Chapter 5: Summary and Conclusion

The organization of words in the mental lexicon and the nature of representation of the meanings of the words have been central themes of research in psycholinguistic and neurolinguistic studies. The study of semantic features provides comprehensive knowledge to the understanding of these aspects of mental lexicon. They form the basis of numerous models and theories developed to describe mental lexicon. Studying these features helps in better understanding of neural representation of words in the brain of healthy individuals as it can augment the research findings from the neuroimaging studies. Knowledge of meaning representation and organization of words in the mental lexicon plays an extremely crucial role in rehabilitation of persons who have been affected by semantic deficits caused by neurological, brain damaging conditions such as aphasia and dementia. The semantic feature properties are also very helpful in designing stimuli for various behavioural and linguistic experiments used in research of lexical semantics. Even though semantic features have been employed in Indian languages for Aphasia therapy (Rangamani & Prema, personal communication), the features themselves have not been studied for their properties and for their contribution to organization of the mental lexicon. Hence the present research was designed to study the semantic features for organization and representation of nouns and verbs in Kannada mental lexicon. The next section summarizes the results of the analysis done with respect to the aims and objectives and research questions of the study.

With the primary aim of studying the semantic features of nouns and verbs, initially a list of 300 words were selected from the Kannada lexicon comprising of 200 nouns and 100 verbs. These words were pseudo-randomly distributed into 10 lists each consisting of 30 words (20 nouns & 10 verbs). These word lists were distributed among 300 native Kannada speaking adults (18-30 years) and were instructed to list down the semantic features that they think describes the target words. Each participant thus listed features for 30 words. The obtained responses for words were tabulated into custom software to develop a semantic feature database. This database of semantic features was subjected to further analysis in order to address the primary objective by answering the following two research questions.
Research question 1: Are there any differences in the distribution of semantic feature properties across the domains of nouns and verbs in Kannada mental lexicon?

Findings: The semantic feature properties varied significantly across the domains of nouns and verbs. The semantic features of nouns and verbs generated in the present study were analyzed for different featural properties namely number of features generated for each word, featural weights, types of features generated, distinctive features, shared features and feature correlation. The results revealed that the distribution of all of these featural properties differs across the domains of nouns and verbs.

Research question 2: Are there any differences in the distribution of semantic features properties across the semantic categories in Kannada mental lexicon?

Findings: The distribution of semantic features among the 10 semantic categories of nouns and 7 categories of verbs were studied for the properties namely number of features, featural weights, types of features, distinctive features, shared features and feature correlation. The results reveal that there were statistically significant differences in the distribution of the semantic featural properties across the semantic categories of nouns. The differences in distribution of feature properties were comparatively less for the semantic categories of verbs. This was seen for all the semantic feature properties considered for the study.

The results thus emphasize the differences in the organization of words representing nouns from that of verbs in the mental lexicon. The words representing nouns in the present study being concrete concepts have richer semantic representation and readily accessible semantic features than the verbs as revealed by greater number of features listed for nouns. The semantic featural make up of nouns have consistent patterns as opposed to verbs and greater agreement among participants as revealed by higher featural weights. The study also provides insight into the composition of featural information involved in semantic representation of nouns and verbs and their semantic categories that correlates with the information processing areas in the brain thus providing a neural basis for semantic representation. The distinctive feature distribution emphasizes what features are unique to represent a concept and shared features and
feature correlations on the other hand illustrate what features are present in more than one concept and thus facilitate clustering of words representing similar concepts together. The present research thus elucidates the organization and semantic representation of words in the mental lexicon.

Based on the semantic feature obtained from the present study, an attempt was made to model the possible structure of words and their interconnections in the mental lexicon that formed the second objective of the study. As semantic similarity is an important organizational principle of the mental lexicon, the semantic similarity measures were obtained for the every word by obtaining cosine distances of each word with another. The cosine distances were calculated based on the featural weights generated for semantic features of respective words. Hence the model utilizes empirical evidence obtained from the present study. The interconnections words may have were graphically depicted. The structure and interconnections of words in the model is in agreement with the intuitive categorization of words into semantic categories. The within-category cosine distances for words were significantly smaller than across-category distances providing evidence that the model is sensitive to the categorization principles of mental lexicon. Noun categories had greater differences than verb categories thus indicating that the model demonstrates the differences in categorization between the domains of nouns and verbs. Hence in the present research the Kannada mental lexicon was modeled based on semantic feature properties. The tertiary objective of the study was to compare the lexical semantic representation and organization in Kannada and English, which was addressed in the following research question.

Research question 3: Are there any differences in the distribution of semantic feature properties between Kannada and English language?

Findings: The semantic similarity measures of words belonging to English and Kannada obtained from their semantic feature properties showed significant difference. Although the words represented same concepts in both the languages there were differences observed in this measure.
The result thus indicates that it is not uncommon to find differences in the semantic featural makeup for words in two languages as generation of semantic features is based on verbal language in both the data sets. It may be true that conceptual knowledge may be universal and may not be affected by language but there might be differences at the lexical level where conceptual knowledge is mapped using linguistic symbols for language production and comprehension. At this lexical semantic level in the mental lexicon, the semantic representation is highly influenced by the linguistic, cultural and geographical background of language user. Shaping of conceptual knowledge into linguistic output to accommodate the varying requirements of language users could have led to the above differences leading to differences in organization and representation of words in the mental lexicon of the two languages.

5.1 Limitations of the study

The present study provides valuable insights into the lexical semantic organization of words in the mental lexicon using empirically derived semantic features. Few aspects nonetheless limited the study. One of which can be the nature of descriptions provided by participants in the semantic feature generation task. It is not usually very easy to describe the visuo-spatial information about the concepts (E.g., feature describing size of an object) using written or verbal language and hence such cues may not be adequately present in written semantic feature data. The participants also tend to list more features that help discriminating one concept from another rather than listing all the features, which might result in poor description of each concept, as they are likely to ignore very obvious features. Another concern about semantic features, especially those generated for verbs is that it is generated for isolated words. Features produced for isolated words may not account for the influence of syntactic relations and context for which the word meanings are highly susceptible. This can be more pronounced for agglutinative languages such as Kannada. Despite these drawbacks, there is substantial evidence that the semantic features nonetheless aid in understanding representation in the mental lexicon.
5.2 Conclusion

The present doctoral research provides empirically derived sets of semantic features for nouns and verbs of Kannada. The obtained semantic features were further studied for their featural properties and implications of these properties in the organization and representation of words in the mental lexicon. An attempt was also made to develop a framework to model the structure and organization of words in the mental lexicon based on the degrees of semantic feature similarity. The influence of language on the semantic features and representation of words in the mental lexicon was also analyzed by comparing the semantic similarity measures for words in English to the Kannada translational equivalent words in present study.

5.2.1 Implications and Future directions

The present study provides semantic feature data for 300 words in Kannada along with their distributional statistical measures. The study also provides six features having the highest featural weights for each word along with their featural weights, five most similar words for each word along with their cosine distances and the highly correlating semantic features along with their correlation coefficient values. This data can be employed to conduct various behavioural studies to understand language processing such as semantic priming. The empirically derived semantic similarity measures obtained from the study can be employed to develop stimuli for such behavioural studies thus increasing the objectivity and reliability of the studies.

The semantic feature data for words along with their featural weight measures can be utilized in the selection of stimuli for research studies, rehabilitation of individuals with semantic deficits. Selection of stimuli for therapy techniques used to treat semantic deficits such as Semantic Feature Analysis (SFA) can be based on the featural weight measures of the study that is derived empirically. The semantic features can also be employed in formulating treatment strategies to improve vocabulary in children with language impairments.

The custom software developed in the present study is flexible and language independent and can be easily employed to develop semantic feature database in other
languages. The current semantic feature database for Kannada words can also be further
developed by adding more number of words along with their semantic features. Further
the semantic features can be studied for abstract concepts and other parts of speech such
as adjectives, adverbs, idioms and metaphors to understand their representation in the
mental lexicon.