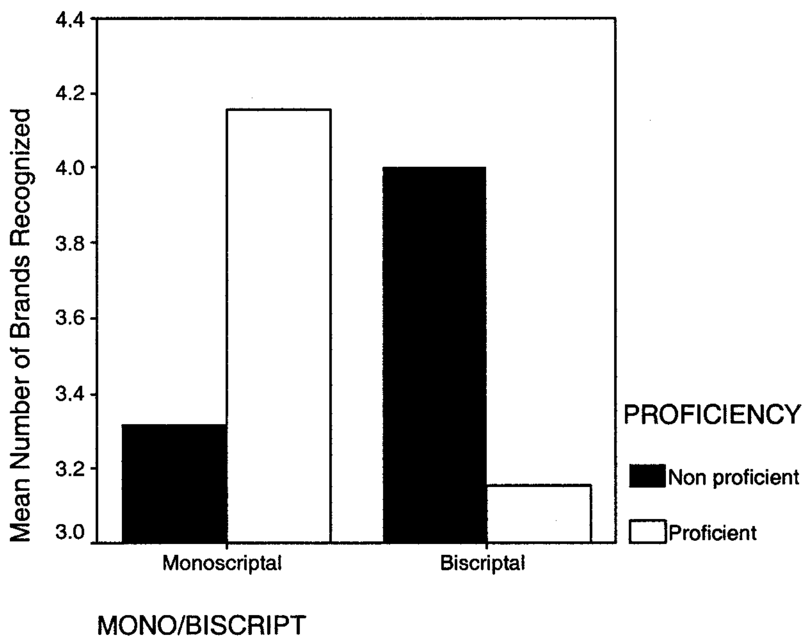
Between participants	SS	df	MS	F	Sig. of F
Intercept	1888.308	1	1888.308	373.635	.000
Script type	25.177	2	12.588	2.491	.085

Proficiency	4.150E-03	1	4.150E-03	.001	.977
Script type*Proficiency	30.363	2	15.181	3.004	.052
Error	980.453	194	5.054		
Corrected total	1045.355	199			

The interaction effect (script by reported proficiency in L2) approached, but did not reach significance (F(1,194)=3.004, MSE=15.181, p=.052). The effect for script was nonsignificant (F (1,194)= 2.491, MSE=12.588, p=.085). The effect of reported proficiency also was nonsignificant (F(1,194)=.933, MSE=.00415, p=.977). Overall, the results indicate that participants of the three script groups had about the same recognition. Thus, the results were inconsistent with the "proficiency-recognition" hypothesis.

Next, a 2(number of scripts: monoscriptal, biscriptal)x2(proficiency: below average, above average) factorial ANOVA with four groups was performed to test the "mono/biscriptal-recognition" hypothesis. The brand recognition score was used as the dependent variable. The brand recognition score was calculated by taking the number of hits minus the number of false alarms. The sample was classified into two groups based on whether their L1 was biscriptal (Korean) or monoscriptal (Chinese, English, Spanish). Each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). The sample means are depicted in the figure 6.

Figure 6



An examination of the sample means suggests that for the biscriptal group, the nonproficient participants did better than the proficient subjects, whereas for the monoscript group, the opposite was true. However, the nonsignificant main effects indicate no difference among groups. Table 12 provides the summary output from the ANOVA performed.

Table 12

Between participants	SS	df	MS	F	Sig. of F
Intercept	1585.856	1	1585.856	306.108	.000
Mono/biscriptal L1	.762	1	.762	.147	.702
Proficiency L2	7.356E-04	1	7.356E-04	.000	.991
Mono/biscriptal	20.975	1	20.975	4.049	.046

L1*Proficiency L2					
Error	1015.420	196	5.181		
Corrected total	1045.355	199			

The interaction effect (mono/biscriptal L1 by reported proficiency in L2) was significant ($F(1,196)=4.049$, $MSE=20.975$, $p<.05$). The effect of mono/biscriptal L1 was nonsignificant ($F(1,196)=.147$, $MSE=.762$, $p=.702$). The effect of reported proficiency also was nonsignificant ($F(1,196)=.000$, $MSE=.0007356$, $p=.991$). The lack of mono/biscriptal L1 was inconsistent with the "mono/biscriptal-recognition" hypothesis.

A simple design for ANOVA was performed to test the "visual trace-recognition" hypothesis. The brand recognition score was used as the dependent variable. The brand recognition score was calculated by taking the number of hits minus the number of false alarms. The sample was classified into two groups based on the independent variable visual trace access (0-Phonological trace access and 1-Visual trace access). The L2 for all participants was a phonological language (English). Thus, the Chinese and Korean participants constituted the visual group and the proficient Mexican and American participants the phonological group. The sample means are depicted in the figure 7.

Figure 7

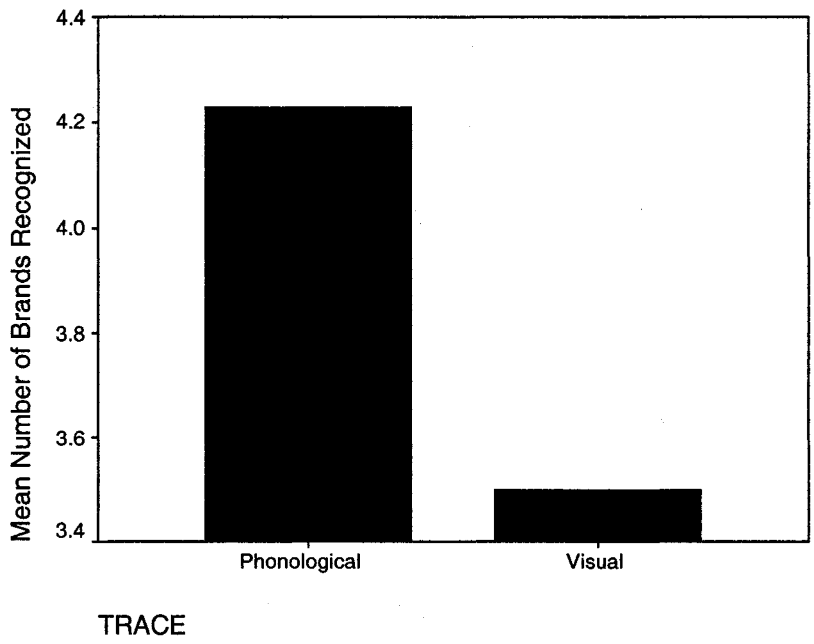


Table 13 provides the summary output from the ANOVA performed. The visual trace effect was significant ($F(1,199)=5.179$, $p<.05$).

Table 13

	SS	df	MS	F	Sig. of F
Visual trace (Between groups)	26.645	1	26.645	5.179	.024
Visual trace (Within groups)	1018.710	198	5.145		
Total	1045.355	199			

Another simple ANOVA was performed to test the "familiarity-based recognition" hypothesis comparing means of brand recognition as a function of the previous familiarity with brands. The brand recognition score was used as the dependent variable. Two groups of familiarity with brands (0-Not familiar, 1-Familiar) were classified based on a 7-point scale. The group of no familiarity with brands included the subjects who classified themselves rating 1 (not familiar) to 3 in the scale. The group of familiarity with brands included the subjects who classified themselves from 4 to 7 (very familiar) in the scale. The sample means are depicted in the figure 8.

Figure 8

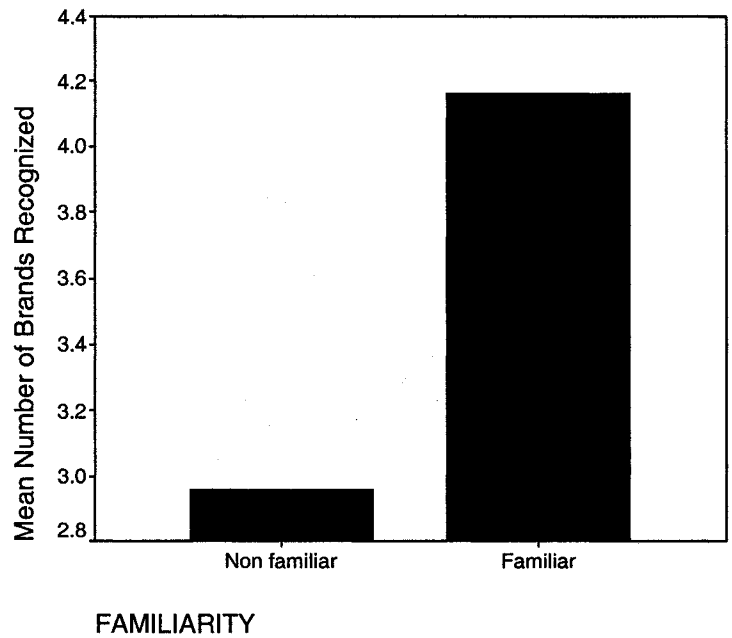


Table 14 provides the summary output from the ANOVA performed.

Table 14

	SS	df	MS	F	Sig. of F
Familiarity (Between groups)	54.602	1	54.602	10.912	.001

Familiarity (Within groups)	990.753	198	5.004		
Total	1045.355	199			

The effect was significant (F(1,198)=10.912, p<.05). Therefore, the "familiarity-based recognition" hypothesis was supported. The main effect suggested that previous familiarity with brands was a factor determining differences in recognition tests.

Analysis on Intrusions

In order to fully assess the influence of L1 and L2 on recall tests, the intrusions in recall were analyzed. The intrusions or false brand recall score comprised the brands recalled that were not present in the games. The intrusion score for each participant was determined by summing all the brands mentioned that did not appear in each game. Table 15 contains the intrusion descriptives for each game per country.

Table 15

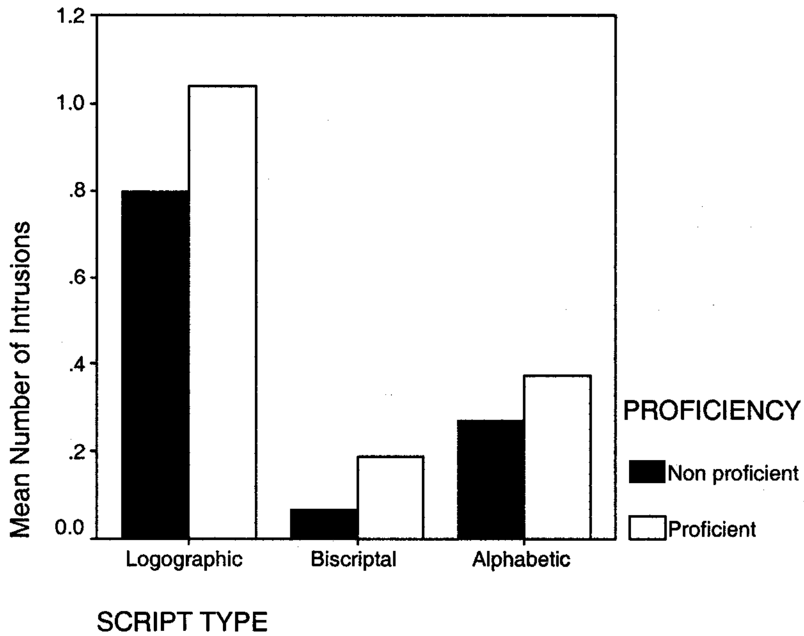
	China (N=50)	Mexico (N=50)	South Korea (N=50)	United States (N=50)
Game A				
Minimum	0	0	0	0
Maximum	1	1	1	1
Mean	.20	.08	.02	.06
Std. deviation	.404	.274	.141	.240

Game B				
Minimum	0	0	0	0
Maximum	2	1	2	3
Mean	.14	.04	.08	.12
Std. deviation	.405	.198	.340	.480
Game C				
Minimum	0	0	0	0
Maximum	2	2	1	2
Mean	.58	.22	.02	.18
Std. deviation	.538	.465	.141	.482

Next, a 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average) factorial ANOVA with six groups was performed to test differences in means of intrusions of brand names. The intrusion score was used as the dependent variable. The sample was classified into three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants constituted the biscriptal group, and the Mexican and American participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average).

The sample means are depicted in figure 9. They describe a pattern in which two situations should be highlighted. First, the proficient participants from the three groups showed more confusion on brands than their not-proficient counterparts. Second, the logographic group showed more confusion in brand recall than the other groups whereas the biscriptal group indicated less confusion in brand recall than the rest of the groups.

Figure 9



An examination of the sample means suggested that both proficient and not proficient Chinese natives scored higher in intrusions than the other groups. In all cases, although the difference was not significant, proficient groups scored higher in false positives. The examination of the means confirmed the main effects results. Table 16 provides the summary output from the ANOVA performed.

Table 16

Between participants	SS	df	MS	F	Sig. of F
Intercept	34.166	1	34.166	71.546	.000
Script type	17.158	2	8.579	17.965	.000

Proficiency	.963	1	.963	2.016	.157
Script type*Proficiency	.155	2	7.772E-02	.163	.850
Error	92.642	194	.478		
Corrected total	111.155	199			

The interaction effect (script by reported proficiency in L2) was nonsignificant (F(2,194)=.163, MSE=7.772E-02, p=.850). This indicated that the effect of the script type is independent of proficiency, thus the main effects can be interpreted generally. The effect of script was significant (F(2,194)=17.965, MSE=8.579, p<.05). The effect of reported proficiency was nonsignificant (F(1,194)=2.016, MSE=.963, p=.157). These results indicated that there was no difference among groups due to the level of proficiency in L2. However, a difference was found due to the native script. The post-hoc Scheffé test revealed that the logographic group significantly differs from both the biscriptal group and the alphabetic group. The asterisk indicates that pair of group means is significantly different at the .05 level. Table 17 shows the Scheffé test results.

Table 17

(I) Script type	(J) Script type	Mean Difference (I-J)	Std. Error	Sig.
Logographic	Biscriptal	-.80*	.138	.000
	Alphabetic	-.57*	.120	.000
Biscriptal	Logographic	-.80*	.138	.000
	Alphabetic	-.23	.120	.161

Alphabetic	Logographic	-.57*	.120	.000
	Biscriptal	.23	.120	.161

A simple design for ANOVA was performed to test the differences in the means of intrusions as a function of memory code (i.e. visual trace versus phonological trace). The intrusion score was used as the dependent variable. The sample was classified into two groups based on the independent variable phonological trace access (0-Visual trace access and 1-Phonological trace access). The L2 for all participants was a phonological language (English). Thus, only non-proficient Chinese participants constituted the visual group, and proficient Chinese, Korean, Mexican and American participants the phonological group. The sample means are depicted in the figure 10.

Figure 10

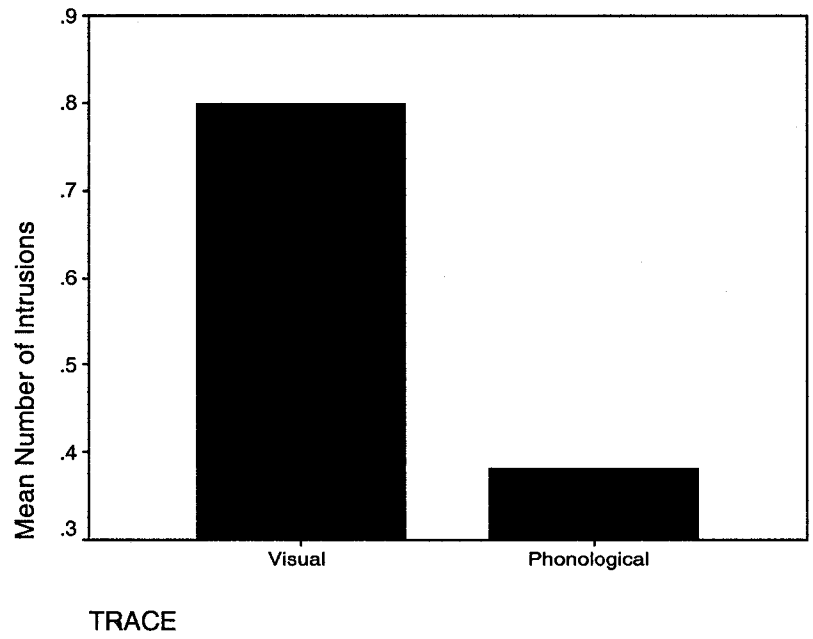


Table 18 provides the summary output from the ANOVA performed. The effect was significant ($F(1,198)=7.021$, $p<.05$).

Table 18

	SS	df	MS	F	Sig. of F
Phonological trace (Between groups)	3.806	1	3.806	7.021	.009
Phonological trace (Within groups)	107.349	198	.542		
Total	111.155	199			

Experiment 1 Discussion

The main finding was that recall and recognition scores differ across groups. While the recall results supported or partially supported the hypotheses, the recognition results disconfirmed the results. Results indicated that all recognition results were not supported or they could not be interpreted. No difference in recognition scores was found among script groups.

As expected, proficiency in a L2 represented a crucial factor in examining memory via recall. In both the recall score and the intrusions score, differences were found due to L2. In addition, consideration of the trace accessed by the L2 was a determinant in assessing recall differences. L2 proficiency was also a factor in determining differences when brand familiarity was assessed.

CHAPTER 5

EXPERIMENT 2

Sampling and Data Collection Procedure

In order to measure the effect of arousal on brand memorability, a second experiment was conducted. Data were collected during Summer 2004. The duration of the experiment was 30 to 35 minutes on average. A convenience sample was used for the study representing both sexes, and various age categories. An additional group of thirty individuals voluntarily participated, ranging from 18 to 59 years of age (mean=34.17). The group of participants was unrelated from the group of participants in experiment 1. All participants were highly educated, from different cultural backgrounds (Chilean, Chinese, Korean, Lebanese, Malaysian, Mexican, Turkish and American) and representing the script groups of interest. Forty-three percent were male. Forty-three percent are currently working, forty-three percent were graduate students and fourteen percent were housewives or retired. Thirty-three percent had a video game console at home, and the average time playing video games per week was 44 minutes (minimum=0, maximum=7 hrs.). Ninety-seven percent had a computer at home, eighty-seven percent had a computer at work and the average hours working in a computer per week was 20 (minimum=2, maximum=60).

All participants were provided with instructions for the games in their L1. The participants were instructed to play three games for five minutes each. Following the gameplay, participants completed the questionnaires including both recall and recognition tests. The free recall tests were applied first, then they were asked to answer to the L2 and demographics items. Next, the recognition tests were applied.

Descriptives

Memory measures. The mean of recalled brands in game A was .63 (maximum=2), the mean of recalled brands in game B was .50 (maximum=3) and the mean of brands recalled in game C was .43 (maximum=1). The mean of recognized brands in game A was 1.27 (maximum=3), the mean of recognized brands in game B was 1.23 (maximum=3), and the mean of recognized brands in game C was .80 (maximum=1).

Self-reported measures. Self-reported arousal measures were assessed by six 7-point Likert scale items. This scale showed an acceptable degree of reliability, alpha=.742. The SELF-REPORTED measure was obtained by summing the scores of the six items. Overall, the participants reported through several descriptive words representing the same level of arousal that they did not feel highly aroused. The participants reported they felt stimulated (mean=4.90), excited (mean=4.60), frenzied (mean=4.23), jittery (mean=4.87), wide-awake (mean=5.73) and aroused (mean=5.10).

Behavioral data. The behavioral data observed included smiles, laughing, excited utterances, body inclination (toward the computer), and verbal expressions of surprise, understanding (i.e. "I see"), celebration or disappointment. The participants either expressed one, several or none of the behavioral measures while they played. Seventy-seven percent of the participants exhibited at least one of the behavioral measures.

Physiological measures. All physiological recordings (heart rate) were taken using Burdik EKG10 equipment. The PHYSIOLOGICAL measure was obtained by using the record at half point minus the beginning heart rate. The average baseline heart rate was 73.64 (standard deviation=11.035). The baseline heart rate was relatively high because of the participants' stress associated with the use of EKG and/or the uncertainty about their possible poor performance in the experiment. Thus, this measure was not included in the PHYSIOLOGICAL measure.

Table 19 describes the means of heart rate measures at the beginning and at 2:30 minutes of gameplay for each one of the advergames. Standard deviations are in parenthesis.

Table 19

	At the beginning	At half point
Game A	74.47 (12.998)	74.50 (11.930)
Game B	71.87 (10.507)	72.87 (10.692)
Game C	71.30 (9.578)	74.87 (10.418)

Data Analysis

Recall Analysis

Regression analysis provides a means of assessing the effect magnitude and direction of each independent variable's relationship with the dependent variable. First, the recall score was selected as the dependent variable to test the "arousal-recall" hypothesis. The physiological, behavioral and self-reported measures were the independent variables. Thus, the ratio of observations to independent variables will be 10 to 1. Although it exceeds the minimum ratio suggested by Hair et al. (1998), this ratio is still below the desired level of 15-20 observations for each independent variable.

Normal probability plots are suggested to assess normality of the error term distribution in small samples (Hair et al., 1998). Both independent and dependent variables' normal probability plots showed a residual line closely following the diagonal, indicating normality.

Table 20 contains all the correlations among the three independent variables and their correlations with the dependent variable. Examination of the correlation matrix indicates that PHYSIOLOGICAL is most closely correlated with the dependent variable. Table 20 also indicates that the independent variables are not highly correlated with each other.

Table 20

Variables	SELF-REPORTED	PHYSIOLOGICAL	BEHAVIOR
Predictors			
SELF-REPORTED			
PHYSIOLOGICAL	.125		
BEHAVIOR	.255	-.018	
Dependent			
RECALL	.330	-.390	.126

All variables were entered into the equation. Tables 21, 22 and 23 include the multiple regression results, containing the model estimation, the regression variate specified, and the collinearity statistics.

Table 21

Multiple R	.546
Multiple R^2	.298
Adjusted R^2	.217
Standard error of estimate	1.106

Table 22

	Sum of Squares	df	Mean Square	F Ratio	Sig.
Regression	13.537	3	4.512	3.686	.025
Residual	31.830	26	1.224		

Table 23

Variables	Unstandardized Coefficient	Standard Error of Coefficient	Standardized Regression Coefficient (beta)	Partial t Value	Sig.
Y-intercept	-.362	1.038		-.348	.730
SELF-REPORTED	.079	.036	.379	2.213	.036
PHYSIOLOGICAL	-.413	.157	-.437	-2.636	.014
BEHAVIOR	.061	.495	.021	.125	.901

From table 23, the beta coefficients indicated that the PHYSIOLOGICAL variable was the most important variable, followed closely by SELF-REPORTED. BEHAVIOR, the third independent variable was nonsignificant and notably lower in importance.

It is important to note that the SELF-REPORTED beta coefficient is positive while the PHYSIOLOGICAL beta coefficient was negative. This indicated that there is a positive relationship between SELF-REPORTED and recall score, while there is a negative relationship between PHYSIOLOGICAL and recall. In other words, better recall resulted when greater values of arousal were self-reported, while poorer recall resulted when increased heart measures were recorded.

High tolerance values denote little collinearity. In this case, tolerance values all exceed .918, denoting very low levels of collinearity. The close-to-1.0 VIF (variance inflation factor) values are also indicative of low intercorrelation among variables. Likewise, all VIF values approach 1.0. Thus, the collinearity statistics indicate that interpretation of the regression variate coefficient should not be affected by multicollinearity.

Table 24

Variables	Collinearity Statistics	
	Tolerance	VIF
SELF-REPORTED	.918	1.089
PHYSIOLOGICAL	.982	1.019
BEHAVIOR	.932	1.073

Recognition Analysis

A regression analysis was conducted to determine the effect of arousal measures on recognition. Thus, the recognition score was selected as the dependent variable to test the "arousal-recognition" hypothesis. In order to correct for guessing, the recognition score was calculated by summing all the brands recognized in each game (hit score) minus the number of false alarms. The physiological, behavioral and self-reported measures were the independent variables. Again, the ratio of observations to independent variables will be 10 to 1.

Table 25 contains all the correlations among the three independent variables and their correlations with the dependent variable. Again, examination of the correlation matrix indicates that PHYSIOLOGICAL is most closely correlated with the dependent variable. Table 25 also indicates that the independent variables are not highly correlated with each other.

Table 25

Variables	SELF-REPORTED	PHYSIOLOGICAL	BEHAVIOR
Predictors			
SELF-REPORTED			
PHYSIOLOGICAL	.125		
BEHAVIOR	.255	-.018	
Dependent			
RECOGNITION	-.036	-.240	.098

All variables were entered into the equation. The following tables include the multiple regression results, containing the model estimation, the regression variate specified, and the collinearity statistics.

Table 26

Multiple R	.260
Multiple R^2	.067
Adjusted R^2	.040
Standard error of estimate	1.759

Table 27

	Sum of Squares	df	Mean Square	F Ratio	Sig.
Regression	5.823	3	1.914	.627	.604
Residual	80.477	26	3.095		

Table 28

Variables	Unstandardized Coefficient	Standard Error of Coefficient	Standardized Regression Coefficient (beta)	Partial t Value	Sig.
Y-intercept	3.604	1.651		2.183	.038
SELF-REPORTED	-.009	.057	-.033	-.167	.868
PHYSIOLOGICAL	-.306	.249	-.234	-1.226	.231

BEHAVIOR	.408	.787	.102	.519	.608

It could be observed from table 28 that none of the variables was significant, indicating that the impacts represented by the coefficients are not generalizable to other samples.

High tolerance values denote little collinearity. In this case, tolerance values all exceed .918, denoting very low levels of collinearity. The close-to-1.0 VIF (variance inflation factor) values are also indicative of low intercorrelation among variables. Likewise, all VIF values approach 1.0. Thus, the collinearity statistics indicate that interpretation of the regression variate coefficient should not be affected by multicollinearity.

Experiment 2 Discussion

The most robust finding is the effect of physiological measures on recall tests. The impact of the heart rate measures was consistent and the most salient. Results of the experiment demonstrated the importance of including physiological measures when assessing arousal in online advergames, particularly the heart rate measures. Although many other physiological measures are available, such as facial EMG, placing electrodes on the participants' face might make them aware, or create demand artifacts and distort the data. As expected, overall heart rate measures freely fluctuated during the advergame playing, which were recorded as the spontaneous depolarization and repolarization of the participant's heart occurred, generating more genuine data. Depolarization occurs when negatively charged ions inside the heart's pacemaker cell travel out from the cell through the cell membrane, and repolarization occurs when positively charged ions travel in.

Results indicated that the physiological measures contributed more to the memory results followed by the self-reported measures, and the behavioral measures contributed very little. However, it is important to note that the self-reported measures indicated that the participants did not feel highly aroused.

While there was effect of arousal on recall test (Adjusted R^2=.217), there was no effect for the recognition test (Adjusted R^2=.040). This means that the arousal measures only explain for recall tests results and not recognition tests results.

CHAPTER 6

GENERAL DISCUSSION

Previous research (Tavassoli 1999; Tavassoli and Han 2001; Tavassoli and Han 2002) suggested that logographic script relies more on visual processes whereas alphabetic script relies more on phonological processes. However, with the exception of Zhang and Schmitt's (2004) study, the effect of L2 proficiency had not been included in previous studies addressing East/West differences in memory. The present study addressed this aspect, in addition to other two factors that affect memory: arousal and familiarity with brands.

The dissertation extended previous work in several respects. Previous studies (Tavassoli 1999; Zhang and Schmitt 2004) addressing East/West differences of bilingual memory only tested differences between two languages: Chinese and English. The dissertation extends previous work by the inclusion of a biscriptal language to the comparison with logographic and alphabetic languages. In addition, the inclusion of another alphabetic language (Spanish) other than English also contributed to the generalization of findings of alphabetic natives as well as alphabetic bilinguals. The comparison across four languages uncovered the advantage of mastering several scripts for memory. Specifically, as indicated by the proficiency-recall and mono/biscriptal hypotheses, recall scores were superior for proficient bilinguals.

The main finding confirmed Zhang and Schmitt's (2004) conclusion that L2 proficiency is a key concept that should be included when comparing East/West bilingual consumers' memory. In particular, L2 proficiency determined differences in recall tests between biscriptal and monoscriptal natives (indicated by the mono/biscriptal-recall hypothesis). In addition, the inclusion of L2 proficiency tapped the possibility of a close analysis of the effect of specific traces (visual and phonological) accessed by both native script and L2. When groups were classified based on whether both native script and L2 might activate phonological trace or not (phonological-recall hypothesis testing), significant differences were found in recall tests. Lastly, when intrusion scores were examined, differences were found due to L2 proficiency.

For both experiments, differences were found in recall of brands but not in recognition of brands. No hypothesis was supported in recognition tests. Overall, the proficiency-recall and phonological-recall hypotheses results indicated that alphabetic and biscriptal participants outperformed logographic participants. This unexpected finding contradicted all previous work on East/West differences. However, it is important to note that advergames fully rely on visual stimuli and very little on phonological stimuli. One of two situations could occur. One, it could be the case that under expectation of graphic environments, only visual trace has been accessed and phonological trace has not been retrieved. Or since the promoted logos were written in alphabet, it could be the case that alphabetic participants relied on phonological trace remembering letters only and logographic participants relied on visual trace remembering the graphic aspect of the logo.

Previous work assessing East/West memory differences had only examined the correct recall and recognition scores. The dissertation addressed memory by taking into account both correct memory scores as well as false memory scores. While correct memory scores analyses did not revealed superiority in memory by the logographic script group in recall tests, intrusion scores analyses revealed differences due to L2 when comparing the three script groups.

Familiarity with brands was a factor affecting both recall and recognition scores, indicated by significant differences among groups. Familiarity was the only factor affecting the recognition tests (familiarity-based recognition hypothesis). This situation is crucial since effect of proficiency, script or arousal did not provide support to the recognition hypotheses (proficiency-recognition, mono/biscriptal-recognition and arousal-recognition, respectively), indicating that familiarity prevailed over the rest of the variables during the recognition tests. The finding also suggests that respondents might have retrieved brand information based on past experience rather than based on the exposure in the advergame. Future work could develop local or hypothetical brands and test them in the same context to ensure that the findings hold.

Arousal affected the recall scores but not the recognition scores. This suggested the possibility that recognition tests were not influenced by this dimension of emotion. Results of the experiment 2 (arousal-recall hypothesis) also demonstrated the validity of triangulation of behavioral, and self-reported and heart rate measures as a physiological measure in the assessment of arousal in online advergames. Triangulation is the application and combination of several research methodologies in the study of the same phenomenon. Within-method triangulation essentially involves cross-checking for internal consistency or reliability. The effectiveness of triangulation rests on the premise that the weaknesses in each single measure will be compensated for the counter-balancing strengths of another. In particular, it was found that the self-reported measures contributed less to explanation of the memory measures, whereas the heart rate measures contributed in a higher percentage. Although contradictory findings were found in the literature, the dissertation findings supported the claim that arousal has an effect on recall memory in the advergaming context.

The experimental stimuli were based on a naturalistic online environment as opposed to controlled environments. Research with fictitious brands should confirm that results do not provide incomplete or incorrect insights into how consumers respond to real familiar brands. The dissertation tested global brand familiarity effects in a real online setting. The selected advergames are accessible to Internet users worldwide. The dissertation also contributes to the body of knowledge regarding the effectiveness of this technique using real global brands. More important, as the findings showed, memory of online brand placements could differ from memory of printed brand placements. Placement is the aid inclusion of branded products or brand identifiers, through audio and/or video means, within mass media programming

Limitations and Future Research

As international experiments, the procedure used in this study was susceptible to some limitations. Several points should be stressed regarding the experimental stimuli. First, selected games represented brands from the same type of products. It is recommended that future work compare between hedonic and utilitarian products. A utilitarian value relates to the instrumentality, usefulness or performance a product offers, while a hedonic value results from the emotional inputs (pleasure, happiness, fun), esthetic qualities (beauty, nicety) or value-expression (self-expression) provided by a product. Second, only recall and recognition of mature global brands were tested in this study. It would be particularly interesting for future research to test memory of new global brands. Lastly, the time assigned to play games was a minimum but acceptable length. A close scrutiny of the effect of exposure time to the stimuli is also recommended.

Following Luna and Peraccio's measures, the proficiency in L2 was only assessed via self-reports. However, the most recent work from Zhang and Schmitt (2004) (published during the dissertation data collection period) assessed proficiency in L2 based on Chinese students' scores on the College English Test. Future research could follow this last procedure, using Test of English as a Foreign Language or equivalent test which might lead to more precise information than self-reports.

Several points should also be highlighted regarding experiment 2. First, though the sample size used for the experiment 2 was comparable with similar studies, the sample size was small. Generalizability of results should be made with caution. Replication of the experiment with a different sample is strongly encouraged. Second, the self-reported measures indicated that the participants did not feel highly aroused. Future research could replicate this study including more extreme emotional games, such as extreme sports or violent games, in order to determine their effect on memory. Future work might also include the effect of valence –the extent to which an emotion is labeled either positive or negative- and/or dominance to better understand the relationship between emotion and memory.

The inclusion of countries speaking different languages is also recommended. For instance, inclusion of countries like India, in which most of the people are required to learn English in addition to their native dialect, or European countries in which bilingualism is conventional will help the comparison among biscriptal natives and proficient monoscriptal natives. Another interesting avenue for research would be the inclusion of other biscriptal languages, such as Japanese. At a difference of Korean language using one script (Hancha or Hangul) at a time, the Japanese combines Chinese characters with its own alphabetic characters. Future research could address differences between biscriptal languages.

A factor not addressed in the dissertation is motivation. All participants voluntarily participated in the experiments. However, this did not guarantee that the participants were motivated while playing games. Thus, motivation is proposed as another possible factor affecting memory. Future work could address this aspect by examining scores obtained under the promise of a prize.

Despite its limitations, the dissertation improves the understanding of the effects of script, L2 proficiency, prior brand familiarity and arousal on bilingual consumer memory in advergames by the provision of empirical cross-script evidence. The dissertation intended to uncover the effect of these elements in short-term brand memory, in order to appropriately provide guidelines for an effective use of brand and product placements in advergames among the diverse Internet audience.

REFERENCES

Akmajian, Adrian, Richard A. Demers, Ann K. Farmer, and Robert M. Harnish (1990), *Linguistics: An Introduction to Language and Communication*, Cambridge, Massachusetts: The MIT Press.

Bolls, Paul D., Annie Lang, and Robert F. Potter (2001), "The Effects of Message Valence and Listener Arousal on Attention, Memory, and Facial Muscular Responses to Radio Advertisement," *Communication Research*, 28 (5), 627-651.

Cahill, Larry, and James L. McGaugh (1995), "A Novel Demonstration of Enhanced Memory Associated with Emotional Arousal," *Consciousness and Cognition*, 4 (4), 410-421.

Campbell, Margaret C. and Kevin L. Keller (2003), "Brand Familiarity and Advertising Repetition Effects," *Journal of Consumer Research*, 30 (2), 292-304.

Crockett, Roger O. (2000), "Surfing in Tongues," *Business Week* (December, 11), 3711, EB18.

Dahlen, Micael (2001), "Banner Advertisements through a New Lens," *Journal of Advertising Research*, 41 (4), 23-30.

Dufour, Robert, and Judith F. Kroll (1995), "Matching Words to Concepts in Two Languages: A Test of the Concept Mediation Model of Bilingual Representation," *Memory & Cognition*, 23, 166-180.

Fairbank, John K., Edwin O. Reischauer, and Albert M. Craig (1973), *East Asia: Tradition and Transformation*. Boston, Massachusetts: Houghton Mifflin Company.

Fattah, Hassan, and Pamela Paul (2002), "Gaming Gets Serious," *American Demographics*, 24, 38-43.

French, Howard W. (2002), "South Korea's Real Rage for Virtual Games," *The New York Times*, (October 9). available at http://www.nytimes.com/2002/10/09/technology/09KORE.html (accessed October 5, 2004).

Fulford, Benjamin (2003), "Korea's Weird Wired World," *Forbes*, (July 21), 172 (2), 92-94.

Green, Heather, and Ira Sager (2004), "China's Great March Online," *Business Week*, 3891, 14.

Groot, Annette M.B. de (1992), "Bilingual Lexical Representation: A Closer Look at Conceptual Representations," In *Orthography, Phonology, Morphology, and Meaning*, Amsterdam: Elsevier. 389-412.

Hair, Joseph F., Rolph E. Anderson, Ronald L. Tatham, and William C. Black (1998), *Multivariate Data Analysis*. 5th ed., Upper Saddle River, New Jersey: Prentice Hall.

Hernandez, Monica D., and Michael S. Minor (2003), "A Decision Tool for the Assessment of Advergaming Suitability," Paper presented at the 2003 American Marketing Association Summer Educators Conference (August).

------, and Sindy Chapa (2004), "Gender Differences in Attitudes Toward Advergames: A Mexican, Peruvian and American Comparison," Paper presented at the 2004 Academy of Marketing Science Cultural Perspectives on Marketing Conference (September).

------, ------, and Michael S. Minor (2004), "A Model of the Antecedents to the Formation of Attitudes Toward Advergames," Paper presented at the 2004 American Marketing Association Winter Educators Conference (February).

------, ------, ------, Cecilia Maldonado, and Fernando Barranzuela (2004), "Hispanic Attitudes Toward Advergames: A Proposed Model of Their Antecedents," *Journal of Interactive Advertising*, Special Issue on Gaming and its Relationship with Advertising, Marketing and Communication, 5 (1), available at jiad.org (accessed October 10, 2004).

------, Michael S. Minor, Jaebeom Suh, Sindy Chapa, and Jose A. Salas (2005), "Brand Recall in the Advergaming Environment: A Cross-National Comparison," in *Advertising, Promotion and the New Media*. Marla R. Stafford and Ronald J. Faber, eds., M.E. Sharpe, Inc. Armonk, NY.

Hung, Kineta, and Heeler, Roger (1998), "Bilinguals' Brand Perceptions Reported on Different Languages Questionnaires," *Advances in Consumer Research*, 25, 246-251.

Instituto Nacional de Estadística, Geografía e Informática (2003), "Usuarios de Internet por Paises Seleccionados 1995-2002," available at http://www.inegi.gob.mx/est/contenidos/espanol/tematicos/mediano/med.asp?t=tinf142&c=4870 (accessed October 5, 2004).

Jackson, Jonathan (2001), "The Effectiveness of Pop-up Ads," Entrepreneur.com. available at www.entrepreneur.com/Your_business/YB_SegArticle/0,4621,290749,00.html (accessed October 5, 2004).

Jang, Dong P., In Y. Kim, Sang W. Nam, Brenda K. Wiederhold, Mark D. Wiederhold, and Sun I. Kim (2002), "Analysis of Physiological Response to Two Virtual Environments: Driving and Flying Simulation," *CyberPsychology & Behavior*, 5 (1), 11-18.

Jung A., Song (2000), "Lingua Future," *Far Eastern Economic Review* (March 2), 163 (9), 38-39.

Kent, Robert J. (1997), "How Ad Claim Similarity and Target Brand Familiarity Moderate Competitive Interference Effects in Memory for Advertising," *Journal of Marketing Communications*, 3 (4), 231-242.

------, and Chris T. Allen (1994), "Competitive Interference Effects in Consumer Memory for Advertising: The Role of Brand Familiarity," *Journal of Marketing*, 58 (3), 97-105.

------, and James J. Kellaris (2001), "Competitive Interference Effects in Memory for Advertising: Are Familiar Brands Exempt?" *Journal of Marketing Communications*, 7 (3), 159-169.

Kroll, Judith F., and Annette M.B. de Groot (1997), "Lexical and Conceptual Memory in the Bilingual: Mapping Form to Meaning in Two Languages," in *Tutorials in Bilingualism*, Annette M.B. de Groot and Judith F. Kroll, eds., Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers, 169-199.

Kushairi, Ahmad (2003), "More Girls Take to Net Gaming," *New Straits Times-Management Times* (January 23).

Lee, Moon-Bong, Kil-Soo Suh, and Jaehoon Whang (2003), "The Impact of Situation Awareness Information on Consumer Attitudes in the Internet Shopping Mall," *Electronic Commerce Research and Applications*, 2 (3), 254-265.

Lerman, Dawn (2003), "The Effect of Morphemic Familiarity and Exposure Mode on Recall and Recognition of Brand Names," *Advances in Consumer Research*, 30 (1), 80-81.

------, and Ellen Garbarino (2002), "Recall and Recognition of Brand Names: A Comparison of Word and Nonword Name Type," *Psychology & Marketing*, 19 (7 & 8), 621-639.

Luna, David, and Laura A. Peracchio (1999), "What's in a Bilingual's Mind?: How Bilingual Consumers Process Information," *Advances in Consumer Research*, 26, 306-311.

------, and ------ (2001), "Moderators of Language Effects in Advertising to Bilinguals: A Psycholinguistic Approach," *Journal of Consumer Research*, 28, 284-295.

------, and ------ (2002a), "Bilinguals, Graphics, and the Web: A Language Processing Approach," *Advances in Consumer Research*, 29, 186-187.

------, and ------ (2002b), "Uncovering the Cognitive Duality of Bilinguals through Word Association," *Psychology & Marketing*, 19 (6), 457-476.

------, and ------ (2002c), "'Where There Is a Will…': Motivation as a Moderator of Language Processing by Bilingual Consumers," *Psychology & Marketing*, 19 (7-8), 573-593.

------, and ------ (2003), "Visual and Linguistic Processing of Ads by Bilingual Consumers," In *Persuasive Imagery: A Consumer Response Perspective*, Linda M. Scott and Rajeev Batra. Mahwah, eds., New Jersey: Lawrence Erlbaum Associates, Publishers, 153-173.

------, ------, and Maria Dolores De Juan (2003), "The Impact of Language and Congruity on Persuasion in Multicultural E-Marketing," *Journal of Consumer Psychology*, 13 (1 & 2), 41-50.

MacIntyre, Peter D., Kimberly A. Noels, and Richard Clement (1997), "Biases in Self-Ratings of Second Language Proficiency: The Role of Language Anxiety," *Language Learning*, 47 (2), 265-287.

Martin, Sumitha (2003), "English is not Enough," *New Straits Times-Management Times* (February 23).

Menon, Satya, and Barbara Kahn (2002), "Cross-Category Effects of Induced Arousal and Pleasure on the Internet Shopping Experience," *Journal of Retailing*, 78 (1), 31-40.

Nelson, Michelle R. (2002), "Recall of Brand Placements in Computer/Video Games," *Journal of Advertising Research*, 42 (2), 80-92.

Newell, Stephen J., Kenneth V. Henderson, and Bob T. Wu (2001), "The Effects of Pleasure and Arousal on Recall of Advertisements during the Super Bowl," *Psychology & Marketing*, 18 (11), 1135-1153.

Nielsen Media Research (2002), "1999 Nielsen Media Research Fourth Quarter Home Technology Report," available at http://www.nielsenmedia.com/newsreleases/1999/hometech.html (accessed October 5, 2004).

Olsen, Stefanie (2001), "Major Brands Play for Attention," News.com. available at http://news.com.com/2102-1023-256982.html (accessed October 5, 2004).

Pavelchak, Mark A., John H. Antil, and James M. Munch (1998), "The Super Bowl: An Investigation into the Relationship Among Program Context, Emotional Experience, and Ad Recall," *Journal of Consumer Research*, 15, 360-367.

Quester, Pascale, and Francis Farrelly (1998), "Brand Association and Memory Decay Effects of Sponsorship: The Case of the Australian Formula One Grand Prix," *Journal of Product and Brand Management*, 7 (6), 539-556.

Ragazzoni, A. (1998), "Arousal: A Neurophysiological View," Abstracts/*International Journal of Psychophysiology*, 30, 9.

Reekum, Carien M. van, Tom Johnstone, Rainer Banse, Alexandre Etter, Thomas Wehrle, and Klaus R. Scherer (2004), "Psychophysiological Responses to Appraisal Dimensions in a Computer Game," *Cognition and Emotion*, 18 (5), 663-688.

Rodgers, Anni Layne (2002), "More Than a Game," *Fast Company* (May), 46-48.

Rohm, Andrew J. and Fareena Sultan (2004), "The Evolution of E-Business," *Marketing Management*, 13 (1), 32-37 (January-February).

Schmitt, Bernd H., Yigang Pan, and Nader T. Tavassoli (1994), "Language and Consumer Memory: The Impact of Linguistic Differences between Chinese and English," *Journal of Consumer Research*, 21, 419-431.

Shapiro, Stewart, Deborah J. Maclnnis, and C. Whan Park (2002), "Understanding Program-Induced Mood Effects: Decoupling Arousal from Valence," *Journal of Advertising*, 31 (4), 15-26.

Singh, Surendra N., and Michael L. Rothschild (1983), "The Effect of Recall on Recognition: An Empirical Investigation of Consecutive Learning Measures," *Advances in Consumer Research*, 10 (1), 271-276.

Soriano, Mirella Yani, and Gordon R. Foxall (2002), "A Spanish Translation of Mehrabian and Russell's Emotionality Scales for Environmental Consumer Psychology," *Journal of Consumer Behaviour*, 2 (1), 23-36.

Tavassoli, Nader T. (1995), "New Research on Limited Cognitive Capacity: Effects of Arousal, Mood and Modality," *Advances in Consumer Research*, 22, 524-525.

------ (1999), "Temporal and Associative Memory in Chinese and English," *Journal of Consumer Research*, 26, 170-181.

------ (2003), "Scripted Thought," In *Persuasive Imagery: A Consumer Response Perspective*. Linda M. Scott and Rajeev Batra, eds., Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers, 141-152.

------, and Jin K. Han (2001), "Scripted Thought: Processing Korean Hancha and Hangul in a Multimedia Context," *Journal of Consumer Research*, 28 (3), 482-493.

------, and ------ (2002), "On the Interaction of Alphabetic and Logographic Words with Sounds and Images," *Advances in Consumer Research*, 29, 185-186.

------, and Yih Hwai Lee (2003), "The Differential Interaction of Auditory and Visual Advertising Elements with Chinese and English," *Journal of Marketing Research*, 40, 468-480.

Thaler, Malcolm S. (1995), *The Only EKG Book You'll Ever Need.* 2nd ed., Pennsylvania, Philadelphia: J. B. Lippincott.

Tsang, Eric W.K. (2002), "Learning from Overseas Venturing Experience: The Case of Chinese Family Businesses," *Journal of Business Venturing*, 17 (1), 21-40.

Vikas, Bajaj (2003), "Online Gaming Captivates S. Korean Youths; Emphasis on Teamwork Counter to Playing Habits in US," *The Dallas Morning News* (January 18), 1H.

Xiong, Chao (2003), "Where the Girls Are," *Wall Street Journal - Eastern Edition* (October 28) 242 (84), B1.

Wallace, Richard (2004), "Opportunity on Tap at China's Net Cafés," *Electronic Engineering Times*, 1313, 18-20.

Web Site Optimization (2004), "US Broadband Penetration Drops to 51.3% Among Active Internet Users - FCC Approves Broadband Over Power Line Rules - October 2004 Bandwidth Report," available at http://www.websiteoptimization.com/bw/0410/ (accessed November 5, 2004).

Wells, William D. (2000), "Recognition, Recall, and Rating Scales," *Journal of Advertising Research*, 40 (6), 14-20.

World Almanac & Book of Facts (2003), "Languages Spoken by the Most People," World Almanac Education Group Inc., 633.

YaYa (2002), "Why Games," available at http://www.yaya.com/why/index_why.html (accessed October 5, 2004).

Youn, Seounmi, and Mira Lee (2003), "Antecedents and Consequences of Attitude toward the Advergame in Commercial Web Sites," Paper presented at the 2003 Conference of the American Academy of Advertising (March).

------, ------, and Kenneth O. Doyle (2003), "Understanding Adult Online Game Players," Paper presented at the 2003 Conference of the American Academy of Advertising (March).

Zhang, Shi, and Bernd H. Schmitt (2001), "Creating Local Brands in Multilingual International Markets," *Journal of Marketing Research*, 38, 313-325.

------, and ------ (2004), "Activating Sound and Meaning: The Role of Language Proficiency in Bilingual Consumer Environments," *Journal of Consumer Research*, 31 (June), 220-228.

APPENDIX A

EXPERIMENT 1 RECALL SURVEY FORMAT

Please answer all of the following questions by listing, checking off or placing a circle on the appropriate number using the indicated scale.

Game A. 3D Dune Derby *Game B. Mini Mini-golf* *Game C. Sumo Wrestling*

1. What brands do you remember seeing in the game A? List any or all below.

2. What brands do you remember seeing in the game B? List any or all below.

3. What brands do you remember seeing in the game C? List any or all below.

4. How familiar were these brands before you played the games? (Scale 1-7; 1- Low, 7- High).

5. What languages do you speak?

6. What is the first language you learned?

7. What age did you started learning your second language?

8. How many years of formal learning you have for your second language?

Please rate your level of proficiency of your second language in the following aspects: (Scale 1-7; 1- Strongly disagree, 7- Strongly agree).

9. I can understand English movies without subtitles.

10. I can understand news broadcasts on radio.

11. I can talk about my favorite hobby at some length, using appropriate vocabulary.

12. I can give direction in the street.

13. I can understand newspaper headlines.

14. I can read popular novels without using a dictionary.

15. I can fill out a job application form requiring information about your interests and qualifications.

16. I can write an advertisement selling a bicycle.

Please rate your overall level of proficiency of your second language: (Scale 1-7; 1- Very poor, 7- Excellent).

17. Proficiency in reading.

18. Proficiency in writing.

19. Proficiency in listening.

20. Proficiency in speaking.

PART II

21. Age

22. Sex (M/F)

23. Occupation

24. Education level (High school/Associate/Undergraduate/Graduate)

25. Country

26. Do you have a computer at home? (Yes/No)

27. Do you have a computer at work? (Yes/No)

28. How many hours per week do you use a computer?

29. Do you own a console (PS2, Xbox, etc.)? (Yes/No)

30. How many hours per week do you play video games?

APPENDIX B

EXPERIMENT 1 RECOGNITION SURVEY FORMAT

Please answer all of the following questions by listing, checking off or placing a circle on the appropriate number using the indicated scale.

Game A. 3D Dune Derby *Game B. Mini Mini-golf* *Game C. Sumo Wrestling*

1. For each pair of options presented, check off the brand you remember seeing in game A.

Pair 1

Pair 2

Pair 3

2. How confident are you that you remember these brands? (Scale 1-7; 1- Not confident, 7- Very confident).

3. For each pair of options presented, check off the brand you remember seeing in game B.

Pair 1

Pair 2

Pair 3

4. How confident are you that you remember these brands? (Scale 1-7).

5. For each pair of options presented, check off the brand you remember seeing in game C.

Pair 1

6. How confident are you that you remember these brands? (Scale 1-7).

7. How familiar were these brands before you played the games? (Scale 1-7; 1- Low, 7- High).

8. What languages do you speak?

9. What is the first language you learned?

10. What age did you started learning your second language?

11. How many years of formal learning you have for your second language?

Please rate your level of proficiency of your second language in the following aspects: (Scale 1-7; 1- Strongly disagree, 7- Strongly agree).

12. I can understand English movies without subtitles.

13. I can understand news broadcasts on radio.

14. I can talk about my favorite hobby at some length, using appropriate vocabulary.

15. I can give direction in the street.

16. I can understand newspaper headlines.

17. I can read popular novels without using a dictionary.

18. I can fill out a job application form requiring information about your interests and qualifications.

19. I can write an advertisement selling a bicycle.

Please rate your overall level of proficiency of your second language: (Scale 1-7; 1- Very poor, 7- Excellent).

20. Proficiency in reading.

21. Proficiency in writing.

22. Proficiency in listening.

23. Proficiency in speaking.

24. Age

25. Sex (M/F)

26. Occupation

27. Education level (High school/Associate/Undergraduate/Graduate)

28. Country

29. Do you have a computer at home? (Yes/No)

30. Do you have a computer at work? (Yes/No)

31. How many hours per week do you use a computer?

32. Do you own a console (PS2, Xbox, etc.)? (Yes/No)

33. How many hours per week do you play video games?

APPENDIX C

EXPERIMENT 2 SURVEY FORMAT

Please answer all of the following questions by listing, checking off or placing a circle on the appropriate number using the indicated scale.

Game A. 3D Dune Derby   *Game B. Mini Mini-golf*   *Game C. Sumo Wrestling*

1. What brands do you remember seeing in the game A? List any or all below.
2. What brands do you remember seeing in the game B? List any or all below.
3. What brands do you remember seeing in the game C? List any or all below.
4. How familiar were these brands before you played the games? (Scale 1-7; 1- Low, 7- High).
5. What languages do you speak?
6. What is the first language you learned?
7. What age did you started learning your second language?
8. How many years of formal learning you have for your second language?

Please rate your level of proficiency of your second language in the following aspects: (Scale 1-7; 1- Strongly disagree, 7- Strongly agree).

9. I can understand English movies without subtitles.
10. I can understand news broadcasts on radio.
11. I can talk about my favorite hobby at some length, using appropriate vocabulary.

12. I can give direction in the street.

13. I can understand newspaper headlines.

14. I can read popular novels without using a dictionary.

15. I can fill out a job application form requiring information about your interests and qualifications.

16. I can write an advertisement selling a bicycle.

Please rate your overall level of proficiency of your second language: (Scale 1-7; 1- Very poor, 7- Excellent).

15. Proficiency in reading.

16. Proficiency in writing.

17. Proficiency in listening.

18. Proficiency in speaking.

PART II

19. For each pair of options presented, check off the brand you remember seeing in game A.

Pair 1	Reese's MILK CHOCOLATE PEANUT BUTTER CUPS	OREO
Pair 2	RITZ	Chips Deluxe
Pair 3	Nutter Butter	Triscuit

20. How confident are you that you remember these brands? (Scale 1-7; 1- Not confident, 7- Very confident).

21. For each pair of options presented, check off the brand you remember seeing in game B.

Pair 1 Chips Ahoy! LifeSavers Gummies

Pair 2 Tom's Nutter Butter

Pair 3 Oreo Cheez-It

22. How confident are you that you remember these brands? (Scale 1-7; 1- Not confident, 7- Very confident).

23. For each pair of options presented, check off the brand you remember seeing in game C.

Pair 1 Ritz Bits Tom's

24. How confident are you that you remember these brands? (Scale 1-7; 1- Not confident, 7- Very confident).

Please rate the reaction you experienced while playing the games (Scale 1-7; 1- Strongly disagree, 7- Strongly agree).

25. Stimulated (relaxed).

26. Excited (calm).

27. Frenzied (sluggish).

28. Jittery (dull).

29. Wide-awake (sleepy).

30. Aroused (unaroused).

31. Age.

32. Sex (M/F).

33. Occupation.

34. Education level (High school/Associate/Undergraduate/Graduate).

35. Country.

36. Do you have a computer at home? (Yes/No)

37. Do you have a computer at work? (Yes/No)

38. How many hours per week do you use a computer?

39. Do you own a console (PS2, Xbox, etc.)? (Yes/No)

40. How many hours per week do you play video games?

APPENDIX D

ADVERGAMES INSTRUCTIONS

Instructions for NABISCO WORLD 3D DUNE DERBY

How to access:

Type in the address bar of the Internet Explorer:

http://www.nabiscoworld.com/games/nw_shock_nwdn.htm

How To Win

RACE: Finish 5 laps, passing through each banner checkpoint, in the fastest time. The arrow points to the next checkpoint. Pickups increase your final score.

CAPTURE THE FLAG: Drive through 8 pickups in the correct order. The arrow points to next pickup.

How To Play:

Use your mouse to navigate the rugged sand dune terrain.

Place mouse in front of the car to accelerate.

Place mouse behind the car to drive in reverse.

Move mouse from side to side to steer.

Use CTRL key to brake.

Instructions for NABISCO WORLD MINI MINI GOLF

How to access:

Type in the address bar of the Internet Explorer:

http://www.nabiscoworld.com/games/nw_shock_nwmm.htm

How To Win:

Try to putt your ball into the hole in the fewest number of strokes. Avoid the obstacles by carefully timing your shot.

How To Play:

TEEING OFF:

Click on one of the larger icons near the top of the screen. When on the tee, move the mouse left and right or up and down, then click to choose the desired tee position.

PUTTING THE BALL:

1. Use the mouse arrow to help you aim the ball. Near the hole you'll have to use the angle of the putter as the arrow disappears.
2. Click and hold down the mouse button to pull back the putter. The longer you hold down the button, the harder you will hit the ball.
3. Release the button to strike the ball.

4. If you have already drawn your club back and are unhappy with the power you have selected, simply place the cursor on your ball and release the mouse button. This will reset the selected shot.

The maximum number of strokes that can be taken on any hole is 14.

Instructions for NABISCO WORLD SUMO WRESTLING

How to access:

Type in the address bar of the Internet Explorer:

http://www.nabiscoworld.com/games/rb_shock_rbsw.htm

How To Win:

Make as many S'mores as possible in the time provided.

How To Play:

Move mouse left or right to position your Sumo wrestler.

Line up your wrestler so that your opponent is directly across from you.

When your opponent stomps his right foot, click and hold the mouse button down, pushing the mouse forward and releasing to dive at opponent.

When you S'more your opponent on his side of the plate, you will receive points. You will receive bonus points for accuracy.

Every 3 times you S'more your opponent, additional time will be added to the round.

APPENDIX E

PILOT STUDY – EXPERIMENT 1

Data Collection Procedure

Data was collected during early Spring 2004. The participants were provided with instructions for the games in their L1. To avoid demand artifacts, they were told this was an electronic games study. The participants were instructed to play three games for five minutes each. Following the gameplay, participants completed the questionnaires in their L1 independently. The instrument was translated to Chinese, Korean and Spanish, and backtranslated to achieve construct equivalence across nations.

Samples

Convenience samples were used for the pilot study representing both sexes and various age categories. One hundred two individuals from China, Mexico, South Korea and the United States voluntarily participated in the study. The same procedure was used in the recruitment of participants in the four countries.

China. Thirty participants from Beijing and Qingdao constituted the Chinese group, ranging from 20 to 50 years old (mean=23.93). The participants' L1 was Chinese and the L2 was English. Thirty percent were male. Seventy percent were students and thirty percent were employees. Seventy-seven percent had a computer at home. Twenty-three percent owned a video game console. Proficiency in their L2 was measured by self-reported rating on a 7-point Likert scale (1-very poor to 7-excellent) of their overall proficiency in reading, writing, listening and speaking. The mean of the overall L2 proficiency by the Chinese participants was 3.54.

Mexico. Twenty-two participants from Ciudad Victoria constituted the Mexican group, ranging from 18 to 33 years old (mean=19.59). The participants' L1 was Spanish and the L2 was English. Fifty-eight percent were male, and ninety-six percent were students. All students had a computer at home. Fifty-nine percent owned a video game console. The mean of the overall L2 proficiency reported by the Mexican participants was 5.12.

South Korea. Twenty participants from Seoul constituted the Korean group, ranging from 21 to 26 years old (mean=23.15). The participants' L1 was Korean and the L2 was English. Seventy percent were male, and all participants were students. Ninety-five percent had a computer at home. Twenty percent owned a video game console. The mean of the overall L2 proficiency reported by the Korean participants was 3.93.

United States. The American participants were thirty individuals from Edinburg and McAllen, TX ranging from 18 to 64 years old (mean=27.33). The participants' L1 was English and the L2 was Spanish. Forty-seven percent were male. Seventy-three percent were students, seventeen percent were employees, and ten percent were retired. Ninety-seven percent had a computer at home. Fifty-three percent owned a video game console. The mean of the overall L2 proficiency reported by the American participants was 5.30.

Data Analyses

"Proficiency-recall" and "Proficiency-recognition" Hypotheses Testing

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average) factorial design for ANOVA with six groups was performed to test $H_{proficiency\text{-}recall}$ addressing differences in means of brand recall. The brand recall score was used as dependent variable. The sample was classified into three groups based on the independent variable L1 script type (denoted by 1-Logographic-based language, 2-Biscriptal language and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants constituted the biscriptal group, and the Mexican and American participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). The interaction effect (script by reported proficiency in L2) was nonsignificant ($F(1,96)=1.697$, $MSE=6.297$, $p=.189$). This indicated that the effect of the treatments are independent, thus the main effects were interpreted generally (Hair et al., 1998). The effect of script was significant ($F(1,96)=4.115$, $MSE=15.459$, $p<.05$). The effect of reported L2 proficiency was nonsignificant ($F(1,96)=1.934$, $MSE=7.180$, $p=.168$). These results indicated that there was a difference among groups due to native script and not due to level of proficiency. In particular, post hoc test with the Scheffé method indicated a difference in the logographic group, which performed lower than the other groups. Thus, $H_{proficiency\text{-}recall}$ was partially supported.

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average) factorial design for ANOVA with six groups was performed to test $H_{proficiency\text{-}recognition}$ addressing differences in means of brand recognition. The brand recognition score was used as dependent variable. The sample was classified into three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, 3-Alphabetic-based language). Again, the Chinese participants constituted the logographic group, the Korean participants constituted the biscriptal group, and the Mexican and American participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). The interaction effect (script by reported proficiency in L2) was nonsignificant ($F(1,96)=7.767$, $MSE=3.383$, $p=.176$). Thus, the main effects were interpreted generally. The effect for script was significant ($F(1,96)=4.822$, $MSE=9.233$, $p<.05$). However, the effect of reported proficiency approached but was nonsignificant ($F(1,96)=3.856$, $MSE=3.856$, $p=.052$). These results indicated that there was a difference among groups due to native script and not due to level of proficiency. Post hoc test with the Scheffé method indicated a difference in the logographic group, which exhibited poorer scores than the other groups. Therefore, $H_{proficiency\text{-}recognition}$ was partially supported.

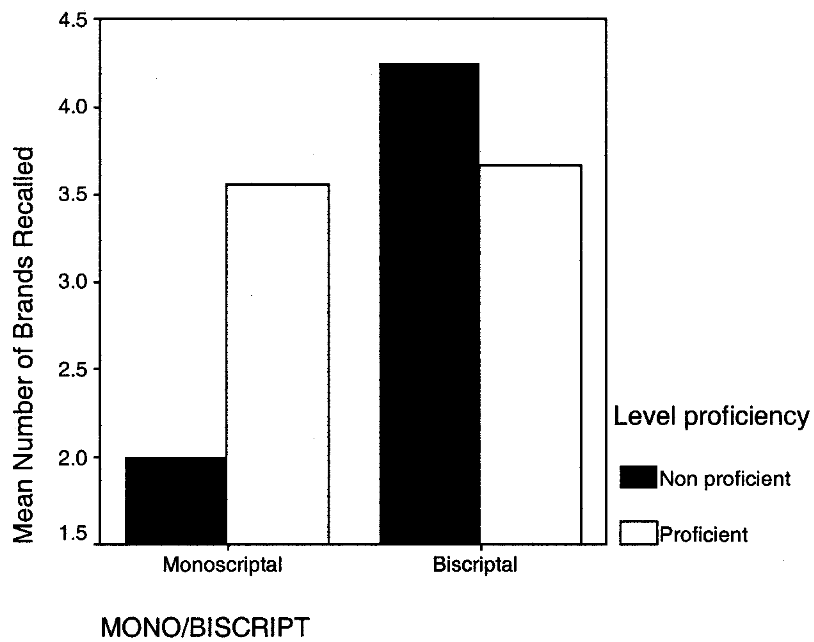
"Mono/biscriptal-recall" and "Mono/biscriptal-recognition" Hypotheses Testing

A 2(number of scripts: monoscriptal, biscriptal)x2(proficiency: below average, above average) factorial design for ANOVA with four groups was performed to test $H_{mono/biscriptal\text{-}recall}$. The brand recall score was used as dependent variable. The sample was classified into two groups based on whether their L1 was biscriptal (Korean) or monoscriptal (Chinese, English, Spanish). Each group was subclassified into two more groups based on the level of proficiency of their L2 (0-Below average, 1-Above average).

The interaction effect (mono/biscriptal L1 by reported proficiency in L2) was significant at the .05 level ($F(1,98)=4.446$, $MSE=16.827$, $p<.05$). Thus, the type of interaction was determined. The residual means depicted in the figure described a disordinal interaction. As can be seen on the figure, the effects of one treatment are positive for some levels and negative for other levels of the other treatment. The effect of mono/biscriptal L1 was significant ($F(1,98)=5.425$, $MSE=20.438$, $p<.05$). The effect of reported proficiency also was nonsignificant ($F(1,98)=.925$, $MSE=3.484$, $p=.339$). However, because of the disordinal interaction, the main effects of the treatments could not be interpreted.

The sample means are depicted in figure 11.

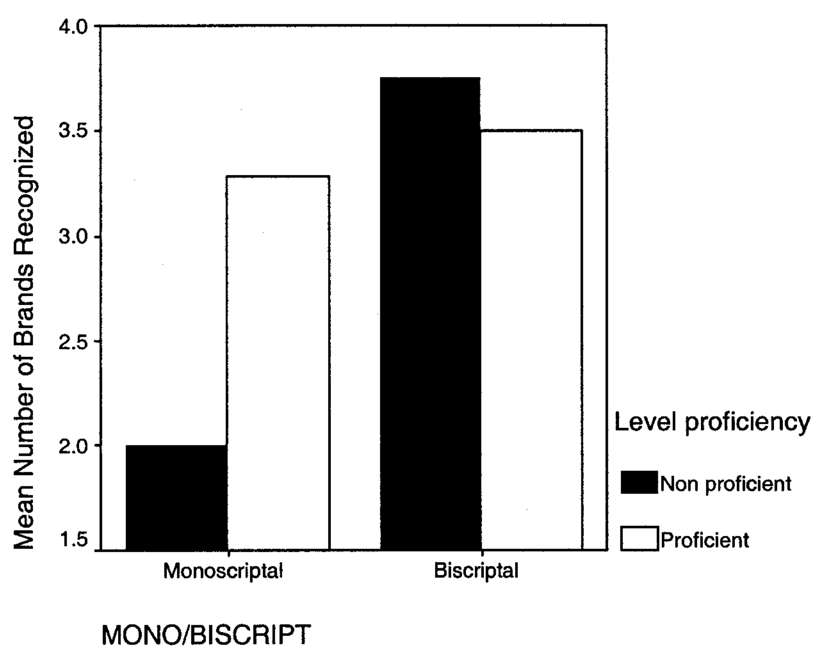
Figure 11



A 2(number of scripts: monoscriptal, biscriptal)x2(proficiency: below average, above average) factorial design for ANOVA with four groups was performed to test $H_{mono/biscriptal\text{-}recognition}$. The brand recognition score was used as dependent variable. The sample was classified into two groups based on whether their L1 was biscriptal (Korean) or monoscriptal (Chinese, English, Spanish). Each group was subclassified into two more groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). The interaction effect (mono/biscriptal L1 by reported proficiency in L2) was significant ($F(1,98)=4.445$, $MSE=8.581$, $p<.05$). Again, the residual means are depicted in the figure that describes a disordinal interaction. The effect of mono/biscriptal L1 was significant ($F(1,98)=7.408$, $MSE=14.269$, $p<.05$). The effect of reported proficiency was nonsignificant ($F(1,98)=2.017$, $MSE=3.886$, $p=.159$). However, because of the disordinal interaction, the main effects of the treatments could not be interpreted.

The sample means are depicted in figure 12.

Figure 12



"Phonological trace-recall" and "Visual trace-recognition" Hypotheses Testing

A simple design for ANOVA was performed to test $H_{phonological\ trace\text{-}recall}$ addressing differences in means of brand recall. The brand recall score was used as the dependent variable. The sample was classified into two groups based on the independent variable phonological trace access (0-Visual trace access and 1-Phonological trace access). The L2 for all participants was a phonological language (English). Thus, only non-proficient Chinese participants constituted the visual group, and proficient Chinese, Korean, Mexican and American participants the phonological group. The effect was significant ($F(1,100)=4.131$, $MSE=16.567$, $p<.05$). Therefore, $H_{phonological\ trace\text{-}recall}$ was supported.

A simple design for ANOVA was performed to test $H_{visual\ trace\text{-}recognition}$ addressing differences in means of brand recognition. The brand recognition score was used as the dependent variable. The sample was classified into two groups based on the independent variable visual trace access (0-Phonological trace access and 1-Visual trace access). The L2 for all participants was a phonological language (English). Thus, the Chinese and Korean participants constituted the visual group and the proficient Mexican and American participants the phonological group. The effect was nonsignificant ($F(1,100)=1.775$, $MSE=3.862$, $p=.186$). Therefore, $H_{visual\ trace\text{-}recognition}$ was not supported.

"Familiarity-based recall" and "Familiarity-based recognition" Hypotheses Testing

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average)x2(familiarity: not familiar, familiar) factorial design for ANOVA with twelve groups was performed to test hypotheses $H_{familiarity\text{-}based\ recall}$ addressing differences in the means of brand recall score. The brand recall score was used as dependent variable. First, the sample was classified into three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the

Korean participants the biscriptal group, and the American and Mexican participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Lastly, the groups were sub-classified on the previous familiarity with brands (0-Not familiar, 1-Familiar). The interaction effect (script by L2 proficiency by familiarity) was nonsignificant ($F(1,91)=.258$, $MSE=.902$, $p=.613$). Thus, the main effects were interpreted generally. The effect of script was significant ($F(1,91)=5.338$, $MSE=18.696$, $p<.05$). The effect of reported L2 proficiency also was significant ($F(1,91)=2.960$, $MSE=4.018$, $p<.05$). The effect of previous familiarity also was nonsignificant ($F(1,91)=.340$, $MSE=1.191$, $p=.561$). The main effects indicated that the difference was due to native script and L2 proficiency. The effect of familiarity of brands indicated no difference in brand recall due to previous familiarity with brands. Therefore, $H_{\text{familiarity-based recall}}$ was not supported.

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average)x2(familiarity: not familiar, familiar) factorial design for ANOVA with twelve groups was performed to test hypotheses $H_{\text{familiarity-based recognition}}$ addressing differences in the means of brand recognition score. The brand recognition score was used as dependent variable. First, the sample was classified into three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants the biscriptal group, and the American and Mexican participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Lastly, the groups were sub-classified on the previous familiarity with brands (0-Not familiar, 1-Familiar). The interaction effect (script by L2 proficiency by familiarity) was nonsignificant ($F(1,91)=2.481$, $MSE=4.372$, $p=.119$). Thus, the main effects were interpreted generally. Again, the effect of script was significant ($F(1,91)=6.608$, $MSE=11.647$, $p<.05$). The effect of reported L2 proficiency also was significant ($F(1,91)=4.268$, $MSE=7.523$, $p<.05$). The effect of previous familiarity was nonsignificant ($F(1,91)=1.429$, $MSE=2.519$, $p=.235$). One more time, the main effects that the difference was due to native script and L2 proficiency. Therefore, $H_{familiarity\text{-}based\ recognition}$ was not supported.

Recall Recognition Relationship

In order to examine the recall-recognition relationship, a canonical correlation analysis was performed. Since both recall and recognition tests were presented to the same participants, this action allows for assessment of a consecutive learning. The brand recall measures (RECALLA, RECALLB and RECALLC) were used as dependent variables. The brand recognition measures (RECOGNA, RECOGNB and RECOGNC) were used as independent variables. Thus, the canonical correlation analysis derived three canonical functions because both the variable sets contained three variables each. Test for the statistical significance of each of the three canonical functions revealed that the three functions were statistically significant at the .05 level. Table 29 details the statistics for each function.

Table 29

Canonical Function	Canonical Correlation	Canonical R^2	F Statistic	Probability

1	.686	.471	14.165	.000
2	.538	.290	11.417	.000
3	.278	.077	8.211	.005

Wilks' lambda, Pillai's criterion, Hotelling's trace and Roy's gcr statistics tested the functions simultaneously, which all indicated that the canonical functions taken collectively are statistically significant. Table 30 details the results.

Table 30

Statistic	Value	Approximate F Statistic	Probability
Wilks' lambda	.346	12.662	.000
Pillai's trace	.838	14.533	.000
Hotelling's trace	1.381	14.165	.000
Roy's gcr	.470		

A redundancy index is calculated for the independent and dependent variates of the first function. Table 31 contains the calculation of the redundancy index. The low redundancy of the first variate result from the relatively low canonical R^2, not the shared variance in the variate. Conversely, the low redundancy index result from a lower shared variance. Thus, from the redundancy analysis and the statistical significance test, the first function is accepted for interpretation.

Table 31

	Canonical	Canonical	Average	Canonical	Redundancy

	Loading	Loading Squared	Loading Squared	R^2	Index
Dependent variables					
RECALLA	-.725	.525			
RECALLB	-.889	.790			
RECALLC	-.706	.498			
Dependent variate		1.813	.604	.471	.284
Independent variables					
RECOGNA	-.575	.330			
RECOGNB	-.558	.311			
RECOGNC	-.680	.462			
Independent variate		1.103	.368	.471	.173

A redundancy index is also calculated for the independent and dependent variates of the second function. Table 32 contains the calculation of the redundancy index. In this case, both the canonical R^2 and the shared variance in the variate are lower than that of the first function. The redundancy index for the dependent variable is smaller than the obtained by the first function. Thus, from the redundancy analysis, the second function is not accepted for interpretation.

Table 32

	Canonical Loading	Canonical Loading Squared	Average Loading Squared	Canonical R^2	Redundancy Index
Dependent variables					
RECALLA	.689	.475			
RECALLB	-.225	.051			
RECALLC	-.108	.012			
Dependent variate		.538	.179	.290	.051
Independent variables					
RECOGNA	.818	.669			
RECOGNB	-.384	.147			
RECOGNC	-.359	.129			
Independent variate		.945	.315	.290	.091

Finally, a redundancy index is also calculated for the independent and dependent variates of the third function. Table 33 contains the calculation of the redundancy index. Again, very low redundancy indexes are obtained. Thus, from the redundancy analysis, the third function will not be interpreted.

Table 33

	Canonical Loading	Canonical Loading Squared	Average Loading Squared	Canonical R^2	Redundancy Index
Dependent variables					
RECALLA	-.019	.000			
RECALLB	-.399	.159			
RECALLC	.700	.490			
Dependent variate		.649	.216	.077	.001
Independent variables					
RECOGNA	.032	.001			
RECOGNB	-.736	.542			
RECOGNC	.639	.408			
Independent variate		.951	.317	.077	.024

Table 34 shows the redundancy analysis of dependent variate for the three canonical functions.

Table 34

Standardized Variance of the Dependent Variables Explained by

	Their Own Canonical Variate (Shared Variance)			The Opposite Canonical Variate (Redundancy)	
Canonical Function	Percentage	Cumulative Percentage	Canonical R^2	Percentage	Cumulative Percentage
1	60.462	60.462	.471	28.466	28.466
2	17.882	78.343	.290	5.184	33.650
3	21.657	100.000	.077	1.674	35.324

Table 35 shows the redundancy analysis of independent variate for the three canonical functions.

Table 35

Standardized Variance of the Independent Variables Explained by					
	Their Own Canonical Variate (Shared Variance)			The Opposite Canonical Variate (Redundancy)	
Canonical Function	Percentage	Cumulative Percentage	Canonical R^2	Percentage	Cumulative Percentage
1	36.816	36.816	.471	17.334	17.334
2	31.491	68.307	.290	9.129	26.463
3	31.693	100.000	.077	2.450	28.913

Consider that the sample size for the pilot study is small. In this case, only the first function is interpreted. Although the coefficients of the second and third function are not interpreted, they are presented. Methods for interpretation of the canonical variates include canonical weights and canonical loadings.

Table 36 contains the canonical weights for the three canonical functions. Canonical weights are typically unstable, in addition to a small sample size used for the analysis, thus the canonical loadings are interpreted instead.

Table 36

	Canonical Weights		
	Function 1	Function 2	Function 3
Standardized canonical coefficients for the dependent variables			
RECALLA	-.261	1.175	-.082
RECALLB	-.624	-.678	-.734
RECALLC	-.363	-.353	1.008
Standardized canonical coefficients for the independent variables			
RECOGNA	-.514	.864	-.062
RECOGNB	-.539	-.349	-.769
RECOGNC	-.594	-.444	.683

In the first dependent variate, the three variables have loadings exceeding .6, resulting in the moderately high shared variance (60.462%). This indicates a moderately high degree of intercorrelation among the three variables. The first independent variate exhibits a similar pattern with loadings above .5, in addition to a shared variance of 36.816%. Table 37 contains the canonical structure for the three canonical functions.

Table 37

	Canonical Loadings		
	Function 1	Function 2	Function 3
Correlations between the dependent variables and their canonical variates			
RECALLA	-.725	.689	-.019
RECALLB	-.889	-.225	-.399
RECALLC	-.70	-.108	.700
Correlations between the independent variables and their canonical variates			
RECOGNA	-.575	.818	.032
RECOGNB	-.558	-.384	-.736
RECOGNC	-.680	-.359	.639

Results of the first variate suggest that moderate shared variance is indicative of a moderate degree of intercorrelation among the variables. The independent variate represents the set of variables that might predict the dependent variate. Thus, the recall test had an effect on the immediately following forced-choice recognition test, indicating that learning occurred.

A sensitivity analysis of the independent variable set was conducted for validation of the canonical correlation analysis. This method was preferred because of the small sample size. Table 38 contains the result of the sensitivity analysis for the first function, including canonical correlation, canonical root, and canonical loadings of independent and dependent variates after deletion of each one of the independent variables.

Table 38

		Results after deletion of

	Complete variate	RECOGNA	RECOGNB	RECOGNC
Canonical correlation (R)	.686	.651	.618	.615
Canonical root (R^2)	.471	.424	.497	.378
Independent variate - Canonical loadings				
RECOGNA	-.575	Omitted	.879	.914
RECOGNB	-.558	-.666	Omitted	.390
RECOGNC	-.680	-.777	.577	Omitted
Shared variance	.368	.523	.553	.493
Redundancy	.173	.222	.275	.186
Dependent variate - Canonical loadings				
RECALLA	-.725	-.366	.941	.974
RECALLB	-.889	-.899	.631	.681
RECALLC	-.706	-.690	.684	.454
Shared variance	.605	.472	.583	.539
Redundancy	.285	.200	.289	.204

The shared variances and the redundancy indexes are somewhat stable and somewhat consistent in the three cases where an independent variable (RECOGNA, RECOGNB or RECOGNC) was deleted. In addition, the overall canonical correlations did not varied across the three cases.

Overall, canonical correlation results suggested that participants should be assigned randomly to either recall or recognition tests, in order to avoid consecutive learning and confound the results.

Pilot Study Discussion

The pilot study results indicated several implications in terms of targeting East/West bilingual consumers. First, only the effect of native script was significant, providing partial support to the hypotheses $H_{proficiency\text{-}recall}$ and $H_{proficiency\text{-}recognition}$. The results reinforce Tavassoli & Lee's (2003) conclusion that meaningless logos, images and colors are more potent retrieval cues for natives of logographic languages than for natives of alphabetic languages. However, this finding is inconsistent with Zhang & Schmitt's (2004) conclusion that proficiency must be included when addressing bilingual consumers. The results could not be interpreted to support the hypotheses $H_{mono/biscriptal\text{-}recall}$ and $H_{mono/biscriptal\text{-}recognition}$. It remained to be seen if under the inclusion of larger samples support could be found for both hypotheses.

Although several cross-cultural studies already controlled for some factors that might explain the results, the effect of several variables remain unexplored in the advergaming context. According to Hernandez et al. (2005), neither expertise in electronic games nor perceived goal difficulty had an effect on brand recall. Another possible factor influencing the results could be the age of participants, nevertheless, the group means indicate that the groups were somewhat similar. Therefore, familiarity with the Internet and electronic games might constitute a factor leading to the results. Specifically, a larger number of South Korean (95%) and American (97%) participants had a computer at home than the Chinese (77%) participants. In addition, fifty-three percent of the Americans owned a video game console vis-à-vis twenty-three percent of the Chinese participants.

Lastly, the pilot study results provided support to the hypothesis $H_{phonological\ trace\text{-}recall}$. Significant differences were found between bilinguals accessing either traces or phonological trace versus bilinguals accessing visual trace only. This finding explains better that the difference among groups rely more on the traces the bilinguals access, and not only on the native trace or L2 trace. However, hypothesis $H_{visual\ trace\text{-}recognition}$ was not supported. This could support the assumption that under expectations of graphic environments, phonological trace might not be retrieved at all.

Both $H_{familiarity\text{-}based\ recall}$ and $H_{familiarity\text{-}based\ recognition}$ were not supported. The effect of familiarity of brands indicated no difference in brand recall and recognition due to the familiarity with brands. Again, a significant difference was found in recognition due to native script and L2 proficiency. This might suggest that the cognitive elements involved in brand processing, such as language (as indicated by Tavassoli (1999)), have a greater impact on memory than previous familiarity with brands.

Although the sample only supported $H_{phonological\ trace\text{-}recall}$ and partially supported $H_{proficiency\text{-}recall}$, and $H_{proficiency\text{-}recognition}$, the outcome is encouraging. Overall results of the pilot study indicate that advergames might represent an effective advertising medium to target both logographic and alphabetic group of bilinguals. However, results of the pilot study cannot be considered conclusive. The very small sample size constituted the major limitation of the pilot study. It remained to be seen if under the inclusion of more countries with larger sample sizes the results still hold.

APPENDIX F

ALTERNATIVE ANOVA ANALYSIS FOR

PREVIOUS FAMILIARITY WITH BRANDS

Recall Analyses

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average)x2(familiarity: not familiar, familiar) factorial ANOVA with twelve groups was performed to test the "familiarity-recall" hypothesis. The brand recall score was used as the dependent variable. First, the sample was classified into three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants the biscriptal group, and the American and Mexican participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Lastly, the groups were sub-classified on the previous familiarity with brands (0-Not familiar, 1-Familiar). Since the number of participants in the cells differs considerably (i.e. alphabetic-proficient-familiar group was very large in comparison to other groups), a random sub-sample was excluded in order to make more even cell distribution. The sample means are depicted in the figures 13, 14 and 15.

Figure 13

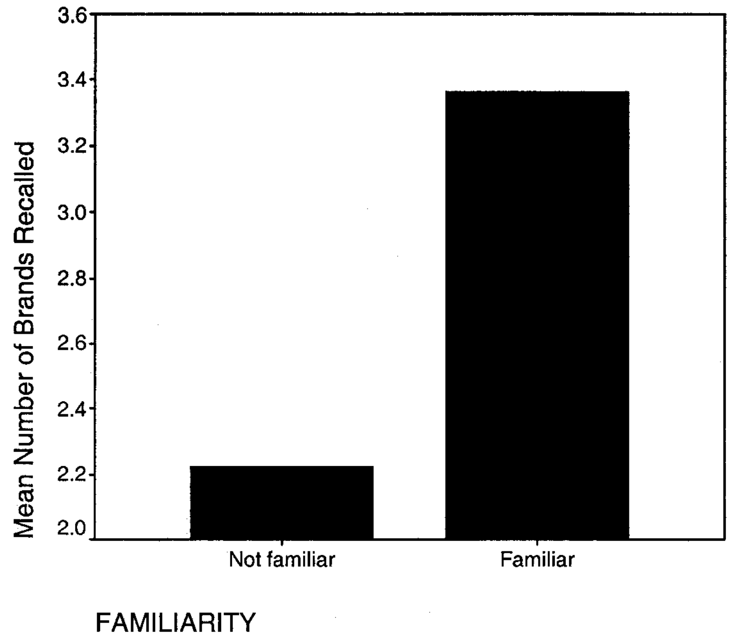


Figure 14

Not familiar

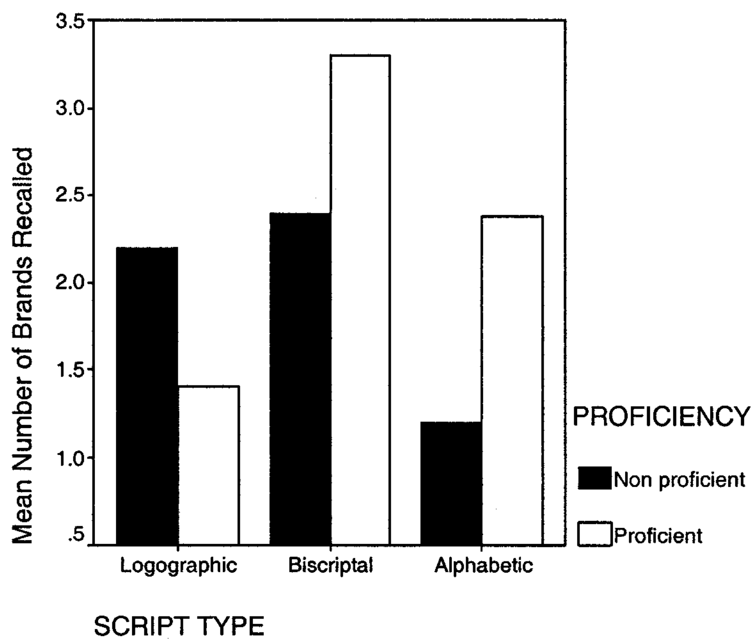


Figure 15

Familiar

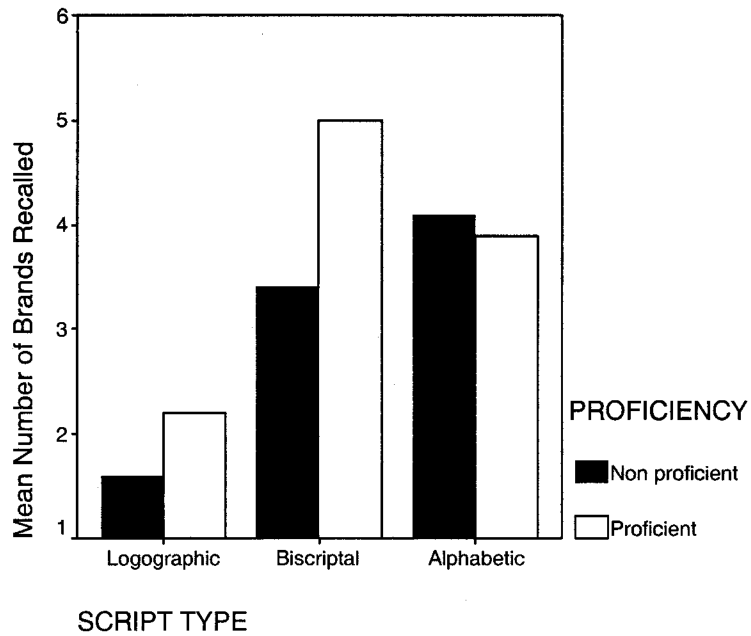


Table 39 contains the number of subjects in each cell.

Table 39

Script	Proficiency L2	Familiarity	N
Logographic	Not proficient	Not familiar	10
		Familiar	10
	Proficient	Not familiar	10
		Familiar	10
Biscriptal	Not proficient	Not familiar	10
		Familiar	10
	Proficient	Not familiar	10
		Familiar	10
Alphabetic	Not proficient	Not familiar	5
		Familiar	10
	Proficient	Not familiar	8

		Familiar	10

Table 40 provides the summary output from the ANOVA performed.

Table 40

Between participants	SS	df	MS	F	Sig. of F
Intercept	825.627	1	825.627	174.681	.000
Script type	57.051	2	28.526	6.035	.003
Proficiency	8.095	1	8.095	1.713	.194
Familiarity	40.495	1	40.495	8.568	.004
Script type* Proficiency	9.155	2	4.577	.968	.383
Script type* Familiarity	20.020	2	10.010	2.118	.126
Proficiency* Familiarity	.397	1	.397	.084	.773
Script type* Proficiency* Familiarity	8.724	2	4.362	.923	.401
Error	477.375	101	4.726		
Corrected total	617.805	112			

The script by L2 proficiency by familiarity interaction effect was nonsignificant (F(7,101)=.401, MSE=4.362, p=.401). The script by L2 proficiency interaction effect was nonsignificant (F(2,101)= .968, MSE=4.577, p=.383). The script by familiarity interaction effect was nonsignificant (F(2,101)= 2.118, MSE=10.010, p=.126). The L2 proficiency by familiarity interaction effect also was nonsignificant (F(1,101)=.084, MSE=.397, p=.773). Thus, the main effects can be interpreted generally. The effect of script was significant (F(1,101)= 6.035, MSE=28.526, p<.05). The effect of reported L2 proficiency was nonsignificant (F(1,101)= 1.713, MSE=8.095, p=.194). Lastly, the effect of previous familiarity also was significant (F(1,101)= 8.568, MSE=40.495, p<.05).

Recognition Analyses

A 3(script: logographic, biscriptal, alphabetic)x2(proficiency: below average, above average)x2(familiarity: non-familiar, familiar) factorial ANOVA with twelve groups was performed to test the "familiarity-recognition" hypothesis. The brand recognition score was used as the dependent variable. The brand recognition score was calculated by taking the number of hits minus the number of false alarms. First, the sample was classified into three groups based on the independent variable L1 script type (1-Logographic-based language, 2-Biscriptal language, and 3-Alphabetic-based language). Thus, the Chinese participants constituted the logographic group, the Korean participants the biscriptal group, and the American and Mexican participants the alphabetic group. Next, each group was subclassified into two groups based on the level of proficiency of their L2 (0-Below average, 1-Above average). Lastly, each of the six groups was subclassified on the previous familiarity with brands (0-Not familiar, 1-

Familiar). Since the number of participants in the cells differs considerably (i.e. alphabetic-proficient-familiar group was very large in comparison to other groups), a random sub-sample was excluded in order to make more even cell distribution. The sample means are depicted in the figures 16, 17 and 18.

Figure 16

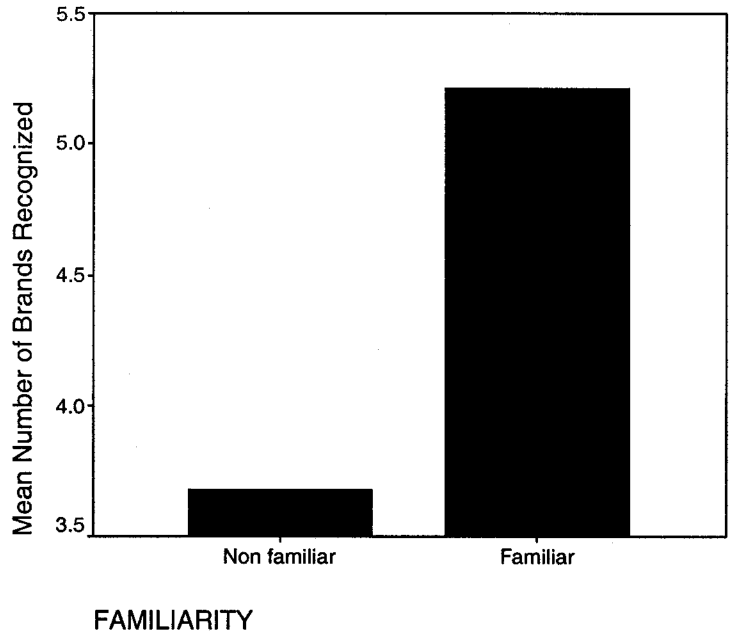


Figure 17

Not familiar

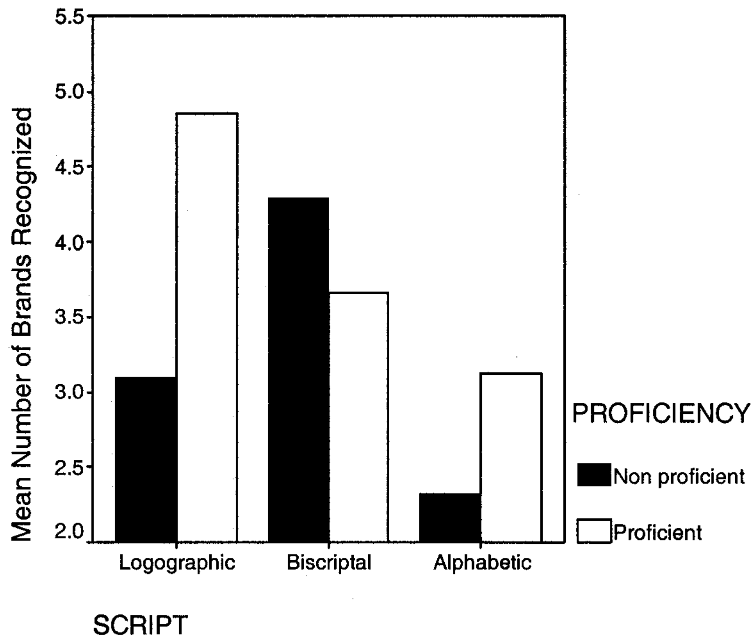


Figure 18

Familiar

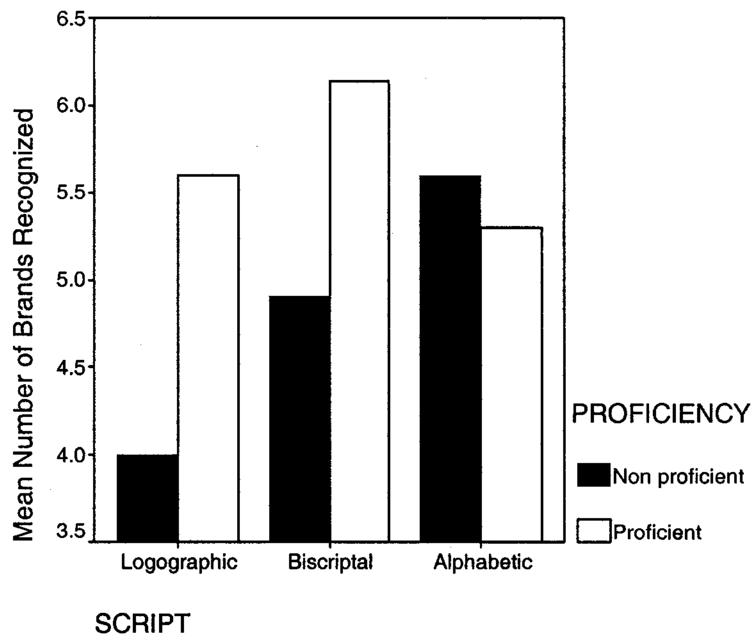


Table 41 contains the number of subjects in each cell.

Table 41

Script	Proficiency L2	Familiarity	N
Logographic	Not proficient	Not familiar	10
		Familiar	10
	Proficient	Not familiar	7
		Familiar	10
Biscriptal	Not proficient	Not familiar	10
		Familiar	10
	Proficient	Not familiar	6
		Familiar	7
Alphabetic	Not proficient	Not familiar	3
		Familiar	10
	Proficient	Not familiar	8
		Familiar	10

Table 42 provides the summary output from the ANOVA performed.

Table 42

Between participants	SS	df	MS	F	Sig. of F
Intercept	1739.015	1	1739.015	606.025	.000
Script type	6.138	2	3.069	1.070	.348
Proficiency	12.340	1	12.340	4.300	.041
Familiarity	64.096	1	64.096	22.337	.000
Script type*	10.743	2	5.372	1.872	.160

Proficiency					
Script type* Familiarity	13.116	2	6.558	2.285	.108
Proficiency* Familiarity	.244	1	.244	.085	.771
Script type* Proficiency* Familiarity	8.289	2	4.145	1.444	.241
Error	255.389	89	2.870		
Corrected total	363.050	100			

The script type by L2 proficiency by familiarity interaction effect was not significant (F(2,89)=1.444, MSE=4.145, p=.241). The script by L2 proficiency interaction effect was nonsignificant (F(2,89)= 1.872, MSE=5.372, p=.160). The script by familiarity interaction effect was nonsignificant (F(2,89)= 2.285, MSE=6.558, p=.108). The L2 proficiency by familiarity interaction effect also was nonsignificant (F(1,89)= .085, MSE=.244, p=.771). Thus, the main effects can be interpreted generally. The effect of script was nonsignificant (F(2,89)=1.070, MSE=3.069, p=.348). The effect of reported L2 proficiency was significant (F(1,89)= 4.300, MSE=12.340, p<.05). The effect of previous familiarity also was significant (F(1,89)= 22.337, MSE=64.096, p<.05).

APPENDIX G

REGRESSION ANALYSIS FOR PREVIOUS FAMILIARITY WITH BRANDS

Recall Analyses

The recall score was selected as the dependent variable to alternatively test the relationship among independent variables in its prediction. The script, proficiency level and familiarity were the independent variables. The three-category nonmetric script variable was represented by two dummy variables (SCRIPT D1 and SCRIPT D2).

Table 43 contains all the correlations among the three independent variables and their correlations with the dependent variable. Examination of the correlation matrix indicates that FAMILIAR is most closely correlated with the dependent variable. Table 43 also indicates that the independent variables are somewhat correlated with each other.

Table 43

Variables	SCRIPT D1	SCRIPT D2	PROFICIENCY L2	FAMILIAR
Predictors				
SCRIPT D1				
SCRIPT D2	-.572			
PROFICIENCY L2	-.250	.500		

FAMILIAR	-.371	.712	.489	
Dependent				
RECALL	-.024	.359	.350	.425

All variables were entered into the equation. Tables 44, 45 and 46 include the multiple regression results, containing the model estimation, the regression variate specified, and the collinearity statistics.

Table 44

Multiple R	.500
Multiple R^2	.250
Adjusted R^2	.234
Standard error of estimate	2.273

Table 45

	Sum of Squares	df	Mean Square	F Ratio	Sig.
Regression	326.306	4	81.576	15.794	.000
Residual	981.356	190	5.65		

Table 46

Variables	Unstandardized Coefficient	Standard Error of Coefficient	Standardized Regression Coefficient	Partial t Value	Sig.

			(beta)		
Y-intercept	.105	.544		.193	.847
SCRIPT D1	1.486	.465	.245	3.194	.002
SCRIPT D2	1.114	.542	.215	2.056	.041
PROFICIENCY L2	.062	.028	.166	2.235	.027
FAMILIAR	.355	.116	.282	3.067	.002

From table 47, the beta coefficients indicated that all variables were significant. The FAMILIAR variable was the most important variable, followed closely by SCRIPT D1 and SCRIPT D2. PROFICIENCY L2, the fourth independent variable was lower in importance.

High tolerance values denote little collinearity. In this case, all tolerance values were below .713, denoting moderate levels of collinearity. The close-to-1.0 VIF (variance inflation factor) values are also indicative of low intercorrelation among variables. As table 48 indicates, the VIF values did not approach 1.0. Thus, the collinearity statistics indicate that interpretation of the regression variate coefficient is affected by multicollinearity.

Table 47

Variables	Collinearity Statistics	
	Tolerance	VIF
SCRIPT D1	.669	1.495
SCRIPT D2	.361	2.769

PROFICIENCY L2	.713	1.402
FAMILIAR	.468	2.139

Following Hair et al. (1998), a model with highly correlated independent variables should be used for prediction only. Therefore, the amount of variance explained is 25 percent and the expected error rate for any prediction is approximately 5 percent.

Recognition Analyses

The recognition score was selected as the dependent variable to alternatively test the relationship among independent variables in its prediction. The script, proficiency level and familiarity were the independent variables. The three-category nonmetric script variable was represented by two dummy variables (SCRIPT D1 and SCRIPT D2).

Table 49 contains all the correlations among the three independent variables and their correlations with the dependent variable. Examination of the correlation matrix indicates that FAMILIAR is most closely correlated with the dependent variable. Table 48 also indicates that the independent variables are somewhat correlated with each other.

Table 48

Variables	SCRIPT D1	SCRIPT D2	PROFICIENCY L2	FAMILIAR
Predictors				
SCRIPT D1				
SCRIPT D2	-.576			
PROFICIENCY	-.383	.658		

L2				
FAMILIAR	-.427	.628	.514	
Dependent				
RECOGNITION	-.037	.177	.117	.281

All variables were entered into the equation. Tables 49, 50 and 51 include the multiple regression results, containing the model estimation, the regression variate specified, and the collinearity statistics. From table 51, the beta coefficients indicated that only the FAMILIAR variable was significant.

Table 49

Multiple R	.301
Multiple R^2	.091
Adjusted R^2	.072
Standard error of estimate	2.208

Table 50

	Sum of Squares	df	Mean Square	F Ratio	Sig.
Regression	92.566	4	23.141	4.745	.001
Residual	926.696	190	4.877		

Table 51

Variables	Unstandardized	Standard	Standardized	Partial t	Sig.

	Coefficient	Error of Coefficient	Regression Coefficient (beta)	Value	
Y-intercept	2.088	.623		3.351	.001
SCRIPT D1	.664	.449	.126	1.479	.141
SCRIPT D2	.428	.511	.094	.838	.403
PROFICIENCY L2	.018	.034	-.052	-.562	.575
FAMILIAR	.361	.108	.303	3.336	.001

High tolerance values denote little collinearity. In this case, all tolerance values were below .713, denoting moderate levels of collinearity. The close-to-1.0 VIF (variance inflation factor) values are also indicative of low intercorrelation among variables. As table 53 indicates, the VIF values did not approach 1.0. Thus, the collinearity statistics indicate that interpretation of the regression variate coefficient is affected by multicollinearity.

Table 52

Variables	Collinearity Statistics	
	Tolerance	VIF
SCRIPT D1	.669	1.495
SCRIPT D2	.361	2.769
PROFICIENCY L2	.713	1.402
FAMILIAR	.468	2.139

Again, because a model with highly correlated independent variables should be used for prediction only, the amount of variance explained is only 9 percent and the expected error rate for any prediction is approximately 4.55 percent.

VITA

Monica del Carmen Hernandez
7103 N 12th lane Apt. 1 McAllen, TX 78504

Educational Background

The University of Texas-Pan American, Ph. D. in Business Administration, 2005.
The University of Texas-Pan American, M. Ed. in Educational Leadership, 1998.
Monterrey Institute of Technology (ITESM), B.B.A. in Computer Information Systems, 1988.

Referred Publications

Hernandez, Monica D., Sindy Chapa, Michael S. Minor, Cecilia Maldonado and Fernando Barranzuela (2004). "Hispanic Attitudes Toward Advergames: A Proposed Model of Their Antecedents," *Journal of Interactive Advertising*, Special Issue in Gaming and its Relationship with Advertising, Marketing and Communication, Volume 5, Number 1, available [www.jiad.org].

Tello, Marco P., Walter Greene, and Garcia-Hernandez Monica D. (2002). "An Integrated Model for Forecasting of Voluntary Turnover in the Mexican Maquiladora Industry," *Journal of Business & Entrepreneurship*, Volume 14, Number 1.

Book Chapter

Hernandez, Monica D., Michael S. Minor, Jaebeom Suh, Sindy Chapa and Jose Salas (2005). "Brand Recall in the Advergaming Environment: A Cross-country Comparison," in Marla R. Stafford and Ronald J. Faber, eds., *Advertising, Promotion and the New Media*, M. E. Sharpe, Armonk, NY.

Refereed National Proceedings

American Academy of Advertising (2005).
American Marketing Association (Summer 2003, Winter 2004, Summer 2004).
Academy of Marketing Science Cultural Perspectives on Marketing (2004).

Teaching Experience

Texas A&M University-Kingsville, Visiting Professor of Management/Marketing, 2005.
The University of Texas-Pan American, Part-time instructor, 2004.