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Beichen Liang, University of Illinois at Chicago, USA

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Linguistic Differences between Chinese and English and Their Effects on Consumers’ Ability to Generate Images

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ABSTRACT

This study examines how language influences subjects’ ability to generate imagery. Experiment 1 shows that Chinese subjects who read Chinese messages tend to generate more images than do Americans who read English messages. High-imagery versus low-imagery words have no significant imagery-provoking effects on Chinese subjects who read Chinese, whereas they do have a strong effect on Americans who read English. Experiment 2 shows that the imagery-provoking ability of Chinese subjects differs when they read a different language. The imagery-provoking ability of Chinese subjects is inhibited when they read English.

INTRODUCTION

Much research has examined the effects of imagery on memory for verbal materials because it is one of the most powerful factors influencing memory. Studies have shown that certain words have higher imagery value and are more likely to facilitate the generation of imagery than other words (Paivio 1971; Paivio and Csapo 1973; Paivio and Foth 1970; Paivio, Yuille, and Madigan 1968; Richardson 1980). High-imagery words, concrete words, may induce images in people’s minds, whereas low-imagery words, abstract words, may fail to do so. For example, such concrete words as apple, banana, table, chair, etc. are more likely to create an image in people’s minds than such abstract words as love, freedom, justice, virtue, etc.

According to the dual coding model, two processings, visual and verbal processing, occur in subjects’ minds (Paivio 1986). Words are represented as verbal codes and pictorial information, such as pictures and mental imagery, are encoded as imaginal codes. Studies also show that the likelihood of retrieval is strongly related to the number of alternative retrieval routes in memory (Anderson and Reder 1979). So high-imagery words are easier to recall than low-imagery words (Lutz and Lutz 1978; Richardson 1980; Sheehan 1972) because people may create visual and verbal codes in their mind when processing high-imagery words and use multiple retrieval routes to recall them, whereas people may form only verbal codes when processing low-imagery words and use one route to recall them. In a manner similar to the picture superiority effect (the superior memorability of pictures over words), the formation of two codes from high-imagery words results in smaller memory differences between pictures and high-imagery words than between pictures and low-imagery words (Paivio 1971; Paivio and Csapo 1969). Moreover, the effect of having pictures accompany high-imagery words may be minimized because images will be formed during the processing of such words and the addition of pictures is redundant (Unnava and Burnkrant 1991). In contrast, the addition of pictures increases the likelihood of recall in low-imagery verbal information because dual codes may serve the retrieval route.

The dual coding model, based on simple arousal of visual and verbal codes, can only offer an explanation at the level of the gross imagery effect (Kieras 1978). Kieras (1978) argues that to memorize a sentence, the subject must visually read the words in the sentence, access their meanings, do a syntactic analysis of the sentence, and construct a representation of the content of the sentence. Whether imagery is manipulated or not, that process must be carried out whenever a sentence is to be comprehended. Kieras (1978) further points out that both empirical evidence and computer simulations of complex mental processes show that “perception and comprehension processes must operate in terms of deep units, such as concepts, relations, properties, features, and meanings, rather than surface units, such as word representations or copies of sensory input” (p. 533). So the dual coding model can only explain the effect of imagery on verbal memory at the surface level.

Many propositions have been developed to explain the imagery-verbal memory effect (see Kieras 1978 for a review). Three models, the prepositional representation model, the semantic elaboration model, and the imaginal elaboration model, seem plausible.

Propositional representation (Anderson 1984, 1985; Anderson and Bower 1973) argues that all knowledge can be expressed in a proposition. A typical example of a proposition is a network that consists of nodes interconnected by links. For example, remembering a pair of words like “monkey” and “bicycle” can be enhanced by imagining a monkey riding a bicycle. In this simple model, the proposition (monkey, bicycle and ride) would appear as a node for the concept MONKEY connected by a RIDING link to a node for the concept BICYCLE. All of the propositions can be retrieved by the activation of any proposition in the network.

The semantic elaboration model argues that the semantic representation of a sentence is derived and then related image(s) may be formed, but the image is not stored. The memory search, which involves image formation, produces additional information about the content of the sentence, such as inferences about the concepts and additional relations between the concepts. The redundant connects provide alternative retrieval routes when the subject suffers from incomplete storage or partial memory loss of the basic sentence content. The mechanism underlying the imagery-words effect is not the storage of image but more redundant semantic information available for storage.

The imaginal elaboration model is like the semantic elaboration model. But this model argues that the image is stored and provides redundant connections, giving alternate retrieval routes.

This research is based on psychology and cognition of Western languages, especially among American subjects. So their generalization and effectiveness across difference cultures is questionable. Recent marketing research has shown that language differences can influence consumer information processing because language, the core of a culture, is central to communication and closely related to thought (Schmitt, Pan and Tavassoli 1994; Tavassoli 1999). Studies have shown that linguistic differences between Chinese and English can influence consumer memory of verbal information by affecting mental representation (Schmitt, Pan, & Tavassoli 1994), judgment and choice (Schmitt and Zhang 1998), and verbal processing (Tavassoli, 1999). It is well known that Chinese is an ideographic language and English is an alphabetic language. So language differences may influence consumers’ ability to generate images in their minds. The purpose of this paper is to check the effect of language differences between Chinese and English on consumers’ imagery-generation ability.

LANGUAGE DIFFERENCES BETWEEN CHINESE AND ENGLISH

“Language is the most primitive and original mode of thought of human beings and is direct realization of thought” (Yang, 1990-1991, p. 48). Language, embedded in culture, is the essence of
communication and can shape mental processes (Schmitt, Pan, and Tavassoli 1994; Tavassoli 1999). All Western languages are based on an alphabet whereas Chinese is an ideographic language. So the different language structures may result in different mental structures and representations (Schmitt, Pan, Tavassoli 1994; Tzeng and Wang 1983; Yik 1978) and ability to generate imagery.

The formation of Chinese characters follows several principles. The earliest Chinese characters were formed by drawing pictographs. The characters were originally pictures of people, animals or other things. For example, the sun was written as  sun, water as  water, an ox as  ox, fish as  fish, rain as  rain, sheep as  sheep, a bird as  bird, and so on. Second, Chinese created indicatives by adding a kind of sign to a character to indicate certain meaning. For example, by adding a point to “刀” (knife), a new word “刃” (blade) is formed; by adding one stroke to “一” (one), a new word “二” (two) is formed. Third, in order to express abstract ideas or concepts, ancient Chinese created “associated compounds” or ideatives by combining two or more elements or characters. For example, the sun and moon were written together to form a new character,  to express the meaning of “bright or brightness”; the sun over a line,  to express the meaning of “sun rise” or “morning”; “人” (person) against “木” (tree), “休”, to express the meaning of “rest”. Over centuries, the Chinese characters have evolved from irregular drawing to stylized forms, from picture-based hieroglyphics to ideographic “square characters”, but they have similar structure and grammar. For example,  (sun) is written as “日” ;  (moon) as “月”;  (ox) as “牛”;  (rain) as “雨”. Since the Chinese characters are more like picture, the processing of Chinese is more likely to generate images in people’s minds.

Moreover, the structure of Chinese characters has nothing to do with their pronunciation. The pronunciation is based on “rote associative learning” (Tavassoli 1999, p.171). So the pronunciation provides no cue to the recall of the structure of the Chinese character. The learning, reading and memory of Chinese characters rely heavily on visuospatial information, on how to discern subtly different structures of characters. For example, in order to tell the difference among “日” (ji, myself), “月” (yi, already), and “牛” (si, snake), between “天” (tian, heaven) and “夫” (fu, husband), and among “甲” (jia, first), “丙” (you, cause), and “丁” (tian, cropland), people must pay attention to subtle structure differences rather than the order of different strokes.

According to Schmitt and Zhang (1998) and Norman (1988), Chinese, Japanese, Korean, and Thai widely use classifiers to categorize words into different groups. Words are classified based on their physical properties, such as shape, size, thickness, and length, and conceptual properties, such as bendable, elastic, and graspable. For example, in yi zhang zuo-zi (a table), zhang is used as a classifier for objects (such as tables, desks, photos, and paper) that have properties of flatness and extendedness. The processing of such classifiers also relies heavily on visual code. In contrast, English, French, German, and Spanish never use such classifiers.

Based on previous discussion, the processing of Chinese words may rely heavily on visual coding and ignore, at least partly, phonemic coding (Rozin, Portisky, and Sotsky 1971; Sasanuma 1975; Schmitt, Pan, Tavassoli 1994; Tavassoli 1999).

In contrast, the entire English alphabet consists of twenty-six meaningless letters whose orthography represents the pronunciation of words (Tavassoli 1999). English speakers subvocalize (phonologically recode) written words (e.g., McCusker, Hillinger, and Bias 1981) and rehearse words in short-term memory’s phonological loop (Baddeley 1986). Moreover, English speakers tend to phonologically recode written information (McCusker, Hillinger, and Bias 1981). So the processing of English is dominated by phonological representation (Schmitt, Pan, and Tavassoli 1994; Tavassoli 1999) and the ability to generate imagery may be inhibited by allocating mental resources to subvocalize words.

McCusker, Hillinger, and Bias (1981) argue that Chinese and English native speakers seem to use multiple codes to process the verbal information because studies have shown that the processing of Chinese may involve phonological coding (e.g., Huang and Tzeng 1981; Nomura 1979; Perfetti and Zhang 1991; Yik 1981) and that processing of English may involve visual coding (Parks et al. 1972; Posner and Keele 1967). But no study has demonstrated that phonological coding overthrows the visual coding in the processing of Chinese and that visual coding dominates the processing of English.

DEVELOPMENT OF HYPOTHESES

The foregoing discussion leads to the conclusion that Chinese rely mainly on visual coding to process Chinese characters and that the Americans rely primarily on phonological coding and less on visual coding to process English. So when Chinese subjects read the verbal message (Chinese) in an advertisement, they are more likely than readers of English to create visual coding in their minds no matter whether the words are highly imagery-provoking or not. In contrast, the visual coding of English may be mediated, at least partially, by phonological coding. Therefore, I expect:

H1: High-imagery messages (versus low-imagery messages) have no significant imagery-provoking effect on the processing of Chinese.

H2: Chinese subjects who read Chinese will generate more mental images than will American subjects who read English under all message conditions.

Studies have shown that for English, high-imagery words are more likely to facilitate the generation of imagery than low-imagery words, therefore, I assume:

H3: High-imagery words (versus low-imagery words) have a strong imagery-provoking effect on the processing of English.

EXPERIMENT 1

The first experiment investigates whether language has a strong impact on the consumer’s processing of verbal messages.

Subject and Design

16 Chinese students and 16 American students who were taking the MBA class at a major mid-western university were selected. They received a gift, key ring, for their participation. The experiment relied on a 2 (Message: High Imagery vs. Low Imagery messages) X 2 (Country: Chinese vs. American) between-subject factorial design.
TABLE 1

<table>
<thead>
<tr>
<th>High Imagery Version</th>
<th>Low Imagery Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>Picture a child’s shiny face, happy smile, and dancing eyes as he blows out his birthday candle. The light of that one candle is enough for the Classa digital camcorder.</td>
<td>A Classa digital camcorder performs very well under low light conditions. With its new filters and lenses, a light as dim as a candle is enough.</td>
</tr>
<tr>
<td>Imagine screaming people on a roller coaster plummeting down the steep track. The excitement on their face can be captured clearly with high zoom ability of 12X optical zoom and 480X digital zoom.</td>
<td>The digital camcorder allows you to capture the scene from a long distance. The new lens gives you 12X optical zoom and 480X digital zoom. Because of the high zoom, you can get clear pictures even from a mile away.</td>
</tr>
<tr>
<td>It also helps improve your tennis. As your feet pound back and forth on the tennis court, under the hot sun, you know that every split second of every stroke you played has been captured forever by your Classa. The tape can be analyzed later, to the minutest detail, using slow motion and freeze-frame.</td>
<td>The Classa can help you in several sports, too. It records all your movements with great accuracy and plays them back at different speeds. Its freeze-frame feature on playback helps you analyze your mistakes. Or you could choose the slow motion feature to play back everything you recorded at 1/15 the speed.</td>
</tr>
<tr>
<td>Makes a professional out of anyone! Ordinary camcorders produce rainbow “noise” between scenes. With the Classa, whether you are making a tape of the Statue of Liberty, a speeding firetruck, or a fast-paced basketball game, it goes from scene to scene cleanly.</td>
<td>Make professional videotapes. This camera does not create noise patterns between scenes when shooting some activity with a lot of scenes like games. The Classa erases head produces clean, clear transitions between scenes. Everything you shoot looks professional.</td>
</tr>
</tbody>
</table>

Stimuli
Stimuli were adapted from those used by Unnava and Burnkrant (1991) to ensure that there was no significant difference on such dimensions as believability, understandability, meaningfulness, distinctiveness, self-referencing, informativeness, or the perceived strength of arguments. Subjects in my study rated an imagery index adapted from Unnava and Burnkrant (1991) on three 10-point Likert scales. They were used to measure the imagery-provoking ability of the ad (not imagery-provoking/imagery provoking; dull/vivid; boring/interesting). A digital camcorder was used as the target product because it should be of enough interest to the subjects that they could process the target advertisement carefully. I chose a digital camcorder because consumers may be quite familiar with it, even they don’t have one, so the ability to generate images may not be inhibited in a situation where little schematic knowledge exists (Wright and Rip 1980). A fictitious name (Classa) was used to minimize the effect of prior experience with established brands. The English version was translated to Chinese. A double translation was used to ensure the accuracy of translation.

Unnava and Burnkrant (1991) used seven advertisements as filler. But filler advertisements were not used in this study. First, research shows that immediate recall seems to be limited to about seven units (Solso 2001) and the target advertisement already has four messages, with more than seven sentences. The experiment might suffer from subjects’ loss of memory if they were asked to read more than seven different advertisements and messages. Second, the purpose of this study is to check whether language can influence consumers’ imagery-generation ability. A picture is also an outstanding external source to induce imagery (Alessandri and Sheikh 1983; Bugelski 1983; Finke 1980; Lutz and Lutz 1978; Paivio 1971; Rossitter 1982; Shepard 1967; Singer 1978). Therefore, the experiment may be biased if subjects recall and write down imagery generated from filler advertisements.

The ad describes four attributes of the digital camcorder (low light performance, zoom, ability to capture sports action, ability to switch between still and action scenes, and the availability of different modes).

Message
The messages for high- or low-imagery words were adapted from those used by Unnava and Burnkrant (1991). The messages are shown in Table 1.

Procedure
Subjects sat in the conference room and were asked to read an advertisement with four messages. They were told that they would evaluate the advertisements for a local magazine. The Chinese subjects read and answered the Chinese version. After reading the ad, the subjects were asked to complete a ten-minute questionnaire on basic information about the U.S. that has nothing to do with this study to clear their memory. Then, the subjects were asked to write down everything in their mind when they were reading the ad. Finally, the subjects were thanked and dismissed.

RESULTS
Manipulation Checks. An analysis of variance of the imagery index with country and message as fixed factors revealed a significant main effect for words ($F(1, 28) = 7.201, p < .05$) and a significant interaction effect ($F(1, 28) = 14.297, p < .01$). Since the interaction effect was significant, simple effect tests were performed. Pooled error from $2 \times 2$ ANOVA was used for simple effect tests. As expected, for the Americans, high-imagery messages were rated higher on the imagery index ($M = 8.63$) than low-imagery messages ($M = 4.88, F(1, 28) = 36.058, p < .01$, see table 2). For the Chinese, there was no significant difference between high-imagery messages ($M = 6.96$) and low-imagery messages ($M = 7.58, F(1, 28) = 1.002, p > .1$).

Generated Images. Two judges who were blind to the purpose of this study counted the images generated in the subjects’ minds. The judges agreed on their number of 88% of the images. Disagree-
ments were resolved by mutual discussion. The generated images were reported in table 2.

An ANOVA was performed on the number of generated images with country and message as fixed factors. The ANOVA revealed significant main effects for country ($F(1, 28)=33.333, p<.01$) and message ($F(1.28)=21.333, p<.01$). The ANOVA also showed a significant interaction effect ($F(1, 28)=12.000, p<.01$). Since the interaction effect was significant, simple effect tests were conducted. Pooled error was used for the simple effect tests. The simple effect tests indicated that for the Chinese subjects, there was no significant difference between high-imagery ($M=4.38$) and low-imagery words ($M=4.13, F(1,31)=0.667, p>.1$). Thus the $H1$ prediction that high-imagery words (vs. low-imagery words) would have no significant imagery-provoking effect on the processing of Chinese was supported. Simple effect tests also showed that American subjects generated more images when reading high-imagery words ($M=3.88$) than when reading low-imagery words ($M=2.13, F(1, 28)=32.667, p<.01$). The $H3$ prediction that high-imagery words would have a stronger imagery-provoking effect than low-imagery words on the processing of English was supported. Third, for low-imagery words, the Chinese subjects generated more images ($M=4.13$) than did the American subjects ($M=2.13, F(1, 28)=42.667, p<.01$); but there was no significant difference between the Chinese subjects ($M=4.38$) and the American subjects ($M=3.88, F(1, 28)=2.667, p>.1$) under high-imagery words condition. So the $H2$ prediction that Chinese subjects tend to generate more images than do American subjects under all conditions was only partially supported. Chinese subjects only generated more images when reading low-imagery words.

**Discussion**. The effect of language differences on subjects’ ability to generate images was generally supported by my findings. Chinese subjects were not influenced by the manipulation of messages ($H1$). They generated about the same number of images in their mind when reading different messages. In contrast, messages have a great impact on American subjects. They generated more images in their mind when reading high-imagery words than when reading low-imagery words ($H3$). Generally, the Chinese subjects generated more images than did the American subjects. But the effect was only significant under low-imagery word condition ($H2$). So $H2$ was only partially supported.

Although experiment 1 provided general support to my theoretical frameworks, other factors, such as different cognitions, which are not considered in experiment 1 may influence subjects’ ability to generate images. My findings would be enhanced if the experiment would show that subjects have different imagery-provoking ability when reading different languages. In order to confirm my result in experiment 1, experiment 2 was used to test whether subjects had different imagery-provoking ability when reading different languages.

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**OVERVIEW OF EXPERIMENT 2**

Findings from experiment 1 supported my hypotheses that language has a strong impact on subjects’ ability to generate images. But in experiment 1, Chinese subjects only read Chinese messages and American subjects only read English messages. So if language does matter, subjects’ ability to generate images should differ when they read different languages. In other words, the high imagery-provoking ability of Chinese might be inhibited by reading English because the processing of English is dominated by phonological coding, not by visual codes. So the purpose of experiment 2 is to test whether the Chinese subjects’ ability to generate images differs when they read different languages (Chinese and English).

**Design of Experiment**

16 Chinese subjects who were not involved in experiment 1 were selected. The experiment relied on a 2 (Language: Chinese vs. English) X 2 (message: high vs. low imagery words) between-subject design. Stimuli, message and procedures were the same as those used in experiment 1, except that only Chinese subjects were involved in experiment 2 and they only read English messages (high/low imagery words). Results of Chinese subjects from experiment 1 were combined with results from experiment 2 to conduct an ANOVA analysis.

**Manipulation Check**. An analysis of variance of the imagery index with languages and message as fixed factors only revealed a significant interaction effect ($F(1, 28)=7.206, p<.05$). Since the interaction effect was significant, simple effect tests were performed. Pooled error was used for simple effect tests. As expected, when reading English, Chinese subjects rated high-imagery messages higher on the imagery index ($M=7.63$) than low-imagery messages ($M=5.38, F(1, 28)=8.827, p<.01$, see table 3); but when reading Chinese, Chinese subjects gave about the same rate to high-imagery messages ($M=6.96$) and low-imagery messages ($M=7.58, F(1, 28)=1.002, p>.1$).

**RESULTS**

**Generated Images**. Two judges who were blind to the purpose of this study counted the images generated in the subjects’ minds. The judges agreed on their number of 90% of the images. Disagreements were resolved by mutual discussion. The generated images were reported in table 3.

An ANOVA was performed on the number of generated images with languages and message as fixed factors. The ANOVA revealed significant main effects for language ($F(1, 28)=24.138, p<.01$) and message ($F(1, 28)=8.690, p<.01$). The ANOVA also showed a marginal significant interaction effect ($F(1, 28)=3.862, p<.1$). Since the interaction effect was significant, simple effect tests were conducted. Pooled error was used for simple effect tests.

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**TABLE 2**

<table>
<thead>
<tr>
<th>Measure</th>
<th>American Subject</th>
<th>Chinese Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Imagery</td>
<td>Low Imagery</td>
</tr>
<tr>
<td>Imagery Index</td>
<td>8.63</td>
<td>4.88</td>
</tr>
<tr>
<td>Generated Images</td>
<td>3.88</td>
<td>2.13</td>
</tr>
<tr>
<td>n</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>
The simple effect tests indicated that when reading English, Chinese subjects generated more images in their minds when reading high-imagery words ($M=3.63$) than when reading low-imagery words ($M=2.38$, $F(1, 28)=12.066$, $p<.01$). In contrast, when reading Chinese, Chinese subjects generated about the same images for high-imagery words ($M=4.38$) and low-imagery words ($M=4.13$, $F(1, 28)=0.483$, $p>.1$). Under the high-imagery words situation, Chinese subjects generated more images when reading Chinese messages ($M=4.38$) than when reading English messages ($M=3.63$, $F(1, 28)=4.34$, $p<.05$). Under the low-imagery words situation, Chinese subjects generated more images when reading Chinese messages ($M=4.13$) than when reading English messages ($M=2.38$, $F(1, 28)=23.649$, $p<.01$).

**Discussion.** The findings from experiment 2 indicated that the image-generation ability of the Chinese subjects differed when exposed to different languages. Chinese subjects’ ability to generate images was inhibited when reading English. They generated fewer images under all message conditions when reading English than when reading Chinese. Moreover, when reading English, Chinese subjects were influenced greatly by the manipulation of different messages, whereas they were not influenced by messages when reading Chinese versions. So the results from experiment 2 confirmed my findings in experiment 1: language does have a strong impact on subjects’ ability to generate images.

**GENERAL DISCUSSION**

Findings from both experiments showed that language does have a strong effect on subjects’ ability to generate images. Ideographic languages, in which the visual codes dominate, tend to spark subjects to generate more images in their minds than do alphabetic languages, in which phonological codes dominate. High-imagery words generally do not have a significant effect over low-imagery words on subjects’ image-generation ability under Chinese conditions although high-imagery words do have a stronger imagery-provoking effect under English conditions. An interesting finding from experiment 2 is that the imagery-provoking ability of Chinese subjects was inhibited when they read English messages. So Chinese subjects generated more images when reading Chinese messages than when reading English messages. One possible explanation is that Chinese subjects might devote more mental resource to processing phonological codes, so their imagery-provoking ability was inhibited.

As with all research studies, this study has some limitations. First, I did not measure the effect of individual differences on imagery-provoking ability. Researchers have developed several categories for studying individual differences in imagery processing (Ernest 1977; Sheehan et al. 1983; Macniss and Price 1987). The four basic categories are scales of imagery ability (vividness and controllability), scales of imagery content, scales of spatial ability, and scales of imagery vs. verbal processing styles. A future study may focus on how individual differences can drive the imagery-provoking ability of subjects from different cultures. Second, I only examined the imagery-provoking ability of Chinese subjects when reading different languages. I did not investigate whether the image-generation ability of Americans also differs when they read different languages. A future study may explore whether Americans have different abilities to generate images when exposed to different languages. Third, I did not collect the measures for ad and brand evaluation in this study. The effect of imagery on ad and brand evaluation should be examined in future studies. Fourth, I did not examine the effect of imagery on memory. A future study should examine whether the effect of imagery on memory is similar across cultures. Fifth, I did not explore the mechanism underlying the effects of imagery and words. A future study can explore this issue. Sixth, the effect of addition picture is not examined in my study. A further study that examines the effect of addition picture can be conducted.

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