Chapter 5

General discussion and Conclusions

5.1 Representations of senses: Separate entries or single entry?

The study aimed to investigate the representation of senses in the mental lexicon and the hemispheric processing of Chinese polysemy. Considering the representations of senses, the separate-entry account assumed that the representation of polysemous senses was comparable to that of homonymous meanings since they both involve separate lexical entries. Processing of both kinds of ambiguity should be the same and obtain inhibitory effects for words of many meanings. Alternatively, the single-entry account held the view that the representation of polysemous senses should be different from that of homonyms. The presence of many related senses within one single entry should benefit word recognition and result in facilitation. Recent RT studies (Rodd et al., 2002; Klepousniotou, 2002) and MEG studies (Beretta et al., 2005; Pylkkänen et al., 2006) had shown that distinct responses resulted from homonymy and polysemy and supported the assumption of the separate-entry account for the former and the single-entry account for the latter.

In this research, we used the manipulation of the number of senses of the first character in Chinese disyllabic compounds to investigate the representation of senses. The results in experiment 1 were consistent with the assumption of single lexical representation. Behavioral data in the bar charts showed that many senses, in general, produced faster response time than few senses, even though they did not reach statistical significance. In the ERPs, many senses in the RVF/LH elicited less negative N400s than few senses. The result was interpreted as the benefits from the presence of many related senses.

Besides the facilitative sense effects, there was also semantic activation in the LVF/ RH where many senses were more negative in the N400s than few senses. Under the single lexical entry hypothesis, there was no prediction as to the fact that many senses should elicit more negative N400s than few senses. Nevertheless, similar patterns were found in the MEG study done by Pylkkänen et al., 2006. They presumed that this activity plausibly played a role in semantic activation, maybe a potential sense competition effect in which the relatedness among senses was weakened.

The facilitation of the sense effect was also replicated in experiment 2 where few senses were more negative than many senses in the N400s. The results of the sense effect in the two experiments were in support of the single lexical entry representation for senses due to the facilitation of relatedness.

5.2 Hemispheric processing of polysemy in different depth of tasks

Many studies have investigated the hemispheric processing of semantic ambiguity in different paradigms such as lexical priming, sentential priming (e.g. Burgess& Simpson, 1988; Faust & Lavidor, 2003). There is a growing body of research suggesting that both cerebral hemispheres processed word meanings but in different ways (see Lindell et al. for a review). For example, while in automatic processing of lexical ambiguity, priming of dominant meanings occurred in both the LH and the RH, in controlled processing, priming with the subordinate meaning was attenuated in the LH but amplified in the RH (Burgess & Simpson, 1988). In general, evidence indicated that, in the LH, semantic activation was much narrower and more focused while the RH was inclined to maintain activation of a broader range and meanings (e. g. Beeman & Chiarello, 1998; Burgess & Simpson, 1988; Faust &

Lavidor, 2003). Therefore, the EPR results in experiment 1 demonstrated that few senses were more negative in the LH and many senses were more negative in the RH. This could result from the nature of hemispheric processing of semantic ambiguity in the lexical decision task.

Yet the pattern in the RH may also result from the separate-entry representation of senses. To clarify this possibility, the depth of the task in experiment 2 was changed. According to Vitevitch and Luce (1998), different levels of processing in perception of words would lead to opposing results. By changing the depth of tasks, we tried to resolve the lexical ambiguity appeared in the LVF/ RH in experiment 1. Under the assumption of single entry representation for senses, there was the chance to discover the sense facilitation effects in the RH. Suppose the representation of Chinese senses had single entry, the pattern should be like that in the LH in experiment 1 where words of many senses elicited less negativity than words of few senses around 400 ms. The results of experiment 2 confirmed the inference. As for the patterns in the LH, the disappearance of the sense effects in the RVF/ LH did not mean that there was not any semantic activation; instead, semantic information has been quickly processed due to the efficient nature of the LH. Therefore, in a deeper level, the efficiency of cerebral hemispheres led to the results we observed.

To sum up, the ERP results in experiment 1 confirmed the hemispheric processing account of semantic activation in that the LH was engaged in fine coding and the RH was engaged in coarse coding. Our ERP data demonstrated that in the RVF/ LH, few senses were more negative because more focused and narrow senses were activated while in the LVF/ RH, many senses were more negative for broader activation of related senses. In a different depth of task, the sense facilitative effect occurred in the LVF/ RH. The result was also consistent with the hemispheric

processing account of semantic ambiguity due to different nature of efficiency in the brain.

5.3 Nouns and verbs

There were many studies investigating the issue concerning word class via aphasia studies (e. g. Damasio & Damasio, 1992; Damasio et al., 1993), ERP (e. g. Pulvermüller et al., 1999), fMRI (e. g. Li et al., 2006, Chinese) and other psycholinguistic studies (e. g. Tyler, 2001; Tsai et al., 2008). In general, there were two assumptions for the neural representation of nouns and verbs; one suggested that nouns and verbs were anatomically distinct (e.g. Damasio & Damasio, 1992; Damasio et al., 1993; Pulvermüller et al., 1999); the other suggested that the neural system for the two parts of speech was overlapping (e.g. Li et al., 2006; Tyler, 2001).

The counter-balanced number for nouns and verbs gave us a chance to look into the sense effect in different word categories. Planned comparison demonstrated that the simple simple-main effects of sense had different distributions of activation. In nouns, the simple simple-main effects of sense primarily occurred in the central-to-occipital areas around C, CP, P electrodes while, in verbs, they mostly appeared in the frontal areas around electrodes of F3, C3, CP3, and FC4. These differences seemed to be in agreement with distinct representations for nouns and verbs.

Though the current study was not meant to resolve the representations for different word categories, the additional results seemed to support the distinct neural representations for nouns and verbs, since each word class had its distribution for the sense effects. Certainly, further evidence of Chinese word class was required to approve the statement since there was also evidence suggesting distributed network

for Chinese lexical processing (e.g. Li et al., 2004).

5.4 Conclusions

In the research, the results obtained in both experiments suggested the single entry representation for senses. This finding was consistent to recent studies on polysemy (e.g. Beretta et al. 2005; Pylkkänen et al. 2006, Rodd et al., 2002). Secondly, the research demonstrated that both cerebral hemispheres played a role in semantic activation in a complementary way. Besides, when the depth of task was changed, the RH advantage for the processing of semantically related senses was observed. Third, planned comparison of simple simple-main effect of senses in experiment 2 had different distribution for nouns and verbs. This pattern seemed to be in favor of the distinct representations for the word parts of speech.