Chapter 1

Introduction

Polysemy is ubiquitous in language and its investigation has considerable potential for illuminating human cognition. (Brown and Witkowski, 1983)

1.1 What are senses? Homonymy vs. Polysemy

Lexical ambiguity is very common in language and is closely related to the issue of the nature of the mental lexicon in human brains. There have been abundant theoretical linguistic literature, behavioral, electrophysiological (EEG, MEG) evidence in an attempt to disclose how the human parser deals with the ambiguity of natural language. Linguistically, two different kinds of ambiguity are traditionally distinguished. One is called homonymy and the other is polysemy (Cruse, 1986; Lyons, 1977). The former means a lexical item having two or more semantically unrelated meanings. For instance, the word *bank* can refer to either a financial institution or the side of a river. The latter means that a lexical item has two or more related meanings, traditionally called 'senses'. For example, the word *lamb* can be used to refer to 'an animal' or 'meat'. In Chinese, homonymous examples such as *kuang1* has three unrelated meanings: (1) light as in *kuang1 xian4*, 'streams of light', *kuang1 liang4*, 'light'; (2) naked as in *kuang1 jiao3*, 'barefoot', *zhi1 ye4 kuang1 tu1*, 'bare trees'; (3) simply as in *kuang1 ping2 kou3 shuo1*, 'simply saying'. Polysemous examples derive from *tou2*, 'head' as in *tou2 lu2*, 'a skull', *tou2 ban3*, 'the front page of a newspaper', *xi1 zhuang1 tou2*, ''a kind of hairstyle', *bai1 le tou2*, 'hair turning white' and so on. Lexicographers respect the distinction of lexical ambiguity. By looking in dictionaries, one can verify that words of unrelated meanings are listed

under separate entries and words of related senses are listed under single entry.

While many psychological studies have been done on homonymy, relative few studies, either English or Chinese, have focused on polysemy, even though it is far more frequent (Pylkkänen et al., 2006). Earlier behavioral studies on semantic ambiguity obtained *ambiguity advantage* effects (e.g., Rubenstein et al., Jastrzembski, 1981, Millis & Button, 1989) in lexical decisions where ambiguous words yielded faster reaction times than unambiguous words. However, the same results were not replicated in some studies (e.g., Borowsky & Masson, 1996; Azuma & Van Orden, 1997). More recent psycholinguistic studies found that the so-called ambiguity advantage effects actually resulted from the activation of words having related *senses* rather than that of words having unrelated meanings (e.g., Rodd et al., 2002; Beretta et al., 2005; Pylkkänen et al., 2006). These studies suggested that it was necessary to distinguish the two types of ambiguity in the operational definition. Furthermore, the findings were also in agreement with the question of how the different but related senses in polysemy are represented in the mental lexicon, which is the first concern in the current study.

The study aims to investigate how the different but related senses in Chinese are stored in the mental lexicon. While it is widely accepted that homonymous words should have separate entries as are listed in dictionaries, the representation of senses have been controversial. One possibility is that senses can be separately represented as homonyms. Alternatively, the senses can be listed as part of the same lexical item, just as the representations in most dictionaries. Different hypotheses would lead to divergent results and implications. Therefore, the investigation of how the senses of words are represented in the brain is valuable in discussing the structure of the mental lexicon and answering the question of what a word is.

1.2 English words vs. Chinese compounds

To investigate the sense effect in Chinese, the study selects disyllabic compounds since the majority of Chinese words are made of two characters (over 80% in Huang et al., 2006, Mandarin Chinese). However, unlike the words in English, which every word is composed of letters corresponding to phonemes, Chinese words consist of characters corresponding to morphemes. In other words, disyllabic compounds are made up of characters, each of which has its own meaning. In the studies of Chinese neighborhood size effects, Huang et al. (2006) found that the neighborhood size of the first character constituent played a more important role in lexical processing than did neighborhood size of the second character constituent. Evidence from eye movement done by Tsai et al. (2006) also confirmed that the first character constituent contributed more to lexical access during word recognition process. Therefore, the current study tried to investigate the representation of senses in semantic polysemy by using the manipulation of the number of senses of the first character in Chinese disyllabic compounds to

In the consequent studies of Chinese neighborhood size effect, researchers also demonstrated that word recognition process in Chinese had to take into consideration of the morphemes (Huang, 2004) and the necessity to distinguish the semantic relations of word meanings and word senses (Huang et al. 2006). These findings were in agreement with more recent psycholinguistic studies on the lexical ambiguity in that the presence of related senses and unrelated meanings will lead to dissociative effects. That is, ambiguity of unrelated meanings would result in inhibitory effects while polysemy of related senses should obtain facilitation (Rodd et al., 2002; Beretta et al., 2005; Klepousniotou, 2002). In light of the studies in Chinese neighborhood size effects, we obtained convergent interpretations to suggest that the representations

of meanings and senses should be different from each other. Accordingly, the study will introduce studies of neighborhood size effects in both English and Chinese.

1.3 Hemispheric processing of semantic ambiguity

Besides the investigation of the representation of senses, the second primary aim of the study is to look into the hemispheric processing of semantic ambiguity. Different from the traditional view that only the Left hemisphere is the language center (Broca, 1865), there are growing evidence demonstrating that the Right hemisphere has significant language processing strength (see Lindell, 2006 for a review). The issue of hemispheric processing in combination with lexical ambiguity have widely been studied (for example, Burgess & Simpson, 1988; Beeman & Chiarello, 1998; Faust & Lavidor, 2003; Federmeier & Kutas, 1999 a. b) and suggested that both cerebral hemispheres process word meanings in different ways. For example, the generality for the LH semantic processing was *fine* coding while that for the RH was *coarse* coding (Beeman & Chiarello, 1998). In other words, both cerebral hemispheres played a role in semantic activation in a complementary way.

In sum, the questions addressed in the study include:

(1) How different but semantically related senses are psychologically stored in the mental lexicon?

(2) How cerebral hemispheres deal with the semantic information of senses?

In the review of literature in chapter two, the neighborhood size effects in both English to Chinese will be firstly introduced in the literature. Secondly, relevant literature includes lexical ambiguity studies in English and Chinese. Third, characteristics of hemispheric asymmetrical processing of semantic ambiguity will be given in turn. The principles of EEG recording, language-related components and the

advantages of using event-related potentials will be introduced. Chapter three and chapter four are experiment designs, results (both behavioral and electrophysiological), discussions for experiment 1 and experiment 2. Chapter five includes general discussions and conclusions for the current study.