http://researchspace.auckland.ac.nz

ResearchSpace@Auckland

Copyright Statement

The digital copy of this thesis is protected by the Copyright Act 1994 (New Zealand).

This thesis may be consulted by you, provided you comply with the provisions of the Act and the following conditions of use:

- Any use you make of these documents or images must be for research or private study purposes only, and you may not make them available to any other person.
- Authors control the copyright of their thesis. You will recognise the author's right to be identified as the author of this thesis, and due acknowledgement will be made to the author where appropriate.
- You will obtain the author's permission before publishing any material from their thesis.

To request permissions please use the Feedback form on our webpage. http://researchspace.auckland.ac.nz/feedback

General copyright and disclaimer

In addition to the above conditions, authors give their consent for the digital copy of their work to be used subject to the conditions specified on the Library Thesis Consent Form and Deposit Licence.
Foreign Language Acquisition of
Mandarin Locative Structures

Wei Li

A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF PHD IN LINGUISTICS AND APPLIED LINGUISTICS, THE
UNIVERSITY OF AUCKLAND, 2014.
Foreign language acquisition of Mandarin locative structures

ABSTRACT

This study establishes a natural acquisition order for Mandarin locative structures through a mixed longitudinal and cross-sectional study of data over two academic semesters from 10 adult students at the University of Auckland, New Zealand. Zhang (2001) and Gao (2005) observe that locative modifiers emerge later than other modifiers in Mandarin noun phrases (NPs), but Charters (2005) argues that the differences in emergence order relate more to differences in the syntactic structures in which locatives appear, though nouns that are locative predicates do involve more syntactic processing than other types of locative nouns. However, neither Processability Theory (PT) nor Emergent Functional Grammar (EFG) could predict the later emergence of locative predicate NPs compared to verb phrases (VPs) and prepositional phrases (PPs) in Mandarin. In addition, as none of these three studies were designed to investigate locative structures, a comprehensive description or explanation of the emergence in Mandarin of locative structures were not provided. This is the issue the current study addresses.

The emergence order observed and the analyses of the emerged structures in the current study indicate the following: (1) structures in a higher stage according to PT emerged later than those in a lower stage, as predicted by PT; (2) as predicted by EFG, structures where no grammatical functions (GFs) were assigned emerged earlier than those with GFs, and structures with only an adjunct GF emerged earlier than those with argument GFs, which, in turn, emerged earlier than structures involving functional control, such as a link between a GF and another GF or a discourse function (DF)); (3) the six stages of PT are less precise than EFG at predicting the emergence order in phrasal structures, as PT cannot predict
different emergence points for different phrasal structures; (4) the mixed head order of
Mandarin, where VP and PP are head initial, but NP is head final, has an impact on structure
emergence that is independent of the syntactic processing considered by either PT or EFG.
Acknowledgements

I would like to express my thanks to the School of Asian Studies for their practical and moral support while I was working on my PhD.

A special debt of gratitude goes to Dr Helen Charters and Dr Robert Sanders for supervising and guiding me to be an academic, along with providing ‘tough love’ during the revision process of my thesis.

I thank Aaron Hobson for helping me improve the quality of my writing. I thank the students who allowed me to record their efforts at conversing in Mandarin, and who so conscientiously attended recording sessions over an entire academic year.

Thanks also to friends and other students in the PhD study room for their language support. I’d like to acknowledge the support I had from The Chinese government and The University of Auckland, which offered me a full scholarship for my study. Most of all, I thank my mother for her patience, kindness, and faithfulness.
# Table of contents

Chapter 1: Introduction

1.1 Mandarin locative structures .......................... 2
1.2 Thesis outline ........................................... 3

Chapter 2: Processability theory (PT)

2.1 Theoretical precursors .................................. 7
2.2 Core theory: LFG ........................................ 9
2.3 The six stages of SLA in PT ............................ 15
2.4 Critical review of PT .................................... 21
2.5 Emergent functional grammar ....................... 23

Chapter 3: Mandarin locative structures

3.1 Chu’s (2004) classification of Mandarin locative NPs ........................................ 28
3.2 Structural Classification of Mandarin locative structures ..................................... 29
   3.2.1 Locative nouns ........................................... 33
   3.2.2 Locative phrasal structures ........................... 36
   3.2.3 Sentential structures ................................. 39
3.3 Predictions for the emergence order of locative structures ............................... 43

Chapter 4: Acquisition of locative structures

4.1 Analysing learner language .............................. 47
4.2 Mandarin locative structures in FLA .................... 50

Chapter 5: Methodology

5.1 Research design ........................................... 57
5.2 Data collection ............................................. 58
5.3 Definition and identification of a locative word ........................................... 62
5.4 Data treatment ............................................. 64

Chapter 6: Results

6.1 Introduction ............................................... 71
   Common structures ......................................... 71
   Target structures ............................................ 72
   Inter-language structures ................................. 72
6.2 Longitudinal perspective ............................... 74
   6.2.1 Year 1 .................................................. 75
### List of Figures

- **Fig.2.1** Lexical entry of the pronoun ‘He’ ................................................................. 7
- **Fig.2.2** Lexical entry of the verb ‘lives’................................................................. 8
- **Fig.2.3** C-structure of example (1) ................................................................. 12
- **Fig.2.4** F-structure of example (1) ................................................................. 13
- **Fig.2.5** F-structure of ‘He stays at home’ ............................................................. 22
- **Fig.7.1** C-structure of semantic S ................................................................. 93
- **Fig.7.2** F-structure of semantic S ................................................................. 93
- **Fig.7.3** Lexical entry of DePoss ................................................................. 95
- **Fig.7.4** C-structure of NP- with DePoss adjunct ............................................. 95
- **Fig.7.5** F-structure of NP- DePoss adjunct .................................................... 95
- **Fig.7.6** Lexical entry of Num+suff ............................................................... 97
- **Fig.7.7** C-structure of NP with Num+suff adjunct ......................................... 97
- **Fig.7.8** F-structure of NP with Num+suff ...................................................... 97
- **Fig.7.9** Lexical entry for three ................................................................. 99
- **Fig.7.10** Lexical entry for classifier kou ...................................................... 99
- **Fig.7.11** Lexical entry for ren ................................................................. 99
- **Fig.7.12** C-structure of NumP ................................................................. 100
- **Fig.7.13** F-structure of NP with NumP ............................................................ 101
- **Fig.7.14** Lexical entry for you (exist) ............................................................ 102
- **Fig.7.15** C-structure of VP ................................................................. 102
- **Fig.7.16** F-structure of VP ................................................................. 103
- **Fig.7.17** Lexical entry of zai (at) ............................................................... 103
- **Fig.7.18** C-structure of PP ................................................................. 104
- **Fig.7.19** F-structure of PP ................................................................. 104
- **Fig.7.20** Lexical entry of locative predicate .................................................. 105
- **Fig.7.21** C-structure of Pred.NP ............................................................... 105
- **Fig.7.22** F-structure of Pred.NP ............................................................... 106
- **Fig.7.23** C-structure of Non-Pred. DeP ....................................................... 108
- **Fig.7.24** F-structure of Non-Pred. DeP ....................................................... 108
- **Fig.7.25** Lexical entry for ‘go’ .................................................................. 109
- **Fig.7.26** Lexical entry for ‘drink’ .................................................................. 109
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.27</td>
<td>C-structure of SVC</td>
<td>111</td>
</tr>
<tr>
<td>7.28</td>
<td>F-structure of SVC</td>
<td>111</td>
</tr>
<tr>
<td>7.29</td>
<td>Lexical entry of think</td>
<td>112</td>
</tr>
<tr>
<td>7.30</td>
<td>C-structures of NP with RC</td>
<td>113</td>
</tr>
<tr>
<td>7.31</td>
<td>F-structures NP with RC</td>
<td>113</td>
</tr>
<tr>
<td>7.32</td>
<td>Lexical entry for ‘middle’</td>
<td>114</td>
</tr>
<tr>
<td>7.33</td>
<td>C-structure of Pred. DeP</td>
<td>117</td>
</tr>
<tr>
<td>7.34</td>
<td>F-structure Pred. DeP</td>
<td>117</td>
</tr>
</tbody>
</table>
List of Tables

Table 2.1 Hierarchy of processing procedures (adapted from Pienemann, 1998, pp. 9 & 87)  
..............................................................................................................16
Table 2.2 Phases in the emergence of syntactic processing (Charters, 2013, p 13)..........23
Table 3.1 Classification of locative structures.........................................................32
Table 3.2 PT Predictions.........................................................................................43
Table 3.3 EFG Predictions.....................................................................................44
Table 4.1 Emergence order of eighteen Mandarin nominal structures (Charters, 2005, p. 190)  
....................................................................................................................................55
Table 5.1 Elicitation timetable..................................................................................61
Table 5.2 First interview of learner C.................................................................67
Table 6.1 Structure emergence for learner C.......................................................74
Table 6.2 Emergence of Year 1 common structures.............................................75
Table 6.3 Two-way correlations between emergence orders (C, L, K and B) for eight  
common structures of Year 1 (Pearson’s R) ......................................................77
Table 6.4 Two-way correlations between emergence orders (C, L, K and B) for eight  
common structures of Year 1 (Kendall’s tau_b) .............................................77
Table 6.5 Correlations between four orders of emergence of Kendall’s W..........78
Table 6.6 Emergence of Year 2 common structures...........................................79
Table 6.7 Order of emergence of Years 1 and 2..................................................80
Table 6.8 Implicational Hierarchy for all Common Structures..............................83
Table 6.9 Values of coefficient of scalability and reproducibility .......................84
Table 7.1 Emergence of Years 1 and 2 common structures with comments...........92
Table 7.2 Comparison between PT and EFG predictions..................................119
Table 8.1 Observed emergence of Mandarin locative structures.........................127
# List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>Full name</th>
<th>Example in Mandarin</th>
<th>English translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adj</td>
<td>The lexical category of Adjective</td>
<td>大 (da)</td>
<td>Big</td>
</tr>
<tr>
<td>AdjP</td>
<td>Adjective phrase</td>
<td>很小 （henxiao）</td>
<td>Very small</td>
</tr>
<tr>
<td>Adv</td>
<td>The lexical category of Adverb</td>
<td>很 (hen)</td>
<td>Very</td>
</tr>
<tr>
<td>AK</td>
<td>Auckland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asp</td>
<td>Aspect</td>
<td>了 (le)</td>
<td></td>
</tr>
<tr>
<td>CLASS</td>
<td>Class feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td>Classifier</td>
<td>个 (ge)</td>
<td></td>
</tr>
<tr>
<td>Conj.P</td>
<td>Conjunction phrase</td>
<td>我和他 (woheta)</td>
<td>He and I</td>
</tr>
<tr>
<td>COUNT</td>
<td>Count feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-structure</td>
<td>Constituent structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DeP</td>
<td>Phrase with a functional head De</td>
<td>车的上面 （chede shangmian）</td>
<td>On top of a car</td>
</tr>
<tr>
<td>DePoss</td>
<td>De as a possessive suffix after pronoun</td>
<td>我的… （wode）</td>
<td>My…</td>
</tr>
<tr>
<td>DEF</td>
<td>Definite feature or value</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dem.Pron</td>
<td>Demonstrative pronoun</td>
<td>那里 (nali)</td>
<td>There</td>
</tr>
<tr>
<td>DET</td>
<td>Determiner</td>
<td>这 （zhe）</td>
<td>This</td>
</tr>
<tr>
<td>DF</td>
<td>Discourse function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D.Loc</td>
<td>Double locative</td>
<td>上面 (shangmian)</td>
<td>On</td>
</tr>
<tr>
<td>DP</td>
<td>Determiner phrase</td>
<td>这家（zhe jia…）</td>
<td>This classifier</td>
</tr>
<tr>
<td>EFG</td>
<td>Emergent functional grammar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-structure</td>
<td>Functional structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLA</td>
<td>Foreign language acquisition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F.Loc</td>
<td>Free locative</td>
<td>楼上 (loushang)</td>
<td>Upstairs</td>
</tr>
<tr>
<td>GEN</td>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GF</td>
<td>Grammatical function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>id</td>
<td>Identification for reference number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>info.</td>
<td>Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IL</td>
<td>Inter-language; the linguistic system of a learner related to a specific TL before fully acquiring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LBR</td>
<td>Locative bound root</td>
<td>上 (shang)</td>
<td>On</td>
</tr>
<tr>
<td>LFG</td>
<td>Lexical functional grammar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>First language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>Subsequent language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>---------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LOC</td>
<td>Locative feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loc.DeP</td>
<td>Locative De phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loc.NP</td>
<td>Locative noun phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loc.VP</td>
<td>Locative verb phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MASC</td>
<td>Masculine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>The lexical category of Noun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NP</td>
<td>Noun phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Num</td>
<td>The feature of number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NumP</td>
<td>Number classifier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Num+suff</td>
<td>‘Num+ge’ inter-language structure of NumP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Pred.DeP</td>
<td>Non-predicate locative De phrases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Pred.Loc.N</td>
<td>Non-predicate locative nouns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Pred.Loc.NP</td>
<td>Non-predicate locative noun phrases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NS.Loc.N</td>
<td>Non-specific locative noun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBJ</td>
<td>Object</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBL</td>
<td>Oblique</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>The lexical category reposition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PERS</td>
<td>Person</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td>Prepositional phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPform</td>
<td>Preposition pattern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRED</td>
<td>Predicate value in LFG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pred.DeP</td>
<td>Predicate locative De phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pred.Loc.N</td>
<td>Predicate locative nouns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pred.NP</td>
<td>Predicate locative noun phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pro</td>
<td>Pronoun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT</td>
<td>Processability theory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POSS</td>
<td>Possesive feature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*PP</td>
<td>Ungrammatical preposition structure in target language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td>Relative clause</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Subject</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC-procedure</td>
<td>Subordinate clause procedure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scomp</td>
<td>Complex sentence</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sentence with embedded clauses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFP</td>
<td>Sentence final particle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SG</td>
<td>Singular</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SLA</td>
<td>Second language acquisition</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SVC</td>
<td>Serial verb construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>去哪儿喝啤酒 (qunaerhepijiu)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Where to go to drink beer?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPEC</td>
<td>Specific</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.Loc.N</td>
<td>Specific locative noun</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D.Locs, F.Locs, Dem.Prons, PLN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.Loc.NP</td>
<td>Specific locative noun phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>这个地方 (zhegedifang)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>This place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SVO</td>
<td>Subject-Verb-Object constituent order</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBJ</td>
<td>Subject</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TL</td>
<td>Target language</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOP</td>
<td>Topic; a discourse function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>The lexical category verb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VP</td>
<td>Verb phrase</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>看 (kan)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Look</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>看书 (kanshu)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Read</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*</td>
<td>Ungrammatical marker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*S</td>
<td>Ungrammatical sentence</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 1: Introduction

Prior research has shown that a certain cross-linguistic order exists in both first- and second-language acquisition (Brown, 1973; Dulay & Burt, 1973; Maratsos, 1975; Larsen-Freeman, 1976; Andersen, 1984; Pienemann, 1998). Moreover, a set acquisition order has also been found in Mandarin nominal structures (Charters, 2005). Within this research context, the current study investigates how adults learn Mandarin as a foreign language, with a particular emphasis on the syntax of locative structures. To that end, this research aims to identify a natural acquisition order for Mandarin locative structures, which will be investigated by analysing processing demands in these structures within the frameworks of processability theory (PT) and emergent functional grammar (EFG). Accordingly, this study addresses the following three research questions:

1. Is there a set emergence order for locative structures in Mandarin foreign language acquisition (FLA)\(^1\)?

2. Are the findings from a cross-sectional study and a longitudinal study consistent or contradictory?

3. Assuming consistent results are found, is the emergence order observed in the data analysis the same as that predicted within a PT or EFG framework?

\(^1\) FLA is defined as a language learned in a place where the language is not the native language of the majority, and second language acquisition (SLA) refers to a language learned in a place where the language is the native language of the majority (Richards & Schmidt, 2002). In the current study Mandarin was being learned and researched in New Zealand, and therefore is an example of FLA. SLA is used to refer to previous research conducted in China.
The analysis of the processing demands in Mandarin locative structures is performed on unplanned speech elicited from adult learners of Mandarin as a foreign language. The findings of this study will further test the explanatory and predictive power of PT with regard to research on Mandarin. The findings will also contribute to the field of formal language instruction in general, as they will serve as a resource for teachers designing curricula that take advantage of the natural order of acquisition. The next section introduces the language and structures under study and section 1.2 presents the thesis outline.

1.1 Mandarin locative structures

Mandarin is now the most spoken language in the world (Nations Online Project, n.d.). In addition to being the official language of Mainland China and Taiwan, Mandarin is also one of the four official languages in Singapore (spoken by 35% of Singaporeans); is widely spoken in Malaysia; and is one of the six official languages of the United Nations. In terms of its linguistic characteristics, Mandarin belongs to the Sino-Tibetan family, with a basic subject-verb-object (SVO) word order (Li & Thompson, 1981).

Locative structures express spatial location and spatial relationships. Generally, locative structures include locative words used alone, such as ‘here’ and ‘down’ in English, and phrases that combine locatives and other words, such as ‘beside X’, ‘next to Y’ or ‘on top of Z’. These examples express very similar concepts, locating something by putting it in a certain place defined in relation to X, Y or Z, so that cognitively none is more complex than the other, but syntactically each is more complex than the one before: ‘beside X’ is a simple PP (beside=P, X=NP); ‘next to Y’ is an AdjP where the Adj ‘next’ selects a PP [to Y] and ‘on top of Z’ is a PP where the P ‘on’ selects an NP [top of Z] which contains another PP [of Z]. These syntactic differences provide a basis for the investigation of natural acquisition order among different locative structures.
An example of a locative structure in Mandarin is the noun phrase (NP) \( X \text{ shangmian} \) (on top of \( X \)), where the locative noun (Loc.N) \( \text{shangmian} \) (top) indicates a place by identifying a specific part (top) of an entity, \( X \): higher than and touching that part of \( X \). In Mandarin certain locative verbs and prepositions, such as, \( \text{qu} \) (go), and \( \text{zai} \) (at) require their complements to be locative, but in contrast to English, not every Mandarin NP qualifies as ‘locative’ just by denoting a place; while \( \text{qu Zhongguo} \) (go [to] China), and \( \text{zai Xinxiilan} \) (in New Zealand) are acceptable, \( \text{qu fangzi} \) (go [to the] house), and \( \text{zai lu} \) (on [the] road) are not. The need to check whether a complement is locative in the relevant sense, or not, will add extra processing demands in the production of locative VPs and locative PPs that require such complements, relative to phrases that do not. This will be discussed further in Chapters 3 and 7.

1.2 Thesis outline

This thesis is composed of eight chapters. Chapter 1 introduces the thesis and Chapter 2 discusses the theoretical frameworks, PT and EFG that are employed in this study, including their main components: the six stages of PT and the three phases of EFG; the different processing demands associated with each stage and each phase; and the relationship between processing demands and emergence order. Within the theoretical framework explicated in Chapter 2, Chapter 3 presents a classification of Mandarin locative structures and predictions for their order of emergence under PT and EFG. PT and EFG predictions will be compared in Chapter 7 (7.2) to see which one is more precise regarding the emergence of Mandarin locative structures.

Chapter 4 provides a historical review of inter-language research, Mandarin locative structures in Chinese linguistics, along with SLA and FLA in Mandarin within PT. The
review of inter-language informs the data collection and analysis of the current study as will be discussed in Chapter 5; the review of Chinese linguistics informs the classification of Mandarin locative structures in Chapter 3; and the review of Mandarin as a foreign language conducted within the framework of PT informs the study’s methodology in Chapter 5 and structural analyses in Chapter 7.

Chapter 5 presents the methodology used in this study, a combination of longitudinal and cross-sectional techniques. The data collection process includes elicitation tasks and schedules, establishing principles for identifying a word, an emergence criterion, and the development of an individual emergence table, which prepares for the emergence results as will be revealed in Chapter 6.

Chapter 6 presents the results of this study, showing that a natural acquisition order is identified in Mandarin locative structures from both a longitudinal and a cross-sectional perspective, and these two observed emergence orders are almost identical. Following the results obtained in Chapter 6, Chapter 7 provides structural analyses of the common structures that emerged. These analyses focus on the relationship between the processing demands entailed by the Mandarin locative structures and their order of emergence. This is because the six stages in which locative structures are arranged in PT are associated with different processing demands, as are the different grammatical function assignments that occur when producing these locative structures, as discussed in EFG.

The observed emergence order and the analyses generally confirm the EFG predictions, and also indicate that the six stages of PT are less precise than EFG at predicting the different emergence points in phrasal structures. This is because PT cannot say anything about the order of phrasal structures emerging within the same interval.
Chapter 8 presents the concluding remarks with reference to the three research questions posited in this chapter, and identifies a detailed natural acquisition order in FLA of Mandarin locative structures. Chapter 8 also identifies a relationship between the six stages of PT and grammatical function assignments, and points out the limitations of the current study, suggesting avenues for possible future research.
Chapter 2: Processability theory (PT)

This study employs PT as its primary theoretical framework (Pienemann, 1998, 2005). PT aims to explain the order in which syntactic structures emerge in SLA by reference to the nature of the syntactic procedures which produce them. According to PT, changes in the structures used by learners over time reflect an increase in the number of processes performed. The different processes required to produce different structures, such as satisfying certain conditions or completing grammatical information exchange between lexical morphs to produce agreement, place different processing demands on the learner. PT recognizes six stages of development, where each stage is defined by the processes that learners at that stage can perform. The nature of these processes is clarified through application of lexical functional grammar (LFG). After a brief introduction to the theoretical precursors of PT in section 2.1, section 2.2 outlines the mechanisms of LFG, which explain the processing demands in the syntactic procedures of PT. The syntactic procedures and their associated six stages are discussed in section 2.3, followed by a short critical review of PT in section 2.4. Section 2.5 introduces emergent functional grammar (EFG), a theoretical framework developed by Charters (2013), which aims to identify the emergence order in syntactic processing that is largely overlooked in PT.

2.1 Theoretical precursors

Pienemann (1998) acknowledges that his theory sits within a cognitive science framework (Bechtel 1988), and specifically mentions the similarity between some basic ideas of PT on
the one hand and Piaget’s (1983) constructivism and Jakobson’s (1968) account of children’s acquisition of phonetics on the other.

Firstly, Jakobson (1968) proposes a hierarchy of phonetic distinctive features, which he says explains the order in which children produce speech sounds (Jakobson, 1968, pp. 23–28). The link between a processing hierarchy and the order of acquisition is one of the central ideas of PT (Pienemann 1998, pp. 34–35).

Secondly, “Piaget’s cognitive system is intended to explain the development of knowledge as an active process of mental construction… The necessity of this process of construction is seen to be inherent in the implicational relationship of the mental processes involved. Those developed at the higher level build on those at the previous levels and so on” (Pienemann, 1998, p. 34).

In PT, accumulating experience of constructing one syntactic structure creates one procedure: a piece of procedural knowledge associated with certain processing demands. This procedural knowledge may contribute to the construction of a more complex structure, creating a more complex procedure associated with greater processing demands compared to the one before. PT emphasizes that a higher-order procedure cannot be created until all prerequisite lower-order procedures have emerged. The first procedure to develop is called the categorial procedure: it adds inflections to lexical items; the next is the phrasal procedure: it combines the output from two or more categorial procedures; the third is the S-procedure, which combines the output of phrasal procedures to make a sentence, and the last is the SC-procedure which produces sub-ordinate clauses.
2.2 Core theory: LFG

LFG is an important theoretical foundation of PT because it can be used to describe processing demands associated with the different procedures which form a processing hierarchy represented as the six stages in PT. The essential components of LFG relevant to PT are: lexical entries, feature unification, constituent structure (C-structure), functional structure (F-structure) and well-formedness (Bresnan, 2001). Pienemann’s reason for choosing LFG over other syntactic theories is that feature unification explains why information in lexical entries, i.e. grammatical features, is stored and exchanged (Pienemann, 1998, p. 91), for example, feature storage in lexical entries characterizes PT’s stage 2 and feature exchange between lexical entries within a phrase characterizes PT’s stage 3 as discussed in detail below.

Lexical entries

In LFG, a lexical entry is a set of syntactic and other properties which identify or distinguish lexical items from each other (Pienemann, 1998, p. 94). In other words, each word has its own lexical entry storing the grammatical features of that specific word. For example, the lexical entries of the pronoun ‘he’ and the verb ‘lives’ can be described as in Fig. 2.1 and Fig. 2.2, respectively.

\[
\begin{align*}
\text{PRED} & \text{ ‘Pro’} \\
\text{NUM: } & \text{ SG} \\
\text{GENDER: } & \text{ MASC} \\
\text{PERSON: } & \text{ 3}
\end{align*}
\]

*Fig. 2.1 Lexical entry of the pronoun ‘he’*
Fig. 2.1 shows that an English pronoun expresses the features: number, person and gender as well as a predicate feature (PRED), which represents the semantic content of a word. The ‘number’ feature of the pronoun ‘he’ has the value ‘SG’ (singular), the ‘person’ feature has the value ‘3 (third)’ and the gender feature has the value ‘MASC’ (masculine), and the PRED feature ‘he’. On the other hand, an English verb expresses tense, and if its tense is present, the person and number values of its subject, as well as its predicate feature. The ‘tense’ feature of the verb ‘lives’ has the value ‘present’, the subject person feature has the value ‘3’ and the subject number feature has the value ‘SG’. The predicate feature of any verb must also show whether the verb requires a subject, object and/or an oblique complement, such as a preposition phrase (PP). As shown in Fig. 2.2 ‘lives’ requires a subject and an oblique.

The grammatical features in lexical entries provide information which may need to be unified to create agreement between words and this contributes significantly to processing demands in PT as discussed next.

**Feature unification**

According to Bresnan (2001), feature unification takes the form of ‘feature copying’ or ‘merging’, when features in two lexical entries are copied into the same F-structure and must become one. This is only possible when the two features are compatible.
Feature unification is considered one of the most significant characteristics distinguishing a phrasal procedure from a lexical procedure in PT. That is to say, a phrasal structure with feature unification is produced minimally by a phrasal procedure, but a phrasal structure does not necessarily involve feature unification. PT clearly assigns phrasal structures with feature unification to stage 3 because the phrasal procedure must retrieve information from two different category procedures and compare it, but PT makes no specific mention of the stage to which phrases without unification should be assigned. However, no phrase can emerge until a phrasal procedure has developed to accept output from two or more categorial procedures. Thus whether they involve unification or not, phrases should emerge only after stage 2 structures – produced by categorial procedures – have emerged. In fact, the observed order (Chapter 6) showed phrasal structures with feature unification did emerge later than those without feature unification. Next, we turn to constituent structure (C-structure).

C-structure

C-structure refers to the surface structure of a sentence viewed as combinations of phrases. It is depicted as a structural tree diagram. Certain nodes in a C-structure diagram have annotations showing the grammatical function of the constituent at that node (Bresnan, 2001). Other nodes represent syntactic heads of the constituent. Fig. 2.3 shows the C-structure of example (1): He lives in a dormitory.
Fig. 2.3 C-structure of example (1)

Fig. 2.3 shows that example (1) is composed of a noun phrase (NP) and a verb phrase (VP). The grammatical functions assigned at each node relate to the position of that node in the C-structure; the NP consisting of a pronoun in Fig. 2.3 is assigned the subject function. In most languages, an NP dominated by S is the subject; an NP dominated by VP is the object; and a PP dominated by VP is either an oblique argument or an adjunct. The grammatical functions assigned in a C-structure correspond to the grammatical functions of the constituent in functional structure (F-structure). F-structure represents the functional relationships between words and phrases in a sentence for example which phrases optionally modify which heads, and which phrases are complements etc. In some languages these functional relationships may be obvious from word order in C-structure but in other languages they are not. Moreover, F-structure is where feature-unification takes place. This is discussed in more
detail below. In creating constituents in F-structures, features must be mapped from the words in C-structure. The annotations above each node indicate how to map additional features from C-structure to F-structure. For example, in Fig. 2.3, the first annotation, ‘↑SUBJ=↓’ above the node NP means in F-structure, the features of the NP below that node are the features of a subject in the F-structure of the node above. The annotation ‘↑ =↓’ above the VP node means, in F-structure, the features of the VP are the features of the sentence as a whole. In this way, annotations reflect a speaker’s knowledge of syntactic or functional relationships between elements of a sentence.

**F-structure**

F-structure combines all the separate pieces of a sentence together, according to the syntactic requirements of the predicate (Pienemann, 1998, p. 95), as Fig. 2.4, the F-structure of example (1) shows:

```
PRED ‘lives’ <SUB, OBL>’
TENSE: present

SUBJ
   PRED: ‘Pro’
      NUM : SG
      PERSON : 3

OBL
   PRED: ‘at <OBJ>’
      OBJ [PRED ‘dormitory’]
```

*Fig. 2.4 F-structure of example (1)*
In Fig. 2.2 above we saw that the predicate value of the verb ‘lives’ requires a subject and an oblique, and that its subject is third person singular. Now from Fig. 2.4 we can see that the subject and oblique are present in the F-structure of the predicate; the oblique’s features have been contributed by the PP in the oblique position, and the subject’s number and person features have been contributed twice, once by the verb, as just described, and again by the NP in the subject position. They have been able to merge because they were identical: feature unification. We can also see that the F-structure of the predicate is that of the sentence, as specified by the annotations above the verb and VP in Fig. 2.3. That is, the C-structure and F-structure correspond with each other, representing a sentence from a structural and a grammatical perspective, respectively.

**Well-formedness conditions**

F-structure must also satisfy three well-formedness conditions in LFG: the uniqueness condition, the completeness condition, and the coherence condition (Bresnan, 2001, p. 63).

Firstly, the uniqueness condition requires a sole value for each attribute in an F-structure. This ensures all the features in a structure are compatible (Pienemann, 1998, p. 97). For instance, the ill-formed English phrase *‘Those lion’ is ungrammatical because the determiner ‘those’ has the number value plural, but the noun ‘lion’ has the singular number singular. The C-structure of NP forces their number values to be stored in one feature in the same F-structure, and because the values are different, the uniqueness condition is violated, ruling this phrase out. To create a grammatically acceptable phrase, the number features from the two lexical entries must unify. The requirement of feature unification in this NP places a greater processing demand on the learner than production of a lexical morph (like plural used alone, or past tense) which does not involve feature unification.
Secondly, the coherence condition requires that ‘every argument function in an F-structure must be designated by a predicator’ (Bresnan, 2001, p. 63). An argument function is a type of grammatical function which is required by a predicate (Bresnan, 2001). In other words, the presence of an argument, like SUBJ or OBL in an F-structure must be licensed by a PRED feature in the same F-structure whose value contains the same argument function. For example, the ill-formed structure *‘I sit an apple’ is ungrammatical because the constituent ‘an apple’ occupies a node in the C-structure associated with the grammatical function of object; but the predicator ‘sit’ has a PRED feature requiring an oblique instead of an object, so the presence of an object violates the coherence condition.

Thirdly, the completeness condition requires that ‘every function designated by a predicate value be present in the F-structure of that predicate’ (Bresnan, 2001, p. 63). In other words, if a predicate in an F-structure requires an object, then the object must be present in the same F-structure, and the procedure must check that there is a predicate value in the F-structure of this object. For example, the structure *‘I have’ is ungrammatical because the PRED ‘have <SUBJ, OBJ>’ requires a subject and an object, but there is no object in the F-structure, which violates the completeness condition.

Now we have discussed the components of LFG relevant to PT, we can see how they help to account for the six stages of acquisition in PT.

2.3 The six stages of SLA in PT

PT proposes six stages in the SLA of morphology (word form) and syntax (phrasal structure and constituent order). The six stages correspond to six types of syntactic procedures, each producing different structures that differ in their processing demands, as Table 2.1 below shows; the processes are in order of decreasing complexity.
Table 2.1: Hierarchy of processing procedures (adapted from Pienemann, 1998, pp. 9 & 87; 2005, p. 245)

According to Pienemann, the six procedures shown in Table 2.1 form a hierarchy, where the emergence of lower procedures is a precondition of the emergence of a higher procedure. Each developmental stage corresponds with its own type of procedure shown in the second column, and structural outcome shown in the third column. The six stages are explained in more detail below.

**Word/lemma access**

The first stage, word/lemma access, is the lowest stage and is shown at the bottom of Table 2.1. It describes a simple semantic relationship of direct mapping from concepts to linguistic forms. This is similar to the first step in lexical access proposed by Levelt (1996), where he proposes a four-step process in speech production: conceptual preparation, lexical selection, phonological encoding, and articulation (Levelt, 1996, p. 1). Conceptual structure is universal and shared by all languages, while morphological form is language-specific. Morphological

<table>
<thead>
<tr>
<th>Stage</th>
<th>Processing procedures</th>
<th>Structural outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Subordinate clause procedure</td>
<td>Subordinate clause</td>
</tr>
<tr>
<td>5</td>
<td>Sentence procedure</td>
<td>Topic Hypothesis. Separation of Topic and Subject. Unmarked Alignment Hypothesis</td>
</tr>
<tr>
<td>4</td>
<td>Simplified sentence procedure</td>
<td>Inter-phrasal morphemes</td>
</tr>
<tr>
<td>3</td>
<td>Phrasal procedure</td>
<td>Phrasal morphemes; phrasal information exchange</td>
</tr>
<tr>
<td>2</td>
<td>Categorial procedure</td>
<td>Lexical morphemes, no information exchange, canonical word order</td>
</tr>
<tr>
<td>1</td>
<td>Word/lemma access</td>
<td>Words, no sequence of constitutes</td>
</tr>
</tbody>
</table>
forms can be directly activated by concepts. That is, both Pienemann and Levelt agree that early speech production involves activation from concepts to linguistic forms.

**Categorial procedure**

In the second stage, the categorial procedure, conceptual structure is integrated with lemmas and morphological structure. A lemma is a store of grammatical features associated with a lexical entry, which is created by a categorial procedure, and links a concept to an inflected word-form. To complete a categorial procedure, firstly a concept initiates a process of lexical selection functioning through lemmas, then the grammatical features in an activated lemma activate relevant inflected word-forms. The addition of the lemma functioning between concepts and morphological forms causes greater processing demands in the categorial procedure than is associated with direct activation. This extra processing demand delays lexical access and provides a basis for the prediction that inflectional morphemes belonging to stage 2 emerge later than root morphemes, belonging to stage 1.

**Phrasal procedure**

In the third stage, phrasal procedure, grammatical information exchange such as feature unification occurs between a head and its modifier. Feature unification is considered the most important characteristic distinguishing a phrasal procedure from a categorial procedure in PT. When a head combines only with a specific form of modifier, and not other forms, this shows that the head and modifier must have grammatical features in common, and they must be unified. Features in a noun phrase that must be brought together and unified with each other in some languages include number, count, class, gender, etc. For example, an English noun ‘child’ can combine with an article ‘a’ but not ‘these’ because the number feature of the word ‘child’ is singular, and cannot unify with the feature of an article expressing plural number, and vice versa. Note that unification depends on the prior acquisition of relevant grammatical
features at the second stage. Recall that in Mandarin, the preposition *zai* (at) accepts some NPs as object and not others. It will be shown in Chapter 3 that the object of ‘*zai* (at)’ must be specific and express a locative feature; thus in a Mandarin PP structure ‘*zai* (at) NP’, the object and preposition must both express locative and specific features, and these must be unified in F-structure. On this basis we can assign the Mandarin PP to PT’s stage 3. This will be discussed in further detail in Chapter 3 and Chapter 7.

There is a processing delay associated with feature unification in a phrasal procedure that provides the foundation for the prediction that a phrasal structure that involves agreement emerges later than an inflected word used alone. In the unification of features in ‘a child’, the NP procedure cannot complete its processing until the feature value of the modifier is retrieved from lexical entries and transferred to the NP procedure. Only then can they unify. It is this information exchange between procedures in the syntactic processor that causes a processing delay greater than that involved in adding lexical morphs in a categorial procedure.

**Simple sentence procedure and sentence procedure**

The fourth and fifth stages are the simplified sentence procedure (Simple S) and sentence procedure (S-procedure), respectively which are in the same row in Table 2.1. The original Simple S had a subject and a pre-subject adverb, but no subject verb agreement; the S-procedure involves subject-verb agreement, where the head of a NP exchanges information with the head of a VP. However, Mandarin does not have subject verb agreement so the shift between Stages 4 and 5 would not be evident in Mandarin at the sentence level.

In an S-procedure, the subject NP must wait for its head noun to complete information exchange with its modifier, as discussed above. Only then can the NP unify with the predicate in the S-procedure. So again we have a procedure that cannot be completed until information
has been transferred. According to PT, because a NP and a VP can only be combined in a S-
procedure, there is a longer processing delay in a S-procedure relative to a phrasal procedure.
This longer delay provides the basis for the prediction that a sentential structure emerges later
than a phrasal structure.

In a more recent, extended version of PT (Pienemann, 2005), “Topic Hypothesis” and
“Unmarked Alignment Hypothesis” are introduced to explain the transition from a simple
sentence stage to a full S-procedure stage. The Topic Hypothesis proposes that at the very
beginning of SLA, learners cannot separate subject from topic; later on, when S-initial
adverbs emerge, PT analyses these as topics and concludes that at that point learners have
begun to differentiate subjects from topics (Pienemann, 2005, p.240). The Unmarked
Alignment hypothesis says that in SLA, “learners will map the most prominent semantic role
to subject, and in turn, the structural expression of the subject will occupy the initial position
in C-structure” (Pienemann, 2005, p.229). Both of these new proposals relate to the
relationship between subjecthood and word order at the sentence level, so neither is directly
relevant to this current study which aims to investigate the emergence order of phrasal
structures, such as, locative NPs, PPs, Loc.VPs, and DePs, because NPs, PPs, VPs and DePs
constitute a different structure level from sentences, involving phrasal procedures, not the S-
procedure, and the information exchange between two different words in the same
phrase constitutes a different processing level from the information exchange in sentential
structures. The Topic and Unmarked Alignment hypotheses are not relevant to the processing
issues involved in locative structures and so are not employed in the current study.
Subordinate clause procedure

The sixth stage, the subordinate clause procedure or SC-procedure, is the most advanced procedure in PT, where information exchange occurs between the main sentence and an embedded clause. A subordinate clause procedure processes an embedded clause, which could be a relative clause, an adverbial or a complement clause. Pienemann argued that an SC-procedure is required when there is a different word order in the main and embedded clauses. In Mandarin, the word order rules are the same for both, however, the relative clause involves a gap which makes additional processing demands. This is discussed in Charters (2005), where she argued that the gap must be linked to a discourse function to satisfy the completeness condition, and this linkage makes greater processing demands in relative clauses than in main clauses, so even if word order is unchanged embedded clauses with gaps involve more processing than a main clause. For example, in the English sentence in example (2) below, in addition to the subject-verb agreement in the main clause, the verb: ‘like’ <OBJ> in the embedded clause requires an object, but the object is not provided in the F-structure of the predicate ‘like’.

(1) He is the one that I like.

To bridge the gap, the relative pronoun ‘that’, which has a discourse function of topic (Dalrymple, 1999, p. 59), is linked to the empty object in the F-structure of the VP ‘like’. It is the information exchange that links the discourse function to an argument requirement of a predicate that causes the processing delay that is the longest among the six procedures. This processing delay provides the basis for the prediction that a subordinate structure emerges later than a simple sentence.

The six procedures have been discussed from the least syntactically complex to the most. Morphemes and structures are expected to be acquired in the order shown in Table 2.1. This
expectation has been supported by empirical studies, such as Pienemann (1998), Zhang (2001), Gao (2005) and Charters (2005). In PT, structures assigned to the same stage, as they are produced by the same procedure, are deemed to have the same processing demands. This provides a basis for PT predictions for the emergence of Mandarin locative structures to be discussed in Chapter 3 (3.2).

One point to note is: it is possible that the same surface form can have two different structures, each produced by a different procedure and used in different contexts. For example, the Mandarin form *chuangshang* (boat-on) can either be a word meaning ‘top of a boat’ or a phrase meaning ‘on a boat’. In this case, the usage of ‘top of a boat’ produced by a categorial procedure is predicted to emerge earlier than the usage of ‘on a boat’ produced by a phrasal procedure (see discussion in Chapter 5).

### 2.4 Critical review of PT

The six stages in PT can represent the SLA of syntactic procedures in general but are not sufficient to cover certain details, as the following points show:

1. There is no clear procedural difference between a sentential procedure and a phrasal procedure other than the subject-verb agreement, which has been noted in Charters (2005). She proposes that it is the need to assign a subject grammatical function (GF), not a delay in conceptualisation, that accounts for the late emergence of subject-verb agreement.

2. The role of grammatical functions in general in assessing processing demands is overlooked in PT (Charters, 2005). For instance, in the S-procedure stage, the VP also needs to wait for its predicate to complete information exchange with its complements. The additional information exchange is associated with grammatical function assignment: to satisfy the completeness condition, the grammatical function in the lexical entry of the
predicate needs to unify with a grammatical function mapped from the C-structure. For example, in Fig. 2.5, the predicate ‘stays’ specifies an oblique grammatical function in its lexical entry ‘<SUB, OBL>’, and the F-structure ‘at home’ has the grammatical function oblique; these two grammatical functions need to be unified. In addition, to satisfy completeness, the procedure must check that there is a predicate value in the F-structure of the oblique.

\[
\begin{align*}
\text{PRED} & \quad \text{‘stays <SUB, OBL>’} \\
\text{TENSE} & \quad \text{present} \\
\text{SUBJ:} & \quad \left\{ \begin{array}{l} 
\text{PRED: ‘Pro’} \\
\text{NUM} & \text{SG} \\
\text{PERSON} & \text{3} 
\end{array} \right. \\
\text{OBL} & \quad \left\{ \begin{array}{l} 
\text{PRED ‘in <OBJ>’} \\
\text{OBJ [PRED ‘home’]}
\end{array} \right.
\end{align*}
\]

*Fig. 2.5 F-structure of ‘He stays at home’*

This oversight can result in over-generalization of the similarity of processing demands in different applications of the same procedure. For instance, phrases with grammatical functions should emerge later than those without grammatical functions, as discussed in Charters (2005, 2013), but not in earlier discussions in PT. The emergence of grammatical functions will be detailed in the next section.
2.5 Emergent functional grammar

Emergent functional grammar (EFG), established as a theoretical framework in Charters (2013), aims to identify the emergence order in syntactic processing that is overlooked in PT. EFG develops from the work in Charters (2005), which noted the inability of PT to explain the difference in emergence between locative predicate nouns which require arguments and other types of nouns which do not, and started to take GF into account in structure emergence. The main contexts of EFG are shown in Table 2.2 taken from Charters (2013, p. 13):

Table 2.2: Phases in the emergence of syntactic processing (Charters, 2013, p 268)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The Pre-syntactic phase:</td>
<td></td>
</tr>
<tr>
<td>1. Semantic activation of individual word-forms by concepts; (cf PT's stage 1)</td>
<td></td>
</tr>
<tr>
<td>2. Topic-Comment structure: Assignment of a Topic Function to a salient unit</td>
<td></td>
</tr>
<tr>
<td>3. Co-activation: compounds and semantic agreement</td>
<td></td>
</tr>
<tr>
<td>B. The Local Syntax Phase:</td>
<td></td>
</tr>
<tr>
<td>4. Feature unification (cf PT's stage 3) (syntactic agreement)</td>
<td></td>
</tr>
<tr>
<td>5. The Adjunct Function</td>
<td></td>
</tr>
<tr>
<td>C. The Long-distance Syntax Phase:</td>
<td></td>
</tr>
<tr>
<td>6. Assignment of Argument Functions (Subject, Object etc).</td>
<td></td>
</tr>
<tr>
<td>7. Functional control: Linking Grammatical Functions</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.2 shows the three phases in EFG: the pre-syntactic phase, local syntax phase and the long-distance syntax phase. The first phase is the pre-syntactic phase, and includes three characteristics: semantic activation, topic-comment and co-activation in compounds and semantic agreement. Semantic activation equates with PT’s ‘direct activation by concepts in stage 1; topic-comment structure provides an alternative to PT’s canonical word order; it stresses the influence of information structure, or activation states over assignment of the
grammatical function subject, assumed by PT; co-activation argues that two lexical items can be activated at the same time, categorial and either form a compound by accessing one categorial procedure, or form a phrase with the appearance of agreement, without unification. These structures would therefore belong to PT’s stage 2. In EFG, these three subtypes are expected to emerge in the order in which they are listed: Semantic activation emerges earlier than topic-comment structure, which in turn emerges earlier than co-activation.

The second phase is the local syntax phase, and includes two elements: feature unification and emergence of the adjunct function. Feature unification is basically the same as that which underlies syntactic agreement in stage 3 in PT; an adjunct is said to emerge before argument functions, because it does not need to satisfy the completeness or coherence condition (Bresnan, 2001). Assignment of an adjunct GF is called ‘simple GF assignment’ in the current study (see Chapter 7). In EFG, feature unification is said to emerge earlier than the adjunct function. In fact, this is not supported by the emergence order established in the current study (Chapter 6), as simple NP with an adjunct emerged earlier than the NP composed of a numeral, classifier (NumP) and noun, where a class feature is unified between NumP and the head noun, as will be detailed in Chapter 7 (7.1). The third phase is the long-distance syntax phase, and includes two developments: the emergence of argument functions and then, of functional control. Argument functions must satisfy the completeness condition (Bresnan, 2001) as explained above. This makes their assignment more demanding than that of the Adjunct GF Assignment of an argument GF is called complex GF assignment in the current study (see Chapter 7). Functional control is a linkage between two GFs, or a GF and a DF, and is involved in De phrases (DePs), as will be introduced in Chapter 3 (3.1) and discussed in Chapter 7 (7.1). In EFG, argument functions must emerge earlier than functional control, because function control involves the linking of two argument functions. However, EFG is
not explicit on the emergence point of the DFs Topic and Focus to which GFs can also be linked.

EFG’s proposals also generate predictions for emergence in some Mandarin structures. For example, predicate NP (Pred.NP) with argument functions is predicted to emerge earlier than predicate DePs with functional control (see Chapter 3, section 3.2). This is confirmed by the observed order discussed in Chapter 6.

In summary, this chapter has introduced the theoretical precursors and the compulsory components in LFG relevant to PT, along with PT’s six stages, and EFG as well as its three phases in syntactic processing. This has provided the foundation for classification of Mandarin locative structures, along with predictions for their emergence order to be discussed in Chapter 3.
Chapter 3: Mandarin locative structures

As noted in the Introduction, locative structures in general are language structures that denote spatial relationships. However, in modern Mandarin, some place denoting nouns can complement a locative preposition (as in [3]), but others cannot (as in [4]). By adding a locative predicate N *shang* (on) to the non-locative N *chuan* (boat) in (4), we can produce the grammatical structure in (5).

(3) *zai Zhongguo* (in China) ‘in China’

(4) *zai chuan* (at boat) ‘on boat’

(5) *zai chuan shang* (at boat on) ‘on boat’

This is generally explained by the fact that the preposition *zai* needs a locative complement (*fangwei duanyu*) (cf. Lv, 1999; Li & Thompson, 1981; Huang & Liao, 1991; Qi, 1996; Chu, 2004). In other words, some kind of agreement relationship exists between the preposition *zai* and its complements. In this chapter, I discuss a classification of Mandarin locative NPs based on this observation (Chu, 2004) then introduce my own classification of Mandarin locative structures more generally. This includes PPs, VPs and sentences as well as NPs and these are assigned to six types related to their syntactic complexity, as discussed in detail in Chapter 7 Analysis. I then present predictions for the emergence orders of these structures, according to PT and EFG. Since the classification is based on syntactic complexity and emergence order is theorized to reflect syntactic complexity, structures of the same type in my classification are expected to emerge at much the same time. Chu’s classification of NPs
is discussed in section 3.1; my classification of locative structures is discussed in section 3.2; predictions of emergence order are discussed in section 3.3.

3.1 Chu’s (2004) classification of Mandarin locative NPs

Earlier research on Mandarin locative structures in Chinese linguistics has largely been targeted at developing a proper classification, as well as a corresponding explanation, from a cognitive perspective (Qi, 1994, 1996, 1998; Fang 1999, 2000, 2002, 2004; Cui, 2002; Chu, 2004, 2008, 2010). While other researchers have focused on locative words, Chu (2004) studied larger locative structures, especially NPs and PPs.

Chu (2004) approached the task of classifying locative NPs by considering whether a locative word such as *limian* (inside), or bound form such as *li* (in) can be omitted from the NP in the Mandarin prepositional phrase (PP) \[zai \text{ locative noun phrase(Loc.NP)}\] (at Loc.NP). Chu identified two types of Loc.NP: the first, consisting of nouns he called place noun (PLN), such as *bangongshi* (office), that meet the omission requirement, and the second composed of a non-locative noun, (i.e. a noun which fails the omission requirement if used alone) such as *zhuozi* followed by a locative bound form, such as *shang* as in \[zai zhuozi shang\] (at table-on) ‘on the table’.

Based on these findings, Chu defined a locative concept as one expressing positional concreteness and assumed the prototype locatives to be places or directions. According to their closeness to the prototypes, Chu graded nouns into three different levels: (1) transformable nouns, referring to non-locative nouns, such as *yizi* (chair) which can complement *zai*, when a locative word is added; (2) restrictive nouns which do not need such an addition, such as *bangongshi* (office); (3) specifiable nouns, referring to compound words made up of a non-locative noun and a locative bound form, such as *xinli* (heart in) ‘in heart’.
In type 1, general nouns are not locative, but they can become locative by the addition of a locative bound form, such as \textit{shang} (on) in \textit{yizi shang} (chair-on) ‘on the chair’, forming a type 3 free locative or a locative.NP. In type 2, the PLN is locative itself such as \textit{bangongshi} (office) but a locative bound form can also be added to it as in \textit{bangongshi li} (office-in) ‘in the office’. In type 3, a noun is a locative.NP, because it already contains a locative bound form and only a different locative bound form can be added to it. For example, either \textit{xinli} (heart-in) ‘in heart’ or \textit{xinli shang} (heart-in-on) ‘in heart’ is grammatical, but \textit{*xinli li} (heart-in-in) ‘in heart’ is ungrammatical.

Chu concluded that in the prepositional structure \textit{[zai Loc.NP]} a locative bound form following a type 1 noun cannot be omitted because \textit{zai} (at) requires its complement to be locative and the general noun itself is non-locative. The implication is that the locative item provides the locative meaning required by the preposition.

Chu’s classification of Mandarin locative NPs and the identification of a selection relationship between a preposition and its complement provide a foundation for a classification of Mandarin locative structures more generally. In the current study, this selection restriction is formalized in an LFG framework by incorporating a locative feature in the lexical structure of \textit{zai}, and other prepositions, and matching features in one of the other elements of the complements that \textit{zai} selects. In other words, \textit{zai} (at) provides an obligatory context (See Chapter 4) for the provision of a locative feature. In addition, I argue that in some cases, a specific value must also be provided.

\textbf{3.2 Structural Classification of Mandarin locative structures}

In this section I propose a classification of locative structures, including PPs NPs DePs and VPs into six types, based on whether each structure can be the complement of the
preposition zai (at) or not. As discussed above, it has long been established that zai requires locative complement. I propose that in structures like (3) above, the place noun *Zhongguo* (China) provides feature value required by zai (at) that the common noun *chuan* (boat) cannot provide in (4); in (5) it is provided by the locative predicate N *shang* (on). I will call this feature ‘locative’.

Moreover, *shang* (on) is a member of a closed set of nominal predicates that select a NP complement and are morphologically attached to it (Li & Thompson, 1981). Thus, in (5) the noun *chuan* (boat) is actually the complement of *shang* (on). Nominal predicates are discussed in more detail in section 3.1.1 below.

However, examples (6) and (7) below show that an additional feature is also required by zai (at), which is specificity.

(6) a. *zai difang* (at place) ‘in place’
   b. *zai difang li* (at place in) ‘in a place’

(7) *zai zhe ge difang* (at this CLASS place) ‘in this place’

In (6), the noun *difang* (place) clearly has a locative meaning but (6 a) and (b) are both ungrammatical. However, the inclusion of the determiner *zhege* (this) in (7) makes the structure grammatical. The accepted function of a definite determiner is to restrict the scope of a referring expression, to a limited, identifiable or specific item or set, thus we can hypothesize that *zhege* (this) contributes the feature value [+specific] to the whole phrase. Thus, we can see that the lack of a locative feature and a specific feature are responsible for the ungrammaticalitity of examples (4) and (6), respectively. This means that in Mandarin, zai (at) provides an obligatory context for both locative and specific features. As discussed above, it is this kind of agreement relationship that underlies the calculation of processing demands.
at stage 3 in PT. In Chapter 4 it will be seen that obligatory contexts can be used as evidence of the acquisition of feature unification, and hence as a way to assess learner proficiency.

Using this diagnostic, we can begin to classify Mandarin locative structures as shown in Table 3.1 below. This classification will be discussed in more detail in section 3.2.1.
Table 3.1: Classification of locative structures

<table>
<thead>
<tr>
<th>Type 1: Locative nouns (Loc.Ns)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal locative predicates (Predicate nouns require an argument.)</td>
</tr>
<tr>
<td>i  Locative bound roots (LBR): e.g. <em>shang</em> (‘on’)</td>
</tr>
<tr>
<td>ii Double locative nouns (D.Loc): e.g <em>shangmian</em> (on-face ‘on/above’)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Non-predicate locative nouns (Non-predicate nouns do not require an argument.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i  PLN: Proper place nouns: e.g. <em>Zhongguo</em> (China)</td>
</tr>
<tr>
<td>ii  Common place nouns: e.g. <em>xuexiao</em> (school)</td>
</tr>
<tr>
<td>iii Free locatives: (F.Loc) e.g. <em>hubian</em> (lakeside)</td>
</tr>
<tr>
<td>Non-specific locative nouns, non-predicates: <em>difang</em> (place)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type 2: Locative noun phrases (Loc. NPs): Phrases headed by locative nouns as defined in type 1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicate NPs (Pred.NP): phrases headed by predicate nouns. e.g. <em>Tushuguan wai</em> (library out) ‘outside of library’</td>
</tr>
</tbody>
</table>

| Non-predicate NPs (Non-Pred.NP): phrases headed by non-predicate nouns. e.g. *da xuexiao* (big school). |

| Type 3: Prepositional phrases (PPs): Phrases headed by prepositions, which take a locative complement. e.g. *zai shu shangmian* (on the tree). |

| Type 4: Locative verb phrases (Loc. VPS): Phrases headed by verbs *qu* (go), *dao* (get to), *guai* (turn), etc. that take Locative NP as their complements. e.g. *qu xuexiao* (go to school). |

<table>
<thead>
<tr>
<th>Type 5: De phrases (DePs): phrases with a functional head <em>de</em>.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicate DeP (Pred.DeP): those DePs followed by predicate nouns, such as: <em>shu de shangmian</em> (top of the tree).</td>
</tr>
<tr>
<td>Non-predicate DeP (Non-Pred.DeP): those DePs followed by non-predicate nouns, such as: <em>piaoliang de xuexiao</em> (nice school).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type 6: Locative sentences (with locative NP subject)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>yuanzi li you hen duo shu.</em></td>
</tr>
<tr>
<td>Garden in have very many tree</td>
</tr>
<tr>
<td>There are many trees in the garden.</td>
</tr>
</tbody>
</table>
In the classification presented above, LBRs and D.Locs are identified as locative predicates and the NPs that contain them, labelled predicate Loc.NP correspond to Chu’s type 2 specified NPs; general nouns, PLNs and free locatives (F.Locs) correspond respectively to Chu’s (2004) transformable nouns, restrictive nouns and specifiable nouns. The last two, together with demonstrative pronouns and non-specific locative nouns make up the class called non-predicate locative nouns (Non-Pred.Loc.Ns), as explained in Section 3.2.2 below. The six types of locative structures are discussed in more detail individually next.

3.2.1 Locative nouns

Locative nouns (Loc.Ns) are nouns that can denote a locative meaning and have an innate locative feature. In the current study, Loc.Ns with a specific feature are labelled specific locative nouns (S.Loc.Ns), and those without a specific feature are labelled non-specific locative nouns (NS.Loc.Ns).

Specific locative nouns can complement zai (at) and include place nouns (PLNs), free locative nouns (F.Locs), double locative nouns (D.Locs) and demonstrative pronouns (Dem.Prons). F.Locs are compound words like chuanshang (boat-on) ‘on the boat’ in (5) above. As mentioned above, they are formed when a nominal predicate which is a locative bound root (LBR) selects a non-locative complement and attaches to it. Double locatives are compound words formed when a LBR modifies one of the two F.Locs mian (face) or bian (side).

These four subtypes can be divided into predicate locative nouns (Pred.Loc.N) and non-predicate locative nouns (Non-Pred.Loc.N). Pred.Loc.Ns, consisting of D.Locs and LBRs, require complements; Non-Pred.Loc.Ns, consisting of PLNs, F.Locs and Dem.Prons, do not require complements.
LBRs cannot stand alone and are always combined with Non-Pred.Loc.Ns or with two F.Locs. For example, the LBR shang (on) can either select a Non-Pred.Loc.N lou (building) to be its complement, as in loushang (upstairs), or modify mian (side) as in shangmian (on). When LBRs are combined with Non-Pred.Loc.Ns, the newly combined units become either lexicalized, such as loushang (upstairs), or a locative noun phrase (Loc.NP), such as fangzi shang (house on) ‘on top of a house’. When a LBR combines with mian (face) or bian (side), the combination will form a D.Loc, which is a nominal predicate. D.Locs function almost identically to LBRs, except that D.Locs are free words and can stand alone, while LBRs cannot. Being predicates, LBRs and D.Locs need to select arguments and relate them to each other, rather like prepositions do in English.

PT suggests that L2 learners cannot process unification of the locative and specific features central to these locative structures until stage 3. In addition, I suggest that even if L2 learners at stage 2 – where lexical features can be represented in lexical entries – are consciously aware of this syntactic requirement, they cannot tell from the meaning of a noun whether it has a locative feature in the target language or not. This is because nouns are arbitrarily assigned to the locative class, for example, shangdian (shop) has a locative feature but the semantically similar noun fangzi (house) does not.

Once a locative feature is represented in a lexical entry, it is ready to be unified with features of zai (at). However, this does not mean that all L2 productions will be grammatical, for example, they might say *zai fangzi (at-house) ‘at house’, zai lou qianmian (at-building-in) ‘in front of the building’, because they have mistakenly assigned the locative feature to the noun fangzi (house), but have correctly included the D.Loc qianmian (front) in a structure with a non-locative noun.
Dem.Prons refer to structures like *zhe* (this)/*na* (that)/*na* (which) added to *li/bian/mian/tou*, as shown in the two contrasting examples below:

(8) *zhe li/bian/mian/tou* (here)

While *bian* (side), *mian* (face) and *tou* (head) are all F.Loc roots (see above), *li* (in) is the only LBR to which a Dem.Pron can attach, as shown in (8) and (9)

(9) *zhe shang/xia/zuo/you* (this up/down/left/right)

The last type of S.Loc.N is the F.Locs, which are composed of a noun and a LBR. As discussed above, when a LBR selects a general noun as its complement, the compound noun that it creates denotes a certain part of, or a location related to, the thing denoted by the general noun. For example, *loushang* (upstairs) is part of the *lou* (building), while *louwai* (outside of the building) refers to a location outside the *lou* (building).

NS.Loc.Ns are all non-predicate nouns, such as *difang* (place) which cannot complement *zai* (at), unless combined by determiners that express specificity. For example, when the NS.Loc.N *difang* (place) is embedded in a phrasal structure *zhe ge difang* (this CLASS place) ‘this place’, the phrasal structure can be the complement of *zai*. For this reason, the noun is assumed to have a locative feature, as S.Loc.Ns do, while lacking the necessary specific feature value. The determiner *zhege* (this) contributes the specific value to the F-structure of the complete NP, so together the determiner and noun satisfy the requirements *zai* places on its complements.

Significant differences exist between predicate nouns and non-predicate nouns that are relevant to processing demands. For example, predicate nouns require arguments which have to be assigned grammatical functions in the F-structure of the predicate, while non-predicate nouns do not have this syntactic requirement. According to EFG (Charters, 2013),
grammatical functions also play a part in processing demands. Recall (section 2.4 and 2.5) that structures with grammatical functions will contribute to a later order of emergence compared to those without grammatical functions. Thus, according to EFG predicate nouns with argument requirements should emerge later than non-predicate nouns without argument requirements. This is an aspect of processing demands that is not discussed in PT, as discussed in Chapter 2. Predicate nouns and non-predicate nouns are produced by lexical procedures so, according to PT, they will emerge at the same time. Having reviewed the five types of locative nouns, I will now discuss locative phrasal structures.

3.2.2 Locative phrasal structures

Locative phrasal structures consist of locative noun phrases (Loc.NPs), preposition phrases (PPs), locative verb phrases (Loc.VPs) and locative de phrases (Loc.DePs).

A noun phrase (NP) is a phrase whose lexical head is a noun such as *da zhuozi* (big-table) ‘big table’. Similarly, a Loc.NP is an NP with a Loc.N head, e.g. *da fangjian* (big-room) ‘big room’. Loc.NPs can be divided into predicate locative NPs (Pred.NPs) and non-predicate locative NPs (Non-Pred.NPs) depending on their heads. In the case of Pred.NPs, such as *nazhang zhuozi shang* (that-CL-table-on) ‘on that table’, the determiner, classifier and noun form a complete phrase *na zhang zhuozi* (that-CL-table) ‘that table’, which is the complement of head *shang* (on). This is detailed in the structural analyses of Pred.NP in Figs.7.21 and 7.22. Note that the structural analyses are all provided in Chapter 7. In a Non-Pred.Loc.NP such as *da fangjian* (big-room) ‘big room’, the adjective *da* (big) is the adjunct of the head *fangjian* (room). The detailed structural analyses of Non-Pred.NP are shown in Figs.7.4, 7.5, 7.7 and 7.8. According to EFG, this difference will cause greater processing demands in Pred.NP than that in Non-Pred.NP. This was mentioned in section 2.5 and will be expanded on in Chapter 7.
**Prepositional phrase (PP)**

PPs are phrases headed by prepositions, which require a complement, e.g. *zai chuan shang* (at-boat-on) ‘on boat’. In the current study, PPs include *zai* (at), which requires its complement to be locative and specific, as discussed above, and directional prepositions such as *cong* (from), *wang* (towards), which take locative phrases as their complements, like *zai* does, e.g. structures such as *cong jie* (from street) are ungrammatical while *cong xuexiao* (from school) ‘from school’) or *wang hubian* (towards lakeside) (towards lakeside), are acceptable. In fact, Loc.Ns that can complement *zai* can also complement directional prepositions.

As in Pred.NPs, both grammatical functions and feature unification are found in PPs, e.g. *zai xuexiao* (at school) ‘at school’. The preposition *zai* with a predicate value ‘at’ requires an object and it must have a locative and a specific feature, as shown in its lexical entry in Fig. 7.14. According to the completeness condition, as discussed in Chapter 2, this object must be present in the F-structure in which *zai* (at) is the predicate (‘the argument requirement’); this F-structure is presented in Fig. 7.16. It is the constituent *xuexiao* (school) which receives the object function in the C-structure (Fig. 7.15). Thus, the features of the constituent *xuexiao* (school) must unify with the object features required by *zai* (at), i.e. feature unification must take place.

**Locative verb phrases (Loc.VPs)**

Loc.VPs are phrases headed by verbs which require locative complements. According to their complements, locative verbs can be divided into: deictic locative verbs and non-deictic locative verbs, as the following examples show:

(10) *qu xuexiao* (go-school) ‘go to school’
(11) *laï wo jia (come-my-house) ‘come to my house’

(12) *guai xuëxiao (turn-school) ‘turn to school’

(13) *guai wo jia (turn-my-house) ‘turn to my house’

(14) cong zuobian guai (from-left) ‘turn from left’

(15) guai qu/dao wang/wo jia (turn-go/to/towards-my-house) ‘turn to my house’

All of the above examples involve a grammatical relationship between the verb and its complement, but we can see that locative verbs, such as qu (go) in (10) are different from directional guai (turn) in (12). qu (go) and laï (come) are deictic, relating to the location of the speaker; guai (turn) is non-deictic and needs a reference point and direction to be specified. In (10) and (11) the complements are goals; in (12)–(15) the complement can either be a source or a goal, but (12) and (13) are ill-formed because they do not distinguish source from goal; the preposition is needed to do that, as shown in (14). A preposition is not needed for laï (come) and qu (go) because they already encode direction to and direction from, respectively. In (14) and (15), guai (turn) is a two-place predicate that needs a complement, but it cannot be direct (i.e. an NP). It either needs to be a PP, as in (14), or another l Loc.VP, as in (15). This study therefore separates the deictic locative verbs that select Loc.NPs, but not directional ones, from non-deictic verbs that select a PP or another Loc.VP, not a Loc.NP. As in the case of PPs, both grammatical functions and feature unification are found in Loc.VPs.

**Locative de phrases (Loc.DePs)**

To modify an NP, it is generally necessary to use a functional head de, which takes the modified NP as its complement, and the modifier as its specifier. This is called a de phrase (DeP). DePs with a locative complement (Loc.DePs), e.g. yi ge piaoliang de fangjian (one-
CL-beautiful-de-room) ‘a beautiful room’ are Loc.DePs. Loc.DePs can follow zai (at), but the NP that follows de need not be specific, because the specifier in the DeP restricts the interpretation of the complement NP.

Loc.DePs that take predicate NPs as complements are labelled predicate DePs (Pred.DeP), and those that take non-predicate locative complements are labelled non-predicate DePs (Non-Pred.DePs). In Pred.DeP, such as zhuozi de zuobian (table-de-left) ‘left side of the table’, the predicate head noun zuobian (left) requires a complement (Fig. 7.29), but the local complement position immediately before the noun is empty, so the object function usually associated with the missing complement must be linked to a discourse function associated with the specifier position preceding de. This is shown in the C-structure (Fig. 7.30) and F-structure (Fig. 7.31) of Pred.DeP.

In Non-Pred.DePs, such as yi ge piaoliang de fangjian (one-CL-beautiful-de-room) ‘a beautiful room’, the noun does not require a complement, but the specifier of de must still be linked to a grammatical function to satisfy the coherence condition, as discussed in Chapter 2, so it is linked to an adjunct function in the F-structure (Fig. 7.24).

3.2.3 Sentential structures

In modern Mandarin grammar, sentences are mainly composed of subjects and predicates, and the basic word order is SVO (Huang & Liao, 1991; Chen, 2000; Zhu, 2004.).

(16) Wo xihuan ni.

I like you.

I like you.

For the purposes of this study, I broadly categorize sentences into simple sentences (S-simple), serial verb constructions (SVC) and relative clauses (RC).
S-simple refers to a sentence of the form \[(NP) \ VP/\AdjP/\PP \ (SFP^2)\], as in (16) above.

Subjects are usually Non-Pred.NPs, while predicates are either mainly verb phrases, as in (16), or AdjPs or PPs, as in (17):

\[\text{(17) } Ta \ zai \ tushuguan.\]

\hspace{1cm}3sg at library

\hspace{1cm}He/She is at the library.

\[\text{(17) is a type of locative sentence whose predicate is locative. There is also a type of locative sentence whose subject is a Pred.Loc.NP and whose predicate is usually you (exist):}\]

\[\text{(18) } Zhuozi \ shang \ you \ yi \ ge \ pingguo.\]

\hspace{1cm}table \ on \ have \ one \ CL \ apple

\hspace{1cm}There is an apple on the table.

When \textit{you} (have) has a locative subject, it is interpreted as existential and will be translated as ‘there is’, as in (18). When \textit{you} has (have) a non-locative subject it is interpreted as possessive:

\[\text{(19) } wo \ you \ yi \ ge \ fangzi\]

\hspace{1cm}I \ have \ one \ CL \ house

\hspace{1cm}I have a house.

Mandarin is a pro-drop language (Huang & Li, 1999; Huang, 1998), meaning the subject may be excluded without loss of coherence when the referent is known from the context. LFG (Dalrymple, 2001) explains this by proposing that every predicate can provide an optional PRED ‘Pro’ value for its subject. The predicate creates its subject entry ‘SUBJ [Pred: ‘pro’]’ in its F-structure to satisfy the coherence condition. Since there is no subject-verb agreement in Mandarin, as (18 and (19) show above, the predicate (verb) does not need to change with

\[^2\text{SFP stands for “sentence final particle”; these generally appear in questions or suggestions, (particles like a/ya and ne are often found in ‘basic sentences’).}\]
different subject forms. That is the emergence of S-simple is not different from the emergence of its predicate in Mandarin; accordingly, the emergence of S-simple will be treated the same as that of its predicates, such as VP or PP.

Serial verb constructions (SVCs) refer to sentences with two verb phrases:

(20) *Laoshi qi che qu xuexiao.*

   teacher ride bike go school
   The teacher cycles to school.

The VPs in SVCs have a more strict distribution relative to the VP in S-simple. For example, in (20), the VP *qi che* (ride-bike) must be placed before the other VP *qu xuexiao* (go-school) (go to school), while the VP in (16) can be placed either before or after the subject. This is because in SVC the two VPs occupy different grammatical functions as shown in its C-structure (Fig. 7.27) and F-structure (Fig. 7.28).

Relative clause (RC) refers to a structure in which a clause modifies a noun. In Mandarin, all RCs include the functional head *de* in between the clause and the modified noun.

(21) *wo xiang de difang*

   I think *de* place
   The place I am thinking of

The RC in (21) is incomplete because there is no object to serve as the predicate for *xiang* (think). To satisfy the completeness condition, the object function must be linked to the head noun, as shown in its F-structure (Fig. 7.31). RC is a standard indicator for the last stage of acquisition (Pienemann, 1998), so they can serve as a benchmark against which locative structures can be compared.
PT predicts that all Simple-Ss produced by the same sentential procedure should emerge at much the same time (Pienemann, 1998). However, according to EFG, grammatical functions also need to be taken into account in calculating processing demands. In the locative subject sentence, there are two predicates: the locative predicate within the subject and the predicate you (existential). Their arguments must be linked in the F-structure. The object of you (have) (existential) links to the thing located by the locative predicate. Thus, according to EFG, locative subject sentence should emerge later than other non-locative subject sentences. This is proved by the fact that in the current study, locative subject sentence was produced by none of the participants. This lack of data in locative subject sentence indicates participants so far have not acquired locative subject sentence.

Within SLA, to produce a structure as a PP, a learner must acquire the locative feature unification between zai (at) and its complement. This unification process as discussed in Chapter 2 might affect the learning process of Mandarin learners. For example, in the two PPs: zai fangjian (at-room) ‘in the room’ and zai zhuozi shang (at-table-on) ‘on the table’, fangjian (room) and zhuozi (table) belong to Chu’s (2004) restrictive and transformable noun types, respectively. Learners tend to produce inter-language structures like *zai zhuozi (at-table) ‘on the table’, as shown in both Charters (2005) and the current study. I propose three possible explanations for the lack of LBRs: (1) learners might not have yet acquired the locative feature unification in the PP: zai (at) locative NPs; in PT, feature unification belongs to stage 3-phrasal procedure; (2) learners do not realise that there are two types of nouns, only one of which can follow zai (at). This shows a lack of syntactic knowledge – acquisition has not occurred; (3) learners have not yet fully acquired those nouns, and do not know which have locative features and which do not; in PT this corresponds to stage 2 – lexical knowledge.
The above classification of locative structures ranges from the most syntactically basic structure, a simple noun to the most syntactically complex, a relative clause. These syntactic differences, as will be discussed in detail in Chapter 7, provide a basis for emergence-order predictions for these six types of locative structures, as discussed below.

### 3.3 Predictions for the emergence order of locative structures

Each theory has its own set of predictions regarding the emergence order of locative structures. According to PT, structures within the same stage produced by the same procedure should emerge at the same time (Table 3.2).

Table 3.2: PT predictions

<table>
<thead>
<tr>
<th>Structure</th>
<th>Emergence order</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1</td>
</tr>
<tr>
<td>Non-Pred.NP</td>
<td>2</td>
</tr>
<tr>
<td>VP</td>
<td></td>
</tr>
<tr>
<td>Pred.NP</td>
<td></td>
</tr>
<tr>
<td>PP</td>
<td></td>
</tr>
<tr>
<td>Loc.VP</td>
<td></td>
</tr>
<tr>
<td>Non-Pred.DeP</td>
<td></td>
</tr>
<tr>
<td>Pred.DeP</td>
<td></td>
</tr>
<tr>
<td>SVC</td>
<td>3</td>
</tr>
<tr>
<td>RC</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.2 shows that each structure is assigned to a corresponding stage, as shown in the second row, and the predicted emergence order is in accordance with their stages. That is a higher stage a structure is a later order it has, as discussed in Chapter 2. Thus, the structures are predicted to emerge in the way as shown in the last row: Ns without any syntactic process
should emerge before phrasal structures; the six phrasal structures: Non-Pred.NPs, VPs, Pred.NPs, PPs, Loc.VPs, Non-Pred.DePs and Pred. DePs emerge at much the same time, together earlier than the sentential structure SVC, which in turn emerges earlier than a relative clause (RC).

According to EFG (Charters, 2013), which takes grammatical functions into account, I also made a prediction for the above locative structures, as Table 3.3 shows:

Table 3.3: EFG Predictions

<table>
<thead>
<tr>
<th>Structure</th>
<th>Emergence order</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>1</td>
</tr>
<tr>
<td>Non-Pred. NP</td>
<td>2</td>
</tr>
<tr>
<td>VP</td>
<td>3</td>
</tr>
<tr>
<td>Pred.NP</td>
<td>4</td>
</tr>
<tr>
<td>PP</td>
<td>5</td>
</tr>
<tr>
<td>Loc.VP</td>
<td>6</td>
</tr>
<tr>
<td>Non-Pred.DeP</td>
<td></td>
</tr>
<tr>
<td>Pred.DeP</td>
<td></td>
</tr>
<tr>
<td>SVC</td>
<td></td>
</tr>
<tr>
<td>RC</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.3 shows a set emergence order: Ns without any syntactic process emerge before phrasal structures. Among phrasal structures, Non-Pred.NPs emerge before Pred.NPs and VPs because the Non-Pred. structures do not involve complex GF assignment and the others do. PPs and Loc.VPs emerge later than Pred.NPs and VPs because the former group involves additional locative feature unification relative to the latter group. DePs (Pred.DePs/Non-Pred.DePs), SVC and RCs emerge after PPs, VPs and NPs because the former group with a functional head involve a linkage between GF and discourse function (DF), which defines the informational status of a constituent (Kees & Lachlan, 2008), in F-structures, as DePs and
RCs do, or with a linkage between an empty GF from the local F-structure to the GF in the main F-structure as SVCs do, but others do not. Following the emergence results in Chapter 6, and the structural analyses in Chapter 7 (7.1), the PT and EFG predictions will be compared in section 7.2 to see which theory is more precise at predicting and explaining the emergence of Mandarin locative structures. The next chapter surveys existing research on Mandarin locative structures.
Chapter 4: Acquisition of locative structures

This chapter identifies and discusses previous research on the foreign language acquisition of Mandarin locative structures from the same theoretical perspective that informs the current study. After a brief introduction of inter-language studies in section 4.1, section 4.2 discusses three major studies on Mandarin FLA within the framework of PT: Zhang (2001), Gao (2005) and Charters (2005).

4.1 Analysing learner language

SLA research focuses on the acquisition of any subsequent language beyond a learner’s first language and is concerned with the development of the learner’s language, dubbed ‘inter-language’ by Selinker (1972). While earlier inquiry focused almost entirely on the grammaticality of the target language, by the 1970s inter-language studies had become an important area focusing on learner’s language.

Inter-language studies, which developed from error analysis (see below), have now been expanded by way of several methods of analysis: obligatory occasion analysis, frequency analysis, functional analysis, interactional analysis, conversation analysis, socio-cultural analysis, metaphor and computer-based analyses (Ellis & Barkhuizen, 2009). The current study is informed by a combination of obligatory occasion analysis and frequency analysis. Therefore a succinct account of these two techniques will be provided after a brief summary of their forerunner – error analysis.

Since its inception in the 1960s, error analysis has been utilised to address the disadvantages of contrastive analysis, which placed too much emphasis on the grammar of the target
language. In contrast to contrastive analysis, error analysis outlines the importance of learner errors and views them as indicators of the acquisition of the target language. The primary research focus in error analysis shifts from the grammaticality of the learner language to evidence of systematicity in learner errors. However, error analysis provides only a rudimentary platform for learner language research, and retains unsolved issues such as the difficulty in distinguishing an error from a mistake and the difference between overt errors and covert errors (Ellis, 1994, pp. 51–54). According to Corder (1967), an error is representative of competence and so is different from a mistake, which is related to performance, and separating overt errors from superficially well-formed structures is important.

The unsolved issues in error analysis provided a basis for the development of obligatory occasion analysis, which took shape in the 1970s. Obligatory occasion analysis was developed by Brown (1973) to investigate the acquisition order of fourteen discrete English morphemes in children’s first language acquisition. Brown defines an obligatory occasion as the supply of an obligatory context for certain morphemes. For example, the context ‘two apple(s)’ will be considered an obligatory occasion for the plural marker ‘s’. Brown (1973) proposed a level of accuracy in obligatory occasion analysis of 90%: a morpheme would not be considered acquired unless it had a 90% level of accuracy in a set of obligatory occasions. In FLA, the threshold is generally lower, sometimes as low as 60% (Dulay & Burt, 1973, p. 45). That is a morpheme would be deemed acquired when it has a 60% or greater level of accuracy in a set of obligatory occasions.

Morpheme studies in SLA, referencing obligatory occasion analysis as a research methodology from first language acquisition, aim to find the natural acquisition order for discrete morphemes (Dulay & Burt, 1973; Krashen, 1974; Krashen, 1977; Larsen-Freeman, 1976). The natural acquisition order research in SLA pointed towards the notion of a
developmental hierarchy in English SLA (Krashen, 1974). Although, research on natural acquisition order itself became one of the most popular research topics in SLA, like error analysis, obligatory occasion analysis eventually fell out of favour. It was criticised by researchers who identified several unsatisfactory aspects, including: the insufficient supply of obligatory occasions (Krashen, 1977), the limitations of the small size of samples (Pica, 1984), and the questionable equivalence between a higher rate of accuracy and the order of acquisition (Ellis, 2009).

Another type of inter-language analysis, frequency analysis, was proposed in the 1980s to address some of the disadvantages of obligatory occasion analysis. Frequency analysis aims to manifest one’s inter-language development by calculating the changes in the usages of inter-language frequency over time. This method has attracted much attention in SLA studies (Dulay, Burt & Krashen, 1982). It contributed to the idea of a sequence of structure acquisition, and is considered largely different from morpheme studies under obligatory occasion analysis (Ellis & Barkhuizen, 2008). Like Selinker (1972), frequency analysis views inter-language as an independent developmental system, rather than one always referenced to a target language, the latter being the view of obligatory occasion analysis. A number of longitudinal studies conducted under frequency analysis have found that there is a regular change in one’s inter-language acquisition during the learning process (Schumann, 1978; Ellis, 1984a; Anderson, 1984; Johnston, Pienemann & Brindley, 1988; Klein & Perdue, 1992; Spada & Lightbown, 1993).

Frequency analysis tracks the developmental change of a certain structure from inter-language to target language. It focuses on the sequence of acquisition within a structure. In frequency analysis, emergence criteria (Pienemann, 1985) which is the criteria employed in the current study to be discussed in Chapter 5 (5.4) is used to measure emergence, rather than acquisition. Emergence represents the point at which there is evidence that a learner can
process a specific structure. In spite of differences in acquisition standards, the accuracy criteria in obligatory occasion analysis and the emergence criteria in frequency analysis have some prominent similarities. For example, they both aim to show acquisition order in a second language. Obligatory occasion analysis is concerned with the natural acquisition order of set discrete morphemes, while frequency analysis is concerned with the sequence of acquisition of a certain structure. Therefore, obligatory occasion and frequency analysis should be regarded as complementary techniques (Ellis & Barkhuizen, 2009).

As the current study attempts to track the emergence order of Mandarin locative structures, it is informed by the results of natural acquisition order of morpheme studies using obligatory analysis, and the emergence criteria from frequency analysis. Nonetheless, the current study is different from early morpheme studies (Dulay & Burt, 1974; Larsen-Freeman, 1975), which simply label morphemes, make no predictions about their processing, and do not provide reasons for why they emerge in the order they do. PT and EFG, as discussed in Chapter 2, use the six-stage and the three-phase approach, respectively, in classifying morphemes and structures and also apply syntactic analysis of inter-language structures to determine the processing level a learner is capable of achieving at a given time. Next I will introduce earlier research in Mandarin locative structures in FLA which informs the methodology of the current study to be discussed in Chapter 5.

### 4.2 Mandarin locative structures in FLA

Earlier research on FLA of Mandarin locative structures has focused on two main areas. One is the well-documented difficulty of acquiring Mandarin locative structures in SLA classroom instruction (Chen, 1995; Gou, 2004). The other is the acquisition of Mandarin locative structures as a foreign language (Zhang, 2001; Gao, 2005; Charters, 2005).
Chen (1995) and Gou (2004) began to broaden research on locative structures from L1 (Li, 1995) Mandarin to L2 Mandarin, including one type of PP: the zai (at) structure (Chen, 1995), and LBRs (Gou, 2004). Chen (1995) analysed inter-language locative structures collected from the writing of Mandarin learners through error analysis, and ascribed learner errors to first language transfer and the ambiguity of certain items in the target language. Chen reported the most common learner error was the usage of non-place nouns after the preposition zai (at) when expressing a position or a direction, such as:

(22) * Zai feiji
      At airplane
      On the airplane (Chen, 1995)

Example (22) can become grammatical by adding a predicate locative, such as shangmian (on) or shang (on) to the general noun feiji (plane), creating a Pred.Loc.NP such as feijishang (plane-on) ‘on the plane’, which can complement the preposition zai (at). This locative requirement of zai (at) is the same as the notion explored in Chu (2004), as discussed above. Chu proposed that general nouns need locative predicates to complement zai (at). These two together inform a proposal of the current study: the preposition zai (at) provides an obligatory context for a locative feature, as discussed in Chapter 3.

In addition, Gou (2004) noticed the difficulty in teaching two particular LBRs, shang (on) and xia (under), to L2 Mandarin learners. Gou proposed an explanation from a cognitive-linguistic perspective, which can be described thus: firstly imagine shang (on) as placing some object atop any given reference point, then rotate the object 90 degrees, so that it is now at the right side of the reference point, creating a new usage for shang (on), meaning ‘right side’, which can account for the usage in qiang shang (wall-on) ‘on the wall’. Rotating the object another 90 degrees yields yet another usage of shang (on), physically meaning the position ‘under’ as in the context, tianhuaban shang (ceiling-on) ‘on the ceiling’. Gou
suggests using the physical meaning of the LBR *shang* (on), which he viewed as the prototype of the locative bound roots, to account for the usage of other LBRs, such as *xia* (under). Gou believes that the above explanation can connect the usages of the two LBRs *shang* (on) and *xia* (under), which can reduce the difficulty that L2 learners experience.

Chen’s (1995) and Gou’s (2004) studies were relatively limited in scope. For example, there are only two LBRs *shang* (on) and *xia* (under) in Gou (2004), and he did not collect any inter-language data; there is only one type of preposition phrase: *zai* (at) structure in Chen (1995). Their research has been expanded within the framework of PT by others, including Zhang (2001), Gao (2005) and Charters (2005). These three studies are seminal in illustrating the predictive and explanatory power of PT in Mandarin.

**Zhang (2001)**

Zhang (2001) investigated the developmental sequence of five Mandarin morphemes: the progressive marker *-zhengzai*, the experiential marker *-guo*, the possessive marker *-de*, the classifier and the relative clause marker *-de*. Zhang discussed how the developmental sequence is influenced by formal instruction within the PT framework.

Based on an analysis of structures in the six stages of PT, Zhang allocated the five Chinese grammatical markers to three different processing levels in the six-stage hierarchy in PT, as discussed in Chapter 2: (1) Lexical morphemes: the aspect and possessive markers that do not involve feature unification; (2) Phrasal morphemes: classifier and noun with classifier and noun feature unification; (3) the Inter-phrasal marker *de*, a relative clause particle with grammatical information exchange between phrases (Zhang, 2001, p. 164). Zhang found that the lexical marker *de*, such as the possessive marker in *wo de* (my…), emerges earlier than the phrasal marker *de*, as in *haoting de ge* (nice.listen de song) ‘beautiful song’, which in turn emerges earlier than the relative clause marker *de*, as in *chang ge de ren* (sing song de person)
‘the person who sings’. Moreover, Zhang pointed out that in modifying NPs, noun phrases without a locative meaning emerged earlier than those with a locative meaning, and accordingly separated words with a locative meaning from those without a locative meaning, labelling specific instances of the former simply as ‘country/city/institution’. Zhang’s classification of locative words is the PLN in Chu’s (2004) classification, and the non-Pred. Loc.Ns in the current study. Zhang (2001) was the first study to apply PT to Mandarin; her research design, some data elicitation tasks, and data analysis perspectives are similar to those used by later researchers such as Gao (2005) and Charters (2005).

**Gao (2005)**

Gao (2005) studied SLA development in Mandarin noun phrases and topics also within a PT framework. Gao had similar findings to Zhang (2001): (1) Lexical morphemes: de (ADJ), de (ATT), de (GEN) which are the same as Zhang’s type (1), -and canonical order SVO, reflecting the category level of development (PT’s stage 2), emerged earlier than those on a phrasal level, such as classifiers, which in turn emerged earlier than sentential structures and relative clauses (RC); (2) In phrasal structures, locative modifiers emerged later than non-locative modifiers. Moreover, noun phrases with a locative meaning (the same as Zhang’s classification) have a low frequency, as shown in Gao (2005, p. 130). Thus, both Gao (2005) and Zhang (2001) suggested that the emergence order of locative modifiers is different from that of non-locative modifiers.

Although Zhang (2001) and Gao (2005) observed that nouns with locative meaning in Mandarin are special cases in the acquisition of nouns, they did not provide an explanation for what makes these nouns with locative meaning special. This omission was rectified by Charters (2005).
Charters (2005)

Charters (2005) studied the acquisition of Mandarin NPs through eighteen Mandarin nominal structures, which she observed from L2 learners’ spontaneous speech production in the first two years in a foreign language context. The eighteen nominal structures were compound N, name, noun, num-class N, pro, little pro, affine structure, dePPoss, (Adv) Adj N, Conjunct (min), (hen) duo N, dePMod (indef), Incorporated Locatives, Pseudo-RC, Dem Class N, Num-Class deP, ordinals and Locative De (Charters, 2005, p. 108). She also applied PT (Pienemann, 1980, 1984, 1998) and minimalism (Chomsky, 1995, 2000), to see if these two theories could account for the emergence order of the eighteen noun phrases.

The findings in Charters (2005) indicate a natural emergence order among the eighteen Mandarin nominal structures, as shown in Table 4.1.
Table 4.1 Emergence order of eighteen Mandarin nominal structures (Charters, 2005, p. 190)

<table>
<thead>
<tr>
<th>Mean emergence times</th>
<th>Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 weeks</td>
<td>Name; Noun; Pron; little pro; DP</td>
</tr>
<tr>
<td></td>
<td>Num-Class N; Ordinals</td>
</tr>
<tr>
<td>10.5 weeks</td>
<td>Affine structure; dePoss</td>
</tr>
<tr>
<td></td>
<td>Adjp N; Conjunct</td>
</tr>
<tr>
<td>16 weeks</td>
<td>Incorp. Locatives</td>
</tr>
<tr>
<td></td>
<td>deP Mod; Dem Class N</td>
</tr>
<tr>
<td>22 weeks</td>
<td>Recursive Poss</td>
</tr>
<tr>
<td></td>
<td>Num-Class deP N</td>
</tr>
<tr>
<td></td>
<td>Pseudo-RC</td>
</tr>
<tr>
<td></td>
<td>Reverse Locative</td>
</tr>
<tr>
<td>25 weeks</td>
<td>Locative DE</td>
</tr>
</tbody>
</table>

From the above table, we can see that locative structures emerged later than comparable non-locative nominal structures: incorporated locatives (restrictive locative nouns in Chu (2004)) and the free locatives (F.Locs) did not emerge until the 16th week but other nouns (general nouns) emerged at the 7th week and locative *de* structures, Pred Loc.DeP in the current study were the last to emerge in week 25, while modifier De (Non.Pred.DeP) emerged at the 16th week, as shown in Table 4.1.

Charters (2005) identified locative structures as a special subtype of nominal structures, with their own set order of emergence, a conclusion reached by two means: (1) there is a different process requirement for locative structures, compared to non-locative structures. For instance, Charters showed that locative structures involve predicate argument relations, which always
emerge later than structures that are superficially similar but have only optional modification, not arguments (Charters, 2005, p. 190); (2) locative lexical items, such as incorporated locatives, emerge later than non-locatives, but earlier than locative *de* phrases. Since incorporated locatives include a predicate–complement relationship, this suggested that the involvement of grammatical function assignment might be part of the reason for the different order of emergence among locative structures.

Going beyond the work of Gao (2005) and Zhang (2001), Charters (2005) analysed more nominal structures, especially with respect to the emergence order of locative structures when considered collectively. These three studies have shown the difference between locative structures’ and non-locative structures’ emergence, and an emergence order among locative structures. However, none of the above three studies give a comprehensive explanation of the emergence order of all locative structures because none focuses specifically on locative structures when collecting data. The current study addresses this issue in that it has been developed to determine the emergence order of Mandarin locative structures.
Chapter 5: Methodology

The purpose of this study is to investigate the order of emergence of Mandarin locative structures within the framework of PT (Pienemann, 1998). PT makes predictions about the order of structure emergence by analysing unplanned speech collected in a controlled environment, usually from learners in the same year of acquisition. However, the current study is slightly different in that it elicits data from learners both in the same year and different years. I first recorded learners in Year 1 and Year 2 in three-week intervals, respectively, for the longitudinal analysis; then I compared a Year 1 study to a Year 2 study, and the comparison provides a cross-sectional study. In what follows, I introduce the actual paradigms in 5.1, processes in 5.2, principles in 5.3 and data treatment employed in the current study in 5.4.

5.1 Research design

In order to investigate the natural acquisition order of locative structures in Mandarin and collect maximum data from the participants’ automatic speech, this study combined a longitudinal study with a cross-sectional study.

Cross-sectional research focuses on a certain period and always requires a relatively large sample size. It is generally acknowledged that the larger the sample size, the more reliable the research. Thus it benefits a researcher to have as many participants as possible. However, a cross-sectional study can only show features of a certain period or the static situation. It cannot directly show the transitional process of language acquisition required by the current study, which suggests a need for longitudinal research. For practical reasons, the longitudinal
method tends to involve observing a small sample size over a long term, so the transitional process can be directly tracked. For example, Brown (1973) tracked three participants’ use of fourteen English grammatical morphemes in L1 acquisition over a year, while Charters (2005) traced three participants’ process on the emergence order of nominal structures in Mandarin foreign language acquisition over two academic semesters. Longitudinal research admittedly does not involve a large sample size, but it is still the best choice if observation of a transitional process is required.

5.2 Data collection

As PT applies to the process of second language learners’ automatic speech production, the crucial part of data collection is the elicitation of participants’ unplanned spontaneous speech. Data collection tasks (see Appendix 1) need to be able to elicit targeted language structures and should not encourage imitation or repetition. Therefore the structured and semi-structured elicitation tasks below were employed in this study.

(1) Describing pictures. Prepared pictures are used to guide participants to engage verbally. The benefit of this task is that it can be effective in eliciting targeted structures and promises natural production by participants.

(2) Spotting differences. This task asks participants to contrast two dissimilar pictures with slight differences in location. This allows more locative structures to be produced compared to picture description.

(3) Solving puzzles. Solving puzzles allows participants to use Mandarin locative structures in a more real and natural context. For instance, two participants work together to find a place on a map, or one participant shows the other how to arrive at a certain hidden treasure.
(4) Talking on a set topic. Participants are asked to talk for an amount of time on a given topic, for example: Can you please introduce your favourite place? This task is good for eliciting optional Mandarin locative structures, which also allows participants to produce locative structures in a natural context.

All the spontaneous speech from the participants was firstly audio-taped in a language laboratory, then transcribed into a Word document by the recorder (the author of the current study), with each document labelled in a logical fashion (e.g. ‘Learner L1 - Year 1 - Date - first data elicitation activity’). The process for each data elicitation was as follows:

A vocabulary list was designed for all eight elicitation tasks as shown in Appendix 1, because we do not want a lack of lexical knowledge to prevent learners producing the structures of interest. Before each elicitation, the recorder handed out a printed vocabulary list for that specific interview and spent five to ten minutes teaching or otherwise reviewing Mandarin vocabulary that might be used during the recording. The recorder first pronounced these words for learners then asked the learners to read them three times after the recorder. After this short practice, the recorder also asked the learners to read the words one by one to make sure that there was no incorrect pronunciation before the learners started doing any tasks. While speaking with their partners, the learners were allowed to ask the recorder for Mandarin translations of English words but not syntactic patterns. Thus, participants were assisted solely with lexical concerns.

A total of eight data elicitation sessions were recorded across one academic year in the current study. In the first five elicitation sessions, the first task contained a set of activities that were always semi-structured for the purposes of eliciting more target structures. As previously detailed, these tasks included describing pictures, spotting differences, and solving puzzles. The second task was topic-guided conversation, provided in two separate versions.
The first was based on the ‘describe a picture’ activity (e.g. How would you improve the house in the picture?) The second, unrelated to the first, focused on the production of locative structures (e.g. Please tell your partner how to get to your house from the university).

In the last three elicitation sessions, there was only one task (picture description), since by this time, participants were better equipped in terms of linguistic knowledge, and were expected to produce larger amounts of unplanned speech. In addition, the lack of visual cues (like pictures) allows for a relatively higher possibility of natural language output.

**Elicitation timetable**

The data was collected regularly during the two academic semesters of 2011, as Table 5.1 shows.
Table 5.1 Elicitation timetable

<table>
<thead>
<tr>
<th>First semester of 2011</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1 Students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–4</td>
<td>Interview Week 3</td>
<td>Interview Week 6</td>
<td>Interview Week 9</td>
<td>Interview Week 13</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>L&amp;C /1 2 hours</td>
<td>L&amp;C /2 2 hours</td>
<td>L&amp;C /3 2 hours</td>
<td>L&amp;C /4 2 hours</td>
<td>16 hours</td>
</tr>
<tr>
<td></td>
<td>K&amp;B/1 2 hours</td>
<td>K&amp;B/2 2 hours</td>
<td>K&amp;B/3 2 hours</td>
<td>K&amp;B/4 2 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Year 2 Students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5–8</td>
<td>Interview Week 3</td>
<td>Interview Week 6</td>
<td>Interview Week 9</td>
<td>Interview Week 13</td>
<td>16 hours</td>
</tr>
<tr>
<td></td>
<td>T&amp;LS/1 2 hours</td>
<td>T&amp;LS/2 2 hours</td>
<td>T&amp;LS/3 2 hours</td>
<td>T&amp;LS/4 2 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M&amp;LA/1 2 hours</td>
<td>M&amp;LA/2 2 hours</td>
<td>M&amp;LA/3 2 hours</td>
<td>M&amp;LA/4 2 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Year 3 Students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9–10</td>
<td>Interview Week 3</td>
<td>Interview Week 6</td>
<td>Interview Week 9</td>
<td>Interview Week 13</td>
<td>8 hours</td>
</tr>
<tr>
<td></td>
<td>H /1 2 hours</td>
<td>H /2 2 hours</td>
<td>H /3 2 hours</td>
<td>H /4 2 hours</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Second semester of 2011</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year 1 Students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–4</td>
<td>Interview Week 3</td>
<td>Interview Week 6</td>
<td>Interview Week 9</td>
<td>Interview Week 13</td>
<td>16 hours</td>
</tr>
<tr>
<td></td>
<td>L&amp;C /1 2 hours</td>
<td>L&amp;C /2 2 hours</td>
<td>L&amp;C /3 2 hours</td>
<td>L&amp;C /4 2 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>K&amp;B/1 2 hours</td>
<td>K&amp;B/2 2 hours</td>
<td>K&amp;B/3 2 hours</td>
<td>K&amp;B/4 2 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Year 2 Students</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5–8</td>
<td>Interview Week 3</td>
<td>Interview Week 6</td>
<td>Interview Week 9</td>
<td>Interview Week 13</td>
<td>16 hours</td>
</tr>
<tr>
<td></td>
<td>T&amp;LS/1 2 hours</td>
<td>T&amp;LS/2 2 hours</td>
<td>T&amp;LS/3 2 hours</td>
<td>T&amp;LS/4 2 hours</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M&amp;LA/1 2 hours</td>
<td>M&amp;LA/2 2 hours</td>
<td>M&amp;LA/3 2 hours</td>
<td>M&amp;LA/4 2 hours</td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 5.1, each data elicitation recording comprised two hours and involved students grouped in pairs. In 2011, there were four participants from Year 1, four from Year 2, and two from Year 3. Over the course of 16 interviews in 2011, I recorded a total of 32 hours of elicitation from Year 1 students, 32 from Year 2, and 8 from Year 3.
In addition to the recordings, a short questionnaire was distributed to gather information concerning the language background of participants, in order to assist the author in realising and controlling certain participant variables (e.g. the number of languages participants speak, or their depth of exposure to Mandarin beyond classroom instruction; see Appendix 4).

5.3 Definition and identification of a locative word

Li and Thompson (1981) define ‘word’ to mean ‘unit in [a] spoken language characterized by syntactic and semantic independence and integrity’ (p. 13), and this is the definition I adopted in analysing data in the current study. In Mandarin, it is not always obvious whether a structure is a word or not by its morphological form. For example, *xiongmao* (bear-cat), ‘panda/bear, cat’), can be a word or a phrase in different contexts (see below). To reduce this ambiguity, I employed three tests: integrity, semantic and syntactic independence, and a classifier criterion.

Firstly, integrity means the components in a word cannot be rearranged without there being a change in meaning. For example, when the two components of a word *piaoliang* (beautiful) are rearranged into *liangpiao*, it turns into a nonsense word. By contrast, words in a larger structure can be rearranged and the structure can still be grammatical. For instance, in an adjective phrase *piaoliang keai* (beautiful- cute-) (beautiful cute), the order of the two words *piaoliang* (beautiful) and *keai* (cute) can be reordered as *keai piaoliang* (cute-beautiful) (cute beautiful), without a change in grammaticality.

Secondly, tests of semantic and syntactic independence can be applied to Chinese word classification in the following ways according to Li and Thompson (1981) and Packard (2005):
The semantic integrity of a string can be tested by seeing whether its parts can be separated or not; if the parts can be separated without any change in meaning, it is not regarded as a word.

Take the structures *hubian* (lake-side) ‘lakeside’, *chuanshang* (boat-top / boat-on) ‘boat-top/on the boat’ and *che.li* (car.in) ‘in the car’, for example. The syllables that make up these structures cannot be separated as in (23), or reordered as in (24), without any change in meaning, or creating a nonsensical sequence. Therefore, by these two tests, each of these structures is a single word.

(23)  a. *hu de bian* (lake de side)
     b. *chuan de shang* (boat de on)
     c. *che de li* (car de in)

(24)  a. *bian hu* (side lake)
     b. *shang chuan* (go boat)
     c. *li che* (in car)

Thirdly, the classifier criterion is another possible way to identify a word. In Mandarin, quantified nouns require a classifier3, so if a sequence is one word, it should have one classifier; if there are two words in a phrase, each word could have its own classifier, as the

(25)  yuan.zi      li      you      yi zhi     xiongmao
      garden      in     have one CLASS    bear  cat
      In the garden is a panda.

(26)  yuanzi li you yi zhi xiong, yi zhi mao ...
      Garden in have one CLASS bear, one CLASS cat

---

3 In Mandarin, a classifier is a word that must occur with a number, demonstrative or quantifiers before a noun. (Li & Thompson, 1981. p. 104)
In the garden are a bear and a cat.

As shown in (25) and (26): the string xiongmao (bear-cat), ‘panda/bear, cat’ could have two separate meanings in different contexts: panda or bear and cat. Therefore, what matters is whether you can use two classifiers or only one with the sequence of nouns. One word takes one classifier; two words need two classifiers or vice versa. Using one classifier indicates that the sequence is one word; if a sequence cannot be interpreted as one word, it will be ungrammatical as shown below:

(27) *yuan.zi li you zhi niumao
garden in have CL cow cat

In the garden is a cowcat. (There is no compound word niumao ‘cow-cat’ in Chinese.)

5.4 Data treatment

Emergence criterion

For the purposes of the current study, if a structure has been exemplified in two or more tokens, it is considered to have emerged. This criterion is the convention of much research based on PT (Pienemann, 1993, Zhang, 2001, Gao, 2005, Charters, 2005). In the structure zaiP, for example, when structures such as *zai shang (at on) and zai zhuozi shang (at table on) appear, we can claim the emergence of a preposition phrase (PP), even though the first is not a target language structure. The two different complements of zai (at) provide two different tokens of a zaiP and so the criterion for emergence of the PP has been met. The structure *zai shang (at on) is not well-formed in Mandarin because in Mandarin shang is either a bound root meaning (on), which cannot stand alone, or a noun meaning (top) which has no locative feature, as discussed above. Nonetheless, the criterion requires two or more
different tokens, regardless of whether or not the structure is well formed in the target language. When just one token is provided, the structure will not be considered to have emerged.

The following three steps are provided to familiarise readers with the inter-language data treatment in the current study. Reviewing these steps, along with the information gleaned above, should make the results easier to interpret.

**Step 1: Transcription and initial code**

After being transcribed and formatted, all the data was then entered into Toolbox, a linguistic software package. The reasons for choosing Toolbox were: (1) it automatically generates a unique number for each segment of speech; (2) it allows the researcher to insert any field marker when necessary; (3) it provides a filter function for specific investigation (see below).

Below is an example of inter-language transcription, along with its coding from one of the Year 1 learners:

```
\id AK 2011-S11_1 001
\tx qiu qiu, qiu li xiangzi,
\mb qiu qiu qiu li xiangzi
\ps N N N LBT N
NP N
*PP [LBT]
*S [NP *PP]
ge ball ball ball in
\ft Ball is in box.
\sp C1
\idx T1.1 ball and box
```
As shown above, following the interview each segment of speech was assigned at least eight labels, separated by slashes, with the standard abbreviations used in Toolbox. Other than the ‘id’ line, which is generated by Toolbox automatically, I entered all the other labels and contents manually.

The label ‘id’ represents the reference number of a particular segment. This signifier allows the identification of various attributes of the segment, including place, time and the segment’s sequential position within the entire audio file. Functionally, ‘id’ allows each segment to have a unique number in the entire data pool for the study. For example, ‘id AK 2011-S11_1 001’ means this segment is the first line (001) of the first recording (_1) conducted during the first semester of Year 1 learners (S11) in Auckland (AK). The label ‘tx’ (i.e. ‘text’) represents a word transcribed from the audio recording, and follows signifier ‘mb’, which represents the ‘morpheme break’ of the speech in the text line. The label ‘ps’ stands for ‘part of speech’ in syntax, and is labelled in levels, where I have performed the classification into words or phrases under ‘part of speech’. Toolbox helped to check the consistency of this treatment. For example, ‘NP’ signifies a noun phrase, ‘*PP’ signifies an inter-language form for one type of prepositional phrase, and ‘*S’ signifies an inter-language form of a sentence.

Label ‘ge’ represents the English gloss, morpheme by morpheme, based on the ‘tx’ line. Following ‘ge’ is the label ‘ft’, representing free English translation. Label ‘sp’ represents a speaker, where for example, ‘sp C1’ represents speaker C during his first interview. Label ‘idx’ represents an elicitation task. An example of this is ‘idx T1.1 ball and box’, which refers to the first session of the first elicitation task (T1.1), which was ‘ball and box’, and the speech from this session has been elicited from this specific task.
**Step 2: Individual emergence table**

After implementing the above system of labelling, I uploaded the transcriptions of the audio files into Toolbox for the purpose of coding. I created an individual emergence table to ascertain emergence points for each learner based on the filtered searches. This filtered search is performed by the filter function in Toolbox, which can be established based on certain properties, such as labels and contents of labels. Emergence situations were organized into individual tables, as the following example shows:

<table>
<thead>
<tr>
<th>Structures</th>
<th>Freq.</th>
<th>Subtypes</th>
<th>Ref.No. (AK 20111S11_1)</th>
<th>Obligatory Context (If any)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>semantic N</td>
</tr>
<tr>
<td>NumP</td>
<td>1</td>
<td>Num+suff</td>
<td>47</td>
<td></td>
<td>Num+ge</td>
</tr>
<tr>
<td>*PP</td>
<td>5</td>
<td></td>
<td>1/4/7/13(2)</td>
<td></td>
<td>D.Loc or LBT as P</td>
</tr>
<tr>
<td>NP (4)</td>
<td>3</td>
<td>De.Poss N</td>
<td>59 (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Num+suff NP</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>11</td>
<td>SVO</td>
<td>41/49/47/27/25/54/39/49/71/76/68/77</td>
<td>68 and 76 are the same</td>
<td></td>
</tr>
</tbody>
</table>

The above table allows us to identify structures by their quantities, frequencies, tokens and references. The column labelled ‘structure’ represents all structures produced by learner C during his first recording, with the number inside parentheses indicating the total frequency. The column labelled ‘freq.’ represents the frequency of each corresponding structure. Note that when a structure has more than one subtype, its total frequency is in parentheses under.
the ‘structure’ column. However, when a structure has no subtype, its frequency is displayed under the ‘frequency’ column.

‘Ref’ (reference number) represents the unique ‘id’ of each line, for example, ‘Ref.NO. (AK 2011-S11_1)’ indicates the first session (_1) in the first semester of Year 1 learners (S11) of 2011, and the number ‘54/54/49’ was generated by Toolbox to refer to the text.

When an obligatory context was found, it was recorded in the column labelled ‘obligatory’. Likewise, when a context was necessary, comments were made in the ‘comment’ column. For example, if a structure has 12 tokens but contains ‘11’ in the ‘frequency’ column, I would write ‘68 and 76 are the same’ in the ‘comment’ column, as shown in the last row.

**Step 3: Emergence table – arriving at a single emergence order**

I created individual emergence tables for all the structures based on the emergence point of each structure for each learner. However, for the purposes of this study, I only compared the emergence order of certain structures which emerged for all learners, labelled ‘common structures’ (see section 6.1).

The individual emergence tables for each learner, covering all the interviews across all Year 1, Year 2 and Year 3 learners, can be found in Appendix 3. There are also two combined tables for Year 1 and 2 learners (see Chapter 6), but no combined table for Year 3 because only one learner was involved.

There are two different versions of emergence tables of common structures, one individual and the other combined. Individual emergence (section 6.2) tables allow us to track longitudinal acquisition development, while combined tables (Section 6.3) are for the
convenience of cross-sectional comparison. Note that the above three steps are implicational, which means earlier steps serve as a foundation for later steps.

This section has introduced the data treatment, emergence criterion, and the individual and combined emergence tables, which will facilitate comprehension of the results of the current study, which are presented in the next chapter.
Chapter 6: Results

6.1 Introduction

This chapter presents the results of the current study and identifies the order of emergence of Mandarin locative structures from both a longitudinal and a cross-sectional perspective. The results from the longitudinal perspective were obtained from data collected from eight elicitation sessions involving four Year 1 students, eight sessions for three Year 2 students, four sessions for one Year 2 student, and four sessions from one Year 3 student.

The results from the cross-sectional perspective were obtained by combining the data from students in each year in an implicational hierarchy. Before presenting the results, I will explain below some key terms and principles the reader will encounter in the text.

Common structures

Common structure refers to a relevant structure that emerges for all learners from the same year. Common structures were identified only for Years 1 and 2, as there was only one learner in Year 3. Relevant structures include locative structures and milestone structures. Milestone structures are one's whose emergence helps to separate the emergence of locative structures when that order is otherwise unclear.

There were eight common structures in Year 1, including two relevant milestone structures: NP (noun phrase), and NumP (Number classifier), and eleven common structures in Year 2, including another two milestone structures: SVC (serial verb construction) and RC (relative clause).
Target structures

A target structure is a grammatically correct structure in the target language. These give a partial indication of the proficiency of each learner. Ideally, a learner should produce a greater proportion of target structures in later interviews than in earlier interviews, indicating their higher proficiency in later interviews than in earlier ones.

Inter-language structures

Inter-language describes a dynamic linguistic system produced by learners of foreign language (Selinker, 1972), as discussed in Chapter 4. Inter-language structures exemplify language production produced by a language learner when he or she has not yet fully acquired target structure rules. This study shows that a decrease in the number of types of inter-language structures coincides with an increase in the number of types of target structures. This means that as a learner replaces inter-language structures with target structures, we can infer that the learner is moving towards more fully acquiring the target language grammar. Therefore, tracking when a structure appears and disappears can reveal aspects of the linguistic process. For instance, an inter-language structure *[zai non-locative NP] was produced in early interviews by all Year 1 learners. It was replaced gradually by its corresponding target structure [zai locative-specific NP] in later interviews. The appearance of *[zai non-locative NP] shows that learners at the very beginning of the year had not yet acquired the locative requirement of the complement of the preposition zai (at). The replacement of this inter-language structure with a target structure in later interviews would seem to show that learners have realised the locative requirement of zai (at), indicating progress from not having acquired a locative feature to having acquired the feature and being able to unify it, to create agreement.
Rank in order of emergence

Table 6.1 below refers to 'emergence rank'. This indicates a structure's place (first, second, third etc) within an order of emergence, and was employed for the purpose of applying statistical tests that compare correlations between sequences. This allows a comparison of the emergence order of individual learners to see if they are significantly different or not (see Charters, 2005).

As in Charters (2005) two types of rank are used in the current study: individual rank and mean rank. Individual rank marks the sequence in which structures emerge in each learner’s inter-language. Each structure has a rank for each learner. If the structure semantic sentence (Semantic S) meets the emergence criterion during the first interview for all Year 1 learners, we can say the rank of Semantic S for the Year 1 learners is 1. In fact the structure might have emerged prior to the first interview, but we cannot prove this; the best we can say is that it had emerged by the time of the first interview. The structure noun phrase (NP) was also ranked 1 for learner C because it also met the emergence criterion in the first session with that learner; however, NP was ranked 2 for the other three Year 1 learners because it did not reach the emergence criterion in their interviews till after the first session. Thus, the same structure may have the same or different ranks for different individual learners.

Mean rank is the mathematical average of a structure's individual ranks. For example, if the individual ranks of structure NumP for learners C, L, B and K are 2, 3, 3 and 3, respectively, then the mean rank for this structure is 2.75 \( (2+3+3+3)/4 \). Each common structure is effectively ranked nine times, since there were nine participants in total. Mean rank therefore represents a generalized emergence sequence of all common structures for all learners from the same academic semester.
6.2 Longitudinal perspective

The longitudinal perspective tracks the development of individual participants. For each learner a longitudinal table was constructed showing the structures they produced in each elicitation session: eight sessions for the four students from Year 1, eight for three students from Year 2; four for one student from Year 2; and four for the one student from Year 3. These tables are presented in Appendix 3; an example table shown below.

Table 6.1 Structure emergence for learner C

<table>
<thead>
<tr>
<th>Structures</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/*PP /NP/Numsuff</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>PP/ VP/Pred.DeP/ *S/ NumP</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Pred.NP/Non-pred.DeP</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Loc.VP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

Table 6.1 shows all the structures that emerged for learner C in eight sessions; those in bold in the first column are common structures. Columns C1–C8 show how structures emerged in each interview. For example, column C1 shows structures that emerged in the first interview of learner C. The last column shows the ranks of all emerged structures in learner C’s inter-language. Ranks 1–4 represent the order of emergence of all the emerged structures for learner C, shown in the first column. These individual longitudinal tables provide a basis for the overall pattern of structure emergence for each year.
6.2.1 Year 1

The overall patterns of emergence of Year 1 common structures are presented in Table 6.2 below. Year 1 common structures are listed in the first column, and the remaining columns show individual ranks (i.e. the emergence rank for each learner), mean rank, rank variation (the number of places by which a structure's rank varied between learners from the same semester), and the order of emergence based on the mean rank.

Table 6.2 Emergence of Year 1 common structures

<table>
<thead>
<tr>
<th>Structure</th>
<th>Rank C/L/B/K</th>
<th>Rank variation</th>
<th>Mean rank</th>
<th>Emergence Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S</td>
<td>1/1/1/1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>NP</td>
<td>1/2/2/2</td>
<td>1</td>
<td>1.75</td>
<td>2</td>
</tr>
<tr>
<td>NumP</td>
<td>2/3/3/3</td>
<td>1</td>
<td>2.75</td>
<td>3</td>
</tr>
<tr>
<td>PP</td>
<td>2/3/3/3</td>
<td>1</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>VP</td>
<td>2/3/3/3</td>
<td>1</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>Pred. NP</td>
<td>3/3/3/3</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Non-pred. DeP</td>
<td>3/3/3/3</td>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Loc. VP</td>
<td>4/4/4/4</td>
<td>0</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 6.2 shows the individual ranks for the emergence of each structure for each learner in the second column, the mean ranks in the fourth column, and the order of emergence in the last column derived from the mean ranks. Rank variation, as shown in the third column, represents the gap between the highest and lowest individual rank of a given structure. For example, the rank variation of the structure NumP is 1 because the highest individual rank of NumP is three and the lowest is two. Both individual ranks and mean ranks of common structures are compared and contrasted below.
Table 6.2 also shows how some structures emerge earlier for one learner but later for another within individual ranks. For example, structure NP was the first to emerge in learner C’s inter-language but second in the inter-language of the other three learners. These individual differences will be discussed in Section 6.4. Nevertheless, all learners have an identical total number of individual ranks for the same Year 1 common structures, as displayed in the second column. The identical total number of individual ranks tells us that the same Year 1 common structures were acquired in four sequences by the four Year 1 learners, emphasising their almost identical order and rate of acquisition in the same Year 1 common structures.

To test the correlation between the four individual orders, I used Pearson’s R, Kendall’s Tau and Kendall’s W. Statistical significance is indicated by ‘sig.’ in Pearson’s R and Kendall’s Tau; in Kendall’s W, the significance is indicated by P values. To elaborate, when a ‘sig.’ or P value is less than 0.05%, this shows statistical significance, suggesting the finding is highly unlikely to have happened by chance. Otherwise, when a ‘sig.’ or P value is greater than 0.05%, this does not show significance, suggesting the finding is highly likely to have happened by chance (Gay, Mills & Airasian, 2011).

Compared to Pearson’s R, Kendall’s Tau is a relatively conservative coefficient of correlation used for a two-way comparison, as discussed by Charters (2005. The ‘sig.’ values of Pearson’s R and Kendall’s Tau show the significance levels between two variables. Kendall’s W allows for a four-way comparison and the P value in Kendall’s W tells the significance levels among four variables. For Pearson’s R and Kendall’s Tau, the order for each learner is paired with one other. For Kendall’s W the order for each learner is calculated with the other three. Learners are identified by initials as shown above the columns and at the start of the rows in the following tables, which present the statistical results:
Table 6.3 Two-way correlations between emergence orders (C, L, K and B) for eight common structures of Year 1 (Pearson’s R)

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>L</th>
<th>B</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
<td><strong>1</strong></td>
<td>.856*</td>
<td>.856*</td>
<td>.856*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.007</td>
<td>.007</td>
<td>.007</td>
<td>.007</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>.956*</td>
<td><strong>1</strong></td>
<td>1.000*</td>
<td>1.000*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.007</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>.856*</td>
<td>1.000*</td>
<td><strong>1</strong></td>
<td>1.000*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.007</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>.856*</td>
<td>1.000*</td>
<td>1.000*</td>
<td><strong>1</strong></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.007</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

Table 6.4 Two-way correlations between emergence orders (C, L, K and B) for eight common structures of Year 1 (Kendall’s tau_b)

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>L</th>
<th>B</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
<td><strong>1.000</strong></td>
<td>.836*</td>
<td>.836*</td>
<td>.836*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.011</td>
<td>.011</td>
<td>.011</td>
<td>.011</td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>.836*</td>
<td><strong>1.000</strong></td>
<td>1.000*</td>
<td>1.000*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.011</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>.836*</td>
<td>1.000*</td>
<td><strong>1.000</strong></td>
<td>1.000*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.011</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>.836*</td>
<td>1.000*</td>
<td>1.000*</td>
<td><strong>1.000</strong></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.011</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).
Table 6.5 Correlations between four orders of emergence of Kendall’s W

<table>
<thead>
<tr>
<th>Kendall’s W</th>
<th>0.8384</th>
</tr>
</thead>
<tbody>
<tr>
<td>ChiSq</td>
<td>23.4741</td>
</tr>
<tr>
<td>df</td>
<td>7</td>
</tr>
<tr>
<td>p</td>
<td>0.0014</td>
</tr>
</tbody>
</table>

Table 6.3 shows that all ‘sig.’ values are much less than 0.05, suggesting that the correlation between the individual orders has not happened by chance. The ‘sig.’ values of Kendall’s Tau from Table 6.4 are also significant. They strongly indicate that a uniform order exists because Kendall’s Tau is more conservative than the Pearson’s R, that is, it is harder to get a significant result using Kendalls' Tau, as discussed earlier. The P value reported by Kendall’s W in Table 6.5 also represents a significant statistical result, suggesting the four individual orders have been positively correlated and are not similar by chance.

The three statistics above indicate that the four individual emergence orders are significantly correlated with each other. This significant relationship confirms one of the well-established findings in PT that learners’ L1 will not affect L2 emergence order (Pienemann, 1998; Pienemann, 2005; Zhang, 2001; Gao, 2005; Charters, 2005). Despite different first language backgrounds - one Japanese speaker, one Korean speaker and two English speakers (Appendix 4) - they all showed the same pattern in acquisition of Mandarin locative structures as shown in Table 6.2. This is particularly interesting because Mandarin has a mixed head order: VP and PP are head-initial, but NP (and S) are head-final, while English, Japanese and Korean - the L1s of the learners - all have a consistent head order: head first in English and head-final in Japanese and Korean. Given this, one might expect that the Japanese and Korean learners would be quicker to acquire the head-final NPs of Mandarin,
but this was not the case. The head-final order in locative predicates emerged later than both VPs and PPs for all the four Year 1 learners, even those whose first language have head-final orders. This is an issue that will need to be addressed in more depth in later research.

6.2.2 Year 2

Of the four Year 2 participants, learners T, LS and LA participated in eight interviews, while learner M participated in only the first four. In addition, since learner H, who had attended only the first four interviews, was the only participant in Year 3, and since no new structures emerged, I have merged the data from Year 3 with that from Year 2.

The order of emergence of Year 2 common structures has been presented in Table 6.6 below, similar to that for Year 1 above. RC has been included even though it did not emerge at all for M, because we can still conclude something about its emergence rank for M from that fact, it is an important milestone in terms of assessing arrival at PT's stage 6, and it did emerge for the other four learners.

Table 6.6 Emergence of Year 2 common structures

<table>
<thead>
<tr>
<th>Structure</th>
<th>Rank T/LS/LA/M/H</th>
<th>Rank variation</th>
<th>Mean ranks</th>
<th>emergence Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVC</td>
<td>1/1/1/1/1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pred. DeP</td>
<td>1/1/1/2/1</td>
<td>1</td>
<td>1.2</td>
<td>2</td>
</tr>
<tr>
<td>RC</td>
<td>1/1/2/3/1</td>
<td>2</td>
<td>1.6</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 6.6 shows the newly emerged structures in Year 2, compared to Year 1, as indicated in the first column. The second column shows that the order in which Year 2 common structures reached the emergence criterion. RC has been assigned rank 3 for M, which is a rank higher than
the last structure that did emerge in his samples. The emergence criterion for all structures was met at
the same time for learners T, LS and H, and Pearson’s R cannot be computed if any variable is
constant, so we cannot employ statistical analyses to test the significance between the four
individual orders shown here. Nonetheless, the data from learners LA and M shows that Pred.
DeP emerged before RC for both of them, and the data from learner M also shows that SVC
emerged before Pred. DeP for him. Thus it is reasonable to conclude that there is a 3-step
emergence sequence for the Year 2 common structures, as shown in the last column of Table
6.6 above.

Note that all Year 1 common structures which are not ranked in the Year 2 common
structures reoccurred in Year 2 interview 1. I combined Year 1 and Year 2 common
structures to give an overall view of structure emergence from Year 1 to Year 2 in Table 6.7.

Table 6.7 Order of emergence of Years 1 and 2

<table>
<thead>
<tr>
<th>Structure</th>
<th>Rank C/L/B/K</th>
<th>Rank variation</th>
<th>Mean rank</th>
<th>Emergence order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S</td>
<td>1/1/1/1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>NP</td>
<td>1/2/2/2</td>
<td>0</td>
<td>1.75</td>
<td>2</td>
</tr>
<tr>
<td>NumP</td>
<td>2/3/3/3</td>
<td>1</td>
<td>2.75</td>
<td>3</td>
</tr>
<tr>
<td>PP</td>
<td>2/3/3/3</td>
<td>1</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>VP</td>
<td>2/3/3/3</td>
<td>1</td>
<td>2.75</td>
<td></td>
</tr>
<tr>
<td>Pred. NP</td>
<td>3/3/3/3</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Non-pred. DeP</td>
<td>3/3/3/3</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Loc. VP</td>
<td>4/4/3/4</td>
<td>1</td>
<td>3.75</td>
<td>5</td>
</tr>
<tr>
<td>Year 2</td>
<td>Rank T/LS/LA/M/S</td>
<td>Rank variation</td>
<td>Mean rank</td>
<td>Emergence order</td>
</tr>
<tr>
<td>SVC</td>
<td>1/1/1/1/1</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Pred. DeP</td>
<td>1/1/1/2/1</td>
<td>1</td>
<td>1.2</td>
<td>7</td>
</tr>
<tr>
<td>RC</td>
<td>1/1/2/3/1</td>
<td>2</td>
<td>1.6</td>
<td>8</td>
</tr>
</tbody>
</table>
Table 6.7 shows the emergence results from the longitudinal perspective of Years 1 and 2. The first column contains all the structures that emerged in both Years 1 and 2 during eight sessions, with the individual ranks of each participant noted in the second column. The last column shows the order of emergence of these 11 structures, developed from the mean rank in the fourth column. The emergence of the eight common structures in Year 1 divides into five ranks and the emergence of new common structures in Year 2 divides into three ranks. From top to bottom is the chronological order (earliest to latest) of these 11 structures.

6.3 Cross-sectional perspective

The emergence results from the longitudinal perspective have satisfied one of the aims of this study by establishing the chronological order of emergence for locative structures of varying syntactic complexity, from NPs to sentences. This section will introduce the emergence results from a cross-sectional perspective, which relate to the other aim of this study. These are presented in an implicational hierarchy. To develop an implicational hierarchy, all structures are listed across the top of a table, and emergence points of each structure in each learner's interview session is listed vertically, (or vice versa). Columns are then moved side to side, and rows up and down, until we arrive as closely as possible at a table wherein 1) the number of common structures per sample increases from left to right, and 2) the number of samples containing each structure increases from top to bottom (or from bottom to top). For example, in Table 6.8, K1-2 is placed higher than C1 because C1 contains more common structures. The statistical validity of the hierarchy is assessed by calculating the number of 'outliers' or cells that fall outside the general trends (see column 8 for learner C2 in Table 6.8.)
below) using coefficients of scalability and reproducibility. According to Hatch and Lazaraton (1991, p. 210) the coefficients of scalability and reproducibility of an implication hierarchy need to be over 0.60 and 0.90, respectively, to be significant.

Table 6.8 shows the implicational hierarchy for all 11 common structures from years 1 and 2 combined. The first row names the 11 common structures and the second row assigns a number to each structure. Numbers 1–8 represent Year 1 common structures and numbers 9–11 represent Year 2 common structures. The final row shows the mean rank for each structure in the longitudinal-sectional study (see Table 6.7). This represents their emergence order as assessed by the cross-sectional method and allows a comparison between the cross-sectional and longitudinal methods of assessing emergence order.

The first column contains learner initials and interview numbers, for example, K1-2, is learner K in interviews 1 and 2. There are eight interviews in both Year 1 and Year 2, which have been separated into different groups based on structure emergence. Interviews with structure emergence are listed individually, and interviews without structure emergence are merged together. For example, L1 has been listed, showing that there was structure emergence in the first interview in learner L’s inter-language. K1-2, for example, means that interviews 1 and 2 have been merged together, showing there was no structure emergence in the second interview in learner K’s inter-language.
As with the results for Year 2, only the first two interviews have been listed out in the first column because Year 2 common structures had all emerged in all the four learners’ inter-language by the second interview. Interestingly, there was no new common structure emergence after the second interview in Year 2 learners’ inter-language. Therefore, I did not
include the last six interviews of Year 2 in Table 6.8. The symbol ‘+’ indicates that a structure met the emergence criterion in that interview, as discussed in the Chapter 5. Conversely, structures without this symbol are considered not to have emerged. From top to bottom, one should note how structures increase over time, illustrating acquisition development from earlier to later interviews for both years. Reading from left to right, one should also note that structures are placed in a chronological order, from an earlier order of emergence to a later one. The coefficients of scalability and reproducibility shown in Table 6.9 exceed the required limits (0.60 and 0.90, respectively).

Table 6.9 Values of coefficient of scalability and reproducibility

<table>
<thead>
<tr>
<th>Coefficient of scalability</th>
<th>Coefficient of reproducibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.86</td>
<td>0.96</td>
</tr>
</tbody>
</table>

A coefficient of scalability of 0.86 indicates good scalability, i.e., the individual elements are well separated from each other, rather than falling onto groups of many similarly ranked structures. A coefficient of reproducibility of 0.96 means the emergence order presented here is expected to be accurate in 96% of the cases.

From the final row of Table 6.8, we can see that the emergence order in the cross-sectional study is almost identical to that in the longitudinal study. The only exception is the emergence of Pred.DeP before Loc VP and SVC for learners C and B; this might be because they had no need to use t Loc.VP or SVC as will be discussed in Chapter 8 (8.4). For example, there are only four instances of Loc.VP in the entire eight sessions of learner C. However, the statistics above show that this exception, does not affect the validity of the implicational hierarchy as shown in Table 6.9.
Table 6.8 also makes it clear that: (1) structures that emerged in a previous year show recurrence in a later year; and (2) individual differences exist between learners as discussed in the next section. Some learners are more proficient than others; for example, Year 1 learners C, L and B were more proficient than learner K, because Pred.DeP emerged in the inter-language of the first three learners but not in the inter-language of learner K.

These primary features, as indicated above, derived from a cross-sectional perspective, indicate a stable acquisition development from a lower year to a higher year, confirming one of the main findings of the longitudinal perspective: more structures appeared in later interviews than in earlier interviews. This answers one of the research questions as posited in Chapter 1: the results from a cross-sectional perspective confirm the results from a longitudinal perspective.

6.4 Developmental gaps and individual difference

As shown in Table 6.8 above, some learners’ inter-languages develop faster than others. I propose two standards to measure the developmental gap and individual difference of each learner: one is the individual ranks of emergence, by which we mean that the fewer the ranks of emergence, the more efficient that learner is; and the other is the emergence of target structures in each interview for each learner, by which we mean the more target structures a learner produces in a certain interview, the more proficient he or she is. These two standards are complementary. The first standard can be used to measure the overall efficiency of each learner and the second standard can be used to measure learner differences within the same interview. Note that slower learners acquire the same common structures, but with more ranks, illustrating how they take smaller steps towards acquisition relative to faster learners.
**Year 1**

With eight common structures, there were four ranks for all four Year 1 learners (see Appendix 3), suggesting an equal rate of acquisition of the four learners in general. Note that individual developmental gaps in target structure production began to appear among learners in the second interview. In this interview, there were six common structures for learner C, while there were two common structures for learners L, K and B. By the fifth interview, more structures emerged for learners C, L and B than for K. However, by the seventh interview, learner K had acquired all eight common structures and the four Year 1 learners reached the same proficiency level.

**Year 2**

Within the eleven common structures for Year 2, there is one rank for Year 3 learner S, and Year 2 learners T and LS, suggesting that the eleven structures emerged prior to Year 3. There are two ranks for learner LA and three ranks for learner M. Thus, learner LA was generally slower, and learner M was the slowest.

From the above results, we can see that differences, as well as similarities, exist in structure emergence in Years 1 and 2, as summarised below.

Firstly, differences exist in the following three aspects: (1) Number of ranks, where differences exist in both individual ranks and mean ranks. For example, within Year 2 as discussed above, there are one rank for learner T and two ranks for learner LA. (2) Individual differences, where learners in an advanced year tend to be faster than those in a less advanced year. For example, there are five mean ranks for eight Year 1 common structures. The average number of emerged structures in each single rank is 1.5 (8/5), indicating that, on average, 1.5 structures emerged each time. Likewise, there are three mean ranks for the
eleven Year 2 common structures, meaning that 3.67 (11/3) structures emerged each time on average. The greater number of structures in each rank indicates a big step in the acquisition process, leading to faster acquisition, which is the fundamental reason for individual differences.

Secondly, the prominent similarities in structure emergence exist across different years, including the recurrence of structures from a previous year in a later year and the increase of common structures from a lower year to a higher year. For example, the common structures increase from eight in Year 1 to eleven in Year 2.

6.5 Comparison with Charters (2005)

As discussed in Chapter 4, Charters (2005) investigated the order of emergence of nominal structures, which overlaps with some of the structures in this study.

Charters (2005, p. 106) found that compound words emerged in the earliest set; Pred.DeP emerged later than Non-Pred.DeP; and Loc.DeP emerged last, which is similar to the order of emergence for Year 1 in this study: words emerged earliest; DePs emerged later than Non-DeP; and Pred.DeP emerged later than Non-Pred.DePs.

Charters (2005) proposed that the basic order of emergence of common structures can be measured by their rank variation. In addition, Charters noticed that most of the emerged structures share no more than two ranks of variation, which has been confirmed by the results of this study. In particular, this study has found that the more rank variation a structure has, the later its order of emergence. With the same statistical validation, the three individual emergence orders from the three Year 1 learners in Charters (2005) bear a significant correlation, and are thus strongly supported by the results of the current study.
Importantly, one hand, the acquisition of target structures is positively correlated with the length of second language study. The longer a learner’s length of study, the more target structures that learner can produce. This positive correlation was confirmed by Charters (2005) from a longitudinal perspective and by the current study from a longitudinal and a cross-sectional perspective. In a longitudinal perspective, target structures increase from earlier sessions to later sessions. In a cross-sectional perspective, target structures increase from a lower year to a higher year.

On the other hand, the formal classroom instruction sequencing could not have affected the L2 acquisition order. The grammar points of locative structures which are the focus of the current study are placed in Chapter 9 in the learners’ textbook, and were taught between weeks 9 and 10, which corresponded to the time of the third interview. The learners did show the emergence of some of the locative structures, but not locative predicates, in the third interview immediately after the classroom instruction. However, production immediately after instruction is not reliable evidence of acquisition, because research has shown that learners may produce structures they have been drilled on at levels that meet the emergence criterion for up to two weeks after instruction (Zhang, 2001). After this, only those who were at the relevant stage for acquisition of those structures will continue to produce them, while others will revert to non-target like structures. In my data this was apparent with locative structures (Pienemann, 2005). In the three interviews following instruction, learners continued to produce Non-Pred.locatives and PPs, but produced no predicate locative structures. This supports my claim that predicate locative NPs did emerge later than Non-Pred.locatives and PPs, a fact that can be explained, according to EFG, by the greater processing demands associated with the complex GF assignment they involved.

In conclusion, the major features of structure emergence from both a longitudinal and a cross-sectional perspective can be summarised thus:
(1) Structures requiring a locative complement emerge later than those that do not. For instance, Pred.NP emerges later than Non-Pred.NP. This is in accordance with the predictions by EFG. The emergence of PP and VP was found simultaneous with the emergence of feature unification as in NumP. This runs counter to the predictions of EFG and PT. The comparison will be detailed in Chapter 7 (7.2).

(2) Target structures increase from earlier interviews to later interviews and from a lower year to a higher year. This is evidenced by the way the number of target structures increases from two in the first interview to eight in the last interview, and from eight target structures in Year 1 to eleven target structures in Year 2.

(3) Structure emergence did not occur over all eight interviews. There was no structure emergence in the last two interviews for any of the four Year 1 learners.

(4) Despite individual order differences, the correlation between orders of emergence is significant, and this is supported by the results of statistical tests.

As mentioned above, some emergence order confirms some EFG predictions some disproves. The PT and EFG predictions will be compared with reference to the observed emergence order to see which theory is more precise at predicting Mandarin locative structure in the next Chapter.
Chapter 7 Structural analysis

This chapter will discuss factors that underlie the results for the order of emergence of locative structures revealed in the previous chapter. Section 7.1 presents an analysis of emerged structures to ascertain their processing demands, in terms of information exchange and storage, as discussed in Chapter 2. Section 7.2 compares PT and EFG predictions as proposed in Chapter 3 before Section 7.3 identifies the different impact of feature unification and different types of GF assignments on overall processing demands, as indicated by emergence order.

Table 7.1 below shows the results of the analysis. The emergence of Year 1 and Year 2 common structures are shown in the first column, along with comments identifying any relevant syntactic relationships within each structure in the third column, and the observed order of emergence, based on mean ranks, in the last column. The explanation of the comments follows next.
Table 7.1 Emergence of Years 1 and 2 common structures with comments

<table>
<thead>
<tr>
<th>Structure</th>
<th>Examples</th>
<th>Comments</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S</td>
<td>Wo xihuan gongyuan. I like park.</td>
<td>SVO; no GF assigned</td>
<td>1</td>
</tr>
<tr>
<td>NP</td>
<td>Wode chuang my bed</td>
<td>simple GF assignment (adjunct)</td>
<td>2</td>
</tr>
<tr>
<td>NumP</td>
<td>San kou ren three people</td>
<td>Satisfaction of Numeral’s constraint on COUNT feature by classifier, and unification of CLASS feature between classifier and noun</td>
<td>3</td>
</tr>
<tr>
<td>PP</td>
<td>Zai chufang In the kitchen</td>
<td>Complex GF assignment (object), unification of LOC feature between preposition and object.</td>
<td></td>
</tr>
<tr>
<td>VP</td>
<td>You shuilongtou Have a water tap</td>
<td>Complex GF assignment (object)</td>
<td></td>
</tr>
<tr>
<td>Pred. NP</td>
<td>Jia zuobian Left side of house</td>
<td>Complex GF assignment (object, pre-head position)</td>
<td>4</td>
</tr>
<tr>
<td>Non-pred. DeP</td>
<td>Zuobian de fangjian Room on the left</td>
<td>Simple GF assignment (adjunct), Functional head de; link between DF and adjunct GF</td>
<td></td>
</tr>
<tr>
<td>Loc.VP</td>
<td>Qu gonguan go to park</td>
<td>Complex GF assignment (object), with unification of LOC features of verb and object</td>
<td>5</td>
</tr>
<tr>
<td>SVC</td>
<td>Ni qu nar he pijiu? Where do you go to drink beer?</td>
<td>Four complex GF assignments (2 SUBJ and 2 OBJ); unification of LOC feature between verb ‘qu’ and object ‘nar’.</td>
<td>6</td>
</tr>
<tr>
<td>Pred. DeP</td>
<td>fangzi de zhongbian Middle of the house</td>
<td>Functional head de, complex GF assignment (object); link between DF and object DF</td>
<td>7</td>
</tr>
<tr>
<td>RC</td>
<td>Wo xiang de dongxi The object I am thinking</td>
<td>Two Complex GF assignments (SUBJ, OBJ); Functional head de; introduction of PRED ‘Pro’ to head the DeP; coindexing of ‘pro’ and focal noun dongxi. Link between focus DF and the OBJ of ‘xiang’ and a link between topic DF (of RC) and adjunct of DeP;</td>
<td>8</td>
</tr>
</tbody>
</table>
7.1 Structural Analysis

The earliest structure – Semantic sentence

From Table 7.1 we can see the semantic sentence (semantic S) with SVO order is ranked first. Note that it is possible that structures with a mean rank of one might have met the emergence criterion only in the second interview; or in the first interview for some learners and the second interview for others. In fact, semantic S met the emergence criterion for all the four Year 1 learners in their first interview. In interview 1, semantic S consists of a single noun and a simple predicate, e.g. a simple verb phrase with no adjuncts as in (28).

(28) Wo xihuan gongyuan.
    1sg like park
    I like park. (AK 2011-S11_1-67)

\[
\begin{array}{c}
\text{S} \\
\uparrow=\downarrow \\
\text{N} \quad \text{V} \quad \text{N} \\
\text{wo} \quad \text{xihuan} \quad \text{gongyuan}
\end{array}
\]

Fig. 7.1 C-structure of semantic S

\[
\left\{ \begin{array}{l}
\text{PRED ‘like < agent patient>}’ \\
\text{Agent [PRED ‘Pro’; PERS 1; NUM SG]} \\
\text{Patient [PRED ‘park’]}
\end{array} \right.
\]

Fig. 7.2 F-structure of semantic S

Fig. 7.1 shows a simple two-level C-structure for (28) with an S node dominating three lexical items, N, V and N. Fig. 7.2 shows the semantic relationships between the verb and the nouns,
agent and patient rather than grammatical functions (GF), in the F-structure of (28). The semantic description is used here because there was no evidence at this point of any GF assignment. In fact, since Mandarin lacks case-marking and verbal agreement, evidence of argument GFs in Mandarin is only directly available in complex structures (Charters, 2013). In this study, a GF will not be used in an F-structure until we can see evidence in the learners' data that a GF assignment has emerged, such as the adjunct to be discussed below in rank 2 structures. The lack of clear evidence of GF assignment in semantic S suggests that at this time the elements of the sentence are directly activated by concepts. In PT, when linguistic forms can only be directly activated by concepts, without any information exchange between them, the structures consisting of these forms are considered not to involve syntactic processes and belong to stage 1. In fact, LFG assumes a universal default of stable word order as predicted by Endocentric Mapping Principles (Bresnan, 2001), and that word order variation within a language reflects pragmatic functions (focusing, topicalisation, etc). This means that deviations from standard word order in a configural language generally involve discourse functions, which require additional processing as will be discussed in the RC analysis (p. 107), but a stable word order does not. That is to say, in PT and in LFG, the simple sentence has a fixed word order without any syntactic processing being necessarily involved.

**Rank 2 structures - NP**

The second-ranked structure is NP with a one-word adjunct. One adjunct consists of a pronoun and a suffix (DePoss), as (29) shows; the other consists of a numeral and a suffix (Num+suff), discussed below.

(29) *Wo bu xihuan  wo-de chuang, zai shangmian wo-de che.*

1sg no like 1 sg- dePoss bed at top 1sg-dePoss car
I do not like my bed on top of my car. (AK 2011-S11_8 067)

As *de* appeared only after a pronoun in the learners’ language at that time, *de* is deemed a suffix of the pronoun it attaches to. Without *de* the pronoun cannot express a possessive meaning, so *de* is a possessive suffix. Accordingly, a POSS feature is added to the lexical structure composed of ‘pronoun+*de*’, in DePoss as shown in Fig.7.3. Note that additional features would be contributed by the pronoun form to which *de* is attached; features not relevant to the structure under discussion are omitted throughout.

\[
\begin{array}{c}
\text{PRED ‘pro’} \\
\text{POSS +}
\end{array}
\]

*Fig.7.3 lexical entry of DePoss*

Fig.7.3 shows that DePoss with a PRED ‘Pro’ value has a POSS feature. Fig.7.4, the C-structure of (29), shows that an adjunct annotation is assigned above the DePoss node (Pron). This annotation indicates that the features of DePoss are those of an adjunct, as shown in the F-structure in Fig.7.5, below and discussed in Chapter 2 (section 2.2).

\[
\begin{array}{c}
\text{NP} \\
\text{↑ADJ=}\Downarrow \\
\text{Pron} \\
\text{Wode} \\
\text{chuang}
\end{array}
\]

*Fig.7.4 C-structure of NP with DePoss adjunct*

\[
\begin{array}{c}
\text{PRED ‘bed’} \\
\text{ADJ PRED ‘pro’} \\
\text{POSS +}
\end{array}
\]

*Fig.7.5 F-structure of NP with DePoss adjunct*
Fig. 7.5 shows an adjunct with a PRED ‘Pro’ and a POSS feature in its F-structure modifying the PRED feature of the noun. Note that in LFG, an adjunct is not required by a head so the GF adjunct does not need to satisfy the completeness condition (Bresnan, 2001) or involve feature unification, as discussed in EFG (Charters, 2013). Therefore, I describe the GF adjunct as a simple GF. In contrast, in LFG an argument function is required by a predicator and must be present in the F-structure of the predicate to satisfy the completeness condition (Bresnan, 2001). The syntactic processor must check that these requirements are satisfied which involves syntactic processing that is not necessary for the GF Adjunct. This will be discussed in more detail in rank 3 structures below. Because if this difference is in processing demands, I describe an argument function as a complex GF.

The second type of NP used at this stage is shown in (30). It is composed of ‘numeral+ge N’, which is an inter-language alternative to the structure ‘NumP N’ consisting of a numeral, a classifier and a noun. The inter-language ‘numeral+ge’ is labelled Num+suff in the current study.

(30) liang ge fangjian
    two.ge  room
    Two rooms. (AK 2011-S11_8 02)

As ge appeared only after a numeral in the learners’ language at the time this structure emerged, as shown in Appendix 3, ge is considered a suffix, like de above. In addition, as the suffix ge appears whenever the noun is quantified by a numeral, there is no selection relationship between Num+suff and a noun. That is, there is no agreement relationship between Num+suff and the noun or between the suffix and the numeral. In PT, suffixes that do not agree with anything are lexical morphs belonging to stage 2- the categorical procedure. The lexical entry of ‘Num+suff’ is shown below:
Num+suff \[ \text{PRED ‘two’} \]

*Fig. 7.6 Lexical entry of Num+suff*

Fig. 7.6 shows that the ‘Num+suff’ has a PRED value ‘two’. Fig. 7.7, the C-structure of (30) which is the same as that used for ‘Deposs N’, shows an adjunct in the annotation above the node Num+suff, indicating that the features of Num+suff are those of an adjunct. Fig. 7.8, the F-structure of (30) which is also the same as that used for ‘Deposs N’ above, shows this adjunct with a PRED ‘two’ modifying a head noun.

\[
\begin{array}{c}
\text{NP} \\
\text{↑ADJ=}\downarrow \\
\text{Num+suff} \quad \text{N} \\
\text{qige} \quad \text{fangxing}
\end{array}
\]

*Fig. 7.7 C-structure of NP with Num+suff adjunct*

\[
\begin{array}{c}
\text{PRED ‘square’} \\
\text{ADJ [PRED ‘seven’]}
\end{array}
\]

*Fig. 7.8 F-structure of NP with Num+suff adjunct*

Structures composed of two or more words in combination are considered phrases (Pienemann, 1998). In the current study, a phrasal structure with a simple GF assignment but no feature unification, like those above, is described as a simple phrase; one with a complex GF assignment or unification for agreement is described as a complex phrase, such as NumP to be discussed next. Nonetheless, GF assignment and feature unification each have a different impact on processing demands, as discussed below in Section 7.3.
Rank 3 structures – NumP, VP and PP

NumP, VP and PP are the third-ranked structures and they are all complex phrases. However, they are complex in different ways: NumP involves feature unification, VP has a complex GF assignment and PP involves both as discussed next.

The term NumP is used for structures composed of a numeral and classifier after agreement between numeral, classifier and noun has become evident. Classifiers reached the emergence criterion in this study when another classifier besides ge, such as kou in (31), was used consistently with selected nouns.

(31) san kou ren
    three CL people
    Three people. (AK 2011-S11 8)

In Mandarin, when nouns are quantified by numerals, classifiers are required between the head noun and the quantifying numeral (Li & Thompson, 1981; Lu, 2005; He, 2001), as shown in (31). This requirement is not evident when nouns are used alone, therefore, it must be the numeral that requires the presence of the classifier. In addition, when nouns denote a measure themselves, classifiers are not needed (Li & Thompson, 1981, p. 105). This indicates a kind of selection relationship between the numeral and the classifier motivated by the need of the numeral to collocate with something countable. That is, a COUNT feature required by numerals can only be provided by classifiers and certain (measure denoting) nouns. In LFG terms, selection relationships are achieved through the use of a constraint equation which indicates that a feature and value of a specific type must be provided by some other word. In PT's terms, because a constraint equation is a constraint on features, to evaluate whether or not it is satisfied, the processor must look for and find this feature with specific value in F-structure.
While numerals select classifiers in general, the choice of classifier is determined by the noun (Li & Thompson, 1981, p. 104). That is, a particular set of nouns can only be accompanied by a particular set of classifiers, usually just one. This selection relationship between nouns and classifiers involves agreement in features expressed in the lexical entries of classifiers and nouns. Effectively, the CLASS feature expressed by the classifier needs to be unified with the CLASS feature denoted by the N ‘person’, as shown in Fig. 7.13. In order to unify, these features must map into the same F-structure. Then, if they are compatible they then unify and satisfy the uniqueness condition which says a feature can only have one value.

To show how the selection of a classifier by the numeral and unification of a CLASS feature between a classifier and a noun are managed, the lexical entries of the numeral, the classifier and the noun in (31) are provided below:

```
PRED ‘three’
COUNT=c +
```

*Fig.7.9 lexical entry for three*

```
CLASS kou↑
COUNT+
```

*Fig.7.10 lexical entry for classifier kou*

```
PRED ‘person’
CLASS = kou
```

*Fig.7.11 lexical entry for ren*

Fig.7.9 shows the numeral has a PRED value ‘three’ and a constraint equation $\text{COUNT} = c +$. This means the numeral can only be used when some other word provides a COUNT + value to its F-structure. Fig.7.10 shows the classifier *kou* has a COUNT + value. The $\uparrow=\downarrow$ annotation above the Num and Class nodes in the C-structure of NumP shown in Fig. 7.12
below means their features are combined in the same F-structure, so that the COUNT + value
provided by the classifier satisfies the constraint equation expressed by the numeral. This C-
structure also indicates that the F-structure created by the Num and Class nodes is an adjunct
inside the F-structure of the noun, as shown in Fig.7.13.

Fig. 7.10 shows the classifier also expresses a CLASS feature; the arrow is intended to
indicate that this CLASS feature is mapped to an F-structure outside the immediate F-
structure to which the COUNT + feature is sent. This is necessary to allow it to unify with the
CLASS feature of the noun. Fig.7.11 shows the noun with a PRED ‘person’ value and a
CLASS ‘kou’ feature. The CLASS features are brought together because of additional
annotations in the C-structure, shown in Fig. 7.12

```
NP
  ↑ADJ=↓
  ↑=↓
NumP                      N
  ↑=↓
  ↑=↓
  Num                  Class
  ren
San  kou
```

*Fig.7.12 C-structure of NP with NumP adjunct*

In Fig.7.12 the ↑=↓ annotations above Num and Class mean the features of the numeral and
classifier are combined in one F-structure; the annotation ↑ADJ=↓ above NumP means the F-
structure they create is an adjunct inside the F-structure associated with NP. The classifier's
feature CLASS is mapped to this outer F-structure as discussed above; the ↑=↓ annotation
above N indicates that the PRED and CLASS features of N also map to the F-structure
containing the adjunct's F-structure. In this way the CLASS feature of the classifier and the
noun are brought together in one F-structure.
The COUNT feature constraint enforced by a numeral on a classifier, along with the CLASS feature unification between a classifier and a noun in the structure composed of ‘Num classifier noun’ distinguish it from the structure composed of ‘Num+suff noun’ above. Recall that no unification was required there, because there is no selection relationship between Num+suff and noun, as mentioned above.

Feature unification is also the fundamental distinction between stage 2- category procedure and stage 3- phrasal procedure in PT.

Another structure ranked third was PP, composed of a preposition zai (at) and an NP, as (32) shows. Here example (32) is marked ungrammatical because the predicate PP needs an NP to be its subject (Huang & Liao, 1998), but the demonstrative pronoun zhe (this) is not an NP. It will be grammatical when zhe combines with a classifier such as ge creating the structure zhege (this-CL). This is because a structure composed of demonstrative and classifier is nominal in Mandarin (Lü, 2005). However, this ungrammatical subject will not affect the emergence of PP (in italics) which is the structure this study focuses on. The lexical entry of the preposition zai (at), in Fig.7.14 below shows that the PRED ‘at’ requires an object and expresses a constraint equation limiting the acceptable values of LOC feature of its object to ’+'. In other words, PP imposes a constraint equation, like NumP, but also involves a complex GF assignment.
As indicated in the discussion of Semantic S above, GF assignments are employed in F-structure only after evidence of GF assignment has emerged. The inclusion of the OBJ GF can be justified by the fact that the preposition needs to indicate what constituent must provide a LOC + feature for the structure to be well-formed. A GF added to the constituent in C-structure can be used as an identifying label for that constituent in the lexical entry of the preposition. This relates directly to, and provides a kind of motivation for, LFG’s coherence condition (Bresnan, 2001): any GF in F–structure must be present in the lexical structure of a predicate in the same F-structure. We can understand these GFs as labels that make it possible to identify precisely where information needs to go, or to be found in F-structure. Thus it makes sense that GFs emerge when unification emerges.

Fig.7.15, the C-structure of (32), shows the GF OBJ assigned above the node NP indicating that the features of the NP inserted there are the features of an object in the F-structure of PP as shown in the F-structure in Fig.7.16
Fig. 7.16 F-structure of PP

Fig. 7.16 also shows that the completeness condition on complex GF assignment has been satisfied by the presence of the PRED ‘kitchen’ with a LOC feature. The processor must check the OBJ GF assigned in the C-structure against the GFs present in the lexical structure of the preposition to make sure that the assigned GF matches one required by the preposition. The processor does not need to check any such information exchange for an adjunct as discussed in Rank 2 structures – NP. As mentioned earlier, there can be little direct evidence for SUBJ GFs in Mandarin, because there is no SUBJ-verb agreement, but I assume that, once an OBJ GF involving agreement is processable, SUBJ GFs with no agreement may be processed too. And if the coherence condition is active, it will apply to SUBJ as well as OBJ. Hence a SUBJ GF is also included in the lexical entry of the preposition.

The third structure to emerge at this time was VP, composed of a verb and its complement, as (33) shows.

(33) nage fangzi you shuilongtou
    That ge exist water-tap
    There is a water-tap in that house. (AK 2011-S11_14 032)

The lexical entry of the verb ‘exist’ in Fig. 7.17 shows that, like the preposition just discussed, the predicate requires a subject and an object.

Fig. 7.17 Lexical entry for you
The GF OBJ specified in the lexical entry of the verb is required to match the GF OBJ assigned above the NP node in the C-structure of VP in Fig. 7.18.

\[
\begin{array}{c}
\text{VP} \\
\text{↑OBJ =↓} \\
\text{V} \\
\end{array}
\]

\[
\begin{array}{c}
you \text{ (exist) } \\
\text{shuilongtou (water-tap)}
\end{array}
\]

*Fig. 7.18 C-structure of VP*

Fig. 7.18 shows a complex GF assigned above the NP node by the annotation ↑OBJ =↓. As in PP, above, this annotation indicates that the features of the NP inserted below are those of an object in the F-structure of VP. According to the coherence condition (Bresnan, 2001), this GF assigned to the NP in C-structure must also be present in the F-structure of the predicate in the same VP; the C-structure in Fig. 7.18 creates such an F-structure as shown in Fig. 7.19:

\[
\begin{bmatrix}
\text{PRED ‘exist <SUBJ, OBJ>’} \\
\text{SUBJ [ PRED ‘that house’] } \\
\text{OBJ [ PRED ‘water-tap’]} \\
\end{bmatrix}
\]

*Fig. 7.19 F-structure of VP*

Fig. 7.19 also shows the completeness condition on complex GFs, the subject and object, have been satisfied by the presence of a PRED ‘Pro’ (contributed by the verb) and a PRED ‘water-tap’ (contributed by an NP), respectively. The processor must check the GF object assigned in the C-structure and presented in the F-structure to make sure that the assigned GF matches a required GF in the verb’s lexical entry, and ensure that the GFs each have a PRED value, as the processor in PP does. This complex GF assignment explains the later emergence of PP and VP relative to an NP with a simple GF assignment. Note that,
unification required for the complex GF assignment is the same as in PP, but in VP there is no feature unification of the type involved in PP.

Compared to structures ranked second, those ranked third involve: feature unification (NumP), complex GF assignment (VP) or both (PP). These differences contribute to higher processing demands in structures ranked third relative to structures ranked second. The fact that all these structures have the same emergence rank suggests that GF assignment is neither more nor less demanding than feature unification for agreement, there are no additive effects; otherwise we'd expect PP to emerge later than VP and NumP.

**Rank 4 structures - Pred.NP and Non-Pred. DeP**

Pred.NP, composed of a complement and a locative predicate noun, is shown in (34):

(34) *jia zuobian*

    house left
    
    The left side of the house

Fig.7.20, the lexical entry of the locative predicate, shows that the locative predicate requires a complex GF– object.

\[
\text{PRED ‘left side }<\text{OBJ}>\text{'}
\]

*Fig.7.20 lexical entry of locative predicate*

\[
\begin{array}{c}
\text{NP} \\
\uparrow \text{OBJ}=\downarrow \\
\text{NP} \quad \text{NP} \\
\text{jia} \quad \text{zuobian}
\end{array}
\]

*Fig.7.21 C-structure of Pred.NP*
Fig. 7.21, the C-structure of (34), shows an object function assigned above the NP node on the left, indicating that the NP in that position provides the features for an object in the F-structure of the NP; to satisfy the coherence condition, this object GF must be present in the lexical structure of the predicate ‘left side’, and the OBJ GF is indeed found in Fig. 7.22.

\[
\begin{cases}
\text{PRED ‘left side <OBJ>’} \\
\text{OBJ [ PRED ‘house’]}
\end{cases}
\]

*Fig. 7.22 F-structure of Pred.NP*

Fig. 7.22 also shows the completeness condition on complex GFs is satisfied: the locative predicate requires an object with a PRED value and this is supplied by the NP ‘house’. This is almost the same complex GF assignment as discussed in third-ranked structures. However, the complex GF in Pred.NP is assigned to a pre-head position, which is different from the post-head position as in PP or VP above. Thus, the pre-head position in Pred. NP might explain its later emergence relative to third-ranked structures. Neither PT nor EFG can explain this difference between pre-head and post-head argument assignment, which is a weakness in these two theories as will be discussed in Section 7.2 below.

It might be the case that the processor is used to the post-head argument assignment, thus, the processor will first check the post-head assignment as it does in VPs and PPs. This might be the result of L1 transfer, as most of the participants are either English native speakers or fluent English speakers, and in English, the object is usually a post-head position. A special procedure must be developed for NPs specifically, in which the head order is different from that in other phrases. PT maintains that there is a different phrasal procedure for each lexical head anyway, while this finding suggests that a structural development in one phrasal procedure may be extended to all procedures in the first instance, and later modified where the TL employs different constraints. That is how the processor may first adopt a head-initial
structure in the NP procedure and then adopt a new pre-head argument position. For a time, two competing possibilities for argument assignment might cause a longer delay in pre-head argument assignment relative to a post-head argument assignment. This delay can explain its higher processing demand in a pre-head assignment relative to a post-head assignment.

Non-Pred.DeP, the other fourth-ranked structure, composed of a functional head _de_ and a non-predicate NP, is shown in (35):

(35)  _xiao de fangjian_

   Small de room

   Small room (AK 2011-S12_19 026)

Note here that _de_ in Non-Pred.DeP is considered a functional head, which is different from DePoss in an NP discussed in second-ranked structures. This is because _de_ became a free word once there was evidence that it was used consistently following different types of words, such as nouns, and adjectives. A suffix can only attach to one word class. Moreover, as a free word, _de_ does not have a semantic meaning – the structures it appears in were not all possessive and NPs that precede it serve different functions, as shown in a comparison of Fig.7. 23, and Figs 30 and 33 below, thus it is deemed a functional head. According to the Endocentric Mapping Principles (Bresnan, 2001) the specifier of a functional head should be a DF, like TOP and to satisfy the coherence condition, a DF can be linked to any GF.

Treating _de_ as a functional head with a TOP function assigned to its specifier explains the variation in the meaning of the modifiers and their functions in all the later DeP structures.
Fig. 7.23 C-structure of Non-Pred. DeP

Fig. 7.23, the C-structure of (35), shows that a DF is assigned above the node NP preceding \textit{de}, indicating that this DF has the features of the adjective phrase. According to the extended coherence condition (Bresnan, 2001), a DF must be linked to a GF, but the head 'room' does not require a GF. Therefore, the optional GF adjunct must be included in the F-structure so the GF can be linked to it, as it is in Fig. 7.24:

\[
\begin{array}{c}
\text{PRED \textquoteleft room\textquoteright} \\
\text{ADJ [} \\
\text{TOP [PRED \textquoteleft small\textquoteright]} \\
\end{array}
\]

\textit{Fig. 7.24 F-structure of Non-Pred. DeP}

The processor in Non-Pred. DeP needs to assign a simple GF and link it to the DF. According to EFG (Charters, 2013), the linkage required to satisfy the extended coherence condition is enough to explain its extra processing demand in Non-Pred. DePs relative to the earlier phrases without this linkage.
Rank 5 structures – Loc.VP

Loc.VP, the fifth-ranked structure, composed of a locative verb and a locative complement, is a structure almost identical to VP discussed in the third-ranked structures. The only difference is the locative verb in Loc.VP requires a locative object, but the verb in VP does not. To produce a Loc.VP, a learner needs to process a complex GF assignment and locative feature unification. The additional locative feature unification should contribute to a higher processing demand in Loc.VP relative to VP, accounting for its later emergence. But note that PP also combines complex argument assignment and feature unification, and it also emerged earlier than Loc.VP.

Rank 6 structures -SVC

Three common structures emerged in Year 2, as shown in Table 7.1 above, where serial verb construction (SVC) (ranked sixth), emerged earlier than the relative clause (RC) and the predicate de phrase (Pred. DeP) (both ranked seventh). The SVC is composed of two serial verb phrases, as (36) shows:

(36) Ni qu nar he pijiu?
    you go where drink beer
    Where do you go to drink beer? (AK 2011-S21_4 053)

    \[
    \begin{align*}
    \text{PRED} & \left\langle \text{go} < \text{SUBJ, OBJ}> \right\rangle \\
    \text{OBJ LOC} & =c+
    \end{align*}
    \]

    \text{Fig.7.25 Lexical entry for ‘go’}

    \[
    \begin{align*}
    \text{PRED} & \left\langle \text{drink} < \text{SUBJ, OBJ}> \right\rangle \\
    \end{align*}
    \]

    \text{Fig.7.26 Lexical entry for ‘drink’}
Figs. 7.25 and 7.26 show that both the locative verb ‘go’ and the PRED ‘drink’ require subjects and objects, but the structure only includes one NP that serves as subject of both verbs. In Mandarin SVC, the predicates must share the same subject (Zhu, 2004), so to satisfy the completeness condition for both verbs, the two subjects must be linked in F-structure (see Fig. 7.28). This confirms the fact that SUBJ GFs are being assigned by this stage of the learners’ development. The object shown in the lexical entry of ‘go’ in Fig. 7.25 also has a constraint equation limiting its acceptable values of locative feature to +.

Fig. 7.27, the C-structure of (36), shows a subject assigned above the first NP node, an object assigned above the NP node under one VP; an adjunct assigned to the other VP and inside this VP, the other object is assigned above the NP node under the adjunct. That is, the features of the subject are those of the first NP, the features of the object in the main clause are those of the NP under the main VP, the features of the adjunct are those of the second VP, and the features of the object in the adjunct are those of the NP within the adjunct VP. According to the coherence condition, the SUBJ and OBJ GFs must be the same as GFs required in the lexical structure of the predicates and must also appear in the same F-structure as the predicate, but the ADJ GF need only be in an f-structure with a PRED value, as shown in Fig. 7.28.
Fig. 7.27 C-structure of SVC

Fig. 7.28 F-structure of SVC

Fig. 7.28 also shows the completeness condition satisfied for four complex GFs and the locative constraint on the object of the predicate ‘go’, also satisfied. The first complex GF assignment has been satisfied by a pronoun ni (you) and the second, and the locative feature constraint have been satisfied by a pronoun nar (where); the object of the predicate he ‘drink’ is satisfied by the NP jijiu (beer), and the empty subject of ‘he’ is linked to the subject of the
main predicate *qu* (go). The processor in SVC must assign four instances of complex GFs and must also link an empty SUBJ in a local F-structure to the SUBJ in the main F-structure. According to EFG, these additional instances of complex GF assignments and the linkage from one complex GF to another in a SVC contribute its higher processing demands relative to the earlier structures without multiple complex GF assignments or a linkage.

**Rank 7 structure - Pred.DeP**

Pred.DeP, the seventh-ranked structure, is composed of a functional head *de* followed by a locative predicate noun, such as (37); the latter is what differentiates it from Non-Pred.DeP (see fourth-ranked structure).

(37) *Fangzi de zhongjian*  
    house *de* middle  
    Middle of the house (*AK 2011-S11_18 005*)

Fig.7.29, the lexical entry of the locative predicate noun, shows that the predicate requires an object.

```
[PRED 'middle <OBJ>']
```

*Fig.7.29  lexical entry for 'middle'*

Fig.7.30, the C-structure of (37), uses the same basic DeP structure used in Figs.23 and 33; a DF is assigned above the node NP proceeding *de*, as is in Non-Pred.DeP (Fig.7.23) above. However, the DF cannot be linked to the simple GF adjunct, as is in Fig. 24; in this case, the DF must be linked to a complex GF –an object in the F-structure of a predicate noun, as shown in Fig.7. 31, otherwise, the noun's F-structure will be incomplete.
Fig. 7.30 C-structure of Pred. DeP

Fig. 7.31 also shows that the predicate zhongbian requires an object, which is absent from the local F-structure. To satisfy the completeness condition, this empty object is linked to the DF. According to EFG, the linkage between DF and argument in Pred.DeP can explain its greater processing demands than that of Non-Pred.DeP with a linkage between DF and adjunct. Note that the object shown in F-structure is not present in its corresponding C-structure, which is true also in RC to be discussed next.

\[
\begin{array}{c}
\text{PRED 'middle <OBJ>}' \\
\text{OBJ [} \\
\text{TOP [PRED 'house']}
\end{array}
\]

Fig. 7.31 F-structure Pred. DeP

This lack of correspondence between C and F-structures and the need for complex GF-DF linkage, a processing demand not made in earlier structures can explain a higher process demands in Pred.DeP than SVC.

**Rank 8 structure - RC**

The eighth-ranked structure RC is a modifying clause that precedes a noun, and typically has a gap (Li & Thompson, p. 575), such as (38):
Fig. 7.32   Lexical entry of think

Fig. 7.32 shows that the verb ‘think’ requires a subject and an object and both of these arguments have optional PRED ‘Pro’ values. This is because Mandarin is a pro-drop language, which can freely omit any NP that is retrievable from a context (Li & Thompson, 1981, p. 658). In LFG, an optional subject and object must still have PRED features in F-structure to satisfy the completeness condition (Bresnan, 2001). When a lexical NP occupies a SUBJ or OBJ position as in (38), it will prevent the use of the optional PRED 'Pro' feature. Even an overt pronoun in C-structure, will block the use of the optional PRED 'Pro' because two PRED values can never unify, even if their content is the same. That is any Mandarin verb can introduce an optional PRED ‘Pro’ value for its two GFs if required. Charters (2005) found learners used null pronouns when they were topical as early as stage 1.

The analysis of Mandarin the RC is controversial. The main complicating factor is that Mandarin RCs do not contain a relative pronoun, which is generally analysed as the controller of the gap in the relative clause (see Dalrymple, 2001, pp. 401-404). LFG does not allow empty positions in C-structure to have syntactic(143,559),(973,937)
were linked directly to the head noun, (the equivalent of the entire DeP in f-structure) this
would be as if the gap was controlled by itself, or dependent on itself for interpretation.
Therefore, there would be no independent f-structure to which it could be linked and this
seems intuitively incorrect. Based on the analysis of the English RC in LFG (Dalrymple,
2001, pp.401-404), I propose that (38) has the C-structure shown in Fig.7.33. A GF SUBJ is
assigned above the maximal DeP node, indicating that this complete DeP is the subject of a
larger structure but the noun *dongxi* is not the lexical head of this DeP; it is assigned the DF -
focus which is associated with unknown referents (Halliday, 1967). This is comparable to the
treatment of the relative pronoun in English (Dalrymple, 2001, p. 401); it is focal (a wh-
word), occupies a FOCUS DF and is coreferent with the missing argument in the RC. The
only difference is that the DF position occupied by the relative pronoun in the standard
analysis of RCs is a specifier of CP. We could treat de here as the head of CP, and the
following noun as its specifier, which would make the structure even more similar to the
standard analysis, but this would not capture the similarity in Mandarin between RC
structures and other modifiers of nouns, which are also followed by de, but not generally
analysed as CPs.
Treating the lexical noun as the focal element equivalent to the relative pronoun of English
fits its information structure status as a referent needing to be identified, but it also means it
cannot directly provide a PRED value for the DeP as a whole, the way an English head noun
modified by an RC does. There are two ways this might be resolved. One is that the matrix
verb which assigns a GF to DeP, also assigns a PRED 'Pro' value to it, as all verbs in
Mandarin can. Another is that the normally functional head 'de' is the source of the PRED
'Pro' value for the complete DeP. This is consistent with the fact that 'de’ can function as a
'nominalizer' in Mandarin: the lexical head of any modifying DeP can always be omitted in a
context where its referent is retrievable. The choice makes little if any difference to the
information exchange required in this structure; either way a PRED 'Pro' value is supplied by some lexical item outside the RC, either 'de' or the matrix verb.

These alternative sources for a PRED 'Pro' feature leave us free to treat the lexical noun as a focal element. To satisfy the extended coherence condition, it must then be linked to GF inside the f-structure of DeP.

Since the RC [wo xiang] I think of serves to identify the noun 'dongxi', it is associated with the DF – topic which is associated with familiar referents (Halliday, 1967). This DF is assigned above the S node dominating the RC in Fig. 7.33 in the same way as the topic DF was used in this position in Fig. 7.23 above. To satisfy the extended coherence condition, this DF must also be linked to a GF in F-structure. Within the RC, a subject GF is assigned above the NP node indicating that the features of the NP are those of the topic’s subject, as shown in the F-structure - Fig. 7.34. However, note that there is no object in the VP in C-structure. An object must be present in F-structure to satisfy the completeness condition, and again, this could be supplied in either of two ways: it could be a PRED 'Pro' value, supplied by the verb 'xiang' or it could be linked to the focal NP 'dongxi', satisfying the extended coherence condition for that DF as well. Since the focal NP must be linked to a GF, and this linkage helps to account for the fact that an overt object cannot appear in the object position, this is the analysis chosen here. This is reflected in the f-structure shown at 7.34.
First, in Fig.7.34, there is a PRED 'Pro' value introduced by whatever predicate has selected the complete DeP, to satisfy the completeness condition. In accordance with anaphoric control (Bresnan, 2001), this null pronoun, is coindexed with the DF 'dongxi' (thing), just as a head noun is co-indexed with a relative pronoun in an English RC (Dalrymple, 2001, pp. 401-402). Also like the English relative pronoun, the noun dongxi ('thing') has a focus DF. The verb 'xiang' (think) is the predicate of a topic, the RC requires a subject and an object, but only the subject is present in its local F-structure. To satisfy the completeness and the
extended coherence conditions (Bresnan, 2001), the empty local object is linked to the DF - focus. The topic DF which is assigned in C-structure to the complete RC is linked to the optional GF adjunct. Adjunct is the only available GF to which this DF can be linked because there is no other constituent coreferent with it, and no other argument GFs are designated by the predicate ‘xiang’.

The anaphoric control of a null pronoun and the coindexed referent are distinctive features of an RC not present in the earlier structures. Compared to Pred.DeP above, the processor in RC must complete two linkages between the topic DF and adjunct GF, and between the focus DF and the object GF. This can explain a higher processing demand in RC relative to Pred.DeP.

The above structural analyses have provided a perspective from which to interpret and explain the emergence order of locative structures as revealed in the previous chapter, and have also provided a basis for the comparison between PT and EFG predictions in the following section.

7.2 Comparison between PT and EFG predictions

The observed emergence orders in Mandarin locative structures as revealed in Chapter 6, and the structural analyses above provide a basis from which we can compare PT and EFG predictions. This comparison will reveal which theory can make a more precise prediction regarding the emergence of Mandarin locative structures. The observed emergence order, along with PT and EFG predictions as proposed in Chapter 3, are shown in Table 7.2.
Table 7.2 above shows the observed order in the first column, based on the combined rank order for Year 1 and 2 learners from the longitudinal study (Table 6.7), PT predictions in the second and EFG predictions in the third. Following the methodology established in Charters (2005), I employed individual ranks to represent individual emergence orders, and then used Kendall’s Tau and Pearson’s R to test the correlation between any two individual orders. As discussed in Chapter 6, Section 6.1, the four individual orders were all significantly correlated. Note here that ranks are the emerged orders themselves. PT’s stages, on the other hand, provide a theoretical foundation for the emerged order among different syntactic structures. Therefore, it could be said that PT’s stages are theoretical, while ranks can be derived from empirical data. Moreover, as also discussed in Chapter 6, both the longitudinal order shown in mean ranks, and the cross-sectional order shown in the implicational
hierarchy are significantly correlated. In fact, the only difference is the earlier emergence order of Pred.DeP in the implicational hierarchy than in mean ranks (see Tables 6.7 and 6.8).

I have chosen the longitudinal emergence order represented in mean ranks, rather than the cross-sectional order, as shown in the implicational hierarchy, because having 8 separate steps, rather than 7, allows more precision in the testing of PT’s and EFG’s predictions.

The observed order firstly supports PT's predictions in that Semantic S (stage 1) emerged earlier than lexical suffixes- Num+suff/DePoss (stage 2), which in turn, emerged earlier than the phrasal structures (stage 3), and SVC and RC (stage 6) emerged last. However, the observed order also shows PT does not predict the different emergence times for different phrasal structures, because they all belong to PT's stage 3. In particular Pred.DeP (stage 3) does not emerge until after a stage 6 structure. Recall that Charters (2005) also observed that this structure emerged just prior to RC, and proposed that it should be allocated to Stage 6 on the basis of its similarity to RC. In addition, PT could not predict the different emergence times for SVC and RC. In PT, SVC and RC are all in stage 6 and accordingly, expected to emerge at the same time. This is clearly not the case in the observed order.

Secondly, the observed order generally confirms EFG's more precise predictions too. As predicted in EFG, Semantic S without GF assignment emerged earlier than NP with an adjunct, which, in turn, emerged earlier than PP and VP with an argument; Non-Pred. DeP with a link between a DF and an adjunct GF emerged earlier than Pred.DeP and RC with a link between a DF and an argument GF, and SVC, Pred.DeP and RC with functional control emerged later than structures without functional control. Nonetheless, EFG like PT, could not predict the later emergence of head-final Pred.NP relative to head-initial VP and PP. Also, while EFG predicts that the adjunct GF will emerge before an argument GF, and that the latter can't emerge before unification is possible, it does not state clearly whether the adjunct
GF will emerge before feature unification for agreement or not. In the observed order, the adjunct GF emerged (in possessive structures) before feature unification for agreement, (NumP) which emerged at the same time as post-head argument (VP and PP). The concurrent emergence of NumP, VP and PP supports EFGs proposal that unification is required in both. In addition, EFG can distinguish the different syntactic processes in SVC, Pred.DeP and RC.

For example, SVC involves a linkage between a complex GF and another complex GF, Pred.DeP and RC involves linkage between a complex GF and DF, as discussed in the previous section, but EFG could not predict a difference in the emergence order between SVC, Pred.DeP and RC. Nonetheless Charters (2005) did suggest that structural complexity, and the number of syntactic relationships, could contribute to processing demands as well as the type of process involved, and Charters (2013) suggested that the effects of complexity may be more obvious in later stages of acquisition, once all the individual processes have been acquired.

Overall, the observed emergence order indicates: (1) structures in a lower stage according to PT emerged earlier than those in a higher stage, as predicted in PT; (2) as predicted by EFG, structures where no GFs were assigned emerged earlier than those with GFs, and structures with only an adjunct GF emerged earlier than those with argument GFs, which, in turn, emerged earlier than structures involving functional control, such as a link between a GF and another GF or a DF; (3) the six stages of PT are less precise than EFG at predicting the emergence order in phrasal structures, as PT cannot predict different emergence points for different phrasal structures; (4) although EFG can identify the different syntactic processes in structures with functional control, it could not distinguish the different emergence order with these structures; (5) the mixed head order of Mandarin, where VP and PP are head initial, but NP is head final, has an impact on structure emergence that is independent of the syntactic processing considered by either PT or EFG.
These indications above suggest that EFG is more precise than PT regarding the emergence of Mandarin locative structures because EFG can identify more discrete emergence points in phrasal structures, although it could not predict the emergence differences in structures with functional control, as discussed above. This comparison informs a discussion of the relationships among GF assignments, feature unification and processing demands to be presented in the following section.

7.3 GF assignments, feature unification and processing demands

From the analyses and comparisons above, the relationships between GF assignments, feature unification and processing demands which directly affect the order of structure emergence can be summarized below.

In general different GF kinds of assignment relate to different processing demands.

Firstly, a simple GF assignment—an adjunct—as in Non-Pred.NP contributes to greater processing demands compared to no GF assignment as in Semantic S, but lower processing demands than a complex assignment to a post-head argument as in VP and PP. A pre-head argument as in Pred.NP certainly emerges later, but it is not clear if this relates to the need to develop a phrasal procedure that differs from the others, or to additional processing demands somehow related to this different word order, as discussed in Section 7.1.

Secondly, when a GF assignment cannot be completed within the local F-structure of a predicate, it creates a higher processing demand compared to cases where it can be completed within the local F-structure. For example, Pred.DePs where the predicate requires an argument which is absent from the local F-structure, emerges later than VPs or PPs where the
argument requirement is satisfied within the local F-structure. Thus the presence of a functional head correlates positively with increased processing demands, because they are associated with grammaticalised DFs which require linkage to GFs as discussed in EFG (Charters, 2013). Thus, DePs with a functional head emerge later than phrases without a functional head, as predicted in EFG.

In a nutshell, correspondence between C and F-structure is less demanding than a lack of correspondence. For instance, RC and Pred.DeP where C-structure and F-structure do not correspond emerges later than structures where C and F-structure corresponds.

Feature unification also affects processing demands as follows:

Firstly, structures with feature unification, such as NumP with COUNT feature unification between numeral and classifier, and CLASS feature unification between a classifier and a noun have greater processing demands than those without feature unification such as NP.

Secondly, when two structures have the same GF assignment, one with feature unification, for agreement, such as Loc.VP, places greater processing demands than one without feature unification for agreement, such as VP.

Thirdly, different types of feature unification tend to not affect processing demands as different types of GF assignments do. For example, COUNT feature unification between numeral and classifier (NumP) emerges at the same time as locative unification (PP) as discussed in third-ranked structures in section 7.1.

Addressing the relationship between GF assignment and feature unification, a simple GF assignment does not involve feature unification, while a complex GF assignment does: the GF assigned in C-structure must be unified with a GF designated by a predicate. In addition, a complex GF may also involve feature unification for agreement. For example, NP with a
simple GF does not have feature unification, VP with a complex GF has unification of the OBJ GF, but not unification for agreement; and PP with a complex GF assignment has unification of the OBJ GF, and locative feature unification for agreement. This extra feature unification in PP makes it more demanding than a simple GF assignment as in NP, as discussed in third-ranked structures in section 7.1. However it does not make it more demanding than VP. This suggests that agreement comes at little or no cost over and above the cost of GF assignment. But this makes it more difficult to account for the relatively late emergence of the locative VP. This could be a technique issue caused by the elicitation tasks, as the elicitation tasks might not have provided sufficient context for learners to produce a locative verb phrase; or it could be caused by an inappropriate comparison. The emergence of Loc.VP can be claimed with the emergence of locative feature unification and complex argument assignment, as shown in PP. Nonetheless, this emergence difference seems to suggest that the acquisition of different GF assignments is different from the acquisition of the combination of them. In addition, feature unification can occur without GF assignment, such as unification of the count feature between the co-heads Num and Class in NumP.

These different contributions of GF assignments, and feature unification to overall processing demands inform the conclusions of the current study to be discussed in the next chapter.
Chapter 8: Conclusions

This chapter presents the conclusions of the current study. Firstly, section 8.1 answers the three research questions developed in Chapter 1 before section 8.2 posits a detailed natural acquisition order in foreign language acquisition of Mandarin locative structures. Then section 8.3 discusses a one-way relationship between grammatical function assignments and the six stages of PT, and section 8.4 points out the limitations of this study, and suggests possible directions for future research.

8.1 Answering the research questions

To reiterate, the three research questions are as follows:

1. Is there a set emergence order for locative structures in Mandarin FLA?

2. Are the findings from a cross-sectional study and a longitudinal study consistent or contradictory?

3. Assuming consistent results are found, is the emergence order observed in the data analysis the same as that predicted within a PT and an EFG framework?

The first two questions are answered by the main findings of this study as revealed in Chapter 6: an emergence order in FLA of Mandarin locative structures has been identified from both a longitudinal and a cross-sectional perspective, and these two emergence orders are almost identical. With regard to the third research question, as discussed in Chapter 7 (7.2), the results in the current study generally confirm EFG predictions, with three exceptions: the
same emergence order for feature unification (NumP) and argument assignment (VP/PP), the later emergence order of pre-head argument (Pred.NP) than post-head argument (VP and PP), and the different emergence order in structures with functional control (SVC, Pred.DeP and RC); the results also confirm that structures in a higher stage according to PT emerge later than structures in a lower stage, as predicted in PT, but indicate the six stages of PT are less precise than EFG at predicting the emergence order among phrasal structures, as PT cannot predict the different emergence points among phrasal structures. Therefore, EFG proves to be a more precise theory regarding the emergence in Mandarin locative structures, but still cannot account for all the facts. The next section will review the detailed emergence order in locative structures found in the current study.

### 8.2. Detailed emergence order in Mandarin locative structures

A detailed emergence order in Mandarin locative structures is presented in Table 8.1, below, summarizing the results in Chapter 6 and analyses in Chapter 7. For the same reason as given in Table, 7.2, rank is not presented here because it is not relevant to PT’s stages and is employed just for statistic tests. Table 8.1 shows the emerged common structures in the first column, GF assignments associated with each structure in the second and their emergence order based on mean ranks as revealed in Chapter 6, in the third column. This established order can be described as follows:

1. Semantic S and single noun without any GFs emerge earlier than structures with only one adjunct such as Non-Pred.NP.
2. Structures with feature unification (NumP) emerge later than structures with only one adjunct (Non-Pred.NP), but at the same time as structures with post-head argument assignment (VP/PP).
(3) Structures with pre-head argument (Pred.NP) emerges later than post-head assignment (PP and VP), but at the same time as structures with a linkage between DF and adjunct (Non-pred.DeP).

(4) Structures with a linkage between one argument and another (SVC) emerge later than structures with a linkage between DF and adjunct (Non-Pred.DeP), but earlier than those with a linkage between DF and argument (Pred.DeP), which in turn emerge later than structures with two linkages between DF, adjunct and argument (RC).

Table 8.1 Observed emergence of Mandarin locative structures

<table>
<thead>
<tr>
<th>Structures</th>
<th>grammatical function assignments</th>
<th>Emergence Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S/N</td>
<td>No grammatical function assignment</td>
<td>1</td>
</tr>
<tr>
<td>Non-Pred.NP</td>
<td>One-word adjunct</td>
<td>2</td>
</tr>
<tr>
<td>NumP</td>
<td>feature unification</td>
<td>3</td>
</tr>
<tr>
<td>VP/PP</td>
<td>Post-head argument</td>
<td>3</td>
</tr>
<tr>
<td>Pred.NP</td>
<td>Pre-head argument</td>
<td>4</td>
</tr>
<tr>
<td>Non-Pred.DeP</td>
<td>Linkage between DF and adjunct</td>
<td>4</td>
</tr>
<tr>
<td>SVC</td>
<td>Linkage between argument and argument</td>
<td>5</td>
</tr>
<tr>
<td>Pred.DeP</td>
<td>Linkage between DF and argument</td>
<td>6</td>
</tr>
<tr>
<td>RC</td>
<td>Linkage between DF, adjunct and argument</td>
<td>7</td>
</tr>
</tbody>
</table>

The detailed emergence order shown in Table 8.1 generally confirms the acquisition order as predicted by the three phases of EFG, but with also reveals a set acquisition sequence in structures with functional control: SVC, Pred.DeP and RC. This detailed emergence order also indicates the relationship between GF assignments as analysed in EFG and the six stages of PT to be discussed next.
8.3 Relationship between GF assignments and PT’s stages

The relationship between GF assignments in EFG and the six stages of PT can be described as follows: To some extent, knowing what kind of GFs a learner can assign allows us to place them within some of PT's stages. At the same time, knowing the stage a learner has reached in PT's terms, lets us predict, to some extent, what GFs they can assign. However, there is a many-to-many relationship between GFs and stages which makes simple correspondences impossible in some cases.

Charters (2005) argues that advanced proficiency is associated with command of a greater variety of processes, so it is primarily the absence of certain types of GF assignment that can sometimes identify lower stages in PT, and advanced processes can identify the latest stage, but stages in the middle ground cannot be so easily distinguished by reference to GF assignment alone. Structures without GF assignment equate with PT’s stage 1; the GF adjunct is found first in simple phrases involving those lexical morphs but no agreement (e.g. the suffix–ge in Num+suff); such early adjuncts could be seen as marking the transition from stage 2 to stage 3, where agreement becomes possible. Crucially, the OBJ GF begins to be assigned in phrases at stage 3, because this involves unification comparable to that involved in phrasal agreement. But, no further distinctive type of GF assignment clearly marks any progressions between PT's stage 3 and stage 6, where links between a DF and an argument, or between argument GFs are required.

PT suggests that the emergence of inter-phrasal agreement marks arrival at stage 5, just as phrasal agreement marks arrival at stage 3. This implies that unification for agreement is a significant additional burden over and above unification for GF assignment, adjuncts or arguments in phrasal stage 3, and the subject function in stage 5. However, this research suggests that unification for agreement is not more demanding than assignment of an
argument GF, at least, not in phrasal structures. Recall, that PP, which involves agreement with its locative complement, and VP, which does not, emerged together.

We still need then to clarify whether or not the SUBJ GF is harder to process (later to emerge) than complement GFs and whether subject-verb agreement constitutes a significant increase in processing demands beyond SUBJ GF assignment. This is not something that research in Mandarin can readily resolve, because it generally lacks subject-verb agreement.

From the opposite perspective, placing a learner in one of PT's early or late stages should tell us what GFs they can process, and knowing a learner is at stage 4 where S-initial adverbs are in evidence, would indicate that they can at least assign an Adjunct GF (which they could do already at stage 2) and perhaps also a DF at the sentence level, a more advanced process. But knowing they are in stage 3 because they can produce agreement between a head and adjunct in an NP does not allow us readily to predict whether they can also produce agreement between a head and complement, in a PP, or a locative VP, or assign an OBJ GF to a pre-head position.

Therefore, although EFG which emphasizes the impact of GF assignments on Mandarin structure emergence is more precise than PT, as discussed in Chapter 7 (7.2), taking the impacts of stages, defined also in terms of morphological marking, and GF assignments into account seems to be the best solution with regard to the emergence of Mandarin locative structures. Finally, I will offer some suggestions towards future research.

8.4 Future research

As discussed in Chapter 7, PP and Loc.VP belong to the same stage in PT and involve comparable processing according to EFG, both involving complex argument assignment and feature unification for agreement, but Loc.VP emerged later than PP. It would be interesting
to conduct specific research with prepared elicitation tasks on the emergence of phrasal structures for a larger group of learners whose level of proficiency was already established, then instruct them in the use of VP, locative PP and locative VP: Then, using post-tests to see which structures emerged for which students, it could be possible to identify whether or not feature unification for agreement can impact the emergence order among structures with the same argument assignment. If the last two do not have a later emergence order than the first, it would indicate that feature unification is highly unlikely to exert extra processing demands on structures with argument assignment. If the last two do have a relatively later emergence order than the first it would indicate that feature unification does add to processing demands, even when an argument GF is involved. If PP and Locative VP emerge at different times, this would suggest that some other factor, such as frequency, L1 transfer, or markedness of one structure over the other might have as much bearing as issues related to information exchange.

Another direction that may be worth exploring is the emergence order in unification of different features. Due partly to the focus of this study, and partly to the nature of Mandarin, there were only three different features involved in unification for agreement: CLASS, COUNT and LOC, and all emerged together. Little research has been done on the acquisition of specific features and this could prove a fruitful area for future research. In addition, it will be worthwhile to conduct research on first language acquisition of Mandarin locative structures, because this can serve as a point of comparison for the L2 acquisition of these same structures. Also, it will be worthwhile to conduct research on the effect a learner's first language has on the acquisition of locative pred.NPs, which this study has found to be null (as discussed in Chapter 6). In conclusion, a natural acquisition order for Mandarin locative structures has been found using both a longitudinal and a cross-sectional perspective, and the results from each method are almost identical. This established emergence order can now be
applied with some confidence to predict and analyse other aspects of foreign language acquisition in Mandarin beyond locative structures, and can also facilitate classroom instruction, as FLA in Mandarin will be expected to accelerate when the teaching order conforms to the natural emergence order.
Appendix 1: Eight elicitation sets

Set 1

1. Self-introduction

2. Describe two pictures
   First one:
   Please describe the differences between the three pictures.
   Vocabulary list:
   Ball: qiu
   Box: xiangzi

![Three pictures with a ball on a box]

Second one:

Vocabulary list:
学校: xue.xiao school
书店: shu.dian bookshop
公园: gong.yuan park
树: shu tree
山: shan hill, mountain
商店: shang.dian shop
工厂: gong.chang factory
3. Conversation: introduce your favourite place and describe it with details, for instance, shopping centre, park, bar, or any other places.
Set 2

Vocabulary list

Fang.xing: square; Yuan.xing: circle; San.jiao.xing: triangle

1. Describe pictures: please describe the differences between the two pictures

Picture 1

Picture 2
2. Locative games:
   How to play:

Two players share a single picture (cartoon) of a house. Players will take turns choosing
different objects in the house and having the other player guess the object. Players get only 7
chances to guess (more or less, it's up to Li Wei). This game will also work for different
locations (for example, a map of the world...one person has to choose a country, or
state/city/province, while the other person guesses where it is).

Vocabulary list
(1) Zhong.biao: clock
(2) Xiang.zi: box
(3) Shu: books
(4) Tian, hua ban: ceiling
(5) Xiao. xiong: bear
(6) Chuang.hu: window
(7) Chuang: bed
(8) Zhen.tou: pillow
(9) Tai.deng: desk lamp
(10)Zhuo.zi: table
(11)Di.ban: floor
(12) Door: men
(13) Yu.shi: bathroom
(14) Ce.suo: toilet
(15) Shui.long.tou: water tap
(16) Yu.pen: tub
(17) yu.lian: curtain
(18) Bing.xiang: fridge
(19) Chu. fang: Kitchen
(20) Guo. Pot
(21) shou. Tui. che: trolley
(22)Yi. fu: clothes
(23) Bei.zi: shit, cover
(24) Yi. jia: clothes stand
(25) Xie.zi: shoe
(26) Sha.fa: sofa
(27) Yi.zi: chair
(28) yin.xiang: stereo
(29) Ping.zi: bottle
(30) wawa: toys
(31) Qiang: wall

3. Conversation: What do you think about this house? How would you improve it?
Set 3

1. House adventure
   How to play:

This is a drawing game. One player will have a picture of a cross-sectioned house. The other will have a blank piece of paper and a pencil. For five minutes (more or less, it is up to participants), the player with the picture will attempt to describe the house in as much detail as possible, while the other player draws a picture based on the description. The goal is for the drawing player's house to match the original house as much as possible. Only once the time limit is up may the drawing player see the original house. The drawing player may ask questions for clarification and find differences between original one and drawn one.
Vocabulary list

(1) Zhong.biao: clock
(2) Xiang.zi: box
(3) Shu: books
(4) Tian, hua ban: ceiling
(5) Xiao. xiong: bear
(6) Chuang.hu: window
(7) Chuang: bed
(8) Zhen.tou: pillow
(9) Tai.deng: desk lamp

(10) Zhuo.zi: table

(11) Di.ban: floor
(12) Door: men
(13) Yu.shi: bathroom
(14) Ce.suo: toilet
(15) Shui.long.tou: water tap
(16) Yu.pen: tub
(17) yu.lian: curtain
(18) Bing.xiang: fridge
(19) Chu. fang: Kitchen
(20) Guo. Pot
(21) shou. Tui. che: trolley
(22) Yi. fu: clothes
(23) Bei.zi: shit, cover
(24) Yi.jia: clothes stand
(25) Xie.zi: shoe
(26) Sha.fa: sofa
(27) Yi.zi: chair
(28) yin.xiang: stereo
(29) Ping.zi: bottle
(30) wawa: toys
(31) Qiang: wall
(32) Chuang.lian: curtain
(33) Hua: picture
(34) Zhi.wu: plants
(35) Hua.ping: vase
(36) shu. jia: bookshelf
(37) Dian.shi: TV
(38) Bei.zi: cup
(39) shu: tree
(40) Mei.qi.zao: gas cooker
(41) Jing.zi: mirror
(42) Zhuo.zi: table
(43) Xiang.kuang: frame
(44) Lu.zi: stove
(45) Che: car
(46) Xi.yi.ji: washing machine
(47) Kai.guan: switch
(48) Zuo fan: cook
(49) Yuan.zi: yard
(50) Yang.tai: balcony
(51) Yu.jin: bath towel
(52) Diao.deng: pendent lamp

2. Locative games

How to play:

Two players share a single picture of a map. Players will take turns choosing different province in the map and having the other player guess the province according to the other’s description. Players get only 7 chances to guess (more or less, it's up to Li Wei).
3. Conversation: Travel experience
Set 4

House adventure

This is a drawing game. One player will have a picture of a cross-sectioned house. The other will have a blank piece of paper and a pencil. For five minutes (more or less, it is up to participants), the player with the picture will attempt to describe the house in as much detail as possible, while the other player draws a picture based on the description. The goal is for the drawing player's house to match the original house as much as possible. Only once the time limit is up may the drawing player see the original house. The drawing player may ask questions for clarification and find differences between original one and drawn one.
Vocabulary list

(1) Zhong.biao: clock
(2) Xiang.zi: box
(3) Shu: books
(4) Tian, hua ban: ceiling
(5) Xiao. xiong: bear
(6) Chuang.hu: window
(7) Chuang: bed
(8) Zhen.tou: pillow
(9) Tai.deng: desk lamp

(10) Zhuo.zi: table
(11) Di.ban: floor
(12) Door: men
(13) Yu.shi: bathroom
(14) Ce.suo: toilet
(15) Shui.long.tou: water tap
(16) Yu.pen: tub
(17) yu.lian: curtain
(18) Bing.xiang: fridge
(19) Chu. fang: Kitchen
(20) Guo. Pot
(21) shou. Tui. che: trolley
(22) Yi. fu: clothes
(23) Bei.zi: shit, cover
(24) Yi. jia: clothes stand
(25) Xie.zi: shoe
(26) Sha.fa: sofa
(27) Yi.zi: chair
(28) yin.xiang: stereo
(29) Ping.zi: bottle
(30) wawa: toys
(31) Qiang: wall
(32) Chuang.lian: curtain
(33) Hua: picture
(34) Zhi.wu: plants
(35) Hua.ping: vase
(36) shu. jia: bookshelf
(37) Dian.shi: TV
(38) Bei.zi: cup
(39) shu: tree
(40) Mei.qi.zao: gas cooker
(41) Jing.zi: mirror
(42) Zhuo.zi: table
(43) Xiang.kuang: frame
(44) Lu.zi: stove
(45) Che: car
(46) Xi.yi.ji: washing machine
(47) Kai.guan: switch
(48) Zuo fan: cook
(49) Yuan.zi: yard
(50) Yang.tai: balcony
(51) Yu.jin: bath towel
(52) Diao.deng: pendent lamp
Set 5

1. Treasure quest (take turns)
   This can be a “process of elimination” game or according to the description of the keeper, the hunter tries to find the treasure game. Two players share a single dungeon map. One player is the treasure hunter and the other is the dungeon keeper. At the beginning of the game, the dungeon keeper hides five treasures in separate locations in the dungeon. The treasure hunter then explores the dungeon, asking questions about where the treasure could be, or the keeper just give an instruction of how to get to the treasure place and let the hunter tries to find the treasure. The treasure hunter may ask a limited number of questions throughout the entire game.
2. Provide your partner with instructions on how to get to your home from University, and if necessary, you can draw a map for your partner (take turns).
Set 6

1. Describe your bedroom or your house with as much details as you can and let your partner draw your bedroom or house. Then you can check that and find the differences. (take turns)

2. Describe the traditional Chinese classic story of Monkey King according to the pictures. For instance, give great details of each picture.
Set 7

1. Describe the traditional Chinese classic story of Monkey King according to the pictures. For instance, give great details of each picture.
Set 8

Describe the traditional Chinese classic story of Monkey King according to the pictures. For instance, give great details of each picture.
Appendix 2 Sample of transcription

General statement

In appendix 2, I introduce the coding used in the database I have collected, and I hope this introduction proves valuable to future FLA research in Mandarin.

In total, I have 32 recording sessions, 16 sessions from Year 1 participants, 12 sessions from Year 2 participants and four from Year 3 participants. Each recording lasts around two hours, and accordingly, I have more than 1000 pages of transcriptions of 64 hours of talk. Due to the large number of words, I cannot show the whole transcription in an appendix. But because it was a considerable amount of work, I would like to make it accessible to other researchers, if only to save their time and effort.

Below is a complete transcription of the first interview from Year 1 participants C and L, as mentioned in Chapter 5-Methodology. To aid in interpretation of the transcription, here I describe the field markers used.

‘sh v3.0 400 Text’ is generated by Toolbox identifying each complete piece of transcription showing at the very top of each transcription; ‘\id AK 2011-S11, \ref, \tx, \mb, \ps, \ge, \ft, \sp and \idx’ were introduced in Chapter 5 (5.4). ‘St1’ stands for ‘structure type 1’ which is the smallest structure identified in an utterance in the target language; ‘St2’ is a larger structure including ‘St1’. For example, in the first speech, ‘St1’ is a locative bound root (LBR) and ‘St2’ is a locative NP which is larger structure including ‘St1’ LBR. Note here that these analyses are not analysed in terms of inter-language, thus, one needs to reanalyse the speech carefully to clarify what these stand for in inter-language.
Ball is in box.

Ball and box.

Box ball in box.
Ball is on box.

L1

ball and box

Ball is on box.

C1

ball and box

Ball is on box.
Box is on box

Ball and box

shang

li, qiu li xiangzi, second one

in ball in box

ge in ball in box

Ball is in box.

Ball is in box.

so it is the ball on top of the box

yes xiangzi, xiangzi
Do you want to go first?

no, you can.

for the first one qiu li xiangzi For the second one, qiu

for the third one, xiangzi shang qiu

ball in box ball on box box on ball

Ball is in box. Ball is on box. Ball is on box.

qiu li xiangzi qiu shang xiangzi and then the third one

qiuli xiangzi qiu shang xiangzi
Ball is in box. Ball is on box. Ball is on box.

This is one map, ok it is the school, they are looking at the map.

How do you say the first?

How do you say the first picture?
You can say [di yizhang di tu]

School is on north.

No have school

The second map does not have school.
The first map has school. It is on north.

The second map has school. What does not have?
Second map also have school school east

The second map has school. It is on east.

The differences on map

What is the tone of dong (east)

Very very good, you are practicing Chinese.

Do we need shi there

This school is north.
How do you say the school is north?

C1

The differences on map

I2 sorry I cannot you right now, after this record I will tell you, just say what you want.

AK 2011-S11.034

the second one I will say, di er zhang di tu ye you xuexiao, xuexiao dongbian.

AK 2011-S11.035

The second one also has school, the school is east

C1

The differences on map

AK 2011-S11.036

di yi zhang di tu you shangdian dongbian ye di erzhang ditu, this is not a bookshop.

mb di yi zhang di tu you shangdian dongbian ye di erzhang ditu this

Ord. Num CL Ord. N V_funct_t NP PLN D.Loc Conj Ord. second CL N

gge Ord. one CL Ord picture have shop east side also Ord Num CL map

gme First map have shop east Also second map

mps NP V PLN D.Loc Adv NP

ft The first map has a shop, it is on north. Also the second map

L1

the differences on map

I2 just a shop

AK 2011-S11.037

di er zhang di tu, ye you shangdian, shangdian shi beibian, beibian
The first map has a shop. Shop is on north.

Second map has a building beside water.
The second map has a building. Next to the building is water.

The differences on map

The first map has one mountain, the second map has two mountains. The first map is small and the second is big.

The first map is in the west and the second is in the south.
I keep going, very very good, both of you

How to say only again?

The differences on map

zhì yǒu (third tone)

di ěr zhàng dì tú yǒu èr, liáng ge

shan, kēyì, kēshí, dì yī zhàng dì tú

you zúi, dì yī zhàng dì tú, zhì yǒu yī ge

shan, kēyì, kēshí, dì yī zhàng dì tú

shan.

zhì yǒu

shan.

shan.
The second map has two mountains. The first map only has one mountain.

Do I need classifier when I talking about two shop? What is the classifier for shop?

For general probably ge

di yizhang ditu you er ge shangdian, di erzhang ditu ye you er ge shangdian o... this is (x)

di yizhang ditu you er ge shangdian di erzhang ditu ye you er ge shangdian o

di yizhang ditu you er ge shangdian di erzhang ditu ye you er ge shangdian o

First map have two CL shop second map also have two CL shop

The first map only has two shops. The second map also has two shops.
The first map has small factory. The second map has big factory.
The second map looks beautiful. The first map does not look beautiful.
ah… gongyuan park yes sorry can I say is that street?

di yu zhang di tu mei you gongyuan, oh yeath, you gongyuan dongbian, shi dongbian um, di erzhang ditu you gongyuan, how to say center or middle?

The first map does not have park. The park is in east. The second map has park.

so yes, di er zhang di tu you gongyuan shi zhongjian.

The second map has park, it is in the middle.
The factory on first map is in south. The factory on second map is in north.

I do not it is location, translate his sentence to L

The factory on first map is in south. The factory on second map is in north.
The factory on first map is small.

The factory on second map is big. Big street, small street.

I think it is enough.
the differences on map it is good.

How do you say favourite

you can have conversation

ni xihuan shenme?

wo xihuan gongyuan, au..., wo xihuan wo xihuan kan shu, ye kan shui, au....

I like park I like watching tree and water.

ni xihuan shenme?

What is the because

Like I that because
I do not like factory, it is very busy.

I love bookshop because I love watching books.

Oh, it is great, you love reading.
\text{do you want me to say that again, we already say th\text{a}}
Appendix 3-Individual emergence table

Note: the emergence of common structures is in bold. '+' means a structure has reached the emergence criterion. (+) means it just reached the emergence criterion (occurred twice).

**Learner C**

<table>
<thead>
<tr>
<th>Structure</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>C8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S (No grammatical function)/ NP/Numsuff/DePoss</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pred.NP</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Loc.VP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>

**Learner L**

<table>
<thead>
<tr>
<th>Structure</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
<th>L6</th>
<th>L7</th>
<th>L8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S (no grammatical function)</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NumSuff/DePoss / *PP/ NP/PP (one word Adjunct)</td>
<td>-</td>
<td>(+)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>NumP/ PP/ Pred.NP/ DeP/ Pred.DeP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>
### Learner B

<table>
<thead>
<tr>
<th>Structure</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
<th>B4</th>
<th>B5</th>
<th>B6</th>
<th>B7</th>
<th>B8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S (no grammatical function)</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NP (one word adjunct)</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>DePoss/Numsuff</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Loc.VP/ Non-pred.DeP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>NumP/ Pred.NP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

### Learner K

<table>
<thead>
<tr>
<th>Structure</th>
<th>K1</th>
<th>K2</th>
<th>K3</th>
<th>K4</th>
<th>K5</th>
<th>K6</th>
<th>K7</th>
<th>K8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semantic S (No grammatical function)</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>DePoss/Numsuff</td>
<td>-</td>
<td></td>
<td>(+)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>NP (one word adjunct)</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Conj.P/ Loc.VP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>NumP/ Pred.NP/ PP/ AdjP/ Non-pred. DeP</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

### Learner T

<table>
<thead>
<tr>
<th>Structure</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
<th>T7</th>
<th>T8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>AdjP/ NumP/ VP/ DP/ Loc.DP/ S (one verb) /RC/ SVC /Non-Pred.DeP/ Pred.DeP/ *PP/Non-Pred.NP/Loc.VP</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Scomp</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>
### Learner LS

<table>
<thead>
<tr>
<th>structure</th>
<th>LS1</th>
<th>LS2</th>
<th>LS3</th>
<th>LS4</th>
<th>LS5</th>
<th>LS6</th>
<th>LS7</th>
<th>LS8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>NumP/VP/PP/Non-pred.DeP/SVC/RC/DP/Loc.DP/Non-pred.NP/Pred.DeP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pred.NP/AdjP/Loc.VP/*PP/</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Scomp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

### Learner LA

<table>
<thead>
<tr>
<th>Structure</th>
<th>LA1</th>
<th>LA2</th>
<th>LA3</th>
<th>LA4</th>
<th>LA5</th>
<th>LA6</th>
<th>LA7</th>
<th>LA8</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>AdjP/Non-Pred. NP/Loc.VP/S (one verb)/PP/VP/*S/SVC/</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Scomp/ Pred.DeP/Pred.NP/NumP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>RC</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Learner M

<table>
<thead>
<tr>
<th>structure</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
<th>M4</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>AdjP/PP/non-pred.NP/NumP/Loc.DP/Conj.P/S (one word)/*S/SVC/*PP/Loc.VP/*VP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Pred.DeP</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

### Learner S

<table>
<thead>
<tr>
<th>structure</th>
<th>S1</th>
<th>S2</th>
<th>S3</th>
<th>S4</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Pred.DeP/PP/Loc.VP/S (one verb)/SVC/Pred.NP/NumP/Loc.DP/Pred.DeP/Scomp/RC/*S/*PP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Appendix 4: Questionnaire

General statement:
The four Year 1 participants were all English native speakers. Participant C studied Spanish, while L spoke Japanese fluently and B spoke Korean. Two of the Year 2 participants, M and T, were English native speakers. LA was Vietnamese and LS was Korean, but they spoke fluent English. The two Year 3 participants were native Korean speakers and also spoke fluent English. Other than classroom instruction, they did not have any other exposure to Mandarin.

1. How many languages can you speak fluently? Please list.

2. What language did you speak every day before the age of 5?

3. What language do you speak most at home?

4. What exposure to Mandarin have you had before?

5. What Chinese classes are you enrolled in for semester 1, 2011? Chinese 100, 200, 300?
   (Please circle your choice)
6. What Chinese classes do you plan to attend in future?

Semester 2, 2011: Chinese 101, 201, 301? (Please circle your choice) Semester 1, 2012:
Chinese 200 and 300? (Please circle your choice).

7. Other than formal classroom instruction, what other opportunities do you have to use
Mandarin? For instance, language practice with native speakers, Mandarin TV, movies, radio
and so on?

After interview small questions How many hours would you say you spent learning Mandarin
in the last two weeks?

<table>
<thead>
<tr>
<th></th>
<th>each week</th>
<th>total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class hours</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extra hours</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5: Data

For reference, I have included the Toolbox data output as a CD, which can be found inside the back cover of this dissertation.
References


192


