1. Introduction

This paper explores relationships between the Mandarin locative structure shown in (1) and a similar construction shown in (2), which Li and Thompson (1981) call the associative phrase.

(1) nà liàng chē dē mǐnian
that classifier car dē inside
Inside the car

(2) nà zhī gòu dē gūtōu
that classifier dog dē bone
The dog’s bone

The paper is organized into four main parts: the first part considers evidence from constituent order and thematic structure which suggests that locative structures like those in (1) are simply a semantic subset of the associative phrase; the second part considers evidence from structural variation and from Mandarin Second Language Acquisition (MSL) which suggests significant differences between the two. This raises the question: do these differences relate to constituent-structure (c-structure) differences or to something else?

The third part of the paper presents evidence against two different c-structures that have been suggested for associative phrases (Li and Thompson, 1981; Simpson, 2001) and proposes a simple alternative that is consistent with recent thinking about nominal structures as functional projections (DPs) rather than lexical projections (NPs) (Szabolcsi, 1983; Abney, 1987; Cinque, 1994; Longobardi, 2001). Finally, the fourth part accounts for differences between the structures in terms of processing demands that arise at the functional level rather than the c-structural level. Relevant theory from Lexical Functional Grammar (LFG; Bresnan, 1982; 2001) and from Processability Theory (Pienemann, 1998) will be introduced as required.

2. Locative de structures: a sub-type of associative phrase

Li and Thompson (1981) define the associative phrase as a structure where two nouns are separated by the particle de. For convenience the first noun is often referred to as NP1 and the second as NP2. Each NP can be of various semantic types as long as some plausible semantic relationship can be construed between the two. Accordingly, the structures

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1 Thanks to Elaine Ballard, Jenefer Philp, Donna Starks, members of the Auckland University Women’s Writing Group, and the anonymous reviewer for feedback on drafts of this paper that greatly improved it. All errors are my own responsibility.
express a range of relationships, as illustrated in (3) below. (The associative structure is in bold-face; and pending further discussion, the particle de is glossed simply as DE.

(3) a. tāmen liǎngr de bàbà hěn hàowánr
   3pl two DE father very good-play
   The father of those two is amusing
   The father(s) those two saw / drew / portrayed etc. is / are amusing

b. wōmen liǎngr de guójìa hěn xiǎo
   1pl two DE country very small
   Our country is small (Lit: the country of the two of us is small)
   The country we two drew / have to visit /saw a cut-out of etc. is small

c. [nàzhī gǒu] de gǔtou hěn chòu
   that class dog DE bone very smelly
   The dog’s bone stinks
   The bone from / given to / found by the dog stinks

d. [[zǐ zhǒng] de mùtóu] de zhuōzǐ
   self grow DE wood DE table
   The table made of wood we grew ourselves
   The table for the wood we grew ourselves (after Zhang, 2001)

e. [yèwān] de tiānkǒng
   night DE sky
   The night sky   (Li and Thompson, 1981: 115).

f. [liǎng zhǒng kēxué] de fāzhǎn
   two kind science DE development
   The development of two kinds of science (from Li & Thompson, 1981: 114).

The structures at (3a) thru (3c) are typically labelled possessive, but have alternative interpretations, as shown. The structures at (3d) and (3e) have no possessive interpretation: in (3d) the table is not a possession of the wood, and in (3e) the night does not possess the sky; NP1 simply indicates some attribute associated with NP2. The example at (3f) is rather different: NP2, fāzhǎn ‘development’ is a predicate, and NP1, liǎng zhǒng kēxué ‘two kinds of science’, is its semantic argument, specifically an undergoer. It is because the structure can express such a range of semantic associations between NP1 and NP2 that Li and Thompson (1981) call the structures in (3) ‘associative phrases’.

In the framework of LFG, the fixed interpretation of (3f) indicates that the lexical structure of the predicate fāzhǎn ‘develop’ includes a grammatical function (GF), such as Object, to which the semantic role of undergoer is mapped, and this GF has been assigned to NP1. On the other hand, the vagueness of the semantic associations expressed in (3a-e) indicates that there is no particular semantic role and therefore no particular GF originating with DE or with NP2 in those structures; the various possible interpretations derive from pragmatic knowledge of the world, not from lexically encoded GFs to which semantic roles are
mapped. According to this theory then, there is an important thematic difference between the associative phrases at (3a-e) and that at (3f).

The locative structures at (4) look much like those at (3) except that DE is followed by what Li and Thompson (1981) call locative particles.

(4) a. nà liàng chē de lǐmian
that classifier car DE inside
In that car

b. nà tiáo lù de nánbian
that classifier road DE South
South of that road

Thematically these locative structures pattern with (3f); the initial NP has a consistent interpretation related to the meaning of the locative noun: that of a spatial domain or locus. So, in (4a) the phrase nà liàng chē ‘that car’, denotes what someone or something is inside of, and in (4b) nà tiáo lù ‘that road’ denotes what someone or something is to the south of. In short, the locus has the characteristics of an argument, and the locative has those of a GF-assigning predicate.

However, Li and Thompson (1981) include no locative examples in their discussion of associative phrases. Moreover, when they do discuss locative structures they refer to the locative predicates as ‘particles’. This could be taken to indicate that locative predicates are not nouns, and so that locative structures like those at (4) do not belong to the class of associative phrase.

Nonetheless, Li and Cheng (1982) have shown that locative ‘particles’ are in fact nouns. Some diagnostics for identifying nouns in Mandarin include the fact that certain nouns can be quantified without classifiers, while quantified verbs must be accompanied by a verbal classifier, such as, ī ‘time’. Other word classes in Mandarin are not generally quantified at all. Conversely, verbs (including copulas and ‘co-verbs’)2 can be negated by the negator bù, and can function as a minimal sentence, but nouns cannot. Locatives behave like nouns in all respects as illustrated in (5) - (7) below.

(5) a. zhè liǎng biān dōu yìyàng hǎo
this two side all same good
The two sides are equally good

b. zhè liǎng tiān dōu yìyàng hǎo
this two day all same good
The two days are equally good

c. *zhè liǎng qù zhōngguó dōu yìyàng hǎo
this two go China all same good

2 Li and Thompson (1981) characterize co-verbs as lexemes that function sometimes as main verbs, but sometimes introduce obliques the way English prepositions do, however, Ross (1991) argues that Mandarin ‘co-verbs’ are simply a sub-class of verb and there is no evidence for a separate class of co-verb or of preposition.
d. zhe liang cì qù zhōngguó dòu yíyàng hǎo
   this two time go China all same good
   These two trips to China (lit: two times going to China) were equally good

(6) a. tā shì bù shì lǎoshi
   3sg COP NEG COP teacher
   Is she or is she not a teacher?

b. bù shì
   Neg COP
   (She) is not

c. *bù lǎoshi
   NEG teacher
   * Not a teacher

(7) a. tā zài bù zài zhè.bian
   3sg at NEG at this side
   Is she or is she not present (lit: at this side)?

b. bù zài
   Neg at
   Not present

c. *bù zhè.bian
   NEG this side

(5a) shows the locative biàn ‘side’ quantified without a classifier; (5b) shows the same construction with a common noun tiān ‘day’; (5c) shows an ungrammatical attempt to quantify the verb qù ‘go’ in this way, and (5d) exemplifies grammatical quantification of that verb using the verbal classifier cì ; (6a) shows a well-formed question involving a negated copula, shì followed by the common noun lǎoshi ‘teacher’, and (6b) shows that the copula shì can be negated with bù and function without further support as the answer to the question at (6a); (6c) shows that the noun lǎoshi cannot answer the question or be negated by bù. (7) demonstrates the same contrast with the ‘co-verb’ zài ‘be present’ and a locative noun zhè.bian ‘this side’.

Clearly locative ‘particles’ behave like nouns, and not like verbs. This means the locative structures at (4) clearly fit Li and Thompson’s (1981) definition of associative phrases.

3. Locative structures: not like other associative phrases

Despite the surface similarities between locative and associative structures generally, and the thematic similarities between locative structures and associative phrases like (3f) in particular, there is other evidence that points to significant differences between the constructions.
3.1 Structural variations: the omissability of de

Li and Thompson (1981) call structures like those at (8) and (9) below ‘locative phrases’. The locative phrases in (8) are identical to the locative structures in (4) except the particle de is absent; the locative noun follows immediately after its locus argument. This shows that locative structures that include de are not dependent on that particle. The structures at (9) show bound variants of locative nouns, and (9c) and (9d) demonstrate that these bound forms cannot combine with de at all.

(8) a. nà liàng chē límian
    that classifier car inside
    Inside that car

  b. nà tiáo lù nánbian
    that Class road south
    South of that road

(9) a. chē hū yǒu hěn duō dōngxi
    car in have adv many thing
    In the car are many things

  b. lù nán yǒu hěn duō dōngxi
    road south have adv many thing
    South of that road are many things

  c. *chē de hū yǒu hěn duō dōngxi
    car DE in have adv many thing

  d. *lù de nán yǒu hěn duō dōngxi
    road DE south have adv many thing

While the comparison of (4) and (8) suggests that de is simply optional, the evidence of (9) suggests that the basic locative phrase has no structural position in which de can be placed. In other words, the adjacency of a locative noun and its argument is indicative of the basic structural relationship between the two. Thus, when a locative noun collocates with de its argument is actually displaced from its more basic position immediately adjacent to the locative predicate to a more distant position preceding de. For prosodically free locative nouns the use or omission of de appears to be entirely optional (but see Hale and Keyser (2002) for a discussion of lexical, morphological and thematic factors that might contribute to such variations).

In contrast to locative structures, other associative phrases appear to depend crucially on the presence of de. The examples at (10) – (12) repeat the associative phrases at (3) above, omitting de, with the result that each is either unacceptable or has a significantly changed meaning. These changes indicate that a string of words that functions as NP1 in a non-locative associative structure cannot be construed as a single phrase when de is omitted.
(10) a. \*Lisi bàba
   Name father

b. wǒ māmā bàba
   1sg mother father
   My [mother and father]
   NOT: [My mother’s] father

(11) ?zījī zhōng de mùtóu zhuōzi
   self grow DE wood table
   ?The wooden table we grew ourselves

(12) *tā xuéxi liǎng zhōng kēxué fāzhǎn
   3sg study two kind science development
   She studies two kinds of [scientific development]
   NOT: She studies the development of [two kinds of science]

In (10a), we see that a name cannot immediately precede a kin-term and in (10b) a pronoun and the first of two kin-terms cannot be interpreted as a complex, phrasal possessor ‘my mother’ as they could in isolation. Instead, the two kin-terms must be understood as a kind of compound ‘mother -father’ meaning ‘parents’, with a simple possessor ‘my’. In (11) the string zījī zhōng de mútóu cannot be construed as a phrasal modifier ‘wood we grew ourselves’ instead the two nouns, mútóu zhuōzi must be construed as a single compound noun, ‘wooden table’, modified by the RC ‘that we grew ourselves’, resulting in an absurd interpretation. In (12) we see that even the predicate noun fāzhǎn ‘development’ cannot tolerate a phrasal sister: where the structure with de at (3f) above meant ‘the development of two kinds of science’, (12) can only mean ‘two kinds of scientific development’. The quantifier ‘two kinds’ and the noun ‘science’ cannot form a single constituent in this context. This suggests there is generally no phrasal position immediately preceding a noun in Mandarin. For most associative phrases then, there is no counterpart that lacks de comparable to the locative phrase.

In other words, not only is de's contribution is vital to the construction of an associative phrase, it is clearly neither a semantic nor a thematic contribution that de makes; it is a structural one: de clearly licenses the position into which a modifying phrase can be inserted.
3.2 Acquisition order in MSL
Evidence from the SLA of Mandarin also points to significant differences between locative structures and other associative phrases. In two independent longitudinal studies of adults learning Mandarin\(^3\) (Charters, 2005\(^4\); Zhang, 2001\(^5\)), the emergence order for a selection of nominal structures was found to be very stable. This is shown in Tables 1. and 2. below.

<table>
<thead>
<tr>
<th>Weeks elapsed</th>
<th>Kazuko</th>
<th>Sam</th>
<th>Hannah</th>
</tr>
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<tr>
<td>6</td>
<td>Compound N</td>
<td>Affine structure</td>
<td>Compound N</td>
</tr>
<tr>
<td></td>
<td>Num-Class-N</td>
<td>Associative DE</td>
<td>Affine structure</td>
</tr>
<tr>
<td></td>
<td>Adj(^6)-N</td>
<td>Associative DE</td>
<td>Num-Class-N</td>
</tr>
<tr>
<td>8</td>
<td>Associative DE</td>
<td>Compund N</td>
<td>Associative DE</td>
</tr>
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<td></td>
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<tr>
<td></td>
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<td>Adj-N</td>
<td>Assocaitive DE</td>
</tr>
<tr>
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</tr>
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<td>14</td>
<td>Adjecitival DE N</td>
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<td></td>
<td>Locative phrase</td>
<td>Assocaitive DE</td>
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<td>Assocaitive DE</td>
<td>Assocaitive DE</td>
</tr>
<tr>
<td>21</td>
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<td>Dem.-Class-N</td>
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</tr>
<tr>
<td>24</td>
<td>Locative DE</td>
<td>Locative DE</td>
<td>Locative phrase</td>
</tr>
</tbody>
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<table>
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<tr>
<th>Weeks elapsed</th>
<th>Sharon</th>
<th>Kate</th>
<th>Dave</th>
</tr>
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<tbody>
<tr>
<td>5</td>
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<td>Compound N</td>
<td>Compound N</td>
</tr>
<tr>
<td></td>
<td>Affine structure</td>
<td>Affine structure</td>
<td>Num-Class-N</td>
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<td>Assocaitive DE</td>
<td>Adj-N</td>
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<td>Num-Class-N</td>
<td>Num-Class-N</td>
</tr>
<tr>
<td></td>
<td>Adj-N</td>
<td>Adj-N</td>
<td>Assocaitive DE</td>
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<td>12-13</td>
<td>intensive instruction (locatives and relative clauses)</td>
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<tr>
<td></td>
<td>Locative phrase</td>
<td>Locative DE</td>
<td>Locative phrase</td>
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<tr>
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<td>Locative phrase</td>
<td>Locative DE</td>
<td>Locative phrase</td>
</tr>
<tr>
<td>16</td>
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<td>Dem.-Class-N</td>
<td>Dem.-Class-N</td>
</tr>
<tr>
<td>23</td>
<td>Adjecitival DE</td>
<td>Locative phrase</td>
<td>Locative phrase</td>
</tr>
<tr>
<td>29</td>
<td>Adjecitival DE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^3\) Each study involved three learners aged 18- 25 with no prior knowledge of Chinese. Their L1s were English, Japanese, and Korean; their speech was elicited in structured interviews and games, and was unrehearsed. Observation spanned the first 30 weeks of study.

\(^4\) This work was supported in part by grant number A04/xxxxx/26190/F3418155 from the Auckland University Staff Research Fund.

\(^5\) Based on Zhang’s tables (2001: p112f). To allow comparison of the findings from the two studies, Zhang’s data was re-classified into locative and non-locative associative structures according to the criteria used in the Auckland study. Structures with locative NP1 were included in the non-locative category.

\(^6\) ‘Adj’ refers to stative intransitive predicates that precede N.
In Tables 1 and 2, associative and locative structures are shown in bold. Associative \textit{DE} refers to associative structures where NP2 was not a locative noun; locative \textit{DE} refers to associative structures where NP2 was locative, and locative phrases are the locative structures without \textit{de}. The learners are represented by pseudonyms.

All six learners in the two studies used non-locative structures frequently in their unrehearsed speech for 3-4 months before they first produced\(^7\) locative structures. Moreover, in five out of six cases, locative phrases (without \textit{DE}) emerged earlier than or alongside locative \textit{DE} structures. Moreover, in both studies, locative nouns were the only predicate nouns used in associative structures during the whole of the 30-week observation period.

We can draw a number of conclusions from these findings about differences between locative and other associative structures. Firstly, the use of an emergence criterion\(^8\) indicates that the locative structures pose greater processing demands than other associative structures: the premise is that locative structures are later to emerge because they remain beyond the total processing capacity of learners who can already produce other associative phrases. Secondly, the fact that locative structures were the only associative phrases that included predicates indicates that it is most likely the difference between argument-predicate structures and modifier-modified structures that contributes to the increased processing demands.

In short, while constituent order points to structural similarities between locative \textit{DE} structures and other associative structures, structural alternatives and MSL data point to significant derivational differences between them. This raises the question of how we should relate derivational processes of syntax to constituent structure. The next section considers two past proposals about the c-structure of associative phrases, and then suggests a new alternative analysis that seems to better fit the empirical evidence.

4. The c-structure of the associative phrase

Li and Thompson (1981) suggest that in associative structures, "the first noun phrase together with the particle \textit{DE} is the associative phrase" and it is the sister of the noun it modifies (1981:113). This is shown in Figure 1.

\begin{figure}[h]
\centering
\begin{tikzpicture}
  \node (n1) {NP};
  \node (n2) [below of=n1] {\textit{gǔtóu}};
  \node (n3) [left of=n2] {\textit{dog}};
  \node (n4) [right of=n2] {\textit{bone}};
  \node (n5) [below of=n3, yshift=-0.5cm] {NP};
  \node (n6) [below of=n5, yshift=-0.5cm] {\textit{de}};
  \node (n7) [left of=n6, xshift=-0.5cm] {NP};
  \node (n8) [right of=n7, xshift=0.5cm, yshift=0.5cm] {Associative phrase};
  \node (n9) [right of=n7, xshift=0.5cm, yshift=-0.5cm] {Noun};

  \draw (n1) -- (n2);
  \draw (n2) -- (n3) node [midway, above] {\textit{gǔtóu}};
  \draw (n2) -- (n4) node [midway, below] {\textit{bone}};
  \draw (n3) -- (n6);
  \draw (n6) -- (n7);
  \draw (n7) -- (n8);
  \draw (n7) -- (n9);

\end{tikzpicture}
\caption{Associative Phrase (after Li and Thompson, 1981:126)}
\end{figure}

\(^7\) The criterion for emergence of a structure in a learner's speech is the production of two different tokens of its type within a single sample. This is the standard criterion employed in studies of processability (Pienemann, 1998).

\(^8\) See note 7.
The main evidence against this analysis comes from the constraints on the interpretation of strings immediately preceding nouns as discussed under (10-12) above. These show that most Mandarin nouns do not tolerate an adjacent phrase of any kind. This means de cannot be plausibly viewed as forming a phrase with NP1, which is then the sister of NP2, as Li and Thompson (1981) suggest.

In a rather different approach, Simpson (2001), following Kayne (1994), suggests that associative structures are derived by extraction from relative clause-like structures with an embedded CP as shown in (13) and in Figure 2 below.

(13) $\left[ DP \left[ IP \w_0 \emptyset \ t_jk \ de \ CP \left[ sh\_j \ e \ t_k \right]\right]\right.$
$\left. DP \left[ IP \ 1sg \ have \ t_jk \ DE \ CP \left[ book_j \ e \ t_k \right]\right]\right]$

![Figure 2](image-url) Relative Clause with covert predicate (after Simpson, 2001)

In this derivation, the particle de is the functional head of DP and selects a CP complement with an empty head, ‘e’. That CP contains an IP ($IP_k$) which in turn contains a covert possessive predicate (‘∅’). This predicate assigns possessor and possessed roles to NP1 wǒ ‘1sg’ and NP2 shū ‘book’ respectively. Then NP2 is extracted to Spec, CP, and $IP_k$ is extracted to Spec, DP. Thus NP2 is a specifier stranded after movement of the IP whence it came. To explain why it is the more distant IP that moves to Spec, DP rather than the closer NP2, Simpson argues that de is subject to a categorial selection constraint: it can only attract and attach to an IP.

Evidence against this analysis comes from the fact that the relationship expressed in associative structures is not always a possessive one, as discussed above. Moreover, even when it is potentially possessive, there is clear evidence that a covert predicate is not involved. The overt possessive predicate yǒu ‘have’ lexically selects the negator méi (14a), but neither this negator nor the more usual verbal negator bù can be used in associative structures (14b).

(14) a. wǒ méi yǒu de shū  
1sg NEG have de book  
The book(s) that I don’t have

b. *wǒ méi /bù  de shū  
1sg NEG / NEG de book
This indicates that even the semantically possessive de structure does not contain the VP or IP structure that hosts verbal negation in Mandarin.

Furthermore, Simpson’s extraction analysis is clearly excluded for the argument-predicate structure at (15b) below. As discussed above, the string liǎng zhōng kèxué in (15a) cannot be interpreted as a single constituent; it is kèxué fāzhǎn that forms the constituent here. This means even if (15a) were a legitimate underlying structure with the string liǎng zhōng kèxué fāzhǎn contained within the complement of de, the sub-string liǎng zhōng kèxué could not be extracted out of it to derive (15b).

(15) a. tā xuéxi[DP de liǎng zhōng kèxué fāzhǎn] 3sg study de two kinds science development  
   b. tā xuéxi liǎngzhōng kèxué de fāzhǎn 3sg study two kinds science de development  
      She studies [the development of [two kinds of science]]

To further complicate matters, locative structures like (16), which might plausibly be derived by extraction, cannot be accommodated in Simpson’s analysis either, because they do not pattern like relative clause structures in terms of predicate - argument order. As we have seen above, NP2 fīmian ‘inside’ is clearly a predicate in (16a) and (b); moreover, the string nà liǎng chē ‘that car’ in (16b) can be construed as a phrase. However, the obvious derivation, where that constituent is extracted out of a complement like (16b) to become the specifier of de, is excluded in Simpson’s analysis by his proposal that de can only attract and attach to IP.

(16) a. nà liǎng chē fīmian  
      that classifier car inside   
      Inside that car  
   b. nà liǎng chē de fīmian  
      that classifier car de inside  
      Inside of that car

Effectively this evidence all goes against the notion that the modifier in associative structures is an IP which in turn undermines the claim that they are basically relative clauses that include a CP.

It appears then, that the simplest analysis of Mandarin associative structures is one where de heads a functional phrase, potentially DP, that selects a nominal complement on the one hand, and a nominal specifier on the other. In other words, associative structures can be defined by the rules at (17) and have the constituent structure shown in Figure 3. Since locative predicates can select an argument without support from de, locative phrases must have the structure shown in Figure 4.

(17) deP => NP de'  
    de' => de NP
We can now consider the implications of these c-structures for the processing of locative and other associative structures, and hence for their emergence order in MSL. To do so, we must first review some theory that links emergence order to the processing demands associated with GF assignment.

5. Functional structures, GF assignments and processing demands

Pienemann (1998) argues that emergence orders in SLA reflect cognitive processing demands associated with the storage and transfer of syntactic information as structures are built. The longer information must be stored, the more taxing the structure is for the learner’s processing system.

As we have seen, the processing demands that differentiate locative structures from other associative phrases seem to be associated with the assignment of GFs and thematic roles. In LFG, GF assignment entails the transfer of information between different sources: semantic information encoded in argument structure (a-structure), lexical features that contribute to functional structure (f-structure), and features specified in c-structure.

More specifically, a predicate’s thematic roles, which are part of argument structure, are mapped to abstract feature labels called GFs. These are stored as features in the lexical entry of each predicate. F-structures are mapped to c-structures in accordance with c-structure rules. Among other things, these determine the locations in which a GF can be assigned. GF assignment is implemented in c-structure by adding a specific GF feature to any constituent inserted in a specific c-structural position. The procedural knowledge of the position at which a given GF is assigned is represented in c-structure rules and diagrams by the symbol: ↑GF = ↓ at the relevant position. For example, in locative phrases the initial NP bears a locus role associated with a GF we can call Ncomp. Annotated for GF assignment, the c-structure rule for the locative phrase would therefore be as at (18):
A Completeness Condition requires that each GF in the lexical structure of a predicate be assigned to a functional constituent. Conversely, a Coherence Condition requires that each GF assigned in c-structure must be licensed by the presence of a corresponding GF feature. If there is no predicate available, a constituent must be linked to the Adjunct GF, which is held to be generally available in any functional structure. Finally, a Uniqueness condition states that no single feature in the same f-structural constituent may be assigned two different values. This prevents a single GF from being assigned simultaneously to two different c-structural constituents because all lexical heads contain a feature called a PRED feature that represents their semantic content, and two distinct PRED values cannot be unified.

It is these requirements that each structure be both complete and coherent and that each feature be uniquely valued that are the main factors contributing to processing demands in locative structures. They require speakers to implement a syntactic process that stores the Ncomp GF from the lexical structure of a locative predicate and match it to the GF assigned in c-structure, and to verify that the f-structure of the constituent inserted at the Ncomp position contains one and only one PRED value.

Consider how the presence or absence of a predicate affects the processing demands in locative and non-locative associative phrases respectively. In most associative phrases, NP2 is not a predicate. These associative phrases would have the constituent structure illustrated at Figure 5 and the functional structure shown at Figure 6 below.

![Figure 5](image-url) Constituent structure of Associative Phrase:

![Figure 6](image-url) Functional structure of Associative Phrase

More generally this 'NP' can be any nominal constituent, such as the Demonstrative Phrase in e.g. (1).
The outer lines in Figure 6 represent the boundaries of the functional constituent corresponding to the deP wǒde shū ‘my book’ as a whole. The inner lines represent embedded functional constituents, its specifier wǒ ‘1sg’ and its complement shū ‘book’. C-structure rules determine that de’s complement is placed to its right and its specifier to its left. As a functional head, de must have a pronominal PRED value ‘pro’ in order to satisfy completeness with respect to the predicate that selects deP as an argument. However de has no thematic arguments, so its specifier and complement are not associated with lexically licensed GFs, they are each linked to an Adjunct GF (Adj).

The variable semantic interpretations of such structures follow as a matter of course from this functional make-up. Essentially, the adjunct function is licensed by purely conceptual considerations rather than lexical or syntactic ones. Any combination of nouns will be acceptable as long as the speaker/listener can conceive of some pragmatic relationship in which NP1 might function as a restrictive modifier of NP2.

In these associative structures, processing is minimal, and no language-specific knowledge is involved except the basic configurational rules represented at (17) above.

In comparison, the constituent and functional structure of the locative phrase must be as at Figure 7 below. Here the Ncomp GF must be unified. In this case, the NP c-structure rule determines that the NP that bears this GF is realized to the immediate left of N. (Mandarin is well-known as a language that mixes head-final and head-initial phrase structures (Huang, 1982)). In other words, the Ncomp is an immediate constituent of the NP whose head licenses it. This means the GF can be unified as soon as the constituent is inserted in the matrix NP.

![Fig 7 C-structure and F-structure of Locative Phrase](image)

To produce a locative phrase, learners must first acquire language-specific knowledge that the Mandarin locative predicate assigns its GF to an NP on its left, and then develop the procedural knowledge that allows them to retrieve and store the Ncomp GF while an argument is constructed and inserted in the matrix NP, where the Ncomp GF is assigned. Then the stored GF must be checked against the assigned GF to ensure a match and so satisfy coherence. Finally, a PRED value must be located within the constituent to which the GF is assigned to satisfy completeness.

Basically then, the locative phrase is less complex in terms of c-structure than an associative phrase with a non-predicate NP2, but it is more taxing, in terms of processing demands, and it depends upon the acquisition of language-specific knowledge: direction of GF assignment associated with locative predicate’s NCOMP GF, and the lexical category to which that GF is assigned in Mandarin.
An associative structure with a locative predicate as NP2 involves more processing still, because in this case, the locus argument is inserted, not as an immediate constituent of the locative NP, but as an immediate constituent of the larger deP. This late insertion of the argument means the Ncomp GF must be stored while two nominal constituents are constructed and inserted in the matrix deP. Only then can the Ncomp GF be linked to a PRED value. In other words, the unification of the Ncomp GF is delayed until de selects a specifier. Therefore, locative DE structures must have the constituent and functional structure shown at Figure 8.

![Figure 8 C-structure and F-structure of Associative Phrase with locative NP2](image)

Note that the Ncomp GF is not actually assigned to NP1, because, according to the c-structure rules, that GF is assigned only at the complement position in an NP structure, not at the specifier position in a deP structure. This means NP1, the specifier of de must still be associated with an Adjunct GF, as in other associative structures. To satisfy completeness, the Ncomp GF must then be linked to the Adjunct GF. Thus the line representing the unification of the Ncomp GF in Figure 8 goes from the predicate to Ncomp, then to the Adj GF. This structure therefore involves two inter-dependent and delayed unification processes, to satisfy completeness, coherence and uniqueness.

6. Conclusions

To conclude, we've seen that associative structures fall clearly into two sub-types in terms of thematic, pragmatic, and emergence criteria. In one type, a modifier to the left of de restricts the reference of a non-predicate noun to its right; the relationship between the two nouns is pragmatically determined; the processing required to license the NPs is minimal, and the structures are among the first to emerge in Mandarin SLA.

In the second type, a predicate noun to the right of de selects an argument which appears to the left of de; the relationship between the two nouns stems from the semantics of the predicate noun; licensing of the initial NP depends on language-specific procedural knowledge and the storage of grammatical information, and the structures are among the later nominal structures to emerge during the first year of Mandarin SLA.

The observed emergence order relates simply and directly to differences in processing demands associated with the assignment and lexical licensing of a GF, and to delays in this GF assignment that are a consequence of c-structural complexity. However, locative and non-locative associative phrases share a single phrase structure where de is a functional head that selects one phrasal complement and another phrasal specifier.
Further research is still required to explain why *non*-locative nominal predicates in Mandarin cannot assign their GFs in an NP structure the way locative predicates do, to explore how links between argument structure and functional structure impact upon processing demands more generally, and to investigate possible relationships between associative structures and relative clause structures where a *sentential* constituent precedes the particle *de*.

However, the analysis proposed here does provide a unified account of the structural relationships between nouns and the particle *de* in Mandarin locative and associative structures, while still allowing for different syntactic processes to be played out across that single c-structure. Thus it lends support to the idea that functional relationships are somewhat independent of c-structural relationships and equally importantly, it validates attempts to account for emergence orders in SLA in terms of processing demands relating to abstract syntactic relationships. These are the kind of mutually beneficial results we can expect from further investigations into relationships between formal syntactic theory and emergence orders in SLA.

**References**

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